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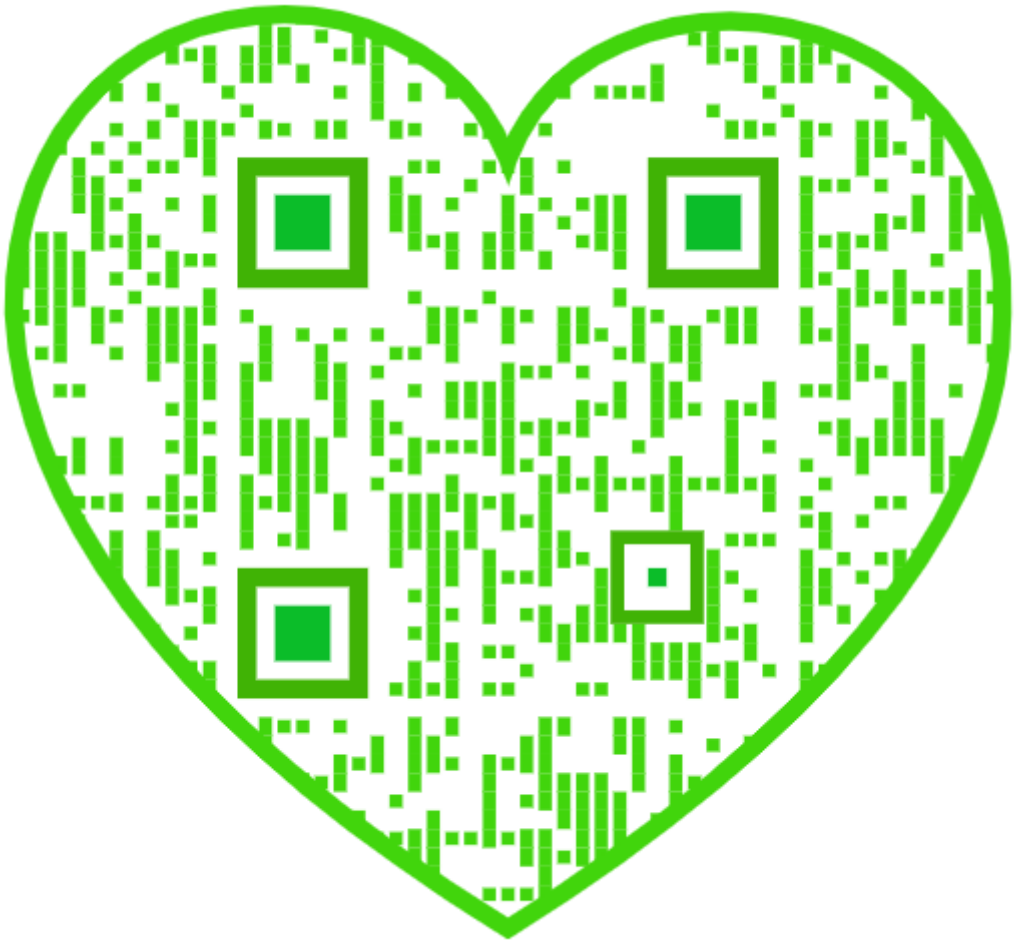

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THE

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VOLUME II

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N. W. T.	NORTHCOTE WHITBRIDGE THOMAS, M.A. Government Anthropologist to Southern Nigeria. Corresponding Member of the Société d'Anthropologie de Paris. Author of *Thought Transference*; *Kinship and Marriage in Australia*; &c.	**Animal-Worship; Animism.**

O. Ba.	OSWALD BARRON, F.S.A. Editor of *The Ancestor*, 1902–1905. Hon. Genealogist to Standing Council of Honourable Society of Baronetage.	**Arms and Armour:** *English.*
O. Br.	OSCAR BRILIANT.	**Austria:** *Statistics.*
P. A.	PAUL DANIEL ALPHANDÉRY. Professor of the History of Dogma, École Pratique des Hautes Études, Sorbonne, Paris. Author of *Les Idées morales chez les hétérodoxes latines au début du XIIIe siècle.*	**Apostolici;** **Arnold of Brescia.**
P. A. K.	PRINCE PETER ALEXEIVITCH KROPOTKIN. See the biographical article: KROPOTKIN, PRINCE PETER A.	**Aral; Astrakhan.**
P. C. M.	PETER CHALMERS MITCHELL, F.R.S., F.Z.S., D.Sc., LL.D. Secretary to the Zoological Society of London from 1903. University Demonstrator in Comparative Anatomy and Assistant to Linacre Professor at Oxford, 1888–1891. Lecturer on Biology at Charing Cross Hospital, 1892–1894; at London Hospital, 1894. Examiner in Biology to the Royal College of Physicians, 1892–1896, 1901–1903. Examiner in Zoology to the University of London, 1903.	**Animal;** **Annelida.**
P. C. Y	PHILIP CHESNEY YORKE, M.A. Magdalen College, Oxford.	**Anglesey, 1st Earl of;** **Anne, Queen;** **Anne of Cleves;** **Anne of Denmark;** **Antrim, 1st Marquess of;** **Argyll, Earls and Dukes of;** **Arlington, Earl of.**
P. G.	PERCY GARDNER, LITT.D., LL.D. See the biographical article: GARDNER, PERCY.	**Apelles.**
P. Gi.	PETER GILES, M.A., LITT.D., LL.D. Fellow and Classical Lecturer of Emmanuel College, Cambridge, and University Reader in Comparative Philology. Author of *Manual of Comparative Philology.*	**Aryan.**
P. La.	PHILIP LAKE, M.A., F.G.S. Lecturer on Physical and Regional Geography in Cambridge University. Formerly of the Geological Survey of India. Author of *Monograph of British Cambrian Trilobites.* Translator and editor of Kayser's *Comparative Geology.*	**Apennines;** **Asia:** *Geology;* **Austria:** *Geology.*
P. Vi.	PAUL VINOGRADOFF, D.C.L. (Oxford), LL.D. (Cambridge and Harvard). Corpus Professor of Jurisprudence in the University of Oxford. Fellow of the British Academy. Honorary Professor of History in the University of Moscow. Author of *Villainage in England*; *English Society in the 11th Century*; &c.	**Anglo-Saxon Law.**
R.	THE RIGHT HON. LORD RAYLEIGH. See the biographical article: RAYLEIGH, 3RD BARON.	**Argon.**
R. A. S. M.	ROBERT ALEXANDER STEWART MACALISTER, M.A., F.S.A. Director of Excavations for the Palestine Exploration Fund.	**Ascalon.**
R. A. W.	COLONEL ROBERT ALEXANDER WAHAB, C.M.G., C. I. E. Served in the Afghan War, 1878–1880; with the Hazara Expeditions, 1888 and 1891; with the Tirah Expeditionary Force, 1897–1898, &c. Commissioner for the Aden Boundary Delimitation.	**Arabia:** *Modern History;* **Asir.**
R. C. J.	SIR RICHARD CLAVERHOUSE JEBB, LL.D., D.C.L. See the biographical article: JEBB, SIR RICHARD C.	**Aristophanes.**
R. G.	RICHARD GARNETT, LL.D. See the biographical article: GARNETT, RICHARD.	**Anthology; Apotheosis.**
R. H. C.	REV. ROBERT HENRY CHARLES, M.A., D.D., LITT.D. (Oxon.). Grinfield Lecturer and Lecturer in Biblical Studies, Oxford. Fellow of the British Academy. Professor of Biblical Greek at Trinity College, Dublin, 1898–1906. Author of *Critical History of a Future Life*; &c.	**Apocalyptic Literature;** **Apocryphal Literature.**
R. I. P.	REGINALD INNES POCOCK, F.Z.S., F.L.S. Superintendent of the Zoological Gardens, London.	**Ant-lion; Aphides.**
R. J. M.	RONALD JOHN MCNEILL, M.A. Christ Church, Oxford. Formerly Editor of the *St James's Gazette* (London).	**Australia:** *Recent Legislation.*
R. L.*	RICHARD LYDEKKER, F.R.S., F.G.S., F.Z.S. Author of *Catalogues of Fossil Mammals, Reptiles and Birds in British Museum*; *The Deer of all Lands*; &c.	**Antelope; Arsinoitherium;** **Artiodactyla; Aurochs.**
R. Ma.	REV. ROBERT MACKINTOSH, M.A., D.D. Professor at Lancashire Independent College, Manchester.	**Anthropomorphism; Apologetics; Apotheosis**(*in part*).
R. N. B.	ROBERT NISBET BAIN (d. 1909). Assistant Librarian, British Museum, 1883–1909. Author of *Scandinavia: the Political History of Denmark, Norway and Sweden, 1513–1900*; *The First Romanovs, 1613 to 1725*; *Slavonic Europe: the Political History of Poland and Russia from 1469 to 1796*; &c.	**Anne, Empress of Russia;** **Apraksin, T. M.;** **Arakcheev, A. A., Count;** **Arany, Janos;** **Armfelt, G. M., Count.**
R. N. W.	RALPH NICHOLSON WORNUM (1812–1877). Keeper of the National Gallery, 1854–1877. Author of *The Epochs of Painting*; &c.	**Arabesque.**
R. P. S.	R. PHENÉ SPIERS, F.S.A., F.R.I.B.A. Formerly Master of the Architectural School, Royal Academy, London. Past President of Architectural Association. Associate and Fellow of King's College, London. Corresponding Member of the Institute of France. Editor of *Fergusson's History of Architecture.* Author of *Architecture: East and West*; &c.	**Apse;** **Arcade;** **Arch;** **Architecture.**

R. Po.	René Poupardin, D.-ès-L. Secretary of the École des Chartes. Honorary Librarian at the Bibliothèque Nationale, Paris.	Aries, Kingdom of.
R. S.	Lieut.-Gen. Sir Richard Strachey, R.E., G.C.S.I., LL.D., F.R.S. See the biographical article: Strachey, Sir R.	Asia: *Climate, Flora and Fauna.*
R. S. C.	Robert Seymour Conway, M.A., D.Litt. (Cantab.). Professor of Latin in the University of Manchester. Formerly Professor of Latin in University College, Cardiff. Fellow of Gonville and Caius College, Cambridge. Author of *The Italic Dialects.*	Apulia: *Archaeology*; Aricini; Aurunci.
R. Tr.	Roland Truslove, M.A. Fellow and Lecturer in Classics, Worcester College, Oxford. Formerly Scholar of Christ Church, Oxford.	Arles.
S. A. C.	Stanley Arthur Cook, M.A. Editor for Palestine Exploration Fund. Formerly Fellow and Lecturer in Hebrew and Syriac, Gonville and Caius College, Cambridge. Examiner in Hebrew and Aramaic, London University, 1904–1908; Council of Royal Asiatic Society, 1904–1905. Author of *Glossary of Aramaic Inscriptions*; *The Laws of Moses and Code of Hammurabi*; *Critical Notes on Old Testament History*; *Religion of Ancient Palestine*; &c.	Ark; Asa; Asher; Astarte.
S. C.	Sidney Colvin, M.A., D.Litt. See the biographical article: Colvin, Sidney.	Art.
S. N.	Simon Newcomb, LL.D., D.Sc., D.C.L. (Oxon.). See the biographical article: Newcomb, Simon.	Astronomy: *Descriptive*; Astrophysics.
ST C.	Viscount St Cyres. See the biographical article: Iddesleigh, 1st Earl of.	Arnauld: *Family.*
Sw.	The Right Hon. Lord Swaythling (Sir Samuel Montagu). M.P. for Whitechapel, 1885–1900. Founder of the firm of Samuel Montagu & Co., Bankers, London.	Arbitrage.
T. A. C.	Timothy Augustine Coghlan, I.S.O. Agent-General for New South Wales. President of Australasian Association for the Advancement of Science (Economics and Statistics), 1902. Author of *The Seven Colonies of Australia*; *Statistical Account of Australia and New Zealand.*	Australia.
T. A. I.	Thomas Allan Ingram, M.A., LL.D. Trinity College, Dublin.	Assignats.
T. As.	Thomas Ashby, M.A., D.Litt. (Oxon.). Director of the British School of Archaeology at Rome. Formerly Scholar of Christ Church, Oxford. Craven Fellow, 1897. Author of numerous articles in the *Papers* of the British School at Rome; *The Classical Topography of the Roman Campagna*; &c.	Antium; Appia Via; Apulia: *History*; Aqueduct: *Roman*; Aquileia; Aquino; Ardea; Arezzo; Ariano di Puglia; Aricia; Ariminum; Arpi; Arpino; Arretium; Ascoli Piceno; Asisium; Assisi; Astura; Ateste; Aufidena; Augusta (Sicily); Augusta Bagiennorum; Augusta Praetoria Salassorum; Aurelia, Via.
T. Ba.	Sir Thomas Barclay, M.P. Member of the Institute of International Law. Member of the Supreme Council of the Congo Free State. Officer of the Legion of Honour. Author of *Problems of International Practice and Diplomacy*; &c. M.P. for Blackburn, 1910.	Angary; Annexation. Asylum, Right of.
T. Ca.	Thomas Case, M.A. President of Corpus Christi College, Oxford. Formerly Waynflete Professor of Moral and Metaphysical Philosophy at Oxford. Author of *Physical Realism*; &c.	Aristotle.
T. H.	Thomas Hodgkin, LL.D., D.Litt. See the biographical article: Hodgkin, T.	Attila.
T. H. H.*	Col. Sir Thomas Hungerford Holdich, K.C.M.G., K.C.I.E., D.Sc., F.R.G.S. Superintendent, Frontier Surveys, India, 1892–1898. Author of *The Indian Borderland*; *The Countries of the King's Award*; &c.	Asia: *Geography and Ethnology.*
T. L. H.	Sir Thomas Little Heath, K.C.B., D.Sc. (Cantab.). Assistant Secretary to the Treasury. Formerly Fellow of Trinity College, Cambridge.	Anthemius; Apollonius of Perga; Archimedes.
T. M. L.	Rev. Thomas Martin Lindsay, LL.D., D.D. Principal of the United Free Church College, Glasgow. Formerly Assistant to the Professor of Logic and Metaphysics in the University of Edinburgh. Author of *History of the Reformation*; *Life of Luther*; &c.	Aquinas, Thomas.
T. W.-D.	Walter Theodore Watts-Dunton. See the biographical article: Watts-Dunton, W. T.	Arnold, Matthew.
T. W. R. D.	T. W. Rhys Davids, M.A., Ph.D., LL.D. Professor of Comparative Religion in the University of Manchester. President of the Pali Text Society. Fellow of the British Academy. Secretary and Librarian of Royal Asiatic Society, 1885–1902. Author of *Buddhism*; &c.	Asoka.

W. A. B. C.	Rev. William Augustus Brevoort Coolidge, M.A., F.R.G.S., Hon. Ph.D. (Bern). Fellow of Magdalen College, Oxford. Professor of English History, St David's College, Lampeter, 1880–1881. Author of *Guide du haut dauphiné*; *The Range of the Tödi*; *Guide to Grindelwald*; *Guide to Switzerland*; *The Alps in Nature and in History*; &c. Editor of the *Alpine Journal*, 1880–1889; &c.	**Annecy; Antibes; Appenzell; Arnaud, Henri.**
W. A. P.	Walter Alison Phillips, M.A. Principal Assistant Editor of the 11th edition of the *Encyclopaedia Britannica*. Formerly Exhibitioner of Merton College, Oxford, and Senior Scholar of St John's College. Author of *Modern Europe*; &c.	**Archbishop; Archdeacon.**
W. Bo.	Wilhelm Bousset, D.Theol. Professor of New Testament Exegesis in the University of Göttingen. Author of *Das Wesen der Religion*; *The Antichrist Legend*; &c.	**Antichrist.**
W. Cr.	Walter Crane. See the biographical article: Crane, Walter.	**Arts and Crafts; Art Teaching.**
W. E. Co.	Right Rev. William Edward Collins, D.D., Bishop of Gibraltar. Formerly Professor of Ecclesiastical History, King's College, London. Lecturer, St John's and Selwyn Colleges, Cambridge. Author of *The Beginnings of English Christianity*.	**Apostolical Constitutions.**
W. E. E.	Major William Egerton Edwards. Captain and Brevet Major, Royal Field Artillery. Inspector, Inspection Staff, Woolwich Arsenal. Lecturer on Armour and Explosives at the Royal Naval War College, Greenwich, 1904–1909.	**Armour Plates.**
W. F. C.	William Feilden Craies, M.A. Barrister-at-law, Inner Temple. Lecturer on Criminal Law, King's College, London. Editor of *Archbold's Criminal Pleading* (23rd edition). Author of *Craies on Statute Law*.	**Appeal.**
W. F. Sh.	William Fleetwood Sheppard, M.A., D.Sc. Senior Examiner under the Board of Education. Senior Wrangler, 1884. Formerly Fellow of Trinity College, Cambridge.	**Arithmetic.**
W. H. Be.	William Henry Bennett, M.A., D.D., D.Litt. (Cantab.). Professor of Old Testament Exegesis in New and Hackney Colleges, London. Formerly Fellow of St John's College, Cambridge. Lecturer in Hebrew at Firth College, Sheffield. Author of *Religion of the Post-Exilic Prophets*; &c.	**Angel; Atonement.**
W. H. Di.	William Henry Dines, F.R.S.	**Anemometer.**
W. J. F.	William Justice Ford, M.A. (d. 1904). Formerly Scholar of St John's College, Cambridge. Head Master of Leamington College.	**Archery.**
W. Ma.	Sir William Markby, K.C.I.E., D.C.L. See the biographical article: Markby, Sir W.	**Austin, John.**
W. M. R.	William Michael Rossetti. See the biographical article: Rossetti, Dante Gabriel.	**Angelico, Fra.**
W. P. R.	Hon. William Pember Reeves. Director, London School of Economics. Agent-General and High Commissioner for New Zealand, 1896–1909. Author of *A History of New Zealand*.	**Atkinson, Sir Henry Albert.**
W. R. L.	W. R. Lethaby, F.S.A. Principal of the Central School of Arts and Crafts under the London County Council. Author of *Architecture, Mysticism and Myth*; &c.	**Architecture:** *Romanesque and Gothic in France.*
W. W.	William Wallace, M.A. See the biographical article: Wallace, William (d. 1897).	**Arabian Philosophy** (*in part*).
W. W. F.*	William Warde Fowler, M.A. Fellow of Lincoln College, Oxford. Sub-Rector, 1881–1904. Gifford Lecturer, Edinburgh University, 1908. Author of *The City-State of the Greeks and Romans*; *The Roman Festivals of the Republican Period*; &c.	**Anna Perenna; Argei.**
W. W. R.*	William Walker Rockwell, Lic. Theol. Assistant Professor of Church History, Union Theological Seminary, New York.	**Antioch, Synods of; Arles, Synod of; Augsburg, Confession of.**

PRINCIPAL UNSIGNED ARTICLES

Anglican Communion.	**Argenson:** *Family.*	**Arya Samaj.**	**Asthma.**	**Augurs.**
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ENCYCLOPÆDIA BRITANNICA

ELEVENTH EDITION

VOLUME II

ANDROS, SIR EDMUND (1637–1714), English colonial governor in America, was born in London on the 6th of December 1637, son of Amice Andros, an adherent of Charles I., and the royal bailiff of the island of Guernsey. He served for a short time in the army of Prince Henry of Nassau, and in 1660–1662 was gentleman in ordinary to the queen of Bohemia (Elizabeth Stuart, daughter of James I. of England). He then served against the Dutch, and in 1672 was commissioned major in what is said to have been the first English regiment armed with the bayonet. In 1674 he became, by the appointment of the duke of York (later James II.), governor of New York and the Jerseys, though his jurisdiction over the Jerseys was disputed, and until his recall in 1681 to meet an unfounded charge of dishonesty and favouritism in the collection of the revenues, he proved himself to be a capable administrator, whose imperious disposition, however, rendered him somewhat unpopular among the colonists. During a visit to England in 1678 he was knighted. In 1686 he became governor, with Boston as his capital, of the "Dominion of New England," into which Massachusetts (including Maine), Plymouth, Rhode Island, Connecticut and New Hampshire were consolidated, and in 1688 his jurisdiction was extended over New York and the Jerseys. But his vexatious interference with colonial rights and customs aroused the keenest resentment, and on the 18th of April 1689, soon after news of the arrival of William, prince of Orange, in England reached Boston, the colonists deposed and arrested him. In New York his deputy, Francis Nicholson, was soon afterwards deposed by Jacob Leisler (*q.v.*); and the inter-colonial union was dissolved. Andros was sent to England for trial in 1690, but was immediately released without trial, and from 1692 until 1698 he was governor of Virginia, but was recalled through the agency of Commissary James Blair (*q.v.*), with whom he quarrelled. In 1693–1694 he was also governor of Maryland. From 1704 to 1706 he was governor of Guernsey. He died in London in February 1714 and was buried at St Anne's, Soho.

See *The Andros Tracts* (3 vols., Boston, 1869–1872).

ANDROS, or ANDRO, an island of the Greek archipelago, the most northerly of the Cyclades, 6 m. S.E. of Euboea, and about 2 m. N. of Tenos; it forms an eparchy in the modern kingdom of Greece. It is nearly 25 m. long, and its greatest breadth is 10 m. Its surface is for the most part mountainous, with many fruitful and well-watered valleys. Andros, the capital, on the east coast, contains about 2000 inhabitants. The ruins of Palaeopolis, the ancient capital, are on the west coast; the town possessed a famous temple, dedicated to Bacchus. The island has about 18,000 inhabitants.

The island in ancient times contained an Ionian population, perhaps with an admixture of Thracian blood. Though originally dependent on Eretria, by the 7th century B.C. it had become sufficiently prosperous to send out several colonies to Chalcidice (Acanthus, Stageirus, Argilus, Sane). In 480 it supplied ships to Xerxes and was subsequently harried by the Greek fleet. Though enrolled in the Delian League it remained disaffected towards Athens, and in 447 had to be coerced by the settlement of a cleruchy. In 411 Andros proclaimed its freedom and in 408 withstood an Athenian attack. As a member of the second Delian League it was again controlled by a garrison and an archon. In the Hellenistic period Andros was contended for as a frontier-post by the two naval powers of the Aegean Sea, Macedonia and Egypt. In 333 it received a Macedonian garrison from Antipater; in 308 it was freed by Ptolemy I. In the Chremonidean War (266–263) it passed again to Macedonia after a battle fought off its shores. In 200 it was captured by a combined Roman, Pergamene and Rhodian fleet, and remained a possession of Pergamum until the dissolution of that kingdom in 133 B.C. Before falling under Turkish rule, Andros was from A.D. 1207 till 1566 governed by the families Zeno and Sommariva under Venetian protection.

ANDROTION (*c.* 350 B.C.), Greek orator, and one of the leading politicians of his time, was a pupil of Isocrates and a contemporary of Demosthenes. He is known to us chiefly from the speech of Demosthenes, in which he was accused of illegality in proposing the usual honour of a crown to the Council of Five Hundred at the expiration of its term of office. Androtion filled several important posts, and during the Social War was appointed extraordinary commissioner to recover certain arrears of taxes. Both Demosthenes and Aristotle (*Rhet.* iii. 4) speak favourably of his powers as an orator. He is said to have gone into exile at Megara, and to have composed an *Atthis*, or annalistic account of Attica from the earliest times to his own days (Pausanias vi. 7; x. 8). It is disputed whether the annalist and orator are identical, but an Androtion who wrote on agriculture is certainly a different person. Professor Gaetano de Sanctis (in *L'Atthide di Androzione e un papiro di Oxyrhynchos*, Turin, 1908) attributes to Androtion, the atthidographer, a 4th-century historical fragment, discovered by B. P. Grenfell and A. S. Hunt (*Oxyrhynchus Papyri*, vol. v.). Strong arguments against this view are set forth by E. M. Walker in the *Classical Review*, May 1908.

ANDÚJAR (the anc. *Sliturgi*), a town of southern Spain, in the province of Jaén; on the right bank of the river Guadalquivir and the Madrid-Cordova railway. Pop. (1900) 16,302. Andújar is widely known for its porous earthenware jars, called *alcarrazas*, which keep water cool in the hottest weather, and are manufactured from a whitish clay found in the neighbourhood.

ANECDOTE (from *ἀν-*, privative, and *ἐκδίδωμι*, to give out or publish), a word originally meaning something not published. It has now two distinct significations. The primary one is something not published, in which sense it has been used to denote either secret histories—Procopius, *e.g.*, gives this as one of the titles of his secret history of Justinian's court—or portions of ancient writers which have remained long in manuscript and are edited for the first time. Of such *anecdota* there are many collections; the earliest was probably L. A. Muratori's, in 1709. In the more general and popular acceptation of the word, however, anecdotes are short accounts of detached interesting particulars. Of such anecdotes the collections are almost infinite; the best in many respects is that compiled by T. Byerley (d. 1826) and J. Clinton Robertson (d. 1852), known as the *Percy Anecdotes* (1820–1823).

ANEL, DOMINIQUE (1679–1730), French surgeon, was born at Toulouse about 1679. After studying at Montpellier and Paris, he served as surgeon-major in the French army in Alsace; then after two years at Vienna he went to Italy and served in the Austrian army. In 1710 he was teaching surgery in Rouen, whence he went to Genoa, and in 1716 he was practising in Paris. He died about 1730. He was celebrated for his successful surgical treatment of *fistula lacrymalis*, and while at Genoa invented for use in connexion with the operation the fine-pointed syringe still known by his name.

ANEMOMETER (from Gr. *ἄνεμος*, wind, and *μέτρον*, a measure), an instrument for measuring either the velocity or the pressure of the wind. Anemometers may be divided into two classes, (1) those that measure the velocity, (2) those that measure the pressure of the wind, but inasmuch as there is a close connexion between the pressure and the velocity, a suitable anemometer of either class will give information about both these quantities.

Velocity anemometers may again be subdivided into two classes, (1) those which do not require a wind vane or weathercock, (2) those which do. The Robinson anemometer, invented (1846) by Dr Thomas Romney Robinson, of Armagh Observatory, is the best-known and most generally used instrument, and belongs to the first of these. It consists of four hemispherical cups, mounted one on each end of a pair of horizontal arms, which lie at right angles to each other and form a cross. A vertical axis round which the cups turn passes through the centre of the cross; a train of wheel-work counts up the number of turns which this axis makes, and from the number of turns made in any given time the velocity of the wind during that time is calculated. The cups are placed symmetrically on the end of the arms, and it is easy to see that the wind always has the hollow of one cup presented to it; the back of the cup on the opposite end of the cross also faces the wind, but the pressure on it is naturally less, and hence a continual rotation is produced; each cup in turn as it comes round providing the necessary force. The two great merits of this anemometer are its simplicity and the absence of a wind vane; on the other hand it is not well adapted to leaving a record on paper of the actual velocity at any definite instant, and hence it leaves a short but violent gust unrecorded. Unfortunately, when Dr Robinson first designed his anemometer, he stated that no matter what the size of the cups or the length of the arms, the cups always moved with one-third of the velocity of the wind. This result was apparently confirmed by some independent experiments, but it is very far from the truth, for it is now known that the actual ratio, or factor as it is commonly called, of the velocity of the wind to that of the cups depends very largely on the dimensions of the cups and arms, and may have almost any value between two and a little over three. The result has been that wind velocities published in many official publications have often been in error by nearly 50%.

The other forms of velocity anemometer may be described as belonging to the windmill type. In the Robinson anemometer the axis of rotation is vertical, but with this subdivision the axis of rotation must be parallel to the direction of the wind and therefore horizontal. Furthermore, since the wind varies in direction and the axis has to follow its changes, a wind vane or some other contrivance to fulfil the same purpose must be employed. This type of instrument is very little used in England, but seems to be more in favour in France. In cases where the direction of the air motion is always the same, as in the ventilating shafts of mines and buildings for instance, these anemometers, known, however, as air meters, are employed, and give most satisfactory results.

Anemometers which measure the pressure may be divided into the plate and tube classes, but the former term must be taken as including a good many miscellaneous forms. The simplest type of this form consists of a flat plate, which is usually square or circular, while a wind vane keeps this exposed normally to the wind, and the pressure of the wind on its face is balanced by a spring. The distortion of the spring determines the actual force which the wind is exerting on the plate, and this is either read off on a suitable gauge, or leaves a record in the ordinary way by means of a pen writing on a sheet of paper moved by clockwork. Instruments of this kind have been in use for a long series of years, and have recorded pressures up to and even exceeding 60 lb per sq. ft., but it is now fairly certain that these high values are erroneous, and due, not to the wind, but to faulty design of the anemometer.

The fact is that the wind is continually varying in force, and while the ordinary pressure plate is admirably adapted for measuring the force of a steady and uniform wind, it is entirely unsuitable for following the rapid fluctuations of the natural wind. To make matters worse, the pen which records the motion of the plate is often connected with it by an extensive system of chains and levers. A violent gust strikes the plate, which is driven back and carried by its own momentum far past the position in which a steady wind of the same force would place it; by the time the motion has reached the pen it has been greatly exaggerated by the springiness of the connexion, and not only is the plate itself driven too far back, but also its position is wrongly recorded by the pen; the combined errors act the same way, and more than double the real maximum pressure may be indicated on the chart.

A modification of the ordinary pressure-plate has recently been designed. In this arrangement a catch is provided so that the plate being once driven back by the wind cannot return until released by hand; but the catch does not prevent the plate being driven back farther by a gust stronger than the last one that moved it. Examples of these plates are erected on the west coast of England, where in the winter fierce gales often occur; a pressure of 30 lb per sq. ft. has not been shown by them, and instances exceeding 20 lb are extremely rare.

Many other modifications have been used and suggested. Probably a sphere would prove most useful for a pressure anemometer, since owing to its symmetrical shape it would not require a weathercock. A small light sphere hanging from the end of 30 or 40 ft. of fine sewing cotton has been employed to measure the wind velocity passing over a kite, the tension of the cotton being recorded, and this plan has given satisfactory results.

Lind's anemometer, which consists simply of a U tube containing liquid with one end bent into a horizontal direction to face the wind, is perhaps the original form from which the tube class of instrument has sprung. If the wind blows into the mouth of a tube it causes an increase of pressure inside and also of course an equal increase in all closed vessels with which the mouth is in air-tight communication. If it blows horizontally over the open end of a vertical tube it causes a decrease of pressure, but this fact is not of any practical use in anemometry, because the magnitude of the decrease depends on the wind striking the tube exactly at right angles to its axis, the most trifling departure from the true direction causing great variations in the magnitude. The pressure tube anemometer (fig. 1) utilizes the increased pressure in the open mouth of a straight tube facing the wind, and the decrease

of pressure caused inside when the wind blows over a ring of small holes drilled through the metal of a vertical tube which is closed at the upper end. The pressure differences on which the action depends are very small, and special means are required to register them, but in the ordinary form of recording anemometer (fig. 2), any wind capable of turning the vane which keeps the mouth of the tube facing the wind is capable of registration.

The great advantage of the tube anemometer lies in the fact that the exposed part can be mounted on a high pole, and requires no oiling or attention for years; and the registering part can be placed in any convenient position, no matter how far from the external part. Two connecting tubes are required. It might appear at first sight as though one connexion would serve, but the differences in pressure on which these instruments depend are so minute, that the pressure of the air in the room where the recording part is placed has to be considered. Thus if the instrument depends on the pressure or suction effect alone, and this pressure or suction is measured against the air pressure in an ordinary room, in which the doors and windows are carefully closed and a newspaper is then burnt up the chimney, an effect may be produced equal to a wind of 10 m. an hour; and the opening of a

FIG. 1.

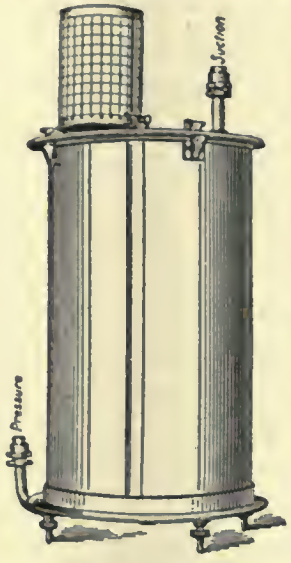


FIG. 2.

window in rough weather, or the opening of a door, may entirely alter the registration.

The connexion between the velocity and the pressure of the wind is one that is not yet known with absolute certainty. Many text-books on engineering give the relation $P = \cdot 005\, v^2$ when P is the pressure in lb per sq. ft. and v the velocity in miles per hour. The history of this untrue relation is curious. It was given about the end of the 18th century as based on some experiments, but with a footnote stating that little reliance could be placed on it. The statement without the qualifying note was copied from book to book, and at last received general acceptance. There is no doubt that under average conditions of atmospheric density, the .005 should be replaced by ·003, for many independent authorities using different methods have found values very close to this last figure. It is probable that the wind pressure is not strictly proportional to the extent of the surface exposed. Pressure plates are generally of moderate size, from a half or quarter of a sq. ft. up to two or three sq. ft., are round or square, and for these sizes, and shapes, and of course for a flat surface, the relation $P = .003\, v^2$ is fairly correct.

In the tube anemometer also it is really the pressure that is measured, although the scale is usually graduated as a velocity scale. In cases where the density of the air is not of average value, as on a high mountain, or with an exceptionally low barometer for example, an allowance must be made. Approximately 1½% should be added to the velocity recorded by a tube anemometer for each 1000 ft. that it stands above sea-level. (W. H. Dr.)

ANEMONE, or WIND-FLOWER (from the Gr. ἄνεμος, wind), a genus of the buttercup order (Ranunculaceae), containing about ninety species in the north and south temperate zones. *Anemone nemorosa*, wood anemone, and *A. Pulsatilla*, Pasque-flower, occur in Britain; the latter is found on chalk downs and limestone pastures in some of the more southern and eastern counties. The plants are perennial herbs with an underground rootstock, and radical, more or less deeply cut, leaves. The elongated flower stem bears one or several, white, red, blue or rarely yellow, flowers; there is an involucre of three leaflets below each flower. The fruits often bear long hairy styles which aid their distribution by the wind. Many of the species are favourite garden plants; among the best known is *Anemone coronaria*, often called the poppy anemone, a tuberous-rooted plant, with parsley-like divided leaves, and large showy poppy-like blossoms on stalks of from 6 to 9 in. high; the flowers are of various colours, but the principal are scarlet, crimson, blue, purple and white. There are also double-flowered varieties, in which the stamens in the centre are replaced by a tuft of narrow petals. It is an old garden favourite, and of the double forms there are named varieties. They grow best in a loamy soil, enriched with well-rotted manure, which should be dug in below the tubers. These may be planted in October, and for succession in January, the autumn-planted ones being protected by a covering of leaves or short stable litter. They will flower in May and June, and when the leaves have ripened should be taken up into a dry room till planting time. They are easily raised from the seed, and a bed of the single varieties is a valuable addition to a flower-garden, as it affords, in a warm situation, an abundance of handsome and often brilliant spring flowers, almost as early as the snowdrop or crocus. The genus contains many other lively spring-blooming plants, of which *A. hortensis* and *A. fulgens* have less divided leaves and splendid rosy-purple or scarlet flowers; they require similar treatment. Another set is represented by *A. Pulsatilla*, the Pasque-flower, whose violet blossoms have the outer surface hairy; these prefer a calcareous soil. The splendid *A. japonica*, and its white variety called Honorine Joubert, the latter especially, are amongst the finest of autumn-blooming hardy perennials; they grow well in light soil, and reach 2½ to 3 ft. in height, blooming continually for several weeks. A group of dwarf species, represented by the native British *A. nemorosa* and *A. apennina*, are amongst the most beautiful of spring flowers for planting in woods and shady places.

The genus *Hepatica* is now generally included in anemone as a subgenus. The plants are known in gardens as hepaticas, and are varieties of the common South European *A. Hepatica*; they are charming spring-flowering plants with usually blue flowers.

ANENCLETUS, or ANACLETUS, second bishop of Rome. About the 4th century he is treated in the catalogues as two persons—Anacletus and Cletus. According to the catalogues he occupied the papal chair for twelve years (*c.* 77–88).

ANERIO, the name of two brothers, musical composers, very great Roman masters of 16th-century polyphony. Felice, the elder, was born about 1560, studied under G. M. Nanino and succeeded Palestrina in 1594 as composer to the papal chapel. Several masses and motets of his are printed in Proske's *Musica Divina* and other modern anthologies, and it is hardly too much to say that they are for the most part worthy of Palestrina himself. The date of his death is conjecturally given as 1630. His brother, Giovanni Francesco, was born about 1567, and seems to have died about 1620. The occasional attribution of some of his numerous compositions to his elder brother is a pardonable mistake, if we may judge by the works that have been reprinted. But the statement, which continues to be repeated in standard works of reference, that " he was one of the first of Italians to use the quaver and its subdivisions " is incomprehensible. Quavers were common property in all musical countries quite early in the 16th century, and semiquavers appear in a madrigal of Palestrina published in 1574. The two brothers are probably the latest composers who handled 16th-century music as their mother-language; suffering neither from the temptation

to indulge even in such mild neologisms as they might have learnt from the elder brother's master, Nanino, nor from the necessity of preserving their purity of style by a mortified negative asceticism. They wrote pure polyphony because they understood it and loved it, and hence their work lives, as neither the progressive work of their own day nor the reactionary work of their imitators could live. The 12-part *Stabat Mater* in the seventh volume of Palestrina's complete works has been by some authorities ascribed to Felice Anerio.

ANET, a town of northern France, in the department of Eure-et-Loir, situated between the rivers Eure and Vègre, 10 m. N.E. of Dreux by rail. Pop. (1906) 1324. It possesses the remains of a magnificent castle, built in the middle of the 16th century by Henry II. for Diana of Poitiers. Near it is the plain of Ivry, where Henry IV. defeated the armies of the League in 1590.

ANEURIN, or ANEIRIN, the name of an early 7th-century British (Welsh) bard, who has been taken by Thomas Stephens (1821–1875), the editor and translator of Aneurin's principal epic poem *Gododin*, for a son of Gildas, the historian. *Gododin* is an account of the British defeat (603) by the Saxons at Cattraeth (identified by Stephens with Dawstane in Liddesdale), where Aneurin is said to have been taken prisoner; but the poem is very obscure and is differently interpreted. It was translated and edited by W. F. Skene in his *Four Ancient Books of Wales* (1866), and Stephens' version was published by the Cymmrodorion Society in 1888. See CELT: *Literature* (Welsh).

ANEURYSM, or ANEURISM (from Gr. *ἀνεύρισμα*, a dilatation), a cavity or sac which communicates with the interior of an artery and contains blood. The walls of the cavity are formed either of the dilated artery or of the tissues around that vessel. The dilatation of the artery is due to a local weakness, the result of disease or injury. The commonest cause is chronic inflammation of the inner coats of the artery. The breaking of a bottle or glass in the hand is apt to cut through the outermost coat of the artery at the wrist (radial) and thus to cause a local weakening of the tube which is gradually followed by dilatation. Also when an artery is wounded and the wound in the skin and superficial structures heals, the blood may escape into the tissues, displacing them, and by its pressure causing them to condense and form the sac-wall. The coats of an artery, when diseased, may be torn by a severe strain, the blood escaping into the condensed tissues which thus form the aneurysmal sac.

The division of aneurysms into two classes, *true* and *false*, is unsatisfactory. On the face of it, an aneurysm which is false is not an aneurysm, any more than a false bank-note is legal tender. A better classification is into *spontaneous* and *traumatic*. The man who has chronic inflammation of a large artery, the result, for instance, of gout, arduous, straining work, or kidney-disease, and whose artery yields under cardiac pressure, has a *spontaneous* aneurysm; the barman or window-cleaner who has cut his radial artery, the soldier whose brachial or femoral artery has been bruised by a rifle bullet or grazed by a bayonet, and the boy whose naked foot is pierced by a sharp nail, are apt to be the subjects of *traumatic* aneurysm. In those aneurysms which are a *saccular* bulging on one side of the artery the blood may be induced to coagulate, or may of itself deposit layer upon layer of pale clot, until the sac is obliterated. This laminar coagulation by constant additions gradually fills the aneurysmal cavity and the pulsation in the sac then ceases; contraction of the sac and its contents gradually takes place and the aneurysm is cured. But in those aneurysms which are *fusiform* dilatations of the vessel there is but slight chance of such cure, for the blood sweeps evenly through it without staying to deposit clot or laminated fibrine.

In the treatment of aneurysm the aim is generally to lower the blood pressure by absolute rest and moderated diet, but a cure is rarely effected except by operation, which, fortunately, is now resorted to more promptly and securely than was previously the case. Without trying the speculative and dangerous method of treatment by compression, or the application of an indiarubber bandage, the surgeon now without loss of time cuts down upon the artery, and applies an aseptic ligature close above the dilatation. Experience has shown that this method possesses great advantages, and that it has none of the disadvantages which were formerly supposed to attend it. Saccular dilatations of arteries which are the result of cuts or other injuries are treated by tying the vessel above and below, and by dissecting out the aneurysm. Popliteal, carotid and other aneurysms, which are not of traumatic origin, are sometimes dealt with on this plan, which is the old "Method of Antyllus" with modern aseptic conditions. Speaking generally, if an aneurysm can be dealt with surgically the sooner that the artery is tied the better. Less heroic measures are too apt to prove painful, dangerous, ineffectual and disappointing. For aneurysm in the chest or abdomen (which cannot be dealt with by operation) the treatment may be tried of injecting a pure solution of gelatine into the loose tissues of the armpit, so that the gelatine may find its way into the blood stream and increase the chance of curative coagulation in the distant aneurysmal sac. (E. O.*)

ANFRACTUOSITY (from Lat. *anfractuosus*, winding), twisting and turning, circuitousness; a word usually employed in the plural to denote winding channels such as occur in the depths of the sea, mountains, or the fissures (*sulci*) separating the convolutions of the brain, or, by analogy, in the mind.

ANGARIA (from *ἄγγαρος*, the Greek form of a Babylonian word adopted in Persian for "mounted courier"), a sort of postal system adopted by the Roman imperial government from the ancient Persians, among whom, according to Xenophon (*Cyrop.* viii. 6; cf. Herodotus viii. 98) it was established by Cyrus the Great. Couriers on horseback were posted at certain stages along the chief roads of the empire, for the transmission of royal despatches by night and day in all weathers. In the Roman system the supply of horses and their maintenance was a compulsory duty from which the emperor alone could grant exemption. The word, which in the 4th century was used for the heavy transport vehicles of the cursus publicus, and also for the animals by which they were drawn, came to mean generally "compulsory service." So *angaria*, *angariare*, in medieval Latin, and the rare English derivatives "angariate," "angariation," came to mean any service which was forcibly or unjustly demanded, and oppression in general.

ANGARY (Lat. *jus angariae*; Fr. *droit d'angarie*; Ger. *Angarie*; from the Gr. *ἀγγαρεία*, the office of an *ἄγγαρος*, courier or messenger), the name given to the right of a belligerent to seize and apply for the purposes of war (or to prevent the enemy from doing so) any kind of property on belligerent territory, including that which may belong to subjects or citizens of a neutral state. Art. 53 of the Regulations respecting the Laws and Customs of War on Land, annexed to the Hague Convention of 1899 on the same subject, provides that railway plant, land telegraphs, telephones, steamers and other ships (other than such as are governed by maritime law), though belonging to companies or private persons, *may be used* for military operations, but "must be restored at the conclusion of peace *and* indemnities paid for them." And Art. 54 adds that "the plant of railways coming from *neutral* states, whether the property of those states or of companies or private persons, shall be sent back to them as soon as possible." These articles seem to sanction the right of angary against neutral property, while limiting it as against both belligerent and neutral property. It may be considered, however, that the right to use implies as wide a range of contingencies as the "necessity of war" can be made to cover. (T. BA.)

ANGEL, a general term denoting a subordinate superhuman being in monotheistic religions, *e.g.* Islam, Judaism, Christianity, and in allied religions, such as Zoroastrianism. In polytheism the grades of superhuman beings are continuous; but in monotheism there is a sharp distinction of kind, as well as degree, between God on the one hand, and all other superhuman beings on the other; the latter are the "angels."

"Angel" is a transcription of the Gr. *ἄγγελος*, messenger. *ἄγγελος* in the New Testament, and the corresponding *mal'akh* in the Old Testament, sometimes mean "messenger," and

sometimes "angel," and this double sense is duly represented in the English Versions. "Angel" is also used in the English Version for אביר *'Abbîr*, Ps. lxxviii. 25. (lit. "mighty"), for אלהים *'Elohîm*, Ps. viii. 5, and for the obscure שׁאון *shin'ân*, in Ps. lxviii. 17.

In the later development of the religion of Israel, *'Elohim* is almost entirely reserved for the one true God; but in earlier times *'Elohim* (gods), *bnê 'Elohim*, *bnê Elim* (sons of gods, *i.e.* members of the class of divine beings) were general terms for superhuman beings. Hence they came to be used collectively of superhuman beings, distinct from Yahweh, and therefore inferior, and ultimately subordinate.[1] So, too, the angels are styled "holy ones,"[2] and "watchers,"[3] and are spoken of as the "host of heaven"[4] or of "Yahweh."[5] The "hosts," צבאות *Sebâôth* in the title *Yahweh Sebaoth*, Lord of Hosts, were probably at one time identified with the angels.[6] The New Testament often speaks of "spirits," πνεύματα.[7] In the earlier periods of the religion of Israel, the doctrine of monotheism had not been formally stated, so that the idea of "angel" in the modern sense does not occur, but we find the *Mal'akh Yahweh*, Angel of the Lord, or *Mal'akh Elohim*, Angel of God. The *Mal'akh Yahweh* is an appearance or manifestation of *Yahweh* in the form of a man, and the term *Mal'akh Yahweh* is used interchangeably with Yahweh (cf. Exod. iii. 2, with iii. 4; xiii. 21 with xiv. 19). Those who see the *Mal' akh Yahweh* say they have seen God.[8] The *Mal'akh Yahweh* (or *Elohim*) appears to Abraham, Hagar, Moses, Gideon, &c., and leads the Israelites in the Pillar of Cloud.[9] The phrase *Mal'akh Yahweh* may have been originally a courtly circumlocution for the Divine King; but it readily became a means of avoiding crude anthropomorphism, and later on, when the angels were classified, the *Mal'akh Yahweh* came to mean an angel of distinguished rank.[10] The identificaton of the *Mal'akh Yahweh* with the *Logos*, or Second Person of the Trinity, is not indicated by the references in the Old Testament; but the idea of a Being partly identified with God, and yet in some sense distinct from Him, illustrates the tendency of religious thought to distinguish persons within the unity of the Godhead, and foreshadows the doctrine of the Trinity, at any rate in some slight degree.

In the earlier literature the *Mal'akh Yahweh* or *Elohim* is almost the only *mal'akh* ("angel") mentioned. There are, however, a few passages which speak of subordinate superhuman beings other than the *Mal'akh Yahweh* or *Elohim*. There are the cherubim who guard Eden. In Gen. xviii., xix. (J) the appearance of Yahweh to Abraham and Lot is connected with three, afterwards two, men or messengers; but possibly in the original form of the story Yahweh appeared alone.[11] At Bethel, Jacob sees the angels of God on the ladder,[12] and later on they appear to him at Mahanaim.[13] In all these cases the angels, like the *Mal'akh Yahweh*, are connected with or represent a theophany. Similarly the "man" who wrestles with Jacob at Peniel is identified with God.[14] In Isaiah vi. the seraphim, superhuman beings with six wings, appear as the attendants of Yahweh. Thus the pre-exilic literature, as we now have it, has little to say about angels or about superhuman beings other than Yahweh and manifestations of Yahweh; the pre-exilic prophets hardly mention angels.[15] Nevertheless we may well suppose that the popular religion of ancient Israel had much to say of superhuman beings other than Yahweh, but that the inspired writers have mostly suppressed references to them as unedifying. Moreover such beings were not strictly angels.

[1] *E.g.* Gen. vi. 2; Job i. 6; Ps. viii. 5, xxix. 1. [2] Zech. xiv. 5.
[3] Dan. iv. 13. [4] Deut. xvii. 3 (?). [5] Josh. v. 14 (?).
[6] The identification of the "hosts" with the stars comes to the same thing; the stars were thought of as closely connected with angels. It is probable that the "hosts" were also identified with the armies of Israel.
[7] Rev. i. 4. [8] Gen. xxxii. 30; Judges xiii. 22.
[9] Exod. iii. 2, xiv. 19. [10] Zech. i. 11 f.
[11] Cf. xviii. 1 with xviii. 2, and note change of number in xix. 17.
[12] Gen. xxviii. 12, E. [13] Gen. xxxii. 1, E. [14] Gen. xxxii. 24, 30, J.
[15] "An angel" of 1 Kings xiii. 18 might be the *Mal'akh Yahweh*, as in xix. 5, cf. 7, or the passage, at any rate in its present form, may be exilic or post-exilic.

The doctrine of monotheism was formally expressed in the period immediately before and during the Exile, in Deuteronomy[16] and Isaiah[17]; and at the same time we find angels prominent in Ezekiel who, as a prophet of the Exile, may have been influenced by the hierarchy of supernatural beings in the Babylonian religion, and perhaps even by the angelology of Zoroastrianism.[18] Ezekiel gives elaborate discriptions of cherubim[19]; and in one of his visions he sees seven angels execute the judgment of God upon Jerusalem.[20] As in Genesis they are styled "men," *mal'akh* for "angel" does not occur in Ezekiel. Somewhat later, in the visions of Zechariah, angels play a great part; they are sometimes spoken of as "men," sometimes as *mal'akh*, and the *Mal'akh Yahweh* seems to hold a certain primacy among them.[21] Satan also appears to prosecute (so to speak) the High Priest before the divine tribunal.[22] Similarly in Job the *bnê Elohim*, sons of God, appear as attendants of God, and amongst them Satan, still in his rôle of public prosecutor, the defendant being Job.[23] Occasional references to "angels" occur in the Psalter[24]; they appear as ministers of God.

In Ps. lxxviii. 49 the "evil angels" of A. V. conveys a false impression; it should be "angels of evil," as R.V., *i.e.* angels who inflict chastisement as ministers of God.

The seven angels of Ezekiel may be compared with the seven eyes of Yahweh in Zech. iii. 9, iv. 10. The latter have been connected by Ewald and others with the later doctrine of seven chief angels[25], parallel to and influenced by the Ameshaspentas (Amesha Spenta), or seven great spirits of the Persian mythology, but the connexion is doubtful.

In the Priestly Code, *c.* 400 B.C., there is no reference to angels apart from the possible suggestion in the ambiguous plural in Genesis i. 26.

During the Persian and Greek periods the doctrine of angels underwent a great development, partly, at any rate, under foreign influences. In Daniel, *c.* 160 B.C., angels, usually spoken of as "men" or "princes," appear as guardians or champions of the nations; grades are implied, there are "princes" and "chief" or "great princes"; and the names of some angels are known, Gabriel, Michael; the latter is pre-eminent[26], he is the guardian of Judah. Again in Tobit a leading part is played by Raphael, "one of the seven holy angels."[27]

In Tobit, too, we find the idea of the demon or evil angel. In the canonical Old Testament angels may inflict suffering as ministers of God, and Satan may act as accuser or tempter; but they appear as subordinate to God, fulfilling His will; and not as morally evil. The statement[28] that God "chargeth His angels with folly" applies to all angels. In Daniel the princes or guardian angels of the heathen nations oppose Michael the guardian angel of Judah. But in Tobit we find Asmodaeus the evil demon, τὸ πονηρὸν δαιμόνιον, who strangles Sarah's husbands, and also a general reference to "a devil or evil spirit," πνεῦμα.[29] The Fall of the Angels is not properly a scriptural doctrine, though it is based on Gen. vi. 2, as interpreted by the Book of Enoch. It is true that the *bnê Elohim* of that chapter are subordinate superhuman beings (cf. above), but they belong to a different order of thought from the angels of Judaism and of Christian doctrine; and the passage in no way suggests that the *bnê Elohim* suffered any loss of status through their act.

The guardian angels of the nations in Daniel probably represent the gods of the heathen, and we have there the first step of the process by which these gods became evil angels, an idea expanded by Milton in *Paradise Lost*. The development of the doctrine of an organized hierarchy of angels belongs to the Jewish literature of the period 200 B.C. to A.D. 100. In Jewish apocalypses especially, the imagination ran riot on the rank, classes and names of angels; and such works as the various books of Enoch and

[16] Deut. vi. 4, 5. [17] Isaiah xliii. 10 &c.
[18] It is not however certain that these doctrines of Zoroastrianism were developed at so early a date.
[19] Ezek. i. x. [20] Ezek. ix. [21] Zech. i. 11 f. [22] Zech. iii. 1.
[23] Job i., ii. Cf. 1 Chron. xxi. 1. [24] Pss. xci. 11, ciii. 20 &c.
[25] Tobit xii. 15; Rev. viii. 2. [26] Dan. viii. 16, x. 13, 20, 21.
[27] Tob. xii. 15. [28] Job iv. 18. [29] Tobit iii. 8, 17, vi. 7.

the *Ascension of Isaiah* supply much information on this subject.

In the New Testament angels appear frequently as the ministers of God and the agents of revelation[1]; and Our Lord speaks of angels as fulfilling such functions[2], implying in one saying that they neither marry nor are given in marriage.[3] Naturally angels are most prominent in the Apocalypse. The New Testament takes little interest in the idea of the angelic hierarchy, but there are traces of the doctrine. The distinction of good and bad angels is recognized; we have names, Gabriel[4], and the evil angels Abaddon or Apollyon[5], Beelzebub[6], and Satan[7]; ranks are implied, archangels[8], principalities and powers[9], thrones and dominions[10]. Angels occur in groups of four or seven[11]. In Rev. i.–iii. we meet with the "Angels" of the Seven Churches of Asia Minor. These are probably guardian angels, standing to the churches in the same relation that the "princes" in Daniel stand to the nations; practically the "angels" are personifications of the churches. A less likely view is that the "angels" are the human representatives of the churches, the bishops or chief presbyters. There seems, however, no parallel to such a use of "angel," and it is doubtful whether the monarchical government of churches was fully developed when the Apocalypse was written.

Later Jewish and Christian speculation followed on the lines of the angelology of the earlier apocalypses; and angels play an important part in Gnostic systems and in the Jewish Midrashim and the Kabbala. Religious thought about the angels during the middle ages was much influenced by the theory of the angelic hierarchy set forth in the *De Hierarchia Celesti*, written in the 5th century in the name of Dionysius the Areopagite and passing for his. The creeds and confessions do not formulate any authoritative doctrine of angels; and modern rationalism has tended to deny the existence of such beings, or to regard the subject as one on which we can have no certain knowledge. The principle of continuity, however, seems to require the existence of beings intermediate between man and God.

The Old Testament says nothing about the origin of angels; but the *Book of Jubilees* and the Slavonic *Enoch* describe their creation; and, according to Col. i. 16, the angels were created in, unto and through Christ.

Nor does the Bible give any formal account of the nature of angels. It is doubtful how far Ezekiel's account of the cherubim and Isaiah's account of the seraphim are to be taken as descriptions of actual beings; they are probably figurative, or else subjective visions. Angels are constantly spoken of as "men," and, including even the Angel of Yahweh, are spoken of as discharging the various functions of human life; they eat and drink[12], walk[13] and speak[14]. Putting aside the cherubim and seraphim, they are not spoken of as having wings. On the other hand they appear and vanish[15], exercise miraculous powers[16], and fly[17]. Seeing that the anthropomorphic language used of the angels is similar to that used of God, the Scriptures would hardly seem to require a literal interpretation in either case. A special association is found, both in the Bible and elsewhere, between the angels and the heavenly bodies[18], and the elements or elemental forces, fire, water, &c[19]. The angels are infinitely numerous[20].

The *function* of the angels is that of the supernatural servants of God, His agents and representatives; the Angel of Yahweh, as we have seen, is a manifestation of God. In old times, the *bnē Elohim* and the seraphim are His court, and the angels are alike the court and the army of God; the cherubim are his throne-bearers. In his dealings with men, the angels, as their name implies, are specially His messengers, declaring His will and executing His commissions. Through them he controls nature and man. They are the guardian angels of the nations; and we also find the idea that individuals have guardian angels[21]. Later Jewish tradition held that the Law was given by angels[22]. According to the Gnostic Basilides, the world was created by angels. Mahommedanism has taken over and further elaborated the Jewish and Christian ideas as to angels.

While the scriptural statements imply a belief in the existence of spiritual beings intermediate between God and men, it is probable that many of the details may be regarded merely as symbolic imagery. In Scripture the function of the angel overshadows his personality; the stress is on their ministry; they appear in order to perform specific acts.

Bibliography.—See the sections on "Angels" in the handbooks of O. T. Theology by Ewald, Schultz, Smend, Kayser-Marti, &c.; and of N. T. Theology by Weiss, and in van Oosterzee's *Dogmatics*. Also commentaries on special passages, especially Driver and Bevan on *Daniel*, and G. A. Smith, *Minor Prophets*, ii. 310 ff.; and articles *s.v.* "Angel" in Hastings' *Bible Dictionary*, and the *Encyclopaedia Biblica*. (W. H. Be.)

ANGEL, a gold coin, first used in France (*angelot, ange*) in 1340, and introduced into England by Edward IV. in 1465 as a new issue of the "noble," and so at first called the "angel-noble." It varied in value between that period and the time of Charles I. (when it was last coined) from 6s. 8d. to 10s. The name was derived from the representation it bore of St Michael and the dragon. The angel was the coin given to those who came to be touched for the disease known as king's evil; after it was no longer coined, medals, called touch-pieces, with the same device, were given instead.

ANGELICA, a genus of plants of the natural order *Umbelliferae*, represented in Britain by one species, *A. sylvestris*, a tall perennial herb with large bipinnate leaves and large compound umbels of white or purple flowers. The name Angelica is popularly given to a plant of an allied genus, *Archangelica officinalis*, the tender shoots of which are used in making certain kinds of aromatic sweetmeats. *Angelica balsam* is obtained by extracting the roots with alcohol, evaporating and extracting the residue with ether. It is of a dark brown colour and contains angelica oil, angelica wax and angelicin, $C_{18}H_{30}O$. The essential oil of the roots of *Angelica archangelica* contains β-terebangelene, $C_{10}H_{16}$, and other terpenes; the oil of the seeds also contains β-terebangelene, together with methylethylacetic acid and hydroxymyristic acid.

The angelica tree is a member of the order *Avaliaceae*, a species of *Aralia* (*A. spinosa*), a native of North America; it grows 8 to 12 ft. high, has a simple prickle-bearing stem forming an umbrella-like head, and much divided leaves.

ANGELICO, FRA (1387–1455), Italian painter. Il Beato Fra Giovanni Angelico da Fiesole is the name given to a far-famed painter-friar of the Florentine state in the 15th century, the representative, beyond all other men, of pietistic painting. He is often, but not accurately, termed simply "Fiesole," which is merely the name of the town where he first took the vows; more often Fra Angelico. If we turn his compound designation into English, it runs thus—"the Beatified Friar John the Angelic of Fiesole." In his lifetime he was known no doubt simply as Fra Giovanni or Friar John; "The Angelic" is a laudatory term which was assigned to him at an early date,—we find it in use within thirty years after his death; and, at some period which is not defined in our authorities, he was beatified by due ecclesiastical process. His baptismal name was Guido, Giovanni being only his name in religion. He was born at Vicchio, in the Tuscan province of Mugello, of unknown but seemingly well-to-do parentage, in 1387 (not 1390 as sometimes stated); in 1407 he became a novice in the convent of S. Domenico at Fiesole, and in 1408 he took the vows and entered the Dominican order. Whether he had previously been a painter by profession is not certain, but may be pronounced probable. The painter named Lorenzo Monaco may have contributed to his art-training, and the influence of the Sienese school is discernible in his work.

[1] *E.g.* Matt. i. 20 (to Joseph), iv. 11 (to Jesus), Luke i. 26 (to Mary), Acts xii. 7 (to Peter).
[2] *E.g.* Mark viii. 38, xiii. 27. [3] Mark xii. 25. [4] Luke i. 19.
[5] Rev. ix. 11. [6] Mark iii. 22. [7] Mark i. 13.
[8] Michael, Jude 9. [9] Rom. viii. 38; Col. ii. 10.
[10] Col. i. 16. [11] Rev. vii. 1. [12] Gen. xviii. 8.
[13] Gen. xix. 16. [14] Zech. iv. 1. [15] Judges vi. 12, 21.
[16] Rev. vii. 1. viii. [17] Rev. viii. 13, xiv. 6.
[18] Job xxxviii. 7; *Asc. of Isaiah*, iv. 18; Slav. *Enoch*, iv. 1.
[19] Rev. xiv. 18, xvi. 5; possibly Gal. iv. 3; Col. ii. 8, 20.
[20] Ps. lxviii. 17; Dan. vii. 10.
[21] Matt. xviii. 10; Acts xii. 15.
[22] Gal. iii. 19; Heb. ii. 2; *LXX.* of Deut. xxxiii. 2.

According to Vasari, the first paintings of this artist were in the Certosa of Florence; none such exist there now. His earliest extant performances, in considerable number, are at Cortona, whither he was sent during his novitiate, and here apparently he spent all the opening years of his monastic life. His first works executed in fresco were probably those, now destroyed, which he painted in the convent of S. Domenico in this city; as a fresco-painter, he may have worked under, or as a follower of, Gherardo Starnina. From 1418 to 1436 he was back at Fiesole; in 1436 he was transferred to the Dominican convent of S. Marco in Florence, and in 1438 undertook to paint the altarpiece for the choir, followed by many other works; he may have studied about this time the renowned frescoes in the Brancacci chapel in the Florentine church of the Carmine and also the paintings of Orcagna. In or about 1445 he was invited by the pope to Rome. The pope who reigned from 1431 to 1447 was Eugenius IV., and he it was who in 1445 appointed another Dominican friar, a colleague of Angelico, to be archbishop of Florence. If the story (first told by Vasari) is true—that this appointment was made at the suggestion of Angelico only after the archbishopric had been offered to himself, and by him declined on the ground of his inaptitude for so elevated and responsible a station—Eugenius, and not (as stated by Vasari) his successor Nicholas V., must have been the pope who sent the invitation and made the offer to Fra Giovanni, for Nicholas only succeeded in 1447. The whole statement lacks authentication, though in itself credible enough. Certain it is that Angelico was staying in Rome in the first half of 1447; and he painted in the Vatican the Cappella del Sacramento, which was afterwards demolished by Paul III. In June 1447 he proceeded to Orvieto, to paint in the Cappella Nuova of the cathedral, with the co-operation of his pupil Benozzo Gozzoli. He afterwards returned to Rome to paint the chapel of Nicholas V. In this capital he died in 1455, and he lies buried in the church of the Minerva.

According to all the accounts which have reached us, few men on whom the distinction of beatification has been conferred could have deserved it more nobly than Fra Giovanni. He led a holy and self-denying life, shunning all advancement, and was a brother to the poor; no man ever saw him angered. He painted with unceasing diligence, treating none but sacred subjects; he never retouched or altered his work, probably with a religious feeling that such as divine providence allowed the thing to come, such it should remain He was wont to say that he who illustrates the acts of Christ should be with Christ. It is averred that he never handled a brush without fervent prayer and he wept when he painted a Crucifixion. The Last Judgment and the Annunciation were two of the subjects he most frequently treated.

Bearing in mind the details already given as to the dates of Fra Giovanni's sojournings in various localities, the reader will be able to trace approximately the sequence of the works which we now proceed to name as among his most important productions. In Florence, in the convent of S. Marco (now converted into a national museum), a series of frescoes, beginning towards 1443; in the first cloister is the Crucifixion with St Dominic kneeling; and the same treatment recurs on a wall near the dormitory; in the chapterhouse is a third Crucifixion, with the Virgin swooning, a composition of twenty life-sized figures—the red background, which has a strange and harsh effect, is the misdoing of some restorer; an "Annunciation," the figures of about three-fourths of life-size, in a dormitory; in the adjoining passage, the "Virgin enthroned," with four saints; on the wall of a cell, the "Coronation of the Virgin," with Saints Paul, Thomas Aquinas, Benedict, Dominic, Francis and Peter Martyr; two Dominicans welcoming Jesus, habited as a pilgrim; an "Adoration of the Magi"; the "Marys at the Sepulchre." All these works are later than the altarpiece which Angelico painted (as before mentioned) for the choir connected with this convent, and which is now in the academy of Florence; it represents the Virgin with Saints Cosmas and Damian (the patrons of the Medici family), Dominic, Peter, Francis, Mark, John Evangelist and Stephen; the pediment illustrated the lives of Cosmas and Damian, but it has long been severed from the main subject. In the Uffizi gallery, an altarpiece, the Virgin (life-sized) enthroned, with the Infant and twelve angels. In S. Domenico, Fiesole, a few frescoes, less fine than those in S. Marco; also an altarpiece in tempera of the Virgin and Child between Saints Peter, Thomas Aquinas, Dominic and Peter Martyr, now much destroyed. The subject which originally formed the predella of this picture has, since 1860, been in the National Gallery, London, and worthily represents there the hand of the saintly painter. The subject is a Glory, Christ with the banner of the Resurrection, and a multitude of saints, including, at the extremities, the saints or beati of the Dominican order; here are no fewer than 266 figures or portions of figures, many of them having names inscribed. This predella was highly lauded by Vasari; still more highly another picture which used to form an altarpiece in Fiesole, and which now obtains world-wide celebrity in the Louvre—the "Coronation of the Virgin," with eight predella subjects of the miracles of St. Dominic. For the church of Santa Trinita, Florence, Angelico executed a "Deposition from the Cross," and for the church of the Angeli, a "Last Judgment," both now in the Florentine academy; for S. Maria Novella, a "Coronation of the Virgin," with a predella in three sections, now in the Uffizi,—this again is one of his masterpieces. In Orvieto cathedral he painted three triangular divisions of the ceiling, portraying respectively Christ in a glory of angels, sixteen saints and prophets, and the virgin and apostles: all these are now much repainted and damaged. In Rome, in the Chapel of Nicholas V., the acts of Saints Stephen and Lawrence; also various figures of saints, and on the ceiling the four evangelists. These works of the painter's advanced age, which have suffered somewhat from restorations, show vigour superior to that of his youth, along with a more adequate treatment of the architectural perspectives. Naturally, there are a number of works currently attributed to Angelico, but not really his; for instance, a "St Thomas with the Madonna's girdle," in the Lateran museum, and a "Virgin enthroned," in the church of S. Girolamo, Fiesole. It has often been said that he commenced and frequently practised as an illuminator; this is dubious and a presumption arises that illuminations executed by Giovanni's brother, Benedetto, also a Dominican, who died in 1448, have been ascribed to the more famous artist. Benedetto may perhaps have assisted Giovanni in the frescoes at S. Marco, but nothing of the kind is distinctly traceable. A folio series of engravings from these paintings was published in Florence, in 1852. Along with Gozzoli already mentioned, Zanobi Strozzi and Gentile da Fabriano are named as pupils of the Beato.

We have spoken of Angelico's art as "pietistic"; this is in fact its predominant character. His visages have an air of rapt suavity, devotional fervency and beaming esoteric consciousness, which is intensely attractive to some minds and realizes beyond rivalry a particular ideal—that of ecclesiastical saintliness and detachment from secular fret and turmoil. It should not be denied that he did not always escape the pitfalls of such a method of treatment, the faces becoming sleek and prim, with a smirk of sexless religiosity which hardly eludes the artificial or even the hypocritical; on other minds, therefore, and these some of the most masculine and resolute, he produces little genuine impression. After allowing for this, Angelico should nevertheless be accepted beyond cavil as an exalted typical painter according to his own range of conceptions, consonant with his monastic calling, unsullied purity of life and exceeding devoutness. Exquisite as he is in his special mode of execution, he undoubtedly falls far short, not only of his great naturalist contemporaries such as Masaccio and Lippo Lippi, but even of so distant a precursor as Giotto, in all that pertains to bold or life-like invention of a subject or the realization of ordinary appearances, expressions and actions—the facts of nature, as distinguished from the aspirations or contemplations of the spirit. Technically speaking, he had much finish and harmony of composition and colour, without corresponding mastery of light and shade, and his knowledge of the human frame was restricted. The brilliancy and fair light scale of his tints is constantly remarkable, combined with a free use of gilding; this conduces materially to that celestial character

which so pre-eminently distinguishes his pictured visions of the divine persons, the hierarchy of heaven and the glory of the redeemed.

Books regarding Fra Angelico are numerous. We may mention those by S. Beissel, 1895; V. M. Crawford, 1900; R. L. Douglas, 1900; I. B. Supino, 1901; D. Tumiati, 1897; G. Williamson, 1901. (W. M. R.)

ANGELL, GEORGE THORNDIKE (1823–1909), American philanthropist, was born at Southbridge, Massachusetts, on the 5th of June 1823. He graduated at Dartmouth in 1846, studied law at the Harvard Law School, and in 1851 was admitted to the bar in Boston, where he practised for many years. In 1868 he founded and became president of the Massachusetts Society for the Prevention of Cruelty to Animals, in the same year establishing and becoming editor of *Our Dumb Animals*, a journal for the promotion of organized effort in securing the humane treatment of animals. For many years he was active in the organization of humane societies in England and America. In 1882 he initiated the movement for the establishment of Bands of Mercy (for the promotion of humane treatment of animals), of which in 1908 there were more than 72,000 in active existence. In 1889 he founded and became president of the American Humane Education Society. He became well known as a criminologist and also as an advocate of laws for the safeguarding of the public health and against adulteration of food. He died at Boston on the 16th of March 1909.

ANGEL-LIGHTS, in architecture, the outer upper lights in a perpendicular window, next to the springing; probably a corruption of the word angle-lights, as they are nearly triangular.

ANGELUS, a Roman Catholic devotion in memory of the Annunciation. It has its name from the opening words, *Angelus Domini nuntiavit Mariae.* It consists of three texts describing the mystery, recited as versicle and response alternately with the salutation "Hail, Mary!" This devotion is recited in the Catholic Church three times daily, about 6 A.M., noon and 6 P.M. At these hours a bell known as the Angelus bell is rung. This is still rung in some English country churches, and has often been mistaken for and alleged to be a survival of the curfew-bell. The institution of the Angelus is by some ascribed to Pope Urban II., by some to John XXII. The triple recitation is ascribed to Louis XI. of France, who in 1472 ordered it to be thrice said daily.

ANGELUS SILESIUS (1624–1677), German religious poet, was born in 1624 at Breslau. His family name was Johann Scheffler, but he is generally known by the pseudonym Angelus Silesius, under which he published his poems and which marks the country of his birth. Brought up a Lutheran, and at first physician to the duke of Württemberg-Oels, he joined in 1652 the Roman Catholic Church, in 1661 took orders as a priest, and became coadjutor to the prince bishop of Breslau. He died at Breslau on the 9th of July 1677. In 1657 Silesius published under the title *Heilige Seelenlust, oder geistliche Hirtenlieder der in ihren Jesum verliebten Psyche* (1657), a collection of 205 hymns, the most beautiful of which, such as, *Liebe, die du mich zum Bilde deiner Gottheit hast gemacht* and *Mir nach, spricht Christus, unser Held,* have been adopted in the German Protestant hymnal. More remarkable, however, is his *Geistreiche Sinn- und Schluss-reime* (1657), afterwards called *Cherubinischer Wandersmann* (1674). This is a collection of "Reimsprüche" or rhymed distichs embodying a strange mystical pantheism drawn mainly from the writings of Jakob Böhme and his followers. Silesius delighted specially in the subtle paradoxes of mysticism. The essence of God, for instance, he held to be love; God, he said, can love nothing inferior to himself; but he cannot be an object of love to himself without going out, so to speak, of himself, without manifesting his infinity in a finite form; in other words, by becoming man. God and man are therefore essentially one.

A complete edition of Scheffler's works (*Sämtliche poetische Werke*) was published by D. A. Rosenthal, 2 vols. (Regensburg, 1862). Both the *Cherubinischer Wandersmann* and *Heilige Seelenlust* have been republished by G. Ellinger (1895 and 1901); a selection from the former work by O. E. Hartleben (1896). For further notices of Silesius' life and work, see Hoffmann von Fallersleben in *Weimar'sches Jahrbuch I.* (Hanover, 1854); A. Kahlert, *Angelus Silesius* (1853); C. Seltmann, *Angelus Silesius und seine Mystik* (1896), and a biog. by H. Mahn (Dresden, 1896).

ANGERMÜNDE, a town of Germany, in the Prussian province of Brandenburg, on Lake Münde, 43 m. from Berlin by the Berlin-Stettin railway, and at the junction of lines to Prenzlau, Freienwalde and Schwedt. Pop. (1900) 7465. It has three Protestant churches, a grammar school and court of law. Its industries embrace iron founding and enamel working. In 1420 the elector Frederick I. of Brandenburg gained here a signal victory over the Pomeranians.

ANGERONA, or ANGERONIA, an old Roman goddess, whose name and functions are variously explained. According to ancient authorities, she was a goddess who relieved men from pain and sorrow, or delivered the Romans and their flocks from *angina* (quinsy); or she was the protecting goddess of Rome and the keeper of the sacred name of the city, which might not be pronounced lest it should be revealed to her enemies; it was even thought that Angerona itself was this name. Modern scholars regard her as a goddess akin to Ops, Acca Larentia and Dea Dia; or as the goddess of the new year and the returning sun (according to Mommsen, *ab angerendo* = ἀπὸ τοῦ ἀναφέρεσθαι τὸν ἥλιον). Her festival, called Divalia or Angeronalia, was celebrated on the 21st of December. The priests offered sacrifice in the temple of Volupia, the goddess of pleasure, in which stood a statue of Angerona, with a finger on her mouth, which was bound and closed (Macrobius i. 10; Pliny, *Nat. Hist.* iii. 9; Varro, *L. L.* vi. 23). She was worshipped as Ancharia at Faesulae, where an altar belonging to her has been recently discovered. (See FAESULAE.)

ANGERS, a city of western France, capital of the department of Maine-et-Loire, 191 m. S.W. of Paris by the Western railway to Nantes. Pop. (1906) 73,585. It occupies rising ground on both banks of the Maine, which are united by three bridges. The surrounding district is famous for its flourishing nurseries and market gardens. Pierced with wide, straight streets, well provided with public gardens, and surrounded by ample, tree-lined boulevards, beyond which lie new suburbs, Angers is one of the pleasantest towns in France. Of its numerous medieval buildings the most important is the cathedral of St Maurice, dating in the main from the 12th and 13th centuries. Between the two flanking towers of the west façade, the spires of which are of the 16th century, rises a central tower of the same period. The most prominent feature of the façade is the series of eight warriors carved on the base of this tower. The vaulting of the nave takes the form of a series of cupolas, and that of the choir and transept is similar. The chief treasures of the church are its rich stained glass (12th, 13th and 15th centuries) and valuable tapestry (14th to 18th centuries). The bishop's palace which adjoins the cathedral contains a fine synodal hall of the 12th century. Of the other churches of Angers, the principal are St Serge, an abbey-church of the 12th and 15th centuries, and La Trinité (12th century). The prefecture occupies the buildings of the famous abbey of St Aubin; in its courtyard are elaborately sculptured arcades of the 11th and 12th centuries, from which period dates the tower, the only survival of the splendid abbey-church. Ruins of the old churches of Toussaint (13th century) and Notre-Dame du Ronceray (11th century) are also to be seen. The castle of Angers, an imposing building girt with towers and a moat, dates from the 13th century and is now used as an armoury. The ancient hospital of St Jean (12th century) is occupied by an archaeological museum; and the Logis Barrault, a mansion built about 1500, contains the public library, the municipal museum, which has a large collection of pictures and sculptures, and the Musée David, containing works by the famous sculptor David d'Angers, who was a native of the town. One of his masterpieces, a bronze statue of René of Anjou, stands close by the castle. The Hôtel de Pincé or d'Anjou (1523–1530) is the finest of the stone mansions of Angers; there are also many curious wooden houses of the 15th and 16th centuries. The palais de justice, the Catholic institute, a fine theatre, and

a hospital with 1500 beds are the more remarkable of the modern buildings of the town. Angers is the seat of a bishopric, dating from the 3rd century, a prefecture, a court of appeal and a court of assizes. It has a tribunal of first instance, a tribunal of commerce, a board of trade-arbitrators, a chamber of commerce, a branch of the Bank of France and several learned societies. Its educational institutions include ecclesiastical seminaries, a lycée, a preparatory school of medicine and pharmacy, a university with free faculties (*facultés libres*) of theology, law, letters and science, a higher school of agriculture, training colleges, a school of arts and handicrafts and a school of fine art. The prosperity of the town is largely due to the great slate-quarries of the vicinity, but the distillation of liqueurs from fruit, cable, rope and thread-making, and the manufacture of boots and shoes, umbrellas and parasols are leading industries. The weaving of sail-cloth and woollen and other fabrics, machine construction, wire-drawing, and manufacture of sparkling wines and preserved fruits are also carried on. The chief articles of commerce, besides slate and manufactured goods, are hemp, early vegetables, fruit, flowers and live-stock.

Angers, capital of the Gallic tribe of the Andecavi, was under the Romans called Juliomagus. During the 9th century it became the seat of the counts of Anjou (*q.v.*). It suffered severely from the invasions of the Northmen in 845 and the succeeding years, and of the English in the 12th and 15th centuries; the Huguenots took it in 1585, and the Vendean royalists were repulsed near it in 1793. Till the Revolution, Angers was the seat of a celebrated university founded in the 14th century.

See L. M. Thorode, *Notice de la ville d'Angers* (Angers, 1897).

ANGERSTEIN, JOHN JULIUS (1735–1822), London merchant, and patron of the fine arts, was born at St Petersburg and settled in London about 1749. His collection of paintings, consisting of about forty of the most exquisite specimens of the art, purchased by the British government, on his death, formed the nucleus of the National Gallery.

ANGILBERT (d. 814), Frankish Latin poet, and minister of Charlemagne, was of noble Frankish parentage, and educated at the palace school under Alcuin. As the friend and adviser of the emperor's son, Pippin, he assisted for a while in the government of Italy, and was later sent on three important embassies to the pope, in 792, 794 and 796. Although he was the father of two children by Charlemagne's daughter, Bertha, one of them named Nithard, we have no authentic account of his marriage, and from 790 he was abbot of St Riquier, where his brilliant rule gained for him later the renown of a saint. Angilbert, however, was little like the true medieval saint; his poems reveal rather the culture and tastes of a man of the world, enjoying the closest intimacy with the imperial family. He accompanied Charlemagne to Rome in 800 and was one of the witnesses to his will in 814. Angilbert was the Homer of the emperor's literary circle, and was the probable author of an epic, of which the fragment which has been preserved describes the life at the palace and the meeting between Charlemagne and Leo III. It is a mosaic from Virgil, Ovid, Lucan and Fortunatus, composed in the manner of Einhard's use of Suetonius, and exhibits a true poetic gift. Of the shorter poems, besides the greeting to Pippin on his return from the campaign against the Avars (796), an epistle to David (Charlemagne) incidentally reveals a delightful picture of the poet living with his children in a house surrounded by pleasant gardens near the emperor's palace. The reference to Bertha, however, is distant and respectful, her name occurring merely on the list of princesses to whom he sends his salutation.

Angilbert's poems have been published by E. Dummler in the *Monumenta Germaniae Historica*. For criticisms of this edition see Traube in Roederer's *Schriften für germanische Philologie* (1888). See also A. Molinier, *Les Sources de l'histoire de France*.

ANGINA PECTORIS (Latin for "pain of the chest"), a term applied to a violent paroxysm of pain, arising almost invariably in connexion with disease of the coronary arteries, a lesion causing progressive degeneration of the heart muscle (see HEART: *Disease*). An attack of angina pectoris usually comes on with a sudden seizure of pain, felt at first over the region of the heart, but radiating through the chest in various directions, and frequently extending down the left arm. A feeling of constriction and of suffocation accompanies the pain, although there is seldom actual difficulty in breathing. When the attack comes on, as it often does, in the course of some bodily exertion, the sufferer is at once brought to rest, and during the continuance of the paroxysm experiences the most intense agony. The countenance becomes pale, the surface of the body cold, the pulse feeble, and death appears to be imminent, when suddenly the attack subsides and complete relief is obtained. The duration of a paroxysm rarely exceeds two or three minutes, but it may last for a longer period. The attacks are apt to recur on slight exertion, and even in aggravated cases without any such exciting cause. Occasionally the first seizure proves fatal; but more commonly death takes place as the result of repeated attacks. Angina pectoris is extremely rare under middle life, and is much more common in males than in females. It must always be regarded as a disorder of a very serious nature. In the treatment of the paroxysm, nitrite of amyl has now replaced all other remedies. It can be carried by the patient in the form of nitrite of amyl pearls, each pearl containing the dose prescribed by the physician. Kept in this way the drug does not lose strength. As soon as the pain begins the patient crushes a pearl in his handkerchief and holds it to his mouth and nose. The relief given in this way is marvellous and usually takes place within a very few seconds. In the rare cases where this drug does not relieve, hypodermic injections of morphia are used. But on account of the well-known dangers of this drug, it should only be administered by a medical man. To prevent recurrence of the attacks something may be done by scrupulous attention to the general health, and by the avoidance of mental and physical strain. But the most important preventive of all is "bed," of which fourteen days must be enforced on the least premonition of anginal pain.

Pseudo-angina.—In connexion with angina pectoris, a far more common condition must be mentioned that has now universally received the name of pseudo-angina. This includes the praecordial pains which very closely resemble those of true angina. The essential difference lies in the fact that pseudo-angina is independent of structural disease of the heart and coronary arteries. In true angina there is some condition within the heart which starts the stimulus sent to the nerve centres. In pseudo-angina the starting-point is not the heart but some peripheral or visceral nerve. The impulse passes thence to the medulla, and so reaching the sensory centres starts a feeling of pain that radiates into the chest or down the arm. There are three main varieties:—(1) the reflex, (2) the vaso-motor, (3) the toxic. The reflex is by far the most common, and is generally due to irritation from one of the abdominal organs. An attack of pseudo-angina may be agonizing, the pain radiating through the chest and into the left arm, but the patient does not usually assume the motionless attitude of true angina, and the duration of the seizure is usually much longer. The treatment is that of the underlying neurosis and the prognosis is a good one, sudden death not occurring.

ANGIOSPERMS. The botanical term "Angiosperm" (ἀγγεῖον, receptacle, and σπέρμα, seed) was coined in the form Angiospermae by Paul Hermann in 1690, as the name of that one of his primary divisions of the plant kingdom, which included flowering plants possessing seeds enclosed in capsules, in contradistinction to his Gymnospermae, or flowering plants with achenial or schizo-carpic fruits—the whole fruit or each of its pieces being here regarded as a seed and naked. The term and its antonym were maintained by Linnaeus with the same sense, but with restricted application, in the names of the orders of his class Didynamia. Its use with any approach to its modern scope only became possible after Robert Brown had established in 1827 the existence of truly naked seeds in the Cycadeae and Coniferae, entitling them to be correctly called Gymnosperms. From that time onwards, so long as these Gymnosperms were, as was usual, reckoned as dicotyledonous flowering plants, the term Angiosperm was used antithetically by botanical writers, but with varying limitation, as a group-name for other

dicotyledonous plants. The advent in 1851 of Hofmeister's brilliant discovery of the changes proceeding in the embryo-sac of flowering plants, and his determination of the correct relationships of these with the Cryptogamia, fixed the true position of Gymnosperms as a class distinct from Dicotyledons, and the term Angiosperm then gradually came to be accepted as the suitable designation for the whole of the flowering plants other than Gymnosperms, and as including therefore the classes of Dicotyledons and Monocotyledons. This is the sense in which the term is nowadays received and in which it is used here.

The trend of the evolution of the plant kingdom has been in the direction of the establishment of a vegetation of fixed habit and adapted to the vicissitudes of a life on land, and the Angiosperms are the highest expression of this evolution and constitute the dominant vegetation of the earth's surface at the present epoch. There is no land-area from the poles to the equator, where plant-life is possible, upon which Angiosperms are not found. They occur also abundantly in the shallows of rivers and fresh-water lakes, and in less number in salt lakes and in the sea; such aquatic Angiosperms are not, however, primitive forms, but are derived from immediate land-ancestors. Associated with this diversity of habitat is great variety in general form and manner of growth. The familiar duckweed which covers the surface of a pond consists of a tiny green " thalloid " shoot, one, that is, which shows no distinction of parts—stem and leaf, and a simple root growing vertically downwards into the water. The great forest-tree has a shoot, which in the course perhaps of hundreds of years, has developed a wide-spreading system of trunk and branches, bearing on the ultimate twigs or branchlets innumerable leaves, while beneath the soil a widely-branching root-system covers an area of corresponding extent. Between these two extremes is every conceivable gradation, embracing aquatic and terrestrial herbs, creeping, erect or climbing in habit, shrubs and trees, and representing a much greater variety than is to be found in the other subdivision of seed-plants, the Gymnosperms.

In internal structure also the variety of tissue-formation far exceeds that found in Gymnosperms (see PLANTS: *Anatomy*).

Internal structure. The vascular bundles of the stem belong to the collateral type, that is to say, the elements of the wood or xylem and the bast or phloem stand side by side on the same radius. In the larger of the two great groups into which the Angiosperms are divided, the Dicotyledons, the bundles in the very young stem are arranged in an open ring, separating a central pith from an outer cortex. In each bundle, separating the xylem and phloem, is a layer of meristem or active formative tissue, known as cambium; by the formation of a layer of cambium between the bundles (interfascicular cambium) a complete ring is formed, and a regular periodical increase in thickness results from it by the development of xylem on the inside and phloem on the outside. The soft phloem soon becomes crushed, but the hard wood persists, and forms the great bulk of the stem and branches of the woody perennial. Owing to differences in the character of the elements produced at the beginning and end of the season, the wood is marked out in transverse section into concentric rings, one for each season of growth—the so-called annual rings. In the smaller group, the Monocotyledons, the bundles are more numerous in the young stem and scattered through the ground tissue. Moreover they contain no cambium and the stem once formed increases in diameter only in exceptional cases.

As in Gymnosperms, branching is monopodial; dichotomy or the forking of the growing point into two equivalent branches

Vegetative organs. which replace the main stem, is absent both in the case of the stem and the root. The leaves show a remarkable variety in form (see LEAF), but are generally small in comparison with the size of the plant; exceptions occur in some Monocotyledons, *e.g.* in the Aroid family, where in some genera the plant produces one huge, much-branched leaf each season.

In rare cases the main axis is unbranched and ends in a flower, as, for instance, in the tulip, where scale-leaves, forming the underground bulb, green foliage-leaves and coloured floral leaves are borne on one and the same axis. Generally, flowers are formed only on shoots of a higher order, often only on the ultimate branches of a much branched system. A potential branch or bud, either foliage or flower, is formed in the axil of each leaf; sometimes more than one bud arises, as for instance in the walnut, where two or three stand in vertical series above each leaf. Many of the buds remain dormant, or are called to development under exceptional circumstances, such as the destruction of existing branches. For instance, the clipping of a hedge or the lopping of a tree will cause to develop numerous buds which may have been dormant for years. Leaf-buds occasionally arise from the roots, when they are called adventitious; this occurs in many fruit trees, poplars, elms and others. For instance, the young shoots seen springing from the ground around an elm are not seedlings but root-shoots. Frequently, as in many Dicotyledons, the primary root, the original root of the seedling, persists throughout the life of the plant, forming, as often in biennials, a thickened tap-root, as in carrot, or in perennials, a much-branched root system. In many Dicotyledons and most Monocotyledons, the primary root soon perishes, and its place is taken by adventitious roots developed from the stem.

The most characteristic feature of the Angiosperm is the flower, which shows remarkable variety in form and elaboration, and supplies the most trustworthy characters for the distinction of the series and families or natural orders, into which the group is divided. The flower is a shoot (stem bearing leaves) which has a special form associated with the special function of ensuring the fertilization of the egg and the development of fruit containing seed. Except where it is terminal it arises, like the leaf-shoot, in the axil of a leaf, which is then known as a bract. Occasionally, as in violet, a flower arises singly in the axil of an ordinary foliage-leaf; it is then termed axillary. Generally, however, the flower-bearing portion of the plant is sharply distinguished from the foliage leaf-bearing or vegetative portion, and forms a more or less elaborate branch-system in which the bracts are small and scale-like. Such a branch-system is called an inflorescence. The primary function of the flower is to bear the spores. These, as in Gymnosperms, are of two kinds, microspores or pollen-grains, borne in the stamens (or microsporophylls) and megaspores, in which the egg-cell is developed, contained in the ovule, which is borne enclosed in the carpel (or megasporophyll). The flower may consist only of spore-bearing leaves, as in willow, where each flower comprises only a few stamens or two carpels. Usually, however, other leaves are present which are only indirectly concerned with the reproductive process, acting as protective organs for the sporophylls or forming an attractive envelope. These form the perianth and are in one series, when the flower is termed monochlamydeous, or in two series (dichlamydeous). In the second case the outer series (calyx of sepals) is generally green and leaf-like, its function being to protect the rest of the flower, especially in the bud; while the inner series (corolla of petals) is generally white or brightly coloured, and more delicate in structure, its function being to attract the particular insect or bird by agency of which pollination is effected. The insect, &c., is attracted by the colour and scent of the flower, and frequently also by honey which is secreted in some part of the flower. (For further details on the form and arrangement of the flower and its parts, see FLOWER.)

Flower.

Each stamen generally bears four pollen-sacs (*microsporangia*) which are associated to form the anther, and carried up on a stalk or filament. The development of the microsporangia and the contained spores (pollen-grains) is closely comparable with that of the microsporangia in Gymnosperms or heterosporous ferns. The pollen is set free by the opening (dehiscence) of the anther, generally by means of longitudinal slits, but sometimes by pores, as in the heath family (Ericaceae), or by valves, as in the barberry. It is then dropped or carried by some external agent, wind, water or some member of the animal kingdom, on to the receptive surface of

Stamen and pollen.

the carpel of the same or another flower. The carpel, or aggregate of carpels forming the pistil or gynaeceum, comprises an ovary containing one or more ovules and a receptive surface or stigma; the stigma is sometimes carried up on a style. The mature pollen-grain is, like other spores, a single cell; except in the case of some submerged aquatic plants, it has a double wall, a thin delicate wall of unaltered cellulose, the endospore or intine, and a tough outer cuticularized exospore or extine. The exospore often bears spines or warts, or is variously sculptured, and the character of the markings is often of value for the distinction of genera or higher groups. Germination of the microspore begins before it leaves the pollen-sac. In very few cases has anything representing prothallial development been observed; generally a small cell (the antheridial or generative cell) is cut off, leaving a larger tube-cell. When placed on the stigma, under favourable circumstances, the pollen-grain puts forth a pollen-tube which grows down the tissue of the style to the ovary, and makes its way along the placenta, guided by projections or hairs, to the mouth of an ovule. The nucleus of the tube-cell has meanwhile passed into the tube, as does also the generative nucleus which divides to form two male- or sperm-cells. The male-cells are carried to their destination in the tip of the pollen-tube.

Pistil and embryo-sac.

The ovary contains one or more ovules borne on a placenta, which is generally some part of the ovary-wall. The development of the ovule, which represents the macrosporangium, is very similar to the process in Gymnosperms; when mature it consists of one or two coats surrounding the central nucellus, except at the apex where an opening, the micropyle, is left. The nucellus is a cellular tissue enveloping one large cell, the embryo-sac or macrospore. The germination of the macrospore consists in the repeated division of its nucleus to form two groups of four, one group at each end of the embryo-sac. One nucleus from each group, the polar nucleus, passes to the centre of the sac, where the two fuse to form the so-called definitive nucleus. Of the three cells at the micropylar end of the sac, all naked cells (the so-called egg-apparatus), one is the egg-cell or oosphere, the other two, which may be regarded as representing abortive egg-cells (in rare cases capable of fertilization), are known as synergidae. The three cells at the opposite end are known as antipodal cells and become invested with a cell-wall. The gametophyte or prothallial generation is thus extremely reduced, consisting of but little more than the male and female sexual cells—the two sperm-cells in the pollen-tube and the egg-cell (with the synergidae) in the embryo-sac. At the period of fertilization the embryo-sac lies in close proximity to the opening of the micropyle, into which the pollen-tube has penetrated, the separating cell-wall becomes absorbed, and the male or sperm-cells are ejected into the embryo-sac. Guided by the synergidae one male-cell passes into the oosphere with which it fuses, the two nuclei uniting, while the other fuses with the definitive nucleus, or, as it is also called, the endosperm nucleus. This remarkable double fertilization as it has been called, although only recently discovered, has been proved to take place in widely-separated families, and both in Monocotyledons and Dicotyledons, and there is every probability that, perhaps with variations, it is the normal process in Angiosperms. After impregnation the fertilized oosphere immediately surrounds itself with a cell-wall and becomes the oospore which by a process of growth forms the embryo of the new plant. The endosperm-nucleus divides rapidly to produce a cellular tissue which fills up the interior of the rapidly-growing embryo-sac, and forms a tissue, known as endosperm, in which is stored a supply of nourishment for the use later on of the embryo. It has long been known that after fertilization of the egg has taken place, the formation of endosperm begins from the endosperm nucleus, and this had come to be regarded as the recommencement of the development of a prothallium after a pause following the reinvigorating union of the polar nuclei. This view is still maintained by those who differentiate two acts of fertilization within the embryo-sac, and regard that of the egg by the first male-cell, as the true or generative fertilization, and that of the polar nuclei by the second male gamete as a vegetative fertilization which gives a stimulus to development in correlation with the other. If, on the other hand, the endosperm is the product of an act of fertilization as definite as that giving rise to the embryo itself, we have to recognize that twin-plants are produced within the embryo-sac—one, the embryo, which becomes the angiospermous plant, the other, the endosperm, a short-lived, undifferentiated nurse to assist in the nutrition of the former, even as the subsidiary embryos in a pluri-embryonic Gymnosperm may facilitate the nutrition of the dominant one. If this is so, and the endosperm like the embryo is normally the product of a sexual act, hybridization will give a hybrid endosperm as it does a hybrid embryo, and herein (it is suggested) we may have the explanation of the phenomenon of xenia observed in the mixed endosperms of hybrid races of maize and other plants, regarding which it has only been possible hitherto to assert that they were indications of the extension of the influence of the pollen beyond the egg and its product. This would not, however, explain the formation of fruits intermediate in size and colour between those of crossed parents. The signification of the coalescence of the polar nuclei is not explained by these new facts, but it is noteworthy that the second male-cell is said to unite sometimes with the apical polar nucleus, the sister of the egg, before the union of this with the basal polar one. The idea of the endosperm as a second subsidiary plant is no new one; it was suggested long ago in explanation of the coalescence of the polar nuclei, but it was then based on the assumption that these represented male and female cells, an assumption for which there was no evidence and which was inherently improbable. The proof of a coalescence of the second male nucleus with the definitive nucleus gives the conception a more stable basis. The antipodal cells aid more or less in the process of nutrition of the developing embryo, and may undergo multiplication, though they ultimately disintegrate, as do also the synergidae. As in Gymnosperms and other groups an interesting qualitative change is associated with the process of fertilization. The number of chromosomes (see PLANTS: *Cytology*) in the nucleus of the two spores, pollen-grain and embryo-sac, is only half the number found in an ordinary vegetative nucleus; and this reduced number persists in the cells derived from them. The full number is restored in the fusion of the male and female nuclei in the process of fertilization, and remains until the formation of the cells from which the spores are derived in the new generation.

Fertilization.

In several natural orders and genera departures from the course of development just described have been noted. In the natural order Rosaceae, the series Querciflorae, and the very anomalous genus *Casuarina* and others, instead of a single macrospore a more or less extensive sporogenous tissue is formed, but only one cell proceeds to the formation of a functional female cell. In *Casuarina*, *Juglans* and the order Corylaceae, the pollen-tube does not enter by means of the micropyle, but passing down the ovary wall and through the placenta, enters at the chalazal end of the ovule. Such a method of entrance is styled chalazogamic, in contrast to the porogamic or ordinary method of approach by means of the micropyle.

Embryology.

The result of fertilization is the development of the ovule into the seed. By the segmentation of the fertilized egg, now invested by cell-membrane, the embryo-plant arises. A varying number of transverse segment-walls transform it into a pro-embryo—a cellular row of which the cell nearest the micropyle becomes attached to the apex of the embryo-sac, and thus fixes the position of the developing embryo, while the terminal cell is projected into its cavity. In Dicotyledons the shoot of the embryo is wholly derived from the terminal cell of the pro-embryo, from the next cell the root arises, and the remaining ones form the suspensor. In many Monocotyledons the terminal cell forms the cotyledonary portion alone of the shoot of the embryo, its axial part and the root being derived from the adjacent cell; the cotyledon is thus a terminal structure and the apex of the primary stem a lateral one—a condition in marked contrast with that of the Dicotyledons. In some Monocotyledons,

however, the cotyledon is not really terminal. The primary root of the embryo in all Angiosperms points towards the micropyle. The developing embryo at the end of the suspensor grows out to a varying extent into the forming endosperm, from which by surface absorption it derives good material for growth; at the same time the suspensor plays a direct part as a carrier of nutrition, and may even develop, where perhaps no endosperm is formed, special absorptive "suspensor roots" which invest the developing embryo, or pass out into the body and coats of the ovule, or even into the placenta. In some cases the embryo or the embryo-sac sends out suckers into the nucellus and ovular integument. As the embryo develops it may absorb all the food material available, and store, either in its cotyledons or in its hypocotyl, what is not immediately required for growth, as reserve-food for use in germination, and by so doing it increases in size until it may fill entirely the embryo-sac; or its absorptive power at this stage may be limited to what is necessary for growth and it remains of relatively small size, occupying but a small area of the embryo-sac, which is otherwise filled with endosperm in which the reserve-food is stored. There are also intermediate states. The position of the embryo in relation to the endosperm varies, sometimes it is internal, sometimes external, but the significance of this has not yet been established.

The formation of endosperm starts, as has been stated, from the endosperm nucleus. Its segmentation always begins before that of the egg, and thus there is timely preparation for the nursing of the young embryo. If in its extension to contain the new formations within it the embryo-sac remains narrow, endosperm formation proceeds upon the lines of a cell-division, but in wide embryo-sacs the endosperm is first of all formed as a layer of naked cells around the wall of the sac, and only gradually acquires a pluricellular character, forming a tissue filling the sac. The function of the endosperm is primarily that of nourishing the embryo, and its basal position in the embryo-sac places it favourably for the absorption of food material entering the ovule. Its duration varies with the precocity of the embryo. It may be wholly absorbed by the progressive growth of the embryo within the embryo-sac, or it may persist as a definite and more or less conspicuous constituent of the seed. When it persists as a massive element of the seed its nutritive function is usually apparent, for there is accumulated within its cells reserve-food, and according to the dominant substance it is starchy, oily, or rich in cellulose, mucilage or proteid. In cases where the embryo has stored reserve food within itself and thus provided for self-nutrition, such endosperm as remains in the seed may take on other functions, for instance, that of water-absorption.

Some deviations from the usual course of development may be noted. Parthenogenesis, or the development of an embryo from an egg-cell without the latter having been fertilized has been described in species of *Thalictrum*, *Antennaria* and *Alchemilla*. Polyembryony is generally associated with the development of cells other than the egg-cell. Thus in *Erythronium* and *Limnocharis* the fertilized egg may form a mass of tissue on which several embryos are produced. Isolated cases show that any of the cells within the embryo-sac may exceptionally form an embryo, *e.g.* the synergidae in species of *Mimosa*, *Iris* and *Allium*, and in the last-mentioned the antipodal cells also. In *Coelebogyne* (Euphorbiaceae) and in *Funkia* (Liliaceae) polyembryony results from an adventitious production of embryos from the cells of the nucellus around the top of the embryo-sac. In a species of *Allium*, embryos have been found developing in the same individual from the egg-cell, synergids, antipodal cells and cells of the nucellus. In two Malayan species of *Balanophora*, the embryo is developed from a cell of the endosperm, which is formed from the upper polar nucleus only, the egg apparatus becoming disorganized. The last-mentioned case has been regarded as representing an apogamous development of the sporophyte from the gametophyte comparable to the cases of apogamy described in Ferns. But the great diversity of these abnormal cases as shown in the examples cited above suggests the use of great caution in formulating definite morphological theories upon them.

As the development of embryo and endosperm proceeds within the embryo-sac, its wall enlarges and commonly absorbs the substance of the nucellus (which is likewise enlarging) to near its outer limit, and combines with it and the integument to form the *seed-coat*; or the whole nucellus and even the integument may be absorbed. In some plants the nucellus is not thus absorbed, but itself becomes a seat of deposit of reserve-food constituting the *perisperm* which may coexist with endosperm, as in the water-lily order, or may alone form a food-reserve for the embryo, as in *Canna*. Endospermic food-reserve has evident advantages over perispermic, and the latter is comparatively rarely found and only in non-progressive series. Seeds in which endosperm or perisperm or both exist are commonly called *albuminous* or *endospermic*, those in which neither is found are termed *exalbuminous* or *exendospermic*. These terms, extensively used by systematists, only refer, however, to the grosser features of the seed, and indicate the more or less evident occurrence of a food-reserve; many so-called exalbuminous seeds show to microscopic examination a distinct endosperm which may have other than a nutritive function. The presence or absence of endosperm, its relative amount when present, and the position of the embryo within it, are valuable characters for the distinction of orders and groups of orders. Meanwhile the ovary wall has developed to form the fruit or pericarp, the structure of which is closely associated with the manner of distribution of the seed. Frequently the influence of fertilization is felt beyond the ovary, and other parts of the flower take part in the formation of the fruit, as the floral receptacle in the apple, strawberry and others. The character of the seed-coat bears a definite relation to that of the fruit. Their function is the twofold one of protecting the embryo and of aiding in dissemination; they may also directly promote germination. If the fruit is a dehiscent one and the seed is therefore soon exposed, the seed-coat has to provide for the protection of the embryo and may also have to secure dissemination. On the other hand, indehiscent fruits discharge these functions for the embryo, and the seed-coat is only slightly developed. Dissemination is effected by the agency of water, of air, of animals—and fruits and seeds are therefore grouped in respect of this as hydrophilous, anemophilous and zooidiophilous. The needs for these are obvious—buoyancy in water and resistance to wetting for the first, some form of parachute for the second, and some attaching mechanism or attractive structure for the third. The methods in which these are provided are of infinite variety, and any and every part of the flower and of the inflorescence may be called into requisition to supply the adaptation (see FRUIT). Special outgrowths, arils, of the seed-coat are of frequent occurrence. In the feature of fruit and seed, by which the distribution of Angiosperms is effected, we have a distinctive character of the class. In Gymnosperms we have seeds, and the carpels may become modified and close around these, as in *Pinus*, during the process of ripening to form an imitation of a box-like fruit which subsequently opening allows the seeds to escape; but there is never in them the closed ovary investing from the outset the ovules, and ultimately forming the ground-work of the fruit.

Fruit and seed.

Dissemination.

Their fortuitous dissemination does not always bring seeds upon a suitable nidus for germination, the primary essential of which is a sufficiency of moisture, and the duration of vitality of the embryo is a point of interest. Some seeds retain vitality for a period of many years, though there is no warrant for the popular notion that genuine "mummy wheat" will germinate; on the other hand some seeds lose vitality in little more than a year. Further, the older the seed the more slow as a general rule will germination be in starting, but there are notable exceptions. This pause, often of so long duration, in the growth of the embryo between the time of its perfect development within the seed and the moment of germination, is one of the remarkable and distinctive features of the life of Spermatophytes. The aim of germination is the fixing of the embryo in the soil, effected usually by means of the root, which is the first part of the embryo to appear, in preparation for the elongation of the epicotyledonary portion of the shoot, and there is infinite variety in the details of the process. In

Germination of seed.

albuminous Dicotyledons the cotyledons act as the absorbents of the reserve-food of the seed and are commonly brought above ground (*epigeal*), either withdrawn from the seed-coat or carrying it upon them, and then they serve as the first green organs of the plant. The part of the stem below the cotyledons (*hypocotyl*) commonly plays the greater part in bringing this about. Exalbuminous Dicotyledons usually store reserve-food in their cotyledons, which may in germination remain below ground (*hypogeal*). In albuminous Monocotyledons the cotyledon itself, probably in consequence of its terminal position, is commonly the agent by which the embryo is thrust out of the seed, and it may function solely as a feeder, its extremity developing as a sucker through which the endosperm is absorbed, or it may become the first green organ, the terminal sucker dropping off with the seed-coat when the endosperm is exhausted. Exalbuminous Monocotyledons are either hydrophytes or strongly hygrophilous plants and have often peculiar features in germination.

Distribution by seed appears to satisfy so well the requirements of Angiosperms that distribution by vegetative buds is only an occasional process. At the same time every bud on a shoot has the capacity to form a new plant if placed in suitable conditions, as the horticultural practice of propagation by cuttings shows; in nature we see plants spreading by the rooting of their shoots, and buds we know may be freely formed not only on stems but on leaves and on roots. Where detachable buds are produced, which can be transported through the air to a distance, each of them is an incipient shoot which may have a root, and there is always reserve-food stored in some part of it. In essentials such a bud resembles a seed. A relation between such vegetative distribution buds and production of flower is usually marked. Where there is free formation of buds there is little flower and commonly no seed, and the converse is also the case. Viviparous plants are an illustration of substitution of vegetative buds for flower.

Vegetative reproduction.

The position of Angiosperms as the highest plant-group is unassailable, but of the point or points of their origin from the general stem of the plant kingdom, and of the path or paths of their evolution, we can as yet say little. Until well on in the Mesozoic period geological history tells us nothing about Angiosperms, and then only by their vegetative organs. We readily recognize in them now-a-days the natural classes of Dicotyledons and Monocotyledons distinguished alike in vegetative and in reproductive construction, yet showing remarkable parallel sequences in development; and we see that the Dicotyledons are the more advanced and show the greater capacity for further progressive evolution. But there is no sound basis for the assumption that the Dicotyledons are derived from Monocotyledons; indeed, the palaeontological evidence seems to point to the Dicotyledons being the older. This, however, does not entitle us to assume the origin of Monocotyledons from Dicotyledons, although there is manifestly a temptation to connect helobic forms of the former with ranal ones of the latter. There is no doubt that the phylum of Angiosperms has not sprung from that of Gymnosperms.

Phylogeny and taxonomy.

Within each class the flower-characters as the essential feature of Angiosperms supply the clue to phylogeny, but the uncertainty regarding the construction of the primitive angiospermous flower gives a fundamental point of divergence in attempts to construct progressive sequences of the families. Simplicity of flower-structure has appeared to some to be always primitive, whilst by others it has been taken to be always derived. There is, however, abundant evidence that it may have the one or the other character in different cases. Apart from this, botanists are generally agreed that the concrescence of parts of the flower-whorls—in the gynaeceum as the seed-covering, and in the corolla as the seat of attraction, more than in the androecium and the calyx—is an indication of advance, as is also the concrescence that gives the condition of epigyny. Dorsiventrality is also clearly derived from radial construction, and anatropy of the ovule has followed atropy. We should expect the albuminous state of the seed to be an antecedent one to the exalbuminous condition, and the recent discoveries in fertilization tend to confirm this view. Amongst Dicotyledons the gamopetalous forms are admitted to be the highest development and a dominant one of our epoch. Advance has been along two lines, markedly in relation to insect-pollination, one of which has culminated in the hypogynous epipetalous bicarpellate forms with dorsiventral often large and loosely arranged flowers such as occur in Scrophulariaceae, and the other in the epigynous bicarpellate small-flowered families of which the Compositae represent the most elaborate type. In the polypetalous forms progression from hypogyny to epigyny is generally recognized, and where dorsiventrality with insect-pollination has been established, a dominant group has been developed as in the Leguminosae. The starting-point of the class, however, and the position within it of apetalous families with frequently unisexual flowers, have provoked much discussion. In Monocotyledons a similar advance from hypogyny to epigyny is observed, and from the dorsiventral to the radial type of flower. In this connexion it is noteworthy that so many of the higher forms are adapted as bulbous geophytes, or as aerophytes to special xerophilous conditions. The Gramineae offer a prominent example of a dominant self-pollinated or wind-pollinated family, and this may find explanation in a multiplicity of factors.

Though best known for his artificial (or sexual) system, Linnaeus was impressed with the importance of elaborating a natural system of arrangement in which plants should be arranged according to their true affinities. In his *Philosophia Botanica* (1751) Linnaeus grouped the genera then known into sixty-seven orders (*fragmenta*), all except five of which are Angiosperms. He gave names to these but did not characterize them or attempt to arrange them in larger groups. Some represent natural groups and had in several cases been already recognized by Ray and others, but the majority are, in the light of modern knowledge, very mixed. Well-defined polypetalous and gamopetalous genera sometimes occur in the same order, and even Monocotyledons and Dicotyledons are classed together where they have some striking physiological character in common.

Work on the lines suggested by the Linnaean *fragmenta* was continued in France by Bernard de Jussieu and his nephew, Antoine Laurent, and the arrangement suggested by the latter in his *Genera Plantarum secundum Ordines Naturales disposita* (1789) is the first which can claim to be a natural system. The orders are carefully characterized, and those of Angiosperms are grouped in fourteen classes under the two main divisions Monocotyledons and Dicotyledons. The former comprise three classes, which are distinguished by the relative position of the stamens and ovary; the eleven classes of the latter are based on the same set of characters and fall into the larger subdivisions Apetalae, Monopetalae and Polypetalae, characterized respectively by absence, union or freedom of the petals, and a subdivision, *Diclines Irregulares*, a very unnatural group, including one class only. A. P. de Candolle introduced several improvements into the system. In his arrangement the last subdivision disappears, and the Dicotyledons fall into two groups, a larger containing those in which both calyx and corolla are present in the flower, and a smaller, Monochlamydeae, representing the Apetalae and *Diclines Irregulares* of Jussieu. The dichlamydeous group is subdivided into three, Thalamiflorae, Calyciflorae and Corolliflorae, depending on the position and union of the petals. This, which we may distinguish as the French system, finds its most perfect expression in the classic *Genera Plantarum* (1862–1883) of Bentham and Hooker, a work containing a description, based on careful examination of specimens, of all known genera of flowering plants. The subdivision is as follows:—

Dicotyledons.

- Polypetalae
  - Thalamiflorae.
  - Disciflorae.
  - Calyciflorae.
- Gamopetalae
  - Inferae.
  - Heteromerae.
  - Bicarpellatae.

Monochlamydeae in eight series.
Monocotyledons in seven series.

Of the Polypetalae, series 1, Thalamiflorae, is characterized by hypogynous petals and stamens, and contains 34 orders distributed in 6 larger groups or cohorts. Series 2, Disciflorae, takes its name from a development of the floral axis which forms a ring or cushion at the base of the ovary or is broken up into glands; the ovary is superior. It contains 23 orders in 4 cohorts. Series 3, Calyciflorae, has petals and stamens perigynous, or sometimes superior. It contains 27 orders in 5 cohorts.

Of the Gamopetalae, series 1, Inferae, has an inferior ovary and stamens usually as many as the corolla-lobes. It contains 9 orders in 3 cohorts. Series 2, Heteromerae, has generally a superior ovary, stamens as many as the corolla-lobes or more, and more than two carpels. It contains 12 orders in 3 cohorts. Series 3, Bicarpellatae, has generally a superior ovary and usually two carpels. It contains 24 orders in 4 cohorts.

The eight series of Monochlamydeae, containing 36 orders, form groups characterized mainly by differences in the ovary and ovules, and are now recognized as of unequal value.

The seven series of Monocotyledons represent a sequence beginning with the most complicated epigynous orders, such as Orchideae and Scitamineae, and passing through the petaloid hypogynous orders (series Coronarieae) of which Liliaceae is the representative to Juncaceae and the palms (series Calycinae) where the perianth loses its petaloid character and thence to the Aroids, screw-pines and

others where it is more or less aborted (series Nudiflorae). Series 6, Apocarpeae, is characterized by 5 carpels, and in the last series Glumaceae, great simplification in the flower is associated with a grass-like habit.

The sequence of orders in the polypetalous subdivision of Dicotyledons undoubtedly represents a progression from simpler to more elaborate forms, but a great drawback to the value of the system is the inclusion among the Monochlamydeae of a number of orders which are closely allied with orders of Polypetalae though differing in absence of a corolla. The German systematist, A. W. Eichler, attempted to remove this disadvantage which since the time of Jussieu had characterized the French system, and in 1883 grouped the Dicotyledons in two subclasses. The earlier Choripetalae embraces the Polypetalae and Monochlamydae of the French systems. It includes 21 series, and is an attempt to arrange as far as possible in a linear series those orders which are characterized by absence or freedom of petals. The second subclass, Gamopetalae, includes 9 series and culminates in those which show the most elaborate type of flower, the series Aggregatae, the chief representative of which is the great and wide-spread order Compositae. A modification of Eichler's system, embracing the most recent views of the affinities of the orders of Angiosperms, has been put forward by Dr Adolf Engler of Berlin, who adopts the suggestive names Archichlamydeae and Metachlamydeae for the two subdivisions of Dicotyledons. Dr Engler is the principal editor of a large series of volumes which, under the title *Die naturlichen Pflanzenfamilien*, is a systematic account of all the known genera of plants and represents the work of many botanists. More recently in *Das Pflanzenreich* the same author organized a series of complete monographs of the families of seed-plants.

As an attempt at a phylogenetic arrangement, Engler's system is now preferred by many botanists. More recently a startling novelty in the way of system has been produced by van Tieghem, as follows:

Monocotyledons.
Liorhizal Dicotyledons.
Dicotyledons.
INSEMINEAE.
SEMINEAE.
Unitegmineae.
Bitegmineae.

The most remarkable feature here is the class of Liorhizal Dicotyledons, which includes only the families of Nymphaeaceae and Gramineae. It is based upon the fact that the histological differentiation of the epidermis of their root is that generally characteristic of Monocotyledons, whilst they have two cotyledons—the old view of the epiblast as a second cotyledon in Gramineae being adopted. But the presence of a second cotyledon in grasses is extremely doubtful, and though there may be ground for reconsidering the position of Nymphaeaceae, their association with the grasses as a distinct class is not warranted by a comparative examination of the members of the two orders. Ovular characters determine the grouping in the Dicotyledons, van Tieghem supporting the view that the integument, the outer if there be two, is the lamina of a leaf of which the funicle is the petiole, whilst the nucellus is an outgrowth of this leaf, and the inner integument, if present, an indusium. The Insemineae include forms in which the nucellus is not developed, and therefore there can be no seed. The plants included are, however, mainly well-established parasites, and the absence of nucellus is only one of those characters of reduction to which parasites are liable. Even if we admit van Tieghem's interpretation of the integuments to be correct, the diagnostic mark of his unitegminous and bitegminous groups is simply that of the absence or presence of an indusium, not a character of great value elsewhere, and, as we know, the number of the ovular coats is inconstant within the same family. At the same time the groups based upon the integuments are of much the same extent as the Polypetalae and Gamopetalae of other systems. We do not yet know the significance of this correlation, which, however, is not an invariable one, between number of integuments and union of petals.

Within the last few years Prof. John Coulter and Dr C. J. Chamberlain of Chicago University have given a valuable general account of the morphology of Angiosperms as far as concerns the flower, and the series of events which ends in the formation of the seed (*Morphology of Angiosperms*, Chicago, 1903).

AUTHORITIES.—The reader will find in the following works details of the subject and references to the literature: Bentham and Hooker, *Genera Plantarum* (London, 1862–1883); Eichler, *Bluthendiagramme* (Leipzig, 1875–1878); Engler and Prantl, *Die naturlichen Pflanzenfamilien* (Leipzig, 1887–1899); Engler, *Syllabus der Pflanzenfamilien*, 3rd ed. (Berlin, 1903); Knuth, *Handbuch der Blutenbiologie* (Leipzig, 1898, 1899); Sachs, *History of Botany*, English ed. (Oxford, 1890); Solereder, *Systematische Anatomie der Dicotyledonen* (Stuttgart, 1899); van Tieghem, *Eléments de botanique*; Coulter and Chamberlain, *Morphology of Angiosperms* (New York, 1903). (I. B. B.; A. B. R.)

ANGKOR, an assemblage of ruins in Cambodia, the relic of the ancient Khmer civilization. They are situated in forests to the north of the Great Lake (Tonle-Sap), the most conspicuous of the remains being the town of Angkor-Thom and the temple of Angkor-Vat, both of which lie on the right bank of the river Siem-Reap, a tributary of Tonle-Sap. Other remains of the same form and character lie scattered about the vicinity on both banks of the river, which is crossed by an ancient stone bridge.

Angkor-Thom lies about a quarter of a mile from the river. According to Aymonier it was begun about A. D. 860, in the reign of the Khmer sovereign Jayavarman III., and finished towards A.D. 900. It consists of a rectangular enclosure, nearly 2 m. in each direction, surrounded by a wall from 20 to 30 ft. in height. Within the enclosure, which is entered by five monumental gates, are the remains of palaces and temples, overgrown by the forest. The chief of these are:—

(1) The vestiges of the royal palace, which stood within an enclosure containing also the pyramidal religious structure known as the Phimeanakas. To the east of this enclosure there extends a terrace decorated with magnificent reliefs.

(2) The temple of Bayon, a square enclosure formed by galleries with colonnades, within which is another and more elaborate system of galleries, rectangular in arrangement and enclosing a cruciform structure, at the centre of which rises a huge tower with a circular base. Fifty towers, decorated with quadruple faces of Brahma, are built at intervals upon the galleries, the whole temple ranking as perhaps the most remarkable of the Khmer remains.

Angkor-Vat, the best preserved example of Khmer architecture, lies less than a mile to the south of the royal city, within a rectangular park surrounded by a moat, the outer perimeter of which measures 6060 yds. On the west side of the park a paved causeway, leading over the moat and under a magnificent portico, extends for a distance of a quarter of a mile to the chief entrance of the main building. The temple was originally devoted to the worship of Brahma, but afterwards to that of Buddha; its construction is assigned by Aymonier to the first half of the 12th century A.D. It consists of three stages, connected by numerous exterior staircases and decreasing in dimensions as they rise, culminating in the sanctuary, a great central tower pyramidal in form. Towers also surmount the angles of the terraces of the two upper stages. Three galleries with vaulting supported on columns lead from the three western portals to the second stage. They are connected by a transverse gallery, thus forming four square basins. Khmer decoration, profuse but harmonious, consists chiefly in the representation of gods, men and animals, which are displayed on every flat surface. Combats and legendary episodes are often depicted; floral decoration is reserved chiefly for borders, mouldings and capitals. Sandstone of various colours was the chief material employed by the Khmers; limonite was also used. The stone was cut into huge blocks which are fitted together with great accuracy without the use of cement.

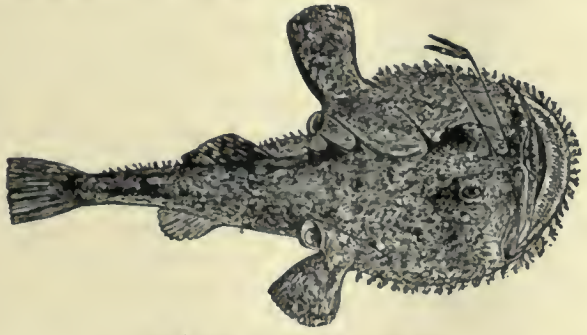
See E. Aymonier, *Le Cambodge* (3 vols., 1900–1904); Doudart de Lagrée, *Voyage d'exploration en Indo-Chine* (1872–1873); A. H. Mouhot, *Travels in Indo-China, Cambodia and Laos* (2 vols., 1864); Fournereau and Porcher, *Les Ruines d'Angkor* (1890); L. Delaporte, *Voyage au Cambodge: l'architecture Khmer* (1880); J. Moura, *Le Royaume de Cambodge* (2 vols., 1883).

ANGLE (from the Lat. *angulus*, a corner, a diminutive, of which the primitive form, *angus*, does not occur in Latin; cognate are the Lat. *angere*, to compress into a bend or to strangle, and the Gr. ἄγκος, a bend; both connected with the Aryan root *ank-*, to bend: see ANGLING), in geometry, the inclination of one line or plane to another. Euclid (*Elements*, book 1) defines a plane angle as the inclination to each other, in a plane, of two lines which meet each other, and do not lie straight with respect to each other (see GEOMETRY, EUCLIDEAN). According to Proclus an angle must be either a quality or a quantity, or a relationship. The first concept was utilized by Eudemus, who regarded an angle as a deviation from a straight line; the second by Carpus of Antioch, who regarded it as the interval or space between the intersecting lines; Euclid adopted the third concept, although his definitions of right, acute, and obtuse angles are certainly quantitative. A discussion of

these concepts and the various definitions of angles in Euclidean geometry is to be found in W. B. Frankland, *The First Book of Euclid's Elements* (1905). Following Euclid, a right angle is formed by a straight line standing upon another straight line so as to make the adjacent angles equal; any angle less than a right angle is termed an acute angle, and any angle greater than a right angle an obtuse angle. The difference between an acute angle and a right angle is termed the complement of the angle, and between an angle and two right angles the supplement of the angle. The generalized view of angles and their measurement is treated in the article TRIGONOMETRY. A solid angle is definable as the space contained by three or more planes intersecting in a common point; it is familiarly represented by a corner. The angle between two planes is termed dihedral, between three trihedral, between any number more than three polyhedral. A spherical angle is a particular dihedral angle; it is the angle between two intersecting arcs on a sphere, and is measured by the angle between the planes containing the arcs and the centre of the sphere.

The angle between a line and a curve (mixed angle) or between two curves (curvilinear angle) is measured by the angle between the line and the tangent at the point of intersection, or between the tangents to both curves at their common point. Various names (now rarely, if ever, used) have been given to particular cases:—amphicyrtic (Gr. *ἀμφί*, on both sides, *κυρτός*, convex) or cissoidal (Gr. *κισσός*, ivy), biconvex; xystroidal or sistroidal (Gr. *ξυστρίς*, a tool for scraping), concavo-convex; amphicoelic (Gr. *κοίλη*, a hollow) or *angulus lunularis*, biconcave.

ANGLER, also sometimes called fishing-frog, frog-fish, sea-devil (*Lophius piscatorius*), a fish well known off the coasts of Great Britain and Europe generally, the grotesque shape of its body and its singular habits having attracted the attention of naturalists of all ages. To the North Sea fishermen this fish is known as the "monk," a name which more properly belongs to *Rhina squatina*, a fish allied to the skates. Its head is of enormous size, broad, flat and depressed, the remainder of the body appearing merely like an appendage. The wide mouth extends



The Angler (*Lophius piscatorius*).

all round the anterior circumference of the head; and both jaws are armed with bands of long pointed teeth, which are inclined inwards, and can be depressed so as to offer no impediment to an object gliding towards the stomach, but to prevent its escape from the mouth. The pectoral and ventral fins are so articulated as to perform the functions of feet, the fish being enabled to move, or rather to walk, on the bottom of the sea, where it generally hides itself in the sand or amongst sea-weed. All round its head and also along the body the skin bears fringed appendages resembling short fronds of sea-weed, a structure which, combined with the extraordinary faculty of assimilating the colour of the body to its surroundings, assists this fish greatly in concealing itself in places which it selects on account of the abundance of prey. To render the organization of this creature perfect in relation to its wants, it is provided with three long filaments inserted along the middle of the head, which are, in fact, the detached and modified three first spines of the anterior dorsal fin. The filament most important in the economy of the angler is the first, which is the longest, terminates in a lappet, and is movable in every direction. The angler is believed to attract other fishes by means of its lure, and then to seize them with its enormous jaws. It is probable enough that smaller fishes are attracted in this way, but experiments have shown that the action of the jaws is automatic and depends on contact of the prey with the tentacle. Its stomach is distensible in an extraordinary degree, and not rarely fishes have been taken out quite as large and heavy as their destroyer. It grows to a length of more than 5 ft.; specimens of 3 ft. are common. The spawn of the angler is very remarkable. It consists of a thin sheet of transparent gelatinous material 2 or 3 ft. broad and 25 to 30 ft. in length. The eggs in this sheet are in a single layer, each in its own little cavity. The spawn is free in the sea. The larvae are free-swimming and have the pelvic fins elongated into filaments. The British species is found all round the coasts of Europe and western North America, but becomes scarce beyond 60° N. lat.; it occurs also on the coasts of the Cape of Good Hope. A second species (*Lophius budegassa*) inhabits the Mediterranean, and a third (*L. setigerus*) the coasts of China and Japan.

ANGLESEY, ARTHUR ANNESLEY, 1st EARL OF (1614–1686), British statesman, son of the 1st Viscount Valentia (cr. 1621) and Baron Mountnorris (cr. 1628), and of Dorothy, daughter of Sir John Philipps of Picton Castle, Pembrokeshire, was born at Dublin on the 10th of July 1614, was educated at Magdalen College, Oxford, and was admitted to Lincoln's Inn in 1634. Having made the grand tour he returned to Ireland; and being employed by the parliament in a mission to the duke of Ormonde, now reduced to the last extremities, he succeeded in concluding a treaty with him on the 19th of June 1647, thus securing the country from complete subjection to the rebels. In April 1647 he was returned for Radnorshire to the House of Commons. He supported the parliamentary as against the republican or army party, and appears to have been one of the members excluded in 1648. He sat in Richard Cromwell's parliament for Dublin city, and endeavoured to take his seat in the restored Rump Parliament of 1659. He was made president of the council in February 1660, and in the Convention Parliament sat for Carmarthen borough. The anarchy of the last months of the commonwealth converted him to royalism, and he showed great activity in bringing about the Restoration. He used his influence in moderating measures of revenge and violence, and while sitting in judgment on the regicides was on the side of leniency. In November 1660 by his father's death he had become Viscount Valentia and Baron Mountnorris in the Irish peerage, and on the 20th April 1661 he was created Baron Annesley of Newport Pagnell in Buckinghamshire and earl of Anglesey in the peerage of Great Britain. He supported the king's administration in parliament, but opposed strongly the unjust measure which, on the abolition of the court of wards, placed the extra burden of taxation thus rendered necessary on the excise. His services in the administration of Ireland were especially valuable. He filled the office of vice-treasurer from 1660 till 1667, served on the committee for carrying out the declaration for the settlement of Ireland and on the committee for Irish affairs, while later, in 1671 and 1672, he was a leading member of various commissions appointed to investigate the working of the Acts of Settlement. In February 1661 he had obtained a captaincy of horse, and in 1667 he exchanged his vice-treasuryship of Ireland for the treasuryship of the navy. His public career was marked by great independence and fidelity to principle. On the 24th of July 1663 he alone signed a protest against the bill "for the encouragement of trade," on the plea that owing to the free export of coin and bullion allowed by the act, and to the importation of foreign commodities being greater than the export of home goods, "it must necessarily follow . . . that our silver will also be carried away into foreign parts and all trade fail for want of money."[1] He especially disapproved of another clause in the same bill forbidding the importation of Irish cattle into England, a mischievous measure promoted by the duke of Buckingham, and he opposed again the bill brought in with that object in January

[1] *Protests of the Lords*, by J. E. Thorold Rogers (1875), i. 27: Carti's *Life of Ormonde* (1851), iv. 234; *Parl. Hist.* iv. 284.

1667. This same year his naval accounts were subjected to an examination in consequence of his indignant refusal to take part in the attack upon Ormonde;[1] and he was suspended from his office in 1668, no charge, however, against him being substantiated. He took a prominent part in the dispute in 1671 between the two Houses concerning the right of the Lords to amend money bills, and wrote a learned pamphlet on the question entitled *The Privileges of the House of Lords and Commons* (1702), in which the right of the Lords was asserted. In April 1673 he was appointed lord privy seal, and was disappointed at not obtaining the great seal the same year on the removal of Shaftesbury. In 1679 he was included in Sir W. Temple's new-modelled council.

In the bitter religious controversies of the time Anglesey showed great moderation and toleration. In 1674 he is mentioned as endeavouring to prevent the justices putting into force the laws against the Roman Catholics and Nonconformists.[2] In the panic of the "Popish Plot" in 1678 he exhibited a saner judgment than most of his contemporaries and a conspicuous courage. On the 6th of December he protested with three other peers against the measure sent up from the Commons enforcing the disarming of all convicted recusants and taking bail from them to keep the peace; he was the only peer to dissent from the motion declaring the existence of an Irish plot; and though believing in the guilt and voting for the death of Lord Stafford, he interceded, according to his own account,[3] with the king for him as well as for Langhorne and Plunket. His independent attitude drew upon him an attack by Dangerfield, and in the Commons by the attorney-general, Sir W. Jones, who accused him of endeavouring to stifle the evidence against the Romanists. In March 1679 he protested against the second reading of the bill for disabling Danby. In 1681 Anglesey wrote *A Letter from a Person of Honour in the Country*, as a rejoinder to the earl of Castlehaven, who had published memoirs on the Irish rebellion defending the action of the Irish and the Roman Catholics. In so doing Anglesey was held by Ormonde to have censured his conduct and that of Charles I. in concluding the "Cessation," and the duke brought the matter before the council. In 1682 he wrote *The Account of Arthur, Earl of Anglesey . . . of the true state of Your Majesty's Government and Kingdom*, which was addressed to the king in a tone of censure and remonstrance, but appears not to have been printed till 1694.[4] In consequence he was dismissed on the 9th of August 1682 from the office of lord privy seal. In 1683 he appeared at the Old Bailey as a witness in defence of Lord Russell, and in June 1685 he protested alone against the revision of Stafford's attainder. He died at his home at Blechingdon in Oxfordshire on the 26th of April 1686, closing a career marked by great ability, statesmanship and business capacity, and by conspicuous courage and independence of judgment. He amassed a large fortune in Ireland, in which country he had been allotted lands by Cromwell.

The unfavourable character drawn of him by Burnet is certainly unjust and not supported by any evidence. Pepys, a far more trustworthy judge, speaks of him invariably in terms of respect and approval as a "grave, serious man," and commends his appointment as treasurer of the navy as that of "a very notable man and understanding and will do things regular and understand them himself."[5] He was a learned and cultivated man and collected a celebrated library, which was dispersed at his death. Besides the pamphlets already mentioned, he wrote:—*A True Account of the Whole Proceedings betwixt . . . the Duke of Ormond and . . . the Earl of Anglesey* (1682); *A Letter of Remarks upon Jovian* (1683); other works ascribed to him being *The King's Right of Indulgence in Matters Spiritual . . . asserted* (1688); *Truth Unveiled, to which is added a short Treatise on . . . Transubstantiation* (1676); *The Obligation resulting from the Oath of Supremacy* (1688); and *England's Confusion* (1659). *Memoirs* of Lord Anglesey were published by Sir P. Pett in 1693, but contain little biographical information and were repudiated as a mere imposture by Sir John Thompson (Lord Haversham), his son-in-law, in his preface to Lord Anglesey's *State of the Government* in 1694. The author however of the preface to *The Rights of the Lords asserted* (1702), while blaming their publication as "scattered and unfinished papers," admits their genuineness.

Lord Anglesey married Elizabeth, daughter and co-heiress of Sir James Altham of Oxey, Hertfordshire, by whom, besides other children, he had James, who succeeded him, Altham, created Baron Altham, and Richard, afterwards 3rd Baron Altham. His descendant Richard, the 6th earl (d. 1761), left a son Arthur, whose legitimacy was doubted, and the peerage became extinct. He was summoned to the Irish House of Peers as Viscount Valentia, but was denied his writ to the parliament of Great Britain by a majority of one vote. He was created in 1793 earl of Mountnorris in the peerage of Ireland. All the male descendants of the 1st earl of Anglesey became extinct in the person of George, 2nd earl of Mountnorris, in 1844, when the titles of Viscount Valentia and Baron Mountnorris passed to his cousin Arthur Annesley (1785–1863), who thus became 10th Viscount Valentia, being descended from the 1st Viscount Valentia, the father of the 1st earl of Anglesey in the Annesley family. The 1st viscount was also the ancestor of the Earls Annesley in the Irish peerage.

AUTHORITIES.—*Dict. of Nat. Biography*, with authorities there collected; lives in Wood's *Athenae Oxonienses* (Bliss), iv. 181, *Biographia Britannica*, and H. Walpole's *Royal and Noble Authors* (1806), iii. 288 (the latter a very inadequate review of Anglesey's character and career); also *Bibliotheca Anglesiana . . .* per Thomam Philippum (1686); *The Happy Future State of England*, by Sir Peter Pett (1688); *Great News from Poland* (1683), where his religious tolerance is ridiculed; *Somers Tracts* (Scott, 1812), viii. 344; *Notes of the Privy Council* (Roxburghe Club, 1896); *Cal. of State Papers, Dom.*; *State Trials*, viii. and ix. 619. (P. C. Y.)

ANGLESEY, HENRY WILLIAM PAGET, 1st MARQUESS OF (1768–1854), British field-marshal, was born on the 17th of May 1768. He was the eldest son of Henry Paget, 1st earl of Uxbridge (d. 1812), and was educated at Westminster School and Christ Church, Oxford, afterwards entering parliament in 1790 as member for Carnarvon, for which he sat for six years. At the outbreak of the French Revolutionary wars Lord Paget (as he was then styled), who had already served in the militia, raised on his father's estate the regiment of Staffordshire volunteers, in which he was given the temporary rank of lieutenant-colonel (1793). The corps soon became part of the regular army as the 80th Foot, and it took part, under Lord Paget's command, in the Flanders campaign of 1794. In spite of his youth he held a brigade command for a time, and gained also, during the campaign, his first experience of the cavalry arm, with which he was thenceforward associated. His substantive commission as lieutenant-colonel of the 16th Light Dragoons bore the date of the 15th of June 1795, and in 1796 he was made a colonel in the army. In 1795 he married Lady Caroline Elizabeth Villiers, daughter of the earl of Jersey. In April 1797 Lord Paget was transferred to a lieut.-colonelcy in the 7th Light Dragoons, of which regiment he became colonel in 1801. From the first he applied himself strenously to the improvement of discipline, and to the perfection of a new system of cavalry evolutions. In the short campaign of 1799 in Holland, Paget commanded the cavalry brigade, and in spite of the unsuitable character of the ground, he made, on several occasions, brilliant and successful charges. After the return of the expedition, he devoted himself zealously to his regiment, which under his command became one of the best corps in the service. In 1802 he was promoted major-general, and six years later lieutenant-general. In command of the cavalry of Sir John Moore's army during the Corunna campaign, Lord Paget won the greatest distinction. At Sahagun, Mayorga and Benavente, the British cavalry behaved so well under his leadership that Moore wrote:—"It is impossible for me to say too much in its praise. . . . Our cavalry is very superior in quality to any the French have, and

[1] Carti's *Ormonde*, iv. 330, 340.
[2] *Cal. of State Pap. Dom.* (1673–1675), p. 152. [3] *Memoirs*, 8, 9.
[4] By Sir J. Thompson, his son-in-law. Reprinted in *Somers Tracts* (Scott, 1812), viii. 344, and in *Parl. Hist.* iv. app. xvi.
[5] *Diary* (ed. Wheatley, 1904), iv. 298, vii. 14.

the right spirit has been infused into them by the example and instruction of their ... leaders ...." At Benavente one of Napoleon's best cavalry leaders, General Lefebvre Desnoëttes, was taken prisoner. Corunna was Paget's last service in the Peninsula. His *liaison* with the wife of Henry Wellesley, afterwards Lord Cowley, made it impossible at that time for him to serve with Wellington, whose cavalry, on many occasions during the succeeding campaigns, felt the want of the true cavalry leader to direct them. His only war service from 1809 to 1815 was in the disastrous Walcheren expedition (1809) in which he commanded a division. During these years he occupied himself with his parliamentary duties as member for Milborne Port, which he represented almost continuously up to his father's death in 1812, when he took his seat in the House of Lords as earl of Uxbridge. In 1810 he was divorced and married Mrs Wellesley, who had about the same time been divorced from her husband. Lady Paget was soon afterwards married to the duke of Argyll. In 1815 Lord Uxbridge received command of the British cavalry in Flanders. At a moment of danger such as that of Napoleon's return from Elba, the services of the best cavalry general in the British army could not be neglected. Wellington placed the greatest confidence in him, and on the eve of Waterloo extended his command so as to include the whole of the allied cavalry and horse artillery. He covered the retirement of the allies from Quatre Bras to Waterloo on the 17th of June, and on the 18th gained the crowning distinction of his military career in leading the great cavalry charge of the British centre, which checked and in part routed D'Erlon's *corps d'armée* (see WATERLOO CAMPAIGN). Freely exposing his own life throughout, the earl received, by one of the last cannon shots fired, a severe wound in the leg, necessitating amputation. Five days later the prince regent created him marquess of Anglesey in recognition of his brilliant services, which were regarded universally as second only to those of the duke himself. He was made a G.C.B. and he was also decorated by many of the allied sovereigns.

In 1818 the marquess was made a knight of the Garter, in 1819 he became full general, and at the coronation of George IV. he acted as lord high steward of England. His support of the proceedings against Queen Caroline made him for a time unpopular, and when he was on one occasion beset by a crowd, who compelled him to shout "The Queen," he added the wish, "May all your wives be like her." At the close of April 1827 he became a member of the Canning administration, taking the post of master-general of the ordnance, previously held by Wellington. He was at the same time sworn a member of the privy council. Under the Wellington administration he accepted the appointment of lord-lieutenant of Ireland (March 1828), and in the discharge of his important duties he greatly endeared himself to the Irish people. The spirit in which he acted and the aims which he steadily set before himself contributed to the allaying of party animosities, to the promotion of a willing submission to the laws, to the prosperity of trade and to the extension and improvement of education. On the great question of the time his views were opposed to those of the government. He saw clearly that the time was come when the relief of the Catholics from the penal legislation of the past was an indispensable measure, and in December 1828 he addressed a letter to the Roman Catholic primate of Ireland distinctly announcing his view. This led to his recall by the government, a step sincerely lamented by the Irish. He pleaded for Catholic emancipation in parliament, and on the formation of Earl Grey's administration in November 1830, he again became lord-lieutenant of Ireland. The times were changed; the act of emancipation had been passed, and the task of viceroy in his second tenure of office was to resist the agitation for repeal of the union carried on by O'Connell. He felt it his duty now to demand Coercion Acts for the security of the public peace; his popularity was diminished, differences appeared in the cabinet on the difficult subject, and in July 1833 the ministry resigned. To the marquess of Anglesey Ireland is indebted for the board of education, the origination of which may perhaps be reckoned as the most memorable act of his viceroyalty. For thirteen years after his retirement he remained out of office, and took little part in the affairs of government. He joined the Russell administration in July 1846 as master-general of the ordnance, finally retiring with his chief in March 1852. His promotion in the army was completed by his advancement to the rank of field-marshal in 1846. Four years before, he exchanged his colonelcy of the 7th Light Dragoons which he had held over forty years, for that of the Royal Horse Guards. He died on the 29th of April 1854.

The marquess had a large family by each of his two wives, two sons and six daughters by the first and six sons and four daughters by the second. His eldest son, Henry, succeeded him in the marquessate; but the title passed rapidly in succession to the 3rd, 4th and 5th marquesses. The latter, whose extravagances were notorious, died in 1905, when the title passed to his cousin.

Other members of the Paget family distinguished themselves in the army and the navy. Of the first marquess's brothers one, SIR CHARLES PAGET (1778–1839), rose to the rank of vice-admiral in the Royal Navy; another, General SIR EDWARD PAGET (1775–1849), won great distinction by his skilful and resolute handling of a division at Corunna, and from 1822 to 1825 was commander-in-chief in India. One of the marquess's sons by his second marriage, LORD CLARENCE EDWARD PAGET (1811–1895), became an admiral; another, LORD GEORGE AUGUSTUS FREDERICK PAGET (1818–1880), led the 4th Light Dragoons in the charge of the Light Brigade at Balaklava, and subsequently commanded the brigade, and, for a short time, the cavalry division in the Crimea. In 1865 he was made inspector-general of cavalry, in 1871 lieutenant-general and K.C.B., and in 1877 full general. His Crimean journals were published in 1881.

ANGLESEY, or ANGLESEA, an insular northern county of Wales. Its area is 176,630 acres or about 276 sq. m. Anglesey, in the see of Bangor, is separated from the mainland by the Menai Straits (Afon Menai), over which were thrown Telford's suspension bridge, in 1826, and the Stephenson tubular railway bridge in 1850. The county is flat, with slight risings such as Parys, Cadair Mynachdy (or Monachdy, *i.e.* "chair of the monastery"; there is a Nanner, "convent," not far away) and Holyhead Mountain. There are a few lakes, such as Cors cerrig y daran, but rising water is generally scarce. The climate is humid, the land poor for the most part compared with its old state of fertility, and there are few industries.

As regards geology, the younger strata in Anglesey rest upon a foundation of very old pre-Cambrian rocks which appear at the surface in three areas:—(1) a western region including Holyhead and Llanfaethlu, (2) a central area about Aberffraw and Trefdraeth, and (3) an eastern region which includes Newborough, Caerwen and Pentraeth. These pre-Cambrian rocks are schists and slates, often much contorted and disturbed. The general line of strike of the formations in the island is from N.E. to S.W. A belt of granitic rocks lies immediately north-west of the central pre-Cambrian mass, reaching from Llanfaelog near the coast to the vicinity of Llanerchymedd. Between this granite and the pre-Cambrian of Holyhead is a narrow tract of Ordovician slates and grits with Llandovery beds in places; this tract spreads out in the N. of the island between Dulas Bay and Carmel Point. A small patch of Ordovician strata lies on the northern side of Beaumaris. In parts, these Ordovician rocks are much folded, crushed and metamorphosed, and they are associated with schists and altered volcanic rocks which are probably pre-Cambrian. Between the eastern and central pre-Cambrian masses carboniferous rocks are found. The carboniferous limestone occupies a broad area S. of Ligwy Bay and Pentraeth, and sends a narrow spur in a south-westerly direction by Llangefni to Malldraeth sands. The limestone is underlain on the N.W. by a red basement conglomerate and yellow sandstone (sometimes considered to be of Old Red Sandstone age). Limestone occurs again on the N. coast about Llanfihangel and Llangoed; and in the S.W. round Llanidan on the border of the Menai Strait. Puffin Island is made of carboniferous limestone. Malldraeth Marsh is occupied by coal measures, and a small patch of the same formation appears near Tall-y-foel Ferry on the Menai Straits. A patch of granitic and felsitic rocks form Parys Mountain, where copper and iron

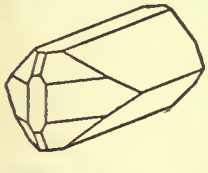
ochre have been worked. Serpentine (Mona Marble) is found near Llanfaerynneubwll and upon the opposite shore in Holyhead. There are abundant evidences of glaciation, and much boulder clay and drift sand covers the older rocks. Patches of blown sand occur on the S.W. coast.

The London & North-Western railway (Chester and Holyhead branch) crosses Anglesey from Llanfairpwllgwyngyll to Gaerwen and Holyhead (Caer Gybi), also from Gaerwen to Amlwch. The staple of the island is farming, the chief crops being turnips, oats, potatoes, with flax in the centre. Copper (near Amlwch), lead, silver, marble, asbestos, lime and sandstone, marl, zinc and coal have all been worked in Anglesey, coal especially at Malldraeth and Trefdraeth. The population of the county in 1901 was 50,606. There is no parliamentary borough, but one member is returned for the county. It is in the north-western circuit, and assizes are held at Beaumaris, the only municipal borough (pop. 2326). Amlwch (2994), Holyhead (10,079), Llangefni (1751) and Menai Bridge (Pont y Borth, 1700) are urban districts. There are six hundreds and seventy-eight parishes.

Môn (a cow) is the Welsh name of Anglesey, itself a corrupted form of O.E., meaning the Isle of the Angles. Old Welsh names are Ynys Dywyll (" Dark Isle ") and Ynys y cedairn (cedyrn or kedyrn; " Isle of brave folk "). It is the Mona of Tacitus (*Ann.* xiv. 29, *Agr.* xiv. 18), Pliny the Elder (iv. 16) and Dio Cassius (62). It is called Mam Cymru by Giraldus Cambrensis. Clas Merddin, Y vel Ynys (honey isle), Ynys Prydein, Ynys Brut are other names. According to the Triads (67), Anglesey was once part of the mainland, as geology proves. The island was the seat of the Druids, of whom 28 cromlechs remain, on uplands overlooking the sea, *e.g.* at Plâs Newydd. The Druids were attacked in A.D. 61 by Suetonius Paulinus, and by Agricola in A.D. 78. In the 5th century Caswallon lived here, and here, at Aberffraw, the princes of Gwynedd lived till 1277. The present road from Holyhead to Llanfairpwllgwyngyll is originally Roman. British and Roman camps, coins and ornaments have been dug up and discussed, especially by the Hon. Mr Stanley of Penrhos. Pen Caer Gybi is Roman. The island was devastated by the Danes (*Dub Gint* or black nations, *gentes*), especially in A.D. 853.

See Edw. Breese, *Kalendar of Gwynedd* (Venedocia), on Anglesey, Carnarvon and Merioneth (London, 1873); and *The History of Powys Fadog.*

ANGLESITE, a mineral consisting of lead sulphate, $PbSO_4$, crystallizing in the orthorhombic system, and isomorphous with barytes and celestite. It was first recognized as a mineral species by Dr Withering in 1783, who discovered it in the Parys copper-mine in Anglesey; the name anglesite, from this locality, was given by F. S. Beudant in 1832. The crystals from Anglesey, which were formerly found abundantly on a matrix of dull limonite, are small in size and simple in form, being usually bounded by four faces of a prism and four faces of a dome; they are brownish-yellow in colour owing to a stain of limonite. Crystals from some other localities, notably from Monteponi in Sardinia, are transparent and colourless, possessed of a brilliant adamantine lustre, and usually modified by numerous bright faces. The variety of combinations and habits presented by the crystals is very extensive, nearly two hundred distinct forms being figured by V. von Lang in his monograph of the species; without measurement of the angles the crystals are frequently difficult to decipher. The hardness is 3 and the specific gravity 6·3. There are distinct cleavages parallel to the faces of the prism {110} and the basal plane {001}, but these are not so well developed as in the isomorphous minerals barytes and celestite.



Anglesite is a mineral of secondary origin, having been formed by the oxidation of galena in the upper parts of mineral lodes where these have been affected by weathering processes. At Monteponi the crystals encrust cavities in glistening granular galena; and from Leadhills, in Scotland, pseudomorphs of anglesite after galena are known. At most localities it is found as isolated crystals in the lead-bearing lodes, but at some places, in Australia and Mexico, it occurs as large masses, and is then mined as an ore of lead, of which the pure mineral contains 68 %.

ANGLI, Anglii or Angles, a Teutonic people mentioned by Tacitus in his *Germania* (cap. 40) at the end of the 1st century. He gives no precise indication of their geographical position, but states that, together with six other tribes, including the Varini (the Warni of later times), they worshipped a goddess named Nerthus, whose sanctuary was situated on " an island in the Ocean." Ptolemy in his *Geography* (ii. 11. § 15), half a century later, locates them with more precision between the Rhine, or rather perhaps the Ems, and the Elbe, and speaks of them as one of the chief tribes of the interior. Unfortunately, however, it is clear from a comparison of his map with the evidence furnished by Tacitus and other Roman writers that the indications which he gives cannot be correct. Owing to the uncertainty of these passages there has been much speculation regarding the original home of the Angli. One theory, which however has little to recommend it, is that they dwelt in the basin of the Saale (in the neighbourhood of the canton Engilin), from which region the *Lex Angliorum et Werinorum hoc est Thuringorum* is believed by many to have come. At the present time the majority of scholars believe that the Angli had lived from the beginning on the coasts of the Baltic, probably in the southern part of the Jutish peninsula. The evidence for this view is derived partly from English and Danish traditions dealing with persons and events of the 4th century (see below), and partly from the fact that striking affinities to the cult of Nerthus as described by Tacitus are to be found in Scandinavian, especially Swedish and Danish, religion. Investigations in this subject have rendered it very probable that the island of Nerthus was Sjaelland (Zealand), and it is further to be observed that the kings of Wessex traced their ancestry ultimately to a certain Scyld, who is clearly to be identified with Skiöldr, the mythical founder of the Danish royal family (Skiöldungar). In English tradition this person is connected with " Scedeland " (pl.), a name which may have been applied to Sjaelland as well as Skåne, while in Scandinavian tradition he is specially associated with the ancient royal residence at Leire in Sjaelland.

Bede states that the Angli before they came to Britain dwelt in a land called Angulus, and similar evidence is given by the *Historia Brittonum.* King Alfred and the chronicler Æthelweard identified this place with the district which is now called Angel in the province of Schleswig (Slesvig), though it may then have been of greater extent, and this identification agrees very well with the indications given by Bede. Full confirmation is afforded by English and Danish traditions relating to two kings named Wermund (*q.v.*) and Offa (*q.v.*), from whom the Mercian royal family were descended, and whose exploits are connected with Angel, Schleswig and Rendsburg. Danish tradition has preserved record of two governors of Schleswig, father and son, in their service, Frowinus (Freawine) and Wigo (Wig), from whom the royal family of Wessex claimed descent. During the 5th century the Angli invaded this country (see Britain, *Anglo-Saxon*), after which time their name does not recur on the continent except in the title of the code mentioned above.

The province of Schleswig has proved exceptionally rich in prehistoric antiquities which date apparently from the 4th and 5th centuries. Among the places where these have been found, special mention should be made of the large cremation cemetery at Borgstedterfeld, between Rendsburg and Eckernförde, which has yielded many urns and brooches closely resembling those found in heathen graves in England. Of still greater importance are the great deposits at Thorsbjaerg (in Angel) and Nydam, which contained large quantities of arms, ornaments, articles of clothing, agricultural implements, &c., and in the latter case even ships. By the help of these discoveries we are able to reconstruct a fairly detailed picture of English civilization in the age preceding the invasion of Britain.

Authorities.—Bede, *Hist. Ecc.* i. 15; King Alfred's version of *Orosius*, i. 1. §§ 12, 19; Æthelweard's *Chronicle*, lib. i. For traditions concerning the kings of Angel, see under Offa (1). L. Weiland,

Die Angeln (1889); A. Erdmann, *Über die Heimat und den Namen der Angeln* (Upsala, 1890—cf. H. Möller in the *Anzeiger für deutsches Altertum und deutsche Litteratur*, xxii. 129 ff.); A. Kock in the *Historisk Tidskrift* (Stockholm), 1895, xv. p. 163 ff.; G. Schütte, *Var Anglerne Tyskere?* (Flensborg, 1900); H. Munro Chadwick, *The Origin of the English Nation* (Cambridge, 1907); C. Engelhardt, *Denmark in the Early Iron Age* (London, 1866); J. Mestorf, *Urnenfriedhöfe in Schleswig-Holstein* (Hamburg, 1886); S. Müller, *Nordische Altertumskunde* (Ger. trans., Strassburg, 1898), ii. p. 122 ff.; see further ANGLO-SAXONS and BRITAIN, *Anglo-Saxon*. (H. M. C.)

ANGLICAN COMMUNION, the name used to denote that great branch of the Christian Church consisting of the various churches in communion with the Church of England. The necessity for such a phrase as "Anglican Communion," first used in the 19th century, marked at once the immense development of the Anglican Church in modern times and the change which has taken place in the traditional conceptions of its character and sphere. The Church of England itself is the subject of a separate article (see ENGLAND, CHURCH OF); and it is not without significance that for more than two centuries after the Reformation the history of Anglicanism is practically confined to its developments within the limits of the British Isles. Even in Ireland, where it was for over three centuries the established religion, and in Scotland, where it early gave way to the dominant Presbyterianism, its religious was long overshadowed by its political significance. The Church, in fact, while still claiming to be Catholic in its creeds and in its religious practice, had ceased to be Catholic in its institutional conception, which was now bound up with a particular state and also with a particular conception of that state. To the native Irishman and the Scotsman, as indeed to most Englishmen, the Anglican Church was one of the main buttresses of the supremacy of the English crown and nation. This conception of the relations of church and state was hardly favourable to missionary zeal; and in the age succeeding the Reformation there was no disposition on the part of the English Church to emulate the wonderful activity of the Jesuits, which, in the 16th and 17th centuries, brought to the Church of Rome in countries beyond the ocean compensation for what she had lost in Europe through the Protestant reformation. Even when English churchmen passed beyond the seas, they carried with them their creed, but not their ecclesiastical organization. Prejudice and real or imaginary legal obstacles stood in the way of the erection of episcopal sees in the colonies; and though in the 17th century Archbishop Laud had attempted to obtain a bishop for Virginia, up to the time of the American revolution the churchmen of the colonies had to make the best of the legal fiction that their spiritual needs were looked after by the bishop of London, who occasionally sent commissaries to visit them and ordained candidates for the ministry sent to England for the purpose.

The change which has made it possible for Anglican churchmen to claim that their communion ranks with those of Rome and the Orthodox East as one of the three great historical divisions of the Catholic Church, was due, in the first instance, to the American revolution. The severance of the colonies from their allegiance to the crown brought the English bishops for the first time face to face with the idea of an Anglican Church which should have nothing to do either with the royal supremacy or with British nationality. When, on the conclusion of peace, the church-people of Connecticut sent Dr Samuel Seabury to England, with a request to the archbishop of Canterbury to consecrate him, it is not surprising that Archbishop Moore refused. In the opinion of prelates and lawyers alike, an act of parliament was necessary before a bishop could be consecrated for a see abroad; to consecrate one for a foreign country seemed impossible, since, though the bestowal of the *potestas ordinis* would be valid, the crown, which, according to the law, was the source of the episcopal *jurisdiction*, could hardly issue the necessary mandate for the consecration of a bishop to a see outside the realm (see BISHOP). The Scottish bishops, however, being hampered by no such legal restrictions, were more amenable; and on the 11th of November 1784 Seabury was consecrated by them to the see of Connecticut. In 1786, on the initiative of the archbishop, the legal difficulties in England were removed by the act for the consecration of bishops abroad; and, on being satisfied as to the orthodoxy of the church in America and the nature of certain liturgical changes in contemplation, the two English archbishops proceeded, on the 14th of February 1787, to consecrate William White and Samuel Prevoost to the sees of Pennsylvania and New York (see PROTESTANT EPISCOPAL CHURCH).

This act had a significance beyond the fact that it established in the United States of America a flourishing church, which, while completely loyal to its own country, is bound by special ties to the religious life of England. It marked the emergence of the Church of England from that insularity to which what may be called the territorial principles of the Reformation had condemned her. The change was slow, and it is not yet by any means complete.

Since the Church of England, whatever her attitude towards the traditional Catholic doctrines, never disputed the validity of Catholic orders whether Roman or Orthodox, nor the jurisdiction of Catholic bishops in foreign countries, the expansion of the Anglican Church has been in no sense conceived as a Protestant aggressive movement against Rome. Occasional exceptions, such as the consecration by Archbishop Plunket of Dublin of a bishop for the reformed church in Spain, raised so strong a protest as to prove the rule. In the main, then, the expansion of the Anglican Church has followed that of the British empire, or, as in America, of its daughter states; its claim, so far as rights of jurisdiction are concerned, is to be the Church of England and the English race, while recognizing its special duties towards the non-Christian populations subject to the empire or brought within the reach of its influence. As against the Church of Rome, with its system of rigid centralization, the Anglican Church represents the principle of local autonomy, which it holds to be once more primitive and more catholic. In this respect the Anglican communion has developed on the lines defined in her articles at the Reformation; but, though in principle there is no great difference between a church defined by national, and a church defined by racial boundaries, there is an immense difference in effect, especially when the race—as in the case of the English—is itself ecumenical.

The realization of what may be called this catholic mission of the English church, in the extension of its organization to the colonies, was but a slow process.

The Church in the Colonies.

On the 12th of August 1787 Dr Charles Inglis was consecrated bishop of Nova Scotia, with jurisdiction over all the British possessions in North America. In 1793 the see of Quebec was founded; Jamaica and Barbados followed in 1824, and Toronto and Newfoundland in 1839. Meanwhile the needs of India has been tardily met, on the urgent representations in parliament of William Wilberforce and others, by the consecration of Dr T. F. Middleton as bishop of Calcutta, with three archdeacons to assist him. In 1817 Ceylon was added to his charge; in 1823 all British subjects in the East Indies and the islands of the Indian Ocean; and in 1824 "New South Wales and its dependencies"! Some five years later, on the nomination of the duke of Wellington, William Broughton was sent out to work in this enormous jurisdiction as archdeacon of Australia. Soon afterwards, in 1835 and 1837, the sees of Madras and Bombay were founded; whilst in 1836 Broughton himself was consecrated as first bishop of Australia. Thus down to 1840 there were but ten colonial bishops; and of these several were so hampered by civil regulations that they were little more than government chaplains in episcopal orders. In April of that year, however, Bishop Blomfield of London published his famous letter to the archbishop of Canterbury, declaring that "an episcopal church without a bishop is a contradiction in terms," and strenuously advocating a great effort for the extension of the episcopate. It was not in vain. The plan was taken up with enthusiasm, and on Whitsun Tuesday of 1841 the bishops of the United Kingdom met and issued a declaration which inaugurated the Colonial Bishoprics Council. Subsequent

declarations in 1872 and 1891 have served both to record progress and to stimulate to new effort. The diocese of New Zealand was founded in 1841, being endowed by the Church Missionary Society through the council, and George Augustus Selwyn was chosen as the first bishop. Since then the increase has gone on, as the result both of home effort and of the action of the colonial churches. Moreover, in many cases bishops have been sent to inaugurate new missions, as in the cases of the Universities' Mission to Central Africa, Lebombo, Corea and New Guinea; and the missionary jurisdictions so founded develop in time into dioceses. Thus, instead of the ten colonial jurisdictions of 1841, there are now about a hundred foreign and colonial jurisdictions, in addition to those of the Protestant Episcopal Church of the United States.

It was only very gradually that these dioceses acquired legislative independence and a determinate organization. At first, sees were created and bishops were nominated by the crown by means of letters patent; and in some cases an income was assigned out of public funds. Moreover, for many years all bishops alike were consecrated in England, took the customary "oath of due obedience" to the archbishop of Canterbury, and were regarded as his extra-territorial suffragans. But by degrees changes have been made on all these points.

(1) Local conditions soon made a provincial organization necessary, and it was gradually introduced. The bishop of Calcutta received letters patent as metropolitan of India when the sees of Madras and Bombay were founded; and fresh patents were issued to Bishop Broughton in 1847 and Bishop Gray in 1853, as metropolitans of Australia and South Africa respectively. Similar action was taken in 1858, when Bishop Selwyn became metropolitan of New Zealand; and again in 1860, when, on the petition of the Canadian bishops to the crown and the colonial legislature for permission to elect a metropolitan, letters patent were issued appointing Bishop Fulford of Montreal to that office. Since then metropolitans have been chosen and provinces formed by regular synodical action, a process greatly encouraged by the resolutions of the Lambeth conferences on the subject. The constitution of these provinces is not uniform. In some cases, as South Africa, New South Wales, and Queensland, the metropolitan see is fixed. Elsewhere, as in New Zealand, where no single city can claim pre-eminence, the metropolitan is either elected or else is the senior bishop by consecration. Two further developments must be mentioned: (*a*) The creation of diocesan and provincial synods, the first diocesan synod to meet being that of New Zealand in 1844, whilst the formation of a provincial synod was foreshadowed by a conference of Australasian bishops at Sydney in 1850; (*b*) towards the close of the 19th century the title of *archbishop* began to be assumed by the metropolitans of several provinces. It was first assumed by the metropolitans of Canada and Rupert's Land, at the desire of the Canadian general synod in 1893; and subsequently, in accordance with a resolution of the Lambeth conference of 1897, it was given by their synods to the bishop of Sydney as metropolitan of New South Wales and to the bishop of Cape Town as metropolitan of South Africa. Civil obstacles have hitherto delayed its adoption by the metropolitan of India.

Provincial organization.

(2) By degrees, also, the colonial churches have been freed from their rather burdensome relations with the state. The church of the West Indies was disestablished and disendowed in 1868. In 1857 it was decided, in *Regina* v. *Eton College*, that the crown could not claim the presentation to a living when it had appointed the former incumbent to a colonial bishopric, as it does in the case of an English bishopric. In 1861, after some protest from the crown lawyers, two missionary bishops were consecrated without letters patent for regions outside British territory: C. F. Mackenzie for the Zambezi region and J. C. Patteson for Melanesia, by the metropolitans of Cape Town and New Zealand respectively. In 1863 the privy council declared, in *Long* v. *The Bishop of Cape Town*, that "the Church of England, in places where there is no church established by law, is in the same situation with any other religious body." In 1865 it adjudged Bishop Gray's letters patent, as metropolitan of Cape Town, to be powerless to enable him "to exercise any coercive jurisdiction, or hold any court or tribunal for that purpose," since the Cape colony already possessed legislative institutions when they were issued; and his deposition of Bishop Colenso was declared to be "null and void in law" (*re The Bishop of Natal*). With the exception of Colenso the South African bishops forthwith surrendered their patents, and formally accepted Bishop Gray as their metropolitan, an example followed in 1865 in the province of New Zealand. In 1862, when the diocese of Ontario was formed, the bishop was elected in Canada, and consecrated under a royal mandate, letters patent being by this time entirely discredited. And when, in 1867, a coadjutor was chosen for the bishop of Toronto, an application for a royal mandate produced the reply from the colonial secretary that "it was not the part of the crown to interfere in the creation of a new bishop or bishopric, and not consistent with the dignity of the crown that he should advise Her Majesty to issue a mandate which would not be worth the paper on which it was written, and which, having been sent out to Canada, might be disregarded in the most complete manner." And at the present day the colonial churches are entirely free in this matter. This, however, is not the case with the church in India. Here the bishops of sees founded down to 1879 receive a stipend from the revenue (with the exception of the bishop of Ceylon, who no longer does so). They are not only nominated by the crown and consecrated under letters patent, but the appointment is expressly subjected "to such power of revocation and recall as is by law vested" in the crown; and where additional oversight was necessary for the church in Tinnevelly, it could only be secured by the consecration of two assistant bishops, who worked under a commission for the archbishop of Canterbury which was to expire on the death of the bishop of Madras. Since then, however, new sees have been founded which are under no such restrictions: by the creation of dioceses either in native states (Travancore and Cochin), or out of the existing dioceses (Chota Nagpur, Lucknow, &c.). In the latter case there is no *legal* subdivision of the older diocese, the new bishop administering such districts as belonged to it under commission from its bishop, provision being made, however, that in all matters ecclesiastical there shall be no appeal but to the metropolitan of India.

Freedom from state control.

(3) By degrees, also, the relations of colonial churches to the archbishop of Canterbury have changed. Until 1855 no colonial bishop was consecrated outside the British Isles, the first instance being Dr MacDougall of Labuan, consecrated in India under a commission from the archbishop of Canterbury; and until 1874 it was held to be unlawful for a bishop to be consecrated in England without taking the suffragan's oath of due obedience. This necessity was removed by the Colonial Clergy Act of 1874, which permits the archbishop at his discretion to dispense with the oath. This, however, has not been done in all cases; and as late as 1890 it was taken by the metropolitan of Sydney at his consecration. Thus the constituent parts of the Anglican communion gradually acquire autonomy: missionary jurisdictions develop into organized dioceses, and dioceses are grouped into provinces with canons of their own. But the most complete autonomy does not involve isolation. The churches are in full communion with one another, and act together in many ways; missionary jurisdictions and dioceses are mapped out by common arrangement, and even transferred if it seems advisable; *e.g.* the diocese Honolulu (Hawaii), previously under the jurisdiction of the archbishop of Canterbury, was transferred in 1900 to the Episcopal Church in the United States on account of political changes. Though the see of Canterbury claims no primacy over the Anglican communion analogous to that exercised over the Roman Church by the popes, it is regarded with a strong affection and deference, which shows itself by frequent consultation and interchange of greetings. There is also a strong common life emphasized by common action.

Spiritual autonomy.

The conference of Anglican bishops from all parts of the world,

instituted by Archbishop Longley in 1867, and known as the Lambeth Conferences (*q.v.*), though even for the Anglican communion they have not the authority of an ecumenical synod, and their decisions are rather of the nature of counsels than commands, have done much to promote the harmony and co-operation of the various branches of the Church. An even more imposing manifestation of this common life was given by the great pan-Anglican congress held in London between the 12th and 24th of June 1908, which preceded the Lambeth conference opened on the 5th of July. The idea of this originated with Bishop Montgomery, secretary to the Society for the Propagation of the Gospel, and was endorsed by a resolution of the United Boards of Mission in 1903. As the result of negotiations and preparations extending over five years, 250 bishops, together with delegates, clerical and lay, from every diocese in the Anglican communion, met in London, the opening service of intercession being held in Westminster Abbey. In its general character, the meeting was but a Church congress on an enlarged scale, and the subjects discussed, *e.g.* the attitude of churchmen towards the question of the marriage laws or that of socialism, followed much the same lines. The congress, of course, had no power to decide or to legislate for the Church, its main value being in drawing its scattered members closer together, in bringing the newer and more isolated branches into consciousness of their contact with the parent stem, and in opening the eyes of the Church of England to the point of view and the peculiar problems of the daughter-churches.

Pan-Anglican Congress.

The Anglican communion consists of the following:—(1) The Church of England, 2 provinces, Canterbury and York, with 24 and 11 dioceses respectively. (2) The Church of Ireland, 2 provinces, Armagh and Dublin, with 7 and 6 dioceses respectively. (3) The Scottish Episcopal Church, with 7 dioceses. (4) The Protestant Episcopal Church of the United States, with 89 dioceses and missionary jurisdictions, including North Tokyo, Kyoto, Shanghai, Cape Palmas, and the independent dioceses of Hayti and Brazil. (5) The Canadian Church, consisting of (*a*) the province of Canada, with 10 dioceses; (*b*) the province of Rupert's Land, with 8 dioceses. (6) The Church in India and Ceylon, 1 province of 11 dioceses. (7) The Church of the West Indies, 1 province of 8 dioceses, of which Barbados and the Windward Islands are at present united. (8) The Australian Church, consisting of (*a*) the province of New South Wales, with 10 dioceses; (*b*) the province of Queensland, with 5 dioceses; (*c*) the province of Victoria, with 5 dioceses. (9) The Church of New Zealand, 1 province of 7 dioceses, together with the missionary jurisdiction of Melanesia. (10) The South African Church, 1 province of 10 dioceses, with the 2 missionary jurisdictions of Mashonaland and Lebombo. (11) Nearly 30 isolated dioceses and missionary jurisdictions holding mission from the see of Canterbury.

AUTHORITIES.—*Official Year-book of the Church of England*; Phillimore, *Ecclesiastical Law*, vol. ii. (London, 1895); *Digest of S.P.G. Records* (London, 1893); E. Stock, *History of the Church Missionary Society*, 3 vols. (London, 1899); H. W. Tucker, *The English Church in Other Lands* (London, 1886); A. T. Wirgman, *The Church and the Civil Power* (London, 1893).

ANGLING, the art or practice of the sport of catching fish by means of a baited hook or "angle" (from the Indo-European root *ank-*, meaning "bend").[1] It is among the most ancient of human activities, and may be said to date from the time when man was in the infancy of the Stone Age, eking out a precarious existence by the slaughter of any living thing which he could reach with the rude weapons at his command. It is probable that attack on fishes was at first much the same as attack on animals, a matter of force rather than of guile, and conducted by means of a rude spear with a flint head. It is probable, too, that the primitive harpooners were not signally successful in their efforts, and so set their wits to work to devise other means of getting at the abundant food which waited for them in every piece of water near their caves. Observation would soon show them that fish fed greedily on each other and on other inhabitants of the water or living things that fell into it, and so, no doubt, arose the idea of entangling the prey by means of its appetite. Hence came the notion of the first hook, which, it seems certain, was not a hook at all but a "gorge," a piece of flint or stone which the fish could swallow with the bait but which it could not eject afterwards. From remains found in cave-dwellings and their neighbourhood in different parts of the world it is obvious that these gorges varied in shape, but in general the idea was the same, a narrow strip of stone or flake of flint, either straight or slightly curved at the ends, with a groove in the middle round which the line could be fastened. Buried in the bait it would be swallowed end first; then the tightening of the line would fix it cross-wise in the quarry's stomach or gullet and so the capture would be assured. The device still lingers in France and in a few remote parts of England in the method of catching eels which is known as "sniggling." In this a needle buried in a worm plays the part of the prehistoric gorge.

The evolution of the fish-hook from the slightly curved gorge is easily intelligible. The ends became more and more curved, until eventually an object not unlike a double hook was attained. This development would be materially assisted by man's discovery of the uses of bronze and its adaptability to his requirements. The single hook, of the pattern more or less familiar to us, was possibly a concession of the lake-dweller to what may even then have been a problem— the "education" of fish, and to a recognition of the fact that sport with the crude old methods was falling off. But it is also not improbable that in some parts of the world the single hook developed *pari passu* with the double, and that, on the sea-shore for instance, where man was able to employ so adaptable a substance as shell, the first hook was a curved fragment of shell lashed with fibre to a piece of wood or bone, in such a way that the shell formed the bend of the hook while the wood or bone formed the shank. Both early remains and recent hooks from the Fiji Islands bear out this supposition. It is also likely that flint, horn and bone were pressed into service in a similar manner. The nature of the line or the rod that may have been used with these early hooks is largely a matter of conjecture. The first line was perhaps the tendril of a plant, the first rod possibly a sapling tree. But it is fairly obvious that the rod must have been suggested by the necessity of getting the bait out over obstacles which lay between the fisherman and the water, and that it was a device for increasing both the reach of the arm and the length of the line. It seems not improbable that the rod very early formed a part of the fisherman's equipment.

Literary History.— From prehistoric times down to comparatively late in the days of chronicles, angling appears to have remained a practice; its development into an art or sport is a modern idea. In the earliest literature references to angling are not very numerous, but there are passages in the Old Testament which show that fish-taking with hook as well as net was one of the common industries in the East, and that fish, where it was obtainable, formed an important article of diet. In *Numbers* (xi. 5) the children of Israel mourn for the fish which they "did eat in Egypt freely." So much too is proved by the monuments of Egypt; indeed more, for the figures found in some of the Egyptian fishing pictures using short rods and stout lines are sometimes attired after the manner of those who were great in the land. This indicates that angling had already, in a highly civilized country, taken its place among the methods of diversion at the disposal of the wealthy, though from the uncompromising nature of the tackle depicted and the apparent simplicity of the fish it would scarcely be safe to assume that in Egypt angling arrived at the dignity of becoming an "art." In Europe it took very much longer for the taking of fish to be regarded even as an

[1] As to whether "angling" necessarily implies a rod as well as a line and hook, see the discussion in the law case of *Barnard* v. *Roberts* (*Times L.R.*, April 13, 1907), when the question arose as to the use of night-lines being angling; but the decision against night-lines went on the ground of the absence of the personal element rather than on the absence of a rod. The various dictionaries are blind guides on this point, and the authorities cited are inconclusive; but, broadly speaking, angling now implies three necessary factors—a personal angler, the sporting element, and the use of recognized fishing-tackle.

amusement, and the earliest references to it in the Greek and Latin classics are not very satisfying to the sportsman. There is, however, a passage in the *Odyssey* (xii. 247) which is of considerable importance, as it shows that fishing with rod and line was well enough understood in early Greece to be used as a popular illustration. It occurs in the well-known scene where Scylla seizes the companions of Odysseus out of the ship and bears them upwards, just as "some fisher on a headland with a long rod" brings small fishes gasping to the shore. Another important, though comparatively late, passage in Greek poetry is the twenty-first idyll of Theocritus. In this the fisherman Asphalion relates how in a dream he hooked a large golden fish and describes graphically, albeit with some obscurity of language, how he "played" it. Asphalion used a rod and fished from a rock, much after the manner of the Homeric angler. Among other Greek writers, Herodotus has a good many references to fish and fishing; the capture of fish is once or twice mentioned or implied by Plato, notably in the *Laws* (vii. 823); Aristotle deals with fishes in his *Natural History*; and there are one or two fishing passages in the anthology. But in Greek literature as a whole the subject of angling is not at all prominent. In writers of late Greek, however, there is more material. Plutarch, for instance, gives us the famous story of the fishing match between Antony and Cleopatra, which has been utilized by Shakespeare. Moreover, it is in Greek that the first complete treatise on fishing which has come down to us is written, the *Halieutica* of Oppian (*c.* A.D. 169). It is a hexameter poem in five books with perhaps more technical than sporting interest, and not so much even of that as the length of the work would suggest. Still it contains some information about tackle and methods, and some passages describing battles with big fish, in the right spirit of enthusiasm. Also in Greek is what is famous as the first reference in literature to fly-fishing, in the fifteenth book of Aelian's *Natural History* (3rd century A.D.). It is there described how the Macedonians captured a certain spotted fish in the river Astraeus by means of a lure composed of coloured wool and feathers, which was presumably used in the manner now known as "dapping." That there were other Greek writers who dealt with fish and fishing and composed "halieutics" we know from Athenaeus. In the first book of his *Deipnosophistae* he gives a list of them. But he compares their work unfavourably with the passage of Homer already cited, in a way which suggests that their knowledge of angling was not a great advance upon the knowledge of their remote literary ancestors. In Latin literature allusions to angling are rather more numerous than in Greek, but on the whole they are unimportant. Part of a poem by Ovid, the *Halieuticon*, composed during the poet's exile at Tomi after A.D. 9, still survives. In other Roman writers the subject is only treated by way of allusion or illustration. Martial, however, provides, among other passages, what may perhaps be entitled to rank as the earliest notice of private fishery rights—the epigram *Ad Piscatorem*, which warns would-be poachers from casting a line in the Baian lake. Pliny the elder devoted the ninth book of his *Natural History* to fishes and water-life, and Plautus, Cicero, Catullus, Horace, Juvenal, Pliny the younger and Suetonius all allude to angling here and there. Agricultural writers, too, such as Varro and Columella, deal with the subject of fish ponds and stews rather fully. Later than any of these, but still just included in Latin literature, we have Ausonius (*c.* A.D. 320) and his well-known idyll the *Mosella*, which contains a good deal about the fish of the Moselle and the methods of catching them. In this poem is to be found the first recognizable description of members of the salmon family, and, though the manner of their application is rather doubtful, the names *salmo*, *salar* and *fario* strike a responsive note in the breast of the modern angler.

Post-classical Literature.—As to what happened in the world of angling in the first few centuries of the Christian era we know little. It may be inferred, however, that both fish and fishermen occupied a more honourable position in Christendom than they ever did before. The prominence of fishermen in the gospel narratives would in itself have been enough to bring this about, but it also happened that the Greek word for fish, ΙΧΘΥΣ, had an anagrammatic significance which the devout were not slow to perceive. The initials of the word resolve into what is practically a confession of faith, Ἰησοῦς Χριστὸς Θεοῦ Υἱὸς Σωτήρ (Jesus Christ, Son of God, Saviour). It is therefore not surprising that we find the fish very prominent as a sacred emblem in the painting and sculpture of the primitive church, or that Clement of Alexandria should have recommended it, among other things, as a device for signet rings or seals. The fisherman too is frequently represented in early Christian art, and it is worthy of remark that he more often uses a line and hook than a net. The references to fish and fishing scattered about in the writings of the early fathers for the most part reflect the two ideas of the sacredness of the fish and divine authorization of the fisherman; the second idea certainly prevailed until the time of Izaak Walton, for he uses it to justify his pastime. It is also not unlikely that the practice of fasting (in many cases fish was allowed when meat was forbidden) gave the art of catching fish additional importance. It seems at any rate to have been a consideration of weight when sites were chosen for monasteries in Europe, and in many cases when no fish-producing river was at hand the lack was supplied by the construction of fish-ponds. Despite all this, however, save for an occasional allusion in the early fathers, there is hardly a connecting link between the literature of Pagan Rome and the literature that sprang up on the invention of printing. One volume, the *Geoponica*, a Greek compilation concerning whose authorship and date there has been much dispute, is attributed in *Bibliotheca Piscatoria* to the beginning of the 10th century. It contains one book on fish, fish-ponds and fishing, with prescriptions for baits, &c., extracted for the most part from other writers. But it seems doubtful whether its date should not be placed very much earlier. Tradition makes it a Carthaginian treatise translated into Greek. A more satisfactory fragment of fishing literature is to be found in the *Colloquy* of Ælfric, written (*ad pueros linguae latinae locutionis exercendos*) towards the end of the same century. Ælfric became archbishop of Canterbury in A.D. 995, and the passage in the Anglo-Saxon text-book takes honourable rank as the earliest reference to fishing in English writings, though it is not of any great length. It is to be noted that the fisher who takes a share in the colloquy states that he prefers fishing in the river to fishing in the sea. Ascribed to the 13th or 14th century is a Latin poem *De Vetula*, whose author was apparently Richard de Fournival. It contains a passage on angling, and was placed to the credit of Ovid when first printed (*c.* 1470). A manuscript in the British museum, *Comptes des pêcheries de l'église de Troyes* (A.D. 1349–1413), gives a minute account of the fisheries with the weights of fish captured and the expenses of working. There is, however, practically nothing else of importance till we come to the first printed book on angling (a translation of Oppian, 1478, excepted), and so to the beginning of the literature proper. This first book was a little volume printed in Antwerp probably in 1492 at the press of Matthias van der Goes. In size it is little more than a pamphlet, and it treats of birds as well as fish:—*Dit Boeczken leert hoe men mach Voghelen . . . ende . . . visschen vangen metten kanden. Ende oeck andersins. . . .* ("This book teaches how one may catch birds . . . and . . . fish with the hands, and also otherwise"). Only one copy apparently survives, in the Denison library, and a translation privately printed for Mr Alfred Denison in 1872 was limited to twenty-five copies. At least two other editions of the book appeared in Flemish, and it also made its way, in 1502, to Germany, where, translated and with certain alterations and additions, it seems to have been re-issued frequently. Next in date comes the famous *Treatyse of Fysshynge wyth an Angle*, printed at Westminster by Wynkyn de Worde in 1496 as a part of the second edition of *The Book of St Albans*. The treatise is for this reason associated with the name of Dame Juliana Berners, but that somewhat dubious compiler can have had nothing whatever to do with it. The treatise is almost certainly a compilation from some earlier work on angling ("bokes of credence" are mentioned in its text), possibly from a manuscript of the earlier part of the 15th century, of which a portion is

preserved in the Denison collection. This was published in 1883 by Mr Thomas Satchell under the title *An Older Form of the Treatyse of Fysshynge wyth an Angle*. But it is also possible that a still older work was the parent of both books, for it has been held that the manuscript is an independent version. However this may be, it is certain that the treatise itself has been the parent of many other works. Many of the instructions contained in it are handed down from generation to generation with little change except in diction. Especially is this the case with the list of trout-flies, a meagre twelve, which survives in many fishing books until well into the 18th century.

From the beginning of the 16th century the fisherman's library begins to grow apace, as, though books solely devoted to fishing are not yet frequent, works on husbandry and country pursuits almost all contain something on the subject. In Italy the fisherman and his occupation apparently were considered poetically; the word *pescatore* or its cognates are common on Italian 16th and 17th century title-pages, though in many instances the fulfilment of the implied promise is not adequate, from an angler's point of view. From the pages of *Bibliotheca Piscatoria* a fairly long list of Italian writers could be gleaned. Among them may be mentioned Sannazaro (*Piscatoria*, &c., Rome, 1526) and Andrea Calmo (*Rime pescatorie*, Venice, 1557). A century later was Parthenius, who published a volume of *Halieutica* at Naples. This writer has an amusing reference to the art of "tickling" trout as practised in Britain. In Germany, as has been shown, the original little Flemish treatise had a wide vogue in the 16th century, and fishing played a part in a good many books on husbandry such as that of Conrad Heresbach (1570). Fish and fish-ponds formed the main topic of a Latin work by Dubravius (1552), while Gesner in the middle of the 16th and Aldrovandi at the beginning of the 17th centuries wrote at length on the natural history of fishes. In France the subject is less well represented, but *Les Pescheries* of Chris. de Gamon (Lyons, 1599) and *Le Plaisir des champs* of Cl. Gauchet (Paris, 1604) deserve to be noted. *Les Ruses innocentes* by François Fortin, first published at Paris in 1600, and several times in later editions, is characterized by Messrs Westwood and Satchell as "on the whole the most interesting contribution made by France to the literature of angling." England during the most part of the 16th century was evidently well enough served by the original treatise out of *The Book of St Albans*. It was republished twice by Wynkyn de Worde, six or seven times by Copland, and some five times by other printers. It was also practically republished in *A Booke of Fishing* by L. M. (1590). L. M. (Leonard Mascall) ranks as an angling author, but he did little more than borrow and edit the treatise. The same may be said of another version of *The Book of St Albans* "now newly collected by W. G. Faulkener" and issued in 1596.

Modern Literature.—In 1600 appeared John Taverner's *Certaine Experiments concerning Fish and Fruite*, and after this the period of angling literature proper begins. The *Secrets of Angling* (1613), by J(ohn) D(ennys), Esq., is one of the most important volumes in the angler's library, both on account of the excellence of the verse in which it is written and also on account of its practical value. Gervase Markham, "the first journalist," as he has been called, published his first book of husbandry at the same date, and, as in most of his many books on the same subject, devoted a certain amount of space to fishing. But Markham gathered his materials in a rather shameless manner and his angling passages have little originality. Thomas Barker's *The Art of Angling* (1st ed., 1651) takes a more honourable position, and received warm commendation from Izaak Walton himself, who followed it in 1653 with *The Compleat Angler*. So much has been written about this treasured classic that it is only necessary to indicate its popularity here by saying that its editions occupy some twenty pages in *Bibliotheca Piscatoria* (1883), and that since that work was published at least forty new editions have to be added to the list. During Walton's life-time the book ran through five editions, and with the fifth (1676) was incorporated Charles Cotton's second part, the "instructions how to angle for a trout or grayling, in a clear stream." In some cases too there was added a third book, the fourth edition of *The Experienced Angler*, by Robert Venables (1st ed., 1662). The three books together bore the title of *The Universal Angler*. Venables's portion was dropped later, but it is worth reading, and contained sound instruction though it has not the literary merit of Walton and Cotton.

A few other notable books of the century call for enumeration, *The Gentleman's Recreation* by Nicholas Cox (1674), Gilbert's *The Angler's Delight* (1676), Chetham's *Vade-Mecum* (1681), *The Complete Troller* by Robert Nobbes (1682), R. Franck's *Northern Memoirs* (1694), and *The True Art of Angling* by J. S. (1696). Of these Chetham, Nobbes, Franck and J. S. have the merit of considerable originality. Franck has gained some notoriety by his round abuse of Walton. In the 18th century among others we find *The Secrets of Angling* by C. G. (1705), Robert Howlett's *The Angler's Sure Guide* (1706), *The Whole Art of Fishing* (1714), *The Compleat Fisherman* by James Saunders (1724), *The Art of Angling* by R. Brookes (1740), another book with the same title by R. and C. Bowlker (Worcester, *c.* 1750), *The Complete Sportsman* by Thomas Fairfax (*c.* 1760), *The Angler's Museum* by T. Shirley (1784), and *A Concise Treatise on the Art of Angling* by Thomas Best (1787). Of these only Saunders's, Bowlker's and Best's books are of much importance, the rest being for the most part "borrowed." One volume of verse in the 18th century calls for notice, Moses Browne's *Piscatory Eclogues* (1729). Among greater names we get angling passages in Pope, Gay and Thomson; the two last were evidently brothers of the angle.

With the 19th century angling literature becomes too big a subject to be treated in detail, and it is only possible to glance at a few of the more important books and writers. Daniel's *Rural Sports* appeared in 1801; it is a treasure-house of odd facts. In 1828 Sir Humphry Davy published his famous *Salmonia*, which was reviewed in the *Quarterly* by Sir Walter Scott. At about this time too were appearing the *Noctes Ambrosianae* in *Blackwood's Magazine*. Christopher North (Professor Wilson) often touched upon angling in them, besides contributing a good many angling articles to the magazine. In 1835 that excellent angling writer Thomas Tod Stoddart began his valuable series of books with *The Art of Angling as Practised in Scotland*. In 1839 he published *Songs and Poems*, among which are pieces of great merit. During this period, too, first appeared, year by year, the *Newcastle Fishers' Garlands*, collected by Joseph Crawhall afterwards and republished in 1864. These border verses, like Stoddart's, have often a genuine ring about them which is missing from the more polished effusions of Gay and Thomson. Alfred Ronalds's *The Fly-Fisher's Entomology* (1st ed., 1836) was a publication of great importance, for it marked the beginning of the scientific spirit among trout-fishers. It ran through many editions and is still a valuable book of reference. A step in angling history is also marked by George Pulman's *Vade-Mecum of Fly-fishing for Trout* (1841), for it contains the first definite instructions on fishing with a "dry fly." Another is marked by Hewett Wheatley's *The Rod and the Line* (1849), where is to be found the earliest reference to the "eyed" hook. Yet another is marked by W. C. Stewart's *The Practical Angler* (1857), in which is taught the new doctrine of "up-stream" fishing for trout. This is a book of permanent value. Among the many books of this period Charles Kingsley's *Miscellanies* (1859) stands out, for it contains the immortal "Chalk-Stream Studies." The work of Francis Francis begins at about the same time, though his *A Book on Angling*, which is still one of the most valuable text-books, was not first published till 1867. Another well-known and excellent writer, Mr H. Cholmondeley Pennell, began in the early 'sixties; it is to him that we owe the admirable volumes on fresh-water fishing in the "Badminton Library." Among other English writers mention must be made of Messrs William Senior, John Bickerdyke and F. M. Halford, who have all performed signal services for angling and its literature. (See further bibliography *ad fin.*) In America the latter half of the 19th century produced a good deal of fishing literature, much of it of a high standard. *I go*

a-Fishing by Dr W. C. Prime (1873), *Fishing with the Fly* by C. F. Orvis, A. Nelson Cheney and others (1883), *The American Salmon Fisherman* and *Fly Rods and Fly Tackle* by H. P. Wells (1886 and 1885), *Little Rivers* and other books by the Rev. H. Van Dyke—these are only a few specially distinguished in style and matter. Germany and France have not contributed so largely to the modern library, but in the first country we find several useful works by Max von dem Borne, beginning with the *Handbuch der Angelfischerei* of 1875, and there are a good many other writers who have contributed to the subject, while in France there are a few volumes on fishing by different hands. The most noticeable is M. G. Albert Petit's *La Truite de rivière* (1897), an admirable book on fly-fishing. As yet, however, though there are many enthusiastic anglers in France, the sport has not established itself so firmly as to have inspired much literature of its own; the same may be said of Germany.

Modern Conditions.—In the modern history of angling there are one or two features that should be touched upon. The great increase in the number of fishermen has had several results. One is a corresponding increase in the difficulty of obtaining fishing, and a notable rise in the value of rivers, especially those which are famed for salmon and trout. Salmon-fishing now may be said to have become a pastime of the rich, and there are signs that trout-fishing will before long have to be placed in the same exclusive category, while even the right to angle for less-esteemed fish will eventually be a thing of price. The development is natural, and it has naturally led to efforts on the part of the angling majority to counteract, if possible, the growing difficulty. These efforts have been directed chiefly in two ways, one the establishment of fishing clubs, the other the adoption of angling in salt water. The fishing club of the big towns was originally a social institution, and its members met together to sup, converse on angling topics and perhaps to display notable fish that they had caught. Later, however, arose the idea that it would be a convenience if a club could give its members privileges of fishing as well as privileges of reunion. So it comes about that all over the United Kingdom, in British colonies and dependencies, in the United States, and also in Germany and France, fishing clubs rent waters, undertake preservation and restocking and generally lead an active and useful existence. It is a good sign for the future of angling and anglers that they are rapidly increasing in number. One of the oldest fishing clubs, if not the oldest, was the Schuylkill club, founded in Pennsylvania in 1732. An account of its history was published in Philadelphia in 1830. Among the earliest clubs in London are to be numbered such societies as The True Waltonians, The Piscatorial, The Friendly Anglers and The Gresham, which are still flourishing. A certain amount of literary activity has been observable in the world of angling clubs, and several volumes of "papers" are on the records. Most noticeable perhaps are the three volumes of *Anglers' Evenings* published in 1880–1894, a collection of essays by members of the Manchester Anglers' Association. The other method of securing a continuance of sport, the adoption of sea-angling as a substitute for fresh-water fishing, is quite a modern thing. Within the memory of men still young the old tactics of hand-line and force were considered good enough for sea fish. Now the fresh-water angler has lent his centuries of experience in deluding his quarry; the sea-angler has adopted many of the ideas presented to him, has modified or improved others, and has developed the capture of sea-fish into a science almost as subtle as the capture of their fresh-water cousins. One more modern feature, which is also a result of the increase of anglers, is the great advance made in fish-culture, fish-stocking and fish-acclimatization during the last half-century. Fish-culture is now a recognized industry; every trout-stream of note and value is restocked from time to time as a matter of course; salmon-hatcheries are numerous, though their practical utility is still a debated matter, in Great Britain at any rate; coarse fish are also bred for purposes of restocking; and, lastly, it is now considered a fairly simple matter to introduce fish from one country to another, and even from continent to continent. In England the movement owes a great deal to Francis Francis, who, though he was not the earliest worker in the field, was among the first to formulate the science of fish-breeding; his book *Fish-Culture*, first published in 1863, still remains one of the best treatises on the subject. In the United States, where fishery science has had the benefit of generous governmental and official support and countenance and so has reached a high level of achievement, Dr. T. Garlick (*The Artificial Reproduction of Fishes*, Cleveland, 1857) is honoured as a pioneer. On the continent of Europe the latter half of the 19th century saw a very considerable and rapid development in fish-culture, but until comparatively recently the propagation and care of fish in most European waters have been considered almost entirely from the point of view of the fish-stew and the market. As to what has been done in the way of acclimatization it is not necessary to say much. Trout (*Salmo fario*) were introduced to New Zealand in the late 'sixties from England; in the 'eighties rainbow trout (*Salmo irideus*) were also introduced from California; now New Zealand provides the finest trout-fishing of its kind in the world. American trout of different kinds have been introduced into England, and brown trout have been introduced to America; but neither innovation can be said to have been an unqualified success, though the rainbow has established itself firmly in some waters of the United Kingdom. It is still regarded with some suspicion, as it has a tendency to wander from waters which do not altogether suit it. For the rest, trout have been established in Ceylon, in Kashmir and in South Africa, and early in 1906 an attempt was made to carry them to British Central Africa. In fact the possibilities of acclimatization are so great that, it seems probable, in time no river of the civilized world capable of holding trout will be without them.

Methods and Practice

Angling now divides itself into two main divisions, fishing in fresh water and fishing in the sea. The two branches of the sport have much in common, and sea-angling is really little more than an adaptation of fresh-water methods to salt-water conditions. Therefore it will not be necessary to deal with it at great length and it naturally comes in the second place. Angling in fresh water is again divisible into three principal parts, fishing on the surface, *i.e.* with the fly; in mid-water, *i.e.* with a bait simulating the movements of a small fish or with the small fish itself; and on the bottom with worms, paste or one of the many other baits which experience has shown that fish will take. With the premise that it is not intended here to go into the minutiae of instruction which may more profitably be discovered in the many works of reference cited at the end of this article, some account of the subdivisions into which these three styles of fishing fall may be given.

Fresh-Water Fishing.

Fly-fishing.—Fly-fishing is the most modern of them, but it is the most highly esteemed, principally because it is the method *par excellence* of taking members of the most valuable sporting family of fish, the *Salmonidae*. It may roughly be considered under three heads, the use of the "wet" or sunk fly, of the "dry" or floating fly, and of the natural insect. Of these the first is the most important, for it covers the widest field and is the most universally practised. There are few varieties of fish which may not either consistently or occasionally be taken with the sunk fly in one of its two forms. The large and gaudy bunch of feathers, silk and tinsel with which salmon, very large trout, black bass and occasionally other predaceous fish are taken is not, strictly speaking, a fly at all. It rather represents, if anything, some small fish or subaqueous creature on which the big fish is accustomed to feed and it may conveniently receive the generic name of salmon-fly. The smaller lures, however, which are used to catch smaller trout and other fish that habitually feed on insect food are in most cases intended to represent that food in one of its forms and are entitled to the name of "artificial flies." The dry or floating fly is simply a development of the imitation theory, and has been evolved from the wet fly in course of closer observation of the habits of flies and fish in certain waters. Both wet and dry fly methods are really a substitute for the third and

oldest kind of surface-fishing, the use of a natural insect as a bait. Each method is referred to incidentally below.

Spinning, &c.—Mid-water fishing, as has been said, broadly consists in the use of a small fish, or something that simulates it, and its devices are aimed almost entirely at those fish which prey on their fellows. Spinning, live-baiting and trolling[1] are these devices. In the first a small dead fish or an imitation of it made in metal, india-rubber, or other substance, is caused to revolve rapidly as it is pulled through the water, so that it gives the idea of something in difficulties and trying to escape. In the second a small fish is put on the angler's hook alive and conveys the same idea by its own efforts. In the third a small dead fish is caused to dart up and down in the water without revolving; it conveys the same idea as the spinning fish, though the manipulation is different.

Bottom-Fishing.—Bottom-fishing is the branch of angling which is the most general. There is practically no fresh-water fish that will not take some one or more of the baits on the angler's list if they are properly presented to it when it is hungry. Usually the baited hook is on or near the bottom of the water, but the rule suggested by the name " bottom-fishing " is not invariable and often the bait is best used in mid-water; similarly, in " mid-water fishing " the bait must sometimes be used as close to the bottom as possible. Bottom-fishing is roughly divisible into two kinds, float-fishing, in which a bite is detected by the aid of a float fastened to the line above the hook and so balanced that its tip is visible above the water, and hand-fishing, in which no float is used and the angler trusts to his hand to feel the bite of a fish. In most cases either method can be adopted and it is a matter of taste, but broadly speaking the float-tackle is more suited to water which is not very deep and is either still or not rapid. In great depths or strong streams a float is difficult to manage.

The Fish.

It is practically impossible to classify the fish an angler catches according to the methods which he employs, as most fish can be taken by at least two of these methods, while many of those most highly esteemed can be caught by all three. Sporting fresh-water fish are therefore treated according to their families and merits from the angler's point of view, and it is briefly indicated which method or methods best succeed in pursuit of them.

Salmon.—First in importance come the migratory *Salmonidae*, and at the head of them the salmon (*Salmo salar*), which has a two-fold reputation as a sporting and as a commercial asset. The salmon fisheries of a country are a very valuable possession, but it is only comparatively recently that this has been realized and that salmon rivers have received the legal protection which is necessary to their well-being. Even now it cannot be asserted that in England the salmon question, as it is called, is settled. Partly owing to our ignorance of the life-history of the fish, partly owing to the difficulty of reconciling the opposed interests of commerce and sport, the problem as to how a river should be treated remains only partially solved, though it cannot be denied that there has been a great advance in the right direction. The life-history of the salmon, so far as it concerns the matter in hand, may be very briefly summed up. It is bred in the rivers and fed in the sea. The parent fish ascend in late autumn as high as they can get, the ova are deposited on gravel shallows, hatching out in the course of a few weeks into parr. The infant salmon remains in fresh water at least one year, generally two years, without growing more than a few inches, and then about May assumes what is called the smolt-dress, that is to say, it loses the dark parr-bands and red spots of infancy and becomes silvery all over. After this it descends without delay to the sea, where it feeds to such good purpose that in a year it has reached a weight of 2 lb to 4 lb or more, and it may then reascend as a grilse. Small grilse indeed may only have been in the sea a few months, ascending in the autumn of the year of their first descent. If the fish survives the perils of its first ascent and spawning season and as a kelt or spawned fish gets down to the sea again, it comes up a second time as a salmon of weight varying from 8 lb upwards. Whether salmon come up rivers, and, if so, spawn, every year, why some fish are much heavier than others of the same age, what their mode of life is in the sea, why some run up in spring and summer when the breeding season is not till about November or December, whether they were originally sea-fish or river-fish—these and other similar questions await a conclusive answer. One principal fact, however, stands out amid the uncertainty, and that is that without a free passage up and down unpolluted rivers and without protection on the spawning beds salmon have a very poor chance of perpetuating their species. Economic prudence dictates therefore that every year a considerable proportion of running salmon should be allowed to escape the dangers that confront them in the shape of nets, obstructions, pollutions, rods and poachers. And it is in the adjustment of the interests which are bound up in these dangers (the last excepted; officially poachers have no interests, though in practice their plea of " custom and right " has too often to be taken into consideration) that the salmon question consists. To secure a fair proportion of fish for the market, a fair proportion for the rods and a fair proportion for the redds, without unduly damaging manufacturing interests, this is the object of those who have the question at heart, and with many organizations and scientific observers at work it should not be long before the object is attained. Already the system of " marking " kelts with a small silver label has resulted in a considerable array of valuable statistics which have made it possible to estimate the salmon's ordinary rate of growth from year to year. It is very largely due to the efforts of anglers that the matter has gone so far. Whether salmon feed in fresh water is another question of peculiar interest to anglers, for it would seem that if they do not then the whole practice of taking them must be an anomaly. Champions have arisen on both sides of the argument, some, scientists, asserting that salmon (parr and kelts excluded, for both feed greedily as opportunity occurs) do not feed, others, mostly anglers, maintaining strongly that they do, and bringing as evidence their undoubted and customary capture by rod and line, not only with the fly, but also with such obvious food-stuffs as dead baits, worms and prawns. On the other side it is argued that food is never found inside a salmon after it has been long enough in a river to have digested its last meal taken in salt water. The very few instances of food found in salmon which have been brought forward to support the contrary opinion are in the scientific view to be regarded with great caution; certainly in one case of recent years, which at first appeared to be well authenticated, it was afterwards found that a small trout had been pushed down a salmon's throat after capture by way of a joke. A consideration of the question, however, which may perhaps make some appeal to both sides, is put forward by Dr J. Kingston Barton in the first of the two volumes on *Fishing* (*Country Life* Series). He maintains that salmon do not habitually feed in fresh water, but he does not reject the possibility of their occasionally taking food. His view is that after exertion, such as that entailed by running from pool to pool during a spate, the fish may feel a very transient hunger and be impelled thereby to snap at anything in its vicinity which looks edible. The fact that the angler's best opportunity is undoubtedly when salmon have newly arrived into a pool, supports this contention. The longer they are compelled to remain in the same spot by lack of water the worse becomes the prospect of catching them, and " unfishable " is one of the expressive words which fishermen use to indicate the condition of a river during the long periods of drought which too often distinguish the sport.

Salmon Tackle and Methods.—It is when the drought breaks up and the long-awaited rain has come that the angler has his chance and makes ready his tackle, against the period of a few days (on some short streams only a few hours) during which the water will be right; *right* is a very exact term on some rivers, meaning not only that the colour of the water is suitable to the fly, but that its height shall be within an inch or two of a given mark, prescribed by experience. As to the tackle which is made ready,

[1] Trolling is very commonly confused in angling writing and talk with *trailing*, which simply means drawing a spinning-bait along behind a boat in motion.

there is, as in most angling matters, divergence of opinion. Salmon fly-rods are now made principally of two materials, greenheart and split-cane; the former is less expensive, the latter is more durable; it is entirely a matter of taste which a man uses, but the split-cane rod is now rather more in favour, and for salmon-fishing it is in England usually built with a core of steel running from butt to tip and known as a "steel centre." How long the rod shall be is also a matter on which anglers differ, but from 16 ft. to 17 ft. 6 in. represents the limits within which most rods are preferred. The tendency is to reduce rather than to increase the length of the rod, which may be accounted for by the adoption of a heavy line. Early in the 19th century anglers used light-topped rods of 20 ft. and even more, and with them a light line composed partly of horse-hair; they thought 60 ft. with such material a good cast. Modern experience, however, has shown that a shorter rod with a heavier top will throw a heavy dressed silk line much farther with less exertion. Ninety feet is now considered a good fishing cast, while many men can throw a great deal more. In the United States, where rods have long been used much lighter than in England, the limits suggested would be considered too high. From 12 ft. 6 in. to 15 ft. 6 in. is about the range of the American angler's choice, though long rods are not unknown with him. The infinite variety of reels, lines, gut collars[1] and other forms of tackle which is now presented to the angler's consideration and for his bewilderment is too wide a subject to be touched upon here. Something, however, falls to be said about flies. One of the perennially fruitful topics of inquiry is what the fish takes a salmon-fly to be. Beyond a fairly general admission that it is regarded as something endowed with life, perhaps resembling a remembered article of marine diet, perhaps inviting gastronomic experiment, perhaps irritating merely and rousing an impulse to destroy, the discussion has not reached any definite conclusion. But more or less connected with it is the controversy as to variety of colour and pattern. Some authorities hold that a great variety of patterns with very minute differences in colour and shades of colour is essential to complete success; others contend that salmon do not differentiate between nice shades of colour, that they only draw distinctions between flies broadly as being light, medium or dark in general appearance, and that the size of a fly rather than its colour is the important point for the angler's consideration. Others again go some way with the supporters of the colour-scheme and admit the efficacy of flies whose general character is red, or yellow, or black, and so on. The opinion of the majority, however, is probably based on past experience, and a man's favourite flies for different rivers and condition of water are those with which he or someone else has previously succeeded. It remains a fact that in most fly-books great variety of patterns will be discoverable, while certain old standard favourites such as the Jock Scott, Durham Ranger, Silver Doctor, and Thunder and Lightning will be prominent. Coming out of the region of controversy it is a safe generalization to say that the general rule is: big flies for spring fishing when rivers are probably high, small flies for summer and low water, and flies medium or small in autumn according to the conditions. Spring fishing is considered the cream of the sport. Though salmon are not as a rule so numerous or so heavy as during the autumn run, and though kelts are often a nuisance in the early months, yet the clean-run fish of February, March or April amply repays patience and disappointment by its fighting powers and its beauty. Summer fishing on most rivers in the British Islands is uncertain, but in Norway summer is the season, which possibly explains to some extent the popularity of that country with British anglers, for the pleasure of a sport is largely increased by good weather.

Two methods of using the fly are in vogue, casting and harling. The first is by far the more artistic, and it may be practised either from a boat, from the bank or from the bed of the river itself; in the last case the angler wades, wearing waterproof trousers or wading-stockings and stout nail-studded brogues. In either case the fishing is similar. The fly is cast across and down stream, and has to be brought over the "lie" of the fish, swimming naturally with its head to the stream, its feathers working with tempting movement and its whole appearance suggesting some live thing dropping gradually down and across stream. Most anglers add to the motion of the fly by "working" it with short pulls from the rod-top. When a fish takes, the rise is sometimes seen, sometimes not; in any case the angler should not respond with the rod until he *feels* the pull. Then he should *tighten*, not strike. The fatal word "strike," with its too literal interpretation, has caused many a breakage. Having hooked his fish, the angler must be guided by circumstances as to what he does; the salmon will usually decide that for him. But it is a sound rule to give a well-hooked fish no unnecessary advantage and to hold on as hard as the tackle will allow. Good tackle will stand an immense strain, and with this "a minute a pound" is a fair estimate of the time in which a fish should be landed. A foul-hooked salmon (no uncommon thing, for a fish not infrequently misses the fly and gets hooked somewhere in the body) takes much longer to land. The other method of using the fly, harling, which is practised on a few big rivers, consists in trailing the fly behind a boat rowed backward and forwards across the stream and dropping gradually downwards. Fly-fishing for salmon is also practised on some lakes, into which the fish run. On lakes the boat drifts slowly along a "beat," while the angler casts diagonally over the spots where salmon are wont to lie. Salmon may also be caught by "mid-water fishing," with a natural bait either spun or trolled and with artificial spinning-baits of different kinds, and by "bottom-fishing" with prawns, shrimps and worms. Spinning is usually practised when the water is too high or too coloured for the fly; trolling is seldom employed, but is useful for exploring pools which cannot be fished by spinning or with the fly; the prawn is a valuable lure in low water and when fish are unwilling to rise; while the worm is killing at all states of the river, but except as a last resource is not much in favour. There are a few waters where salmon have the reputation of not taking a fly at all; in them spinning or prawning are the usual modes of fishing. But most anglers, wherever possible, prefer to use the fly. The rod for the alternative methods is generally shorter and stiffer than the fly-rod, though made of like material. Twelve to fourteen feet represents about the range of choice. Outside the British Islands the salmon-fisher finds the headquarters of his sport in Europe in Scandinavia and Iceland, and in the New World in some of the waters of Canada and Newfoundland.

Land-locked Salmon.—The land-locked salmon (*Salmo salar sebago*) of Canada and the lakes of Maine is, as its name implies, now regarded by scientists as merely a land-locked form of the salmon. It does not often attain a greater size than 20 lb, but it is a fine fighter and is highly esteemed by American anglers. In most waters it does not take a fly so well as a spinning-bait, live-bait or worm. The methods of angling for it do not differ materially from those employed for other *Salmonidae*.

Pacific Salmon.—Closely allied to *Salmo salar* both in appearance and habits is the genus *Oncorhynchus*, commonly known as Pacific salmon. It contains six species, is peculiar to the North Pacific Ocean, and is of some importance to the angler, though of not nearly so much as the Atlantic salmon. The quinnat is the largest member of the genus, closely resembles *salar* in

[1] The precise date when silkworm gut (now so important a feature of the angler's equipment) was introduced is obscure. Pepys, in his *Diary* (1667), mentions "a gut string varnished over" which "is beyond any hair for strength and smallness" as a new angling secret which he likes "mightily." In the third edition (1700) of Chetham's *Vade-Mecum*, already cited, appears an advertisement of the "East India weed, which is the only thing for trout, carp and bottom-fishing." Again, in the third edition of Nobbes's *Art of Trolling* (1805), in the supplementary matter, appears a letter signed by J. Eaton and G. Gimber, tackle-makers of Crooked Lane (July 20, 1801), in which it is stated that gut "is produced from the silkworm and not an Indian weed, *as has hitherto been conjectured*. . . ." The word "gut" is employed before this date, but it seems obvious that silkworm gut was for a long time used under the impression that it was a weed, and that its introduction was a thing of the 17th century. It is probable, however, that vegetable fibre was used too; we believe that in some parts of India it is used by natives to this day. Pepys' "minikin" was probably cat-gut.

appearance and surpasses him in size. The others, sockeye, humpback, cohoe, dog-salmon and masu, are smaller and of less interest to the angler, though some of them have great commercial value. The last-named is only found in the waters of Japan, but the rest occur in greater or less quantities in the rivers of Kamchatka, Alaska, British Columbia and Oregon. The problems presented to science by *salar* are offered by *Oncorhynchus* also, but there are variations in his life-history, such as the fact that few if any fish of the genus are supposed to survive their first spawning season. When once in the rivers none of these salmon is of very much use to the angler; as, though it is stated that they will occasionally take a fly or spoon in fresh water, they are not nearly so responsive as their Atlantic cousin and in many streams are undoubtedly not worth trying for. At the mouths of some rivers, however, where the water is distinctly tidal, and in certain bays of the sea itself they give very fine sport, the method of fishing for them being usually to trail a heavy spoon-bait behind a boat. By this means remarkable bags of fish have been made by anglers. The sport is of quite recent development.

Sea-Trout.—Next to the salmon comes the sea-trout, the other migratory salmonid of Europe. This is a fish with many local names and a good deal of local variation. Modern science, however, recognises two "races" only, *Salmo trutta*, the sea-trout proper, and *Salmo cambricus* or *eriox*, the bull-trout, or sewin of Wales, which is most prominent in such rivers as the Coquet and Tweed. The life-history of sea-trout is much the same as that of salmon, and the fish on their first return from the sea in the grilse-stage are called by many names, finnock, herling and whitling being perhaps the best known. Of the two races *Salmo trutta* alone is of much use to the fly-fisher. The bull-trout, for some obscure reason, is not at all responsive to his efforts, except in its kelt stage. Then it will take greedily enough, but that is small consolation. The bull-trout is a strong fish and grows to a great size and it is a pity that it is not of greater sporting value, if only to make up for its bad reputation as an article of food. Some amends, however, are made by its cousin the sea-trout, which is one of the gamest and daintiest fish on the angler's list. It is found in most salmon rivers and also in not a few streams which are too small to harbour the bigger fish, while there are many lakes in Scotland and Ireland (where the fish is usually known as white trout) where the fishing is superb when the trout have run up into them. Fly-fishing for sea-trout is not a thing apart. A three-pounder that will impale itself on a big salmon-fly, might equally well have taken a tiny trout-fly. Many anglers, when fishing a sea-trout river where they run large, 5 lb or more, and where there is also a chance of a salmon, effect a compromise by using a light 13 ft. or 14 ft. double-handed rod, and tackle not so slender as to make hooking a salmon a certain disaster. But undoubtedly to get the full pleasure out of sea-trout-fishing a single-handed rod of 10 ft. to 12 ft. with reasonably fine gut and small flies should be used, and the way of using it is much the same as in wet-fly fishing for brown trout, which will be treated later. When the double-handed rod and small salmon-flies are used, the fishing is practically the same as salmon-fishing except that it is on a somewhat smaller scale. Flies for sea-trout are numberless and local patterns abound, as may be expected with a fish which has so catholic a taste. But, as with salmon-fishers so with sea-trout-fishers, experience forms belief and success governs selection. Among the small salmon-flies and loch-flies which will fill his book, the angler will do well to have a store of very small trout-flies at hand, while experience has shown that even the dry fly will kill sea-trout on occasion, a thing that is worth remembering where rivers are low and fish shy. July, August and September are in general the best months for sea-trout, and as they are dry months the angler often has to put up with indifferent sport. The fish will, however, rise in tidal water and in a few localities even in the sea itself, or in salt-water lochs into which streams run. Sea-trout have an irritating knack of "coming short," that is to say, they will pluck at the fly without really taking it. There are occasions, on the other hand, in loch-fishing where plenty of time must be given to the fish without tightening on it, especially if it happens to be a big one. Like salmon, sea-trout are to be caught with spinning-baits and also with the worm. The main controversy that is concerned with sea-trout is whether or no the fish captured in early spring are clean fish or well-mended kelts. On the whole, as sea-trout seldom run before May, the majority of opinion inclines to their being kelts.

Non-migratory Salmonidae.—Of the non-migratory members of the *Salmonidae* the most impotant in Great Britain is the brown trout (*Salmo fario*). Its American cousin the rainbow trout (*S. irideus*) is now fairly well established in the country too, while other transatlantic species both of trout and char (which are some of them partially migratory, that is to say, migratory when occasion offers), such as the steelhead (*S. rivularis*), fontinalis (*S. fontinalis*) and the cut-throat trout (*S. clarkii*), are at least not unknown. All these fish, together with their allied forms in America, can be captured with the fly, and, speaking broadly, the wet-fly method will do well for them all. Therefore it is only necessary to deal with the methods applicable to one species, the brown trout.

Trout.—Of the game-fishes the brown trout is the most popular, for it is spread over the whole of Great Britain and most of Europe, wherever there are waters suited to it. It is a fine sporting fish and is excellent for the table, while in some streams and lakes it grows to a very considerable size, examples of 16 lb from southern rivers and 20 lb from Irish and Scottish lakes being not unknown. One of the signs of its popularity is that its habits and history have produced some very animated controversies. Some of the earliest discussions were provoked by the liability of the fish to change its appearance in different surroundings and conditions, and so at one time many a district claimed its local trout as a separate species. Now, however, science admits but one species, though, to such well-defined varieties as the Loch Leven trout, the estuarine trout and the gillaroo, it concedes the right to separate names and "races." In effect all, from the great *ferox* of the big lakes of Scotland and Ireland to the little fingerling of the Devonshire brook, are one and the same—*Salmo fario*.

Wet-Fly Fishing for Trout.—Fly-fishing for trout is divided into three kinds: fishing with the artificial fly sunk or "wet," fishing with it floating or "dry" and fishing with the natural insect. Of the two first methods the wet fly is the older and may be taken first. Time was when all good anglers cast their flies down-stream and thought no harm. But in 1857 W. C. Stewart published his *Practical Angler*, in which he taught that it paid better to fish up-stream, for by so doing the angler was not only less likely to be seen by the trout but was more likely to hook his fish. The doctrine was much discussed and criticized, but it gradually won adherents, until now up-stream fishing is the orthodox method where it is possible. Stewart was also one of the first to advocate a lighter rod in place of the heavy 12 ft. and 13 ft. weapons that were used in the North in his time. There are still many men who use the long rod for wet-fly fishing in streams, but there are now more who find 10 ft. quite enough for their purpose. For lake-fishing from a boat, however, the longer rod is still in many cases preferred. In fishing rivers the main art is to place the right flies in the right places and to let them come naturally down with the stream. The right flies may be ascertained to some extent from books and from local wisdom, but the right places can only be learnt by experience. It does not, however, take long to acquire "an eye for water" and that is half the battle, for the haunts of trout in rapid rivers are very much alike. In lake-fishing chance has a greater share in bringing about success, but here too the right fly and the right place are important; the actual management of rod, line and flies, of course, is easier, for there is no stream to be reckoned with. Though there is little left to be said about wet-fly fishing where the fly is an imitation more or less exact of a natural insect, there is another branch of the art which has been stimulated by modern developments. This is the use of salmon-flies for big trout much in the same way as for salmon. In such rivers as the Thames, where the trout are cannibals and run very large, ordinary trout-flies are of little use, and the fly-fisher's only

chance is to use a big fly and "work" it, casting across and down stream. The big fly has also been found serviceable with the great fish of New Zealand and with the inhabitants of such a piece of water as Blagdon Lake near Bristol, where the trout run very large. For this kind of fishing much stronger tackle and a heavier rod are required than for catching fish that seldom exceed the pound.

Dry Fly.—Fishing with the floating fly is a device of southern origin, and the idea no doubt arose from the facts that on the placid south-country streams the natural fly floats on the surface and that the trout are accustomed to feed on it there. The controversy "dry *versus* wet" was long and spirited, but the new idea won the day and now not only on the chalk-streams, but on such stretches of even Highland rivers as are suitable, the dry-fly man may be seen testing his theories. These theories are simple and consist in placing before the fish an exact imitation of the insect on which it is feeding, in such a way that it shall float down exactly as if it were an insect of the same kind. To this end special tackle and special methods have been found necessary. Not only the fly but also the line has to float on the water; the line is very heavy and therefore the rod (split-cane or greenheart) must be stiff and powerful; special precautions have to be taken that the fly shall float unhindered and shall not "drag"; special casts have to be made to counteract awkward winds; and, lastly, the matching of the fly with the insect on the water is a matter of much nicety, for the water-flies are of many shades and colours. Many brains have busied themselves with the solution of these problems with such success that dry-fly fishing is now a finished art. The entomology of the dry-fly stream has been studied very deeply by Mr F. M. Halford, the late G. S. Marryat and others, and improvements both in flies and tackle have been very great. Quite lately, however, there has been a movement in favour of light rods for dry-fly fishing as well as wet-fly fishing. The English split-cane rod for dry-fly work weighs about an ounce to the foot, rather more or rather less. The American rod of similar action and material weighs much less—approximately 6 oz. to 10 ft. The light rod, it is urged, is much less tiring and is quite powerful enough for ordinary purposes. Against it is claimed that dry-fly fishing is not "ordinary purposes," that chalk-stream weeds are too strong and chalk-stream winds too wild for the light rod to be efficient against them. However, the light rod is growing in popular favour; British manufacturers are building rods after the American style; and anglers are taking to them more and more. The dry-fly method is now practised by many fishermen both in Germany and France, but it has scarcely found a footing as yet in the United States or Canada.

Fishing with the Natural Fly.—The natural fly is a very killing bait for trout, but its use is not wide-spread except in Ireland. In Ireland "dapping" with the green drake or the daddy-longlegs is practised from boats on most of the big loughs. A light whole-cane rod of stiff build, about 16 ft. in length, is required with a floss-silk line light enough to be carried out on the breeze; the "dap" (generally two mayflies or daddy-longlegs on a small stout-wired hook) is carried out by the breeze and just allowed to touch the water. When a trout rises it is well to count "ten" before striking. Very heavy trout are caught in this manner during the mayfly season. In the North "creeper-fishing" is akin to this method, but the creeper is the larva of the stone-fly, not a fly itself, and it is cast more like an ordinary fly and allowed to sink. Sometimes, however, the mature insect is used with equally good results. A few anglers still practise the old style of dapping or "dibbling" after the manner advised by Izaak Walton. It is a deadly way of fishing small overgrown brooks. A stiff rod and strong gut are necessary, and a grasshopper or almost any large fly will serve for bait.

Other Methods.—The other methods of taking trout principally employed are spinning, live-baiting and worming. For big river trout such as those of the Thames a gudgeon or bleak makes the best spinning or live bait, for great lake trout (*ferox*) a small fish of their own species and for smaller trout a minnow. There are numberless artificial spinning-baits which kill well at times, the Devon being perhaps the favourite. The use of the drop-minnow, which is trolling on a lesser scale, is a killing method employed more in the north of England than elsewhere. The worm is mostly deadly in thick water, so deadly that it is looked on askance. But there is a highly artistic mode of fishing known as "clear-water worming." This is most successful when rivers are low and weather hot, and it needs an expert angler to succeed in it. The worm has to be cast up-stream rather like a fly, and the method is little inferior to fly-fishing in delicacy and difficulty. The other baits for trout, or rather the other baits which they will take sometimes, are legion. Wasp-grubs, maggots, caterpillars, small frogs, bread—there is very little the fish will not take. But except in rural districts little effort is made to catch trout by means less orthodox than the fly, minnow and worm, and the tendency nowadays both in England and America is to restrict anglers where possible to the use of the artificial fly only.

Grayling.—The only other member of the salmon family in England which gives much sport to the fly-fisher is the grayling, a fish which possesses the recommendation of rising well in winter. It can be caught with either wet or dry fly, and with the same tackle as trout, which generally inhabit the same stream. Grayling will take most small trout-flies, but there are many patterns of fly tied specially for them, most of them founded on the red tag or the green insect. Worms and maggots are also largely used in some waters for grayling, and there is a curious contrivance known as the "grasshopper," which is a sort of compromise between the fly and bait. It consists of a leaded hook round the shank of which is twisted bright-coloured wool. The point is tipped with maggots, and the lure, half artificial, half natural, is dropped into deep holes and worked up and down in the water. In some places the method is very killing. The grayling has been very prominent of late years owing to the controversy "grayling *versus* trout." Many people hold that grayling injure a trout stream by devouring trout-ova and trout-food, by increasing too rapidly and in other ways. Beyond, however, proving the self-evident fact that a stream can only support a given amount of fish-life, the grayling's opponents do not seem to have made out a very good case, for no real evidence of its injuring trout has been adduced.

Char.—The chars (*Salvelinus*) are a numerous family widely distributed over the world, but in Great Britain are not very important to the angler. One well-defined species (*Salvelinus alpinus*) is found in some lakes of Wales and Scotland, but principally in Westmorland and Cumberland. It sometimes takes a small fly but is more often caught with small artificial spinning-baits. The fish seldom exceeds 1½ lb in Great Britain, though in Scandinavia it is caught up to 5 lb or more. There are some important chars in America, *fontinalis* being one of the most esteemed. Some members of the genus occasionally attain a size scarcely excelled by the salmon. Among them are the Great Lake trout of America, *Cristivomer namaycush*, and the Danubian "salmon" or huchen, *Salmo hucho*. Both of these fish are caught principally with spinning-baits, but both will on occasion take a salmon-fly, though not with any freedom after they have reached a certain size. An attempt has been made to introduce huchen into the Thames but at the time of writing the result cannot yet be estimated.

Pike.—The pike (*Esox lucius*), which after the *Salmonidae* is the most valued sporting fish in Great Britain, is a fish of prey pure and simple. Though it will occasionally take a large fly, a worm or other ground-bait, its systematic capture is only essayed with small fish or artificial spinning-baits. A live bait is supposed to be the most deadly lure for big pike, probably because it is the method employed by most anglers. But spinning is more artistic and has been found quite successful enough by those who give it a fair and full trial. Trolling, the method of "sink and draw" with a dead bait, referred to previously in this article, is not much practised nowadays, though at one time it was very popular. It was given up because the traditional form of trolling-tackle was such that the bait had to be swallowed by the pike before the hook would take hold, and that necessitated killing all fish caught, whether large or small. The same objection formerly applied to

live-baiting with what was known as a gorge-hook. Now, however, what is called snap-tackle is almost invariably used in live-baiting, and the system is by some few anglers extended to the other method too. Pike are autumn and winter fish and are at their best in December. They grow to a very considerable size, fish of 20 lb being regarded as "specimens" and an occasional thirty-pounder rewarding the zealous and fortunate. The heaviest pike caught with a rod in recent years which is sufficiently authenticated, weighed 37 lb, but heavier specimens are said to have been taken in Irish lakes. River pike up to about 10 lb in weight are excellent eating.

America has several species of pike, of which the muskelunge of the great lake region (*Esox masquinongy*) is the most important. It is a very fine fish, excelling *Esox lucius* both in size and looks. From the angler's point of view it may be considered simply as a large pike and may be caught by similar methods. It occasionally reaches the weight of 80 lb or perhaps more. The pickerel (*Esox reticulatus*) is the only other of the American pikes which gives any sport. It reaches a respectable size, but is as inferior to the pike as the pike is to the muskelunge.

Perch.—Next to the pikes come the perches, also predatory fishes. The European perch (*Perca fluviatilis*) has a place by itself in the affections of anglers. When young it is easy to catch by almost any method of fishing, and a large number of Walton's disciples have been initiated into the art with its help. Worms and small live-baits are the principal lures, but at times the fish will take small bright artificial spinning-baits well, and odd attractions such as boiled shrimps, caddis-grubs, small frogs, maggots, wasp-grubs, &c. are sometimes successful. The drop-minnow is one of the best methods of taking perch. Very occasionally, and principally in shallow pools, the fish will take an artificial fly greedily, a small salmon-fly being the best thing to use in such a case. A perch of 2 lb is a good fish, and a specimen of 4½ lb about the limit of angling expectation. There have been rare instances of perch over 5 lb, and there are legends of eight-pounders, which, however, need authentication.

Black Bass.—The yellow perch of America (*Perca flavescens*) is very much like its European cousin in appearance and habits, but it is not so highly esteemed by American anglers, because they are fortunate in being possessed of a better fish in the black bass, another member of the perch family. There are two kinds of black bass (*Micropterus salmoides* and *Micropterus dolomieu*), the large-mouthed and the small-mouthed. The first is more a lake and pond fish than the second, and they are seldom found in the same waters. As the black bass is a fly-taking fish and a strong fighter, it is as valuable to the angler as a trout and is highly esteemed. Bass-flies are *sui generis*, but incline more to the nature of salmon-flies than trout-flies. An artificial frog cast with a fly-rod or very light spinning-rod is also a favourite lure. For the rest the fish will take almost anything in the nature of worms or small fish, like its cousin the perch. A 4 lb bass is a good fish, but five-pounders are not uncommon. Black bass have to some extent been acclimatized in France.

The *ruffe* or *pope* (*Acerina vulgaris*) is a little fish common in the Thames and many other slow-flowing English rivers. It is very like the perch in shape but lacks the dusky bars which distinguish the other, and is spotted with dark brown spots on a golden olive background. It is not of much use to the angler as it seldom exceeds 3 oz. in weight. It takes small worms, maggots and similar baits greedily, and is often a nuisance when the angler is expecting better fish. Allied to the perches is the pike-perch, of which two species are of some importance to the angler, one the wall-eye of eastern America (*Stizostedion vitreum*) and the other the zander of Central Europe (*Sandrus lucioperca*). The last especially is a fine fighter, occasionally reaching a weight of 20 lb. It is usually caught by spinning, but will take live-baits, worms and other things of that nature. The Danube may be described as its headquarters. It is a fish whose sporting importance will be more realized as anglers on the continent become more numerous.

Cyprinidae.—The carp family (*Cyprinidae*) is a large one and its members constitute the majority of English sporting fishes. In America the various kinds of chub, sucker, dace, shiner, &c. are little esteemed and are regarded as spoils for the youthful angler only, or as baits for the better fish in which the continent is so rich. In England, however, the *Cyprinidae* have an honoured place in the affections of all who angle "at the bottom," while in Europe some of them have a commercial value as food-fishes. In India at least one member of the family, the mahseer, takes rank with the salmon as a "big game" fish.

Carp, Tench, Barbel, Bream.—The family as represented in England may be roughly divided into two groups, those which feed on the bottom purely and those which occasionally take flies. The first consists of carp, tench, barbel and bream. Of these carp, tench and bream are either river or pool fish, while the barbel is found only in rivers, principally in the Thames and Trent. The carp grows to a great size, 20 lb being not unknown; tench are big at 5 lb; barbel have been caught up to 14 lb or rather more; and bream occasionally reach 8 lb, while a fish of over 11 lb is on record. All these fish are capricious feeders, carp and barbel being particularly undependable. In some waters it seems to be impossible to catch the large specimens, and the angler who seeks to gain trophies in either branch of the sport needs both patience and perseverance. Tench and bream are not quite so difficult. The one fish can sometimes be caught in great quantities, and the other is generally to be enticed by the man who knows how to set about it. Two main principles have to be observed in attacking all these fish, ground-baiting and early rising. Ground-baiting consists in casting food into the water so as to attract the fish to a certain spot and to induce them to feed. Without it very little can be done with shy and large fish of these species. Early rising is necessary because they only feed freely, as a rule, from daybreak till about three hours after sun-rise. The heat of a summer or early autumn day makes them sluggish, but an hour or two in the evening is sometimes remunerative. The bait for them all should usually lie on the bottom, and it consists mainly of worms, wasp and other grubs, pastes of various kinds; and for carp, and sometimes bream, of vegetable baits such as small boiled potatoes, beans, peas, stewed wheat, pieces of banana, &c. None of these fish feed well in winter.

Roach, Rudd, Dace, Chub.—The next group of *Cyprinidae* consists of fish which will take a bait similar to those already mentioned and also a fly. The sizes which limit the ordinary angler's aspirations are roach about 2 lb, rudd about 2½ lb, dace about 1 lb and chub about 5 lb. There are instances of individuals heavier than this, one or two roach and many rudd of over 3 lb being on record, while dace have been caught up to 1 lb 6 oz., and chub of over 7 lb are not unknown. Roach only take a fly as a rule in very hot weather when they are near the surface, or early in the season when they are on the shallows; the others will take it freely all through the summer. Ordinary trout flies do well enough for all four species, but chub often prefer something larger, and big bushy lures called "palmers," which represent caterpillars, are generally used for them. The fly may be used either wet or dry for all these fish, and there is little to choose between the methods as regards effectiveness. Fly-fishing for these fish is a branch of angling which might be more practised than it is, as the sport is a very fair substitute for trout fishing. Roach, chub and dace feed on bottom food and give good sport all the winter.

Gudgeon, Bleak, Minnow, &c.—The small fry of European waters, gudgeon, bleak, minnow, loach, stickleback and bullhead, are principally of value as bait for other fish, though the first-named species gives pretty sport on fine tackle and makes a succulent dish. Small red worms are the best bait for gudgeon and minnows, a maggot or small fly for bleak, and the rest are most easily caught in a small-meshed net. The loach is used principally in Ireland as a trout bait, and the other two are of small account as hook-baits, though sticklebacks are a valuable form of food for trout in lakes and pools.

Mahseer.—Among the carps of India, several of which give good sport, special mention must be made of the mahseer (*Barbus mosal*), a fish which rivals the salmon both in size and strength. It reaches a weight of 60 lb and sometimes more and is fished for in much the same manner as salmon, with the

difference that after about 10 lb it takes a spinning-bait, usually a heavy spoon-bait, better than a fly.

Cat-fish.—None of the fresh-water cat-fishes (of which no example is found in England) are what may be called sporting fish, but several may be caught with rod and line. There are several kinds in North America, and some of them are as heavy as 150 lb, but the most important is the wels (*Silurus glanis*) of the Danube and neighbouring waters. This is the largest European fresh-water fish, and it is credited with a weight of 300 lb or more. It is a bottom feeder and will take a fish-bait either alive or dead; it is said occasionally to run at a spinning bait when used very deep.

Burbot.—The burbot (*Lota vulgaris*) is the only fresh-water member of the cod family in Great Britain, and it is found only in a few slow-flowing rivers such as the Trent, and there not often, probably because it is a fish of sluggish habits which feeds only at night. It reaches a weight of 3 lb or more, and will take most flesh or fish baits on the bottom. The burbot of America has similar characteristics.

Sturgeon.—The sturgeons, of which there are a good many species in Europe and America, are of no use to the angler. They are anadromous fishes of which little more can be said than that a specimen might take a bottom bait once in a way. In Russia they are sometimes caught on long lines armed with baited hooks, and occasionally an angler hooks one. Such a case was reported from California in *The Field* of the 19th of August 1905.

Shad.—Two other anadromous fish deserve notice. The first is the shad, a herring-like fish of which two species, allice and twaite (*Clupea alosa* and *C. finta*), ascend one or two British and several continental rivers in the spring. The twaite is the more common, and in the Severn, Wye and Teme it sometimes gives very fair sport to anglers, taking worm and occasionally fly or small spinning bait. It is a good fighter, and reaches a weight of about 3 lb. Its sheen when first caught is particularly beautiful. America also has its shads.

Flounder.—The other is the flounder (*Pleuronectes flesus*), the only flat-fish which ascends British rivers. It is common a long way up such rivers as the Severn, far above tidal influence, and it will take almost any flesh-bait used on the bottom. A flounder of 1 lb is, in a river, a large one, but heavier examples are sometimes caught.

Eel.—The eel (*Anguilla vulgaris*) is regarded by the angler more as a nuisance than a sporting fish, but when of considerable size (and it often reaches a weight of 8 lb or more) it is a splendid fighter and stronger than almost any fish that swims. Its life history has long been disputed, but it is now accepted that it breeds in the sea and ascends rivers in its youth. It is found practically everywhere, and its occurrence in isolated ponds to which it has never been introduced by human agency has given rise to a theory that it travels overland as well as by water. The best baits for eels are worms and small fish, and the best time to use them is at night or in thundery or very wet weather.

Sea Angling.

Sea angling is attended by almost as many refinements of tackle and method as fresh-water angling. The chief differences are differences of locality and the habits of the fish. To a certain extent sea angling may also be divided into three classes—fishing on the surface with the fly, at mid-water with spinning or other bait, and on the bottom; but the first method is only practicable at certain times and in certain places, and the others, from the great depths that often have to be sounded and the heavy weights that have to be used in searching them, necessitate shorter and stouter rods, larger reels and stronger tackle than fresh-water anglers employ. Also, of course, the sea-fisherman is liable to come into conflict with very large fish occasionally. In British waters the monster usually takes the form of a skate or halibut. A specimen of the former weighing 194 lb has been landed off the Irish coast with rod and line in recent years. In American waters there is a much greater opportunity of catching fish of this calibre.

Great Game Fishes.—There are several giants of the sea which are regularly pursued by American anglers, chief among them being the tarpon (*Tarpon atlanticus*) and the tuna or tunny (*Thunnus thynnus*), which have been taken on rod and line up to 223 lb and 251 lb respectively. Jew-fish and black sea-bass of over 400 lb have been taken on rod and line, and there are many other fine sporting fish of large size which give the angler exciting hours on the reefs of Florida, or the coasts of California, Texas or Mexico. Practically all of them are taken with a fish-bait either live or dead, and used stationary on the bottom or in mid-water trailed behind a boat.

British Game Fishes.—On a much smaller scale are the fishes most esteemed in British waters. The bass (*Labrax lupus*) heads the list as a plucky and rather difficult opponent. A fish of 10 lb is a large one, but fifteen-pounders have been taken. Small or "school" bass up to 3 lb or 4 lb may sometimes be caught with the fly (generally a roughly constructed thing with big wings), and when they are really taking the sport is magnificent. In some few localities it is possible to cast for them from rocks with a salmon rod, but usually a boat is required. In other places bass may be caught from the shore with fish bait used on the bottom in quite shallow water. They may again sometimes be caught in mid-water, and in fact there are few methods and few lures employed in sea angling which will not account for them at times. The pollack (*Gadus pollachius*) and coal-fish (*Gadus virens*) come next in esteem. Both in some places reach a weight of 20 lb or more, and both when young will take a fly. Usually, however, the best sport is obtained by trailing some spinning-bait, such as an artificial or natural sand-eel, behind a boat. Sometimes, and especially for pollack, the bait must be kept near the bottom and heavy weights on the line are necessary; the coal-fish are more prone to come to the surface for feeding. The larger grey mullet (*Mugil capito*) is a great favourite with many anglers, as it is extremely difficult to hook, and when hooked fights strongly. Fishing for mullet is more akin to fresh-water fishing than any branch of sea-angling, and indeed can be carried on in almost fresh water, for the fish frequent harbours, estuaries and tidal pools. They can be caught close to the surface, at mid-water and at the bottom, and as a rule vegetable baits, such as boiled macaroni, or rag-worms are found to answer best. Usually ground-baiting is necessary, and the finer the tackle used the greater is the chance of sport. Not a few anglers fish with a float as if for river fish. The fish runs up to about 8 lb in weight. The cod (*Gadus morhua*) grows larger and fights less gamely than any of the fish already mentioned. It is generally caught with bait used on the bottom from a boat, but in places codling, or young cod, give some sport to anglers fishing from the shore. The mackerel (*Scomber scomber*) gives the best sport to a bait, usually a strip of fish skin, trailed behind a boat fairly close to the surface, but it will sometimes feed on the bottom. Mackerel on light tackle are game fighters, though they do not usually much exceed 2 lb. Whiting and whiting-pout (*Gadus merlangus* and *Gadus luscus*) both feed on or near the bottom, do not grow to any great size, and are best sought with fine tackle, usually an arrangement of three or four hooks at intervals above a lead which is called a "paternoster." If one or more of the hooks are on the bottom the tackle will do for different kinds of flat fish as well, flounders and dabs being the two species most often caught by anglers. The bream (*Pagellus centrodontus*) is another bottom-feeder which resembles the fresh-water bream both in appearance and habits. It is an early morning or rather a nocturnal fish, and grows to a weight of 3 lb or 4 lb. Occasionally it will feed in mid-water or even close to the surface. The conger eel (*Conger vulgaris*) is another night-feeder, which gives fine sport, as it grows to a great size, and is very powerful. Strong tackle is essential for conger fishing, as so powerful an opponent in the darkness cannot be given any law. The bait must be on or near the bottom. There are, of course, many other fish which come to the angler's rod at times, but the list given is fairly complete as representing the species which are especially sought. Beside them are occasional (in some waters too frequent) captures such as dog-fish and sharks, skates and rays. Many of them run to a great size and give

plenty of sport on a rod, though they are not as a rule welcomed. Lastly, it must be mentioned that certain of the Salmonidae, smelts (*Osmerus eperlanus*), sea-trout, occasionally brown trout, and still more occasionally salmon can be caught in salt water either in sea-lochs or at the mouths of rivers. Smelts are best fished for with tiny hooks tied on fine gut and baited with fragments of shrimp, ragworm, and other delicacies.

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Angling Guide Books, Geographical Information, &c.—Great Britain: *The Angler's Diary* (London), gives information about most important waters in the British Isles, and about some foreign waters, published annually; *The Sportsman's and Tourist's Guide to Scotland* (London), a good guide to angling in Scotland, published twice a year; Augustus Grimble, *The Salmon Rivers of Scotland* (London, 1900, 4 vols.); *The Salmon Rivers of Ireland* (London, 1903); *The Salmon and Sea Trout Rivers of England and Wales* (London, 1904, 2 vols.), this fine series gives minute information as to salmon pools, flies, seasons, history, catches, &c.; W. M. Gallichan, *Fishing in Wales* (London, 1903); *Fishing in Derbyshire* (London, 1905); J. Watson, *English Lake District Fisheries* (London, 1899); C. Wade, *Exmoor Streams* (London, 1903); G. A. B. Dewar, *South Country Trout Streams* (London, 1899); "Hi Regan," *How and Where to Fish in Ireland* (London, 1900); E. S. Shrubsole, *The Land of Lakes* (London, 1906), a guide to fishing in County Donegal). Europe: "Palmer Hackle," *Hints on Angling* (London, 1846), contains "suggestions for angling excursions in France and Belgium," but they are too old to be of much service; W. M. Gallichan, *Fishing and Travel in Spain* (London, 1905); G. W. Hartley, *Wild Sport with Gun, Rifle and Salmon Rod* (Edinburgh, 1903), contains a chapter on huchen fishing; Max von dem Borne, *Wegweiser für Angler durch Deutschland, Oesterreich und die Schweiz* (Berlin, 1877), a book of good conception and arrangement, and still useful, though out of date in many particulars; *Illustrierte Angler-Schule* (*der deutschen Fischerei Zeitung*), Stettin, contains good chapters on the wels and huchen; H. Storck, *Der Angelsport* (Munich, 1898), contains a certain amount of geographical information; E. B. Kennedy, *Thirty Seasons in Scandinavia* (London, 1904), contains useful information about fishing; General E. F. Burton, *Trouting in Norway* (London, 1897); Abel Chapman, *Wild Norway* (London, 1897); F. Sandeman, *Angling Travels in Norway* (London, 1895). America: C. F. Holder, *Big Game Fishes of the United States* (New York, 1903); J. A. Henshall, *Bass, Pike, Perch and Pickerel* (New York, 1903); Dean Sage and others, *Salmon and Trout* (New York, 1902); E. T. D. Chambers, *Angler's Guide to Eastern Canada* (Quebec, 1899); Rowland Ward, *The English Angler in Florida* (London, 1898); J. Turner Turner, *The Giant Fish of Florida* (London, 1902). India: H. S. Thomas, *The Rod in India* (London, 1897); "Skene Dhu," *The Mighty Mahseer* (Madras, 1906), contains a chapter on the acclimatization of trout in India and Ceylon. New Zealand: W. H. Spackman, *Trout in New Zealand* (London, 1894); Capt. Hamilton, *Trout Fishing and Sport in Maoriland* (Wellington, 1905), contains a valuable section on fishing waters.

Fishery Law.—G. C. Oke, *A Handy Book of the Fishery Laws* (edited by J. W. Willis Band and A. C. M'Barnet, London, 1903).

ANGLO-ISRAELITE THEORY, the contention that the British people in the United Kingdom, its colonies, and the United States, are the racial descendants of the "ten tribes" forming the kingdom of Israel, large numbers of whom were deported by Sargon king of Assyria on the fall of Samaria in 721 B.C. The theory (which is fully set forth in a book called *Philo-Israel*) rests on premises which are deemed by scholars—both theological and anthropological—to be utterly unsound.

ANGLO-NORMAN LITERATURE.—The French language (*q.v.*) came over to England with William the Conqueror. During the whole of the 12th century it shared with Latin the distinction of being the literary language of England, and it was in use at the court until the 14th century. It was not until the reign of Henry IV. that English became the native tongue of the kings of England. After the loss of the French provinces, schools for the teaching of French were established in England, among the most celebrated of which we may quote that of Marlborough. The language then underwent certain changes which gradually distinguished it from the French spoken in France; but, except for some graphical characteristics, from which certain rules of pronunciation are to be inferred, the changes to which the language was subjected were the individual modifications of the various authors, so that, while we may still speak of Anglo-Norman writers, an Anglo-Norman language, properly so called, gradually ceased to exist. The prestige enjoyed by the French language, which, in the 14th century, the author of the *Manière de language* calls "le plus bel et le plus gracious language

et plus noble parler, après latin d'escole, qui soit au monde et de touz genz mieulx prisée et amée que nul autre (quar Dieux le fist si douce et amiable principalement à l'oneur et loenge de luy mesmes. Et pour ce il peut comparer au parler des angels du ciel, pour la grand doulceur et biaultée d'icel)," was such that it was not till 1363 that the chancellor opened the parliamentary session with an English speech. And although the Hundred Years' War led to a decline in the study of French and the disappearance of Anglo-Norman literature, the French language continued, through some vicissitudes, to be the classical language of the courts of justice until the 17th century. It is still the language of the Channel Islands, though there too it tends more and more to give way before the advance of English.

It will be seen from the above that the most flourishing period of Anglo-Norman literature was from the beginning of the 12th century to the end of the first quarter of the 13th. The end of this period is generally said to coincide with the loss of the French provinces to Philip Augustus, but literary and political history do not correspond quite so precisely, and the end of the first period would be more accurately denoted by the appearance of the history of William the Marshal in 1225 (published for the *Société de l'histoire de France*, by Paul Meyer, 3 vols., 1891–1901). It owes its brilliancy largely to the protection accorded by Henry II. of England to the men of letters of his day. " He could speak French and Latin well, and is said to have known something of every tongue between 'the Bay of Biscay and the Jordan.' He was probably the most highly educated sovereign of his day, and amid all his busy active life he never lost his interest in literature and intellectual discussion; his hands were never empty, they always had either a bow or a book" (*Dict. of Nat. Biog.*). Wace and Benoît de Sainte-More compiled their histories at his bidding, and it was in his reign that Marie de France composed her poems. An event with which he was closely connected, viz. the murder of Thomas Becket, gave rise to a whole series of writings, some of which are purely Anglo-Norman. In his time appeared the works of Béroul and Thomas respectively, as well as some of the most celebrated of the Anglo-Norman *romans d'aventure*. It is important to keep this fact in mind when studying the different works which Anglo-Norman literature has left us. We will examine these works briefly, grouping them into narrative, didactic, hagiographic, lyric, satiric and dramatic literature.

Narrative Literature: (*a*) *Epic and Romance.*—The French epic came over to England at an early date. We know that the *Chanson de Roland* was sung at the battle of Hastings, and we possess Anglo-Norman MSS. of a few *chansons de geste*. The *Pèlerinage de Charlemagne* (Koschwitz, *Altfranzösische Bibliothek*, 1883) was, for instance, only preserved in an Anglo-Norman manuscript of the British Museum (now lost), although the author was certainly a Parisian. The oldest manuscript of the *Chanson de Roland* that we possess is also a manuscript written in England, and amongst the others of less importance we may mention *La Chançun de Willame*, the MS. of which has (June 1903) been published in facsimile at Chiswick (cf. Paul Meyer, *Romania*, xxxii. 597-618). Although the diffusion of epic poetry in England did not actually inspire any new *chansons de geste*, it developed the taste for this class of literature, and the epic style in which the tales of *Horn*, of *Bovon de Hampton*, of *Guy of Warwick* (still unpublished), of *Waldef* (still unpublished), and of *Fulk Fitz Warine* are treated, is certainly partly due to this circumstance. Although the last of these works has come down to us only in a prose version, it contains unmistakable signs of a previous poetic form, and what we possess is really only a rendering into prose similar to the transformations undergone by many of the *chansons de geste* (cf. L. Brandin, *Introduction to Fulk Fitz Warine*, London, 1904).

The interinfluence of French and English literature can be studied in the Breton romances and the *romans d'aventure* even better than in the epic poetry of the period. The *Lay of Orpheus* is known to us only through an English imitation; the *Lai du cor* was composed by Robert Biket, an Anglo-Norman poet of the 12th century (Wulff, Lund, 1888). The *lais* of Marie de France were written in England, and the greater number of the romances composing the *matière de Bretagne* seem to have passed from England to France through the medium of Anglo-Norman. The legends of Merlin and Arthur, collected in the *Historia Regum Britanniae* by Geoffrey of Monmouth († 1154), passed into French literature, bearing the character which the bishop of St Asaph had stamped upon them. Chrétien de Troye's *Perceval* (*c.* 1175) is doubtless based on an Anglo-Norman poem. Robert de Boron (*c.* 1215) took the subject of his *Merlin* (published by G. Paris and J. Ulrich, 1886, 2 vols., *Société des Anciens Textes*) from Geoffrey of Monmouth. Finally, the most celebrated love-legend of the middle ages, and one of the most beautiful inventions of world-literature, the story of Tristan and Iseult, tempted two authors, Béroul and Thomas, the first of whom is probably, and the second certainly, Anglo-Norman (see ARTHURIAN LEGEND; GRAIL, THE HOLY; TRISTAN). One *Folie Tristan* was composed in England in the last years of the 12th century. (For all these questions see *Soc. des Anc. Textes*, Muret's ed. 1903; Bédier's ed. 1902–1905). Less fascinating than the story of Tristan and Iseult, but nevertheless of considerable interest, are the two *romans d'aventure* of Hugh of Rutland, *Ipomedon* (published by Kölbing and Koschwitz, Breslau, 1889) and *Protesilaus* (still unpublished) written about 1185. The first relates the adventures of a knight who married the young duchess of Calabria, niece of King Meleager of Sicily, but was loved by Medea, the king's wife. The second poem is the sequel to *Ipomedon*, and deals with the wars and subsequent reconciliation between Ipomedon's sons, Daunus, the elder, lord of Apulia, and Protesilaus, the younger, lord of Calabria. Protesilaus defeats Daunus, who had expelled him from Calabria. He saves his brother's life, is reinvested with the dukedom of Calabria, and, after the death of Daunus, succeeds to Apulia. He subsequently marries Medea, King Meleager's widow, who had helped him to seize Apulia, having transferred her affection for Ipomedon to his younger son (cf. Ward, *Cat. of Rom.*, i. 728). To these two romances by an Anglo-Norman author, *Amadas et Idoine*, of which we only possess a continental version, is to be added. Gaston Paris has proved indeed that the original was composed in England in the 12th century (*An English Miscellany presented to Dr Furnivall in Honour of his Seventy-fifth Birthday*, Oxford, 1901, 386-394). The Anglo-Norman poem on the *Life of Richard Cœur de Lion* is lost, and an English version only has been preserved. About 1250 Eustace of Kent introduced into England the *roman d'Alexandre* in his *Roman de toute chevalerie*, many passages of which have been imitated in one of the oldest English poems on Alexander, namely, *King Alisaunder* (P. Meyer, *Alexandre le grand*, Paris, 1886, ii. 273, and Weber, *Metrical Romances*, Edinburgh).

(*b*) *Fableaux, Fables and Religious Tales.*—In spite of the incontestable popularity enjoyed by this class of literature, we have only some half-dozen *fableaux* written in England, viz. *Le chevalier à la corbeille, Le chevalier qui faisait parler les muets, Le chevalier, sa dame et un clerc, Les trois dames, La gageure, Le prêtre d'Alison, La bourgeoise d'Orléans* (Bédier, *Les Fabliaux*, 1895). As to fables, one of the most popular collections in the middle ages was that written by Marie de France, which she claimed to have translated from *King Alfred*. In the *Contes moralisés*, written by Nicole Bozon shortly before 1320 (*Soc. Anc. Textes*, 1889), a few fables bear a strong resemblance to those of Marie de France.

The religious tales deal mostly with the Mary Legends, and have been handed down to us in three collections:

(i.) The Adgar's collection. Most of these were translated from William of Malmesbury († 1143?) by Adgar in the 12th century (" Adgar's Marien-Legenden," *Altfr. Biblioth.* ix.; J. A. Herbert, *Rom.* xxxii. 394).

(ii.) The collection of Everard of Gateley, a monk of St Edmund at Bury, who wrote *c.* 1250 three Mary Legends (*Rom.* xxix. 27).

(iii.) An anonymous collection of sixty Mary Legends composed *c.* 1250 (Brit. Museum Old Roy. 20 B, xiv.), some of which have been published in Suchier's *Bibliotheca Normannica*; in the *Altf. Bibl.* See also Mussafia, " Studien zu den mittelalterlichen

Marien-legenden" in *Sitzungsb. der Wien. Akademie* (t. cxiii., cxv., cxix., cxxiii., cxxix.).

Another set of religious and moralizing tales is to be found in Chardri's *Set dormans* and *Josaphat*, *c.* 1216 (Koch, *Altfr. Bibl.*, 1880; G. Paris, *Poèmes et légendes du moyen âge*).

(*c*) *History.*—Of far greater importance, however, are the works which constitute Anglo-Norman historiography. The first Anglo-Norman historiographer is Geoffrey Gaimar, who wrote his *Estorie des Angles* (between 1147 and 1151) for Dame Constance, wife of Robert Fitz-Gislebert (*The Anglo-Norman Metrical Chronicle*, Hardy and Martin, i. ii., London, 1888). This history comprised a first part (now lost), which was merely a translation of Geoffrey of Monmouth's *Historia regum Britanniae*, preceded by a history of the Trojan War, and a second part which carries us as far as the death of William Rufus. For this second part he has consulted historical documents, but he stops at the year 1087, just when he has reached the period about which he might have been able to give us some first-hand information. Similarly, Wace in his *Roman de Rou et des ducs de Normandie* (ed. Andresen, Heilbronn, 1877–1879, 2 vols.), written 1160–1174, stops at the battle of Tinchebray in 1107 just before the period for which he would have been so useful. His *Brut* or *Geste des Bretons* (Le Roux de Lincy, 1836–1838, 2 vols.), written in 1155, is merely a translation of Geoffrey of Monmouth. "Wace," says Gaston Paris, speaking of the *Roman de Rou*, "traduit en les abrégeant des historiens latins que nous possédons; mais çà et là il ajoute soit des contes populaires, par exemple sur Richard Ier, sur Robert Ier, soit des particularités qu'il savait par tradition (sur ce même Robert le magnifique, sur l'expédition de Guillaume, &c.) et qui donnent à son œuvre un réel intérêt historique. Sa langue est excellente; son style clair, serré, simple, d'ordinaire assez monotone, vous plaît par sa saveur archaïque et quelquefois par une certaine grâce et une certaine malice."

The *History of the Dukes of Normandy* by Benoît de Sainte-More is based on the work of Wace. It was composed at the request of Henry II. about 1170, and takes us as far as the year 1135 (ed. by Francisque Michel, 1836–1844, *Collection de documents inédits*, 3 vols.). The 43,000 lines which it contains are of but little interest to the historian; they are too evidently the work of a *romancier courtois*, who takes pleasure in recounting love-adventures such as those he has described in his romance of Troy. Other works, however, give us more trustworthy information, for example, the anonymous poem on Henry II.'s *Conquest of Ireland* in 1172 (ed. Francisque Michel, London, 1837), which, together with the *Expugnatio hibernica* of Giraud de Barri, constitutes our chief authority on this subject. The *Conquest of Ireland* was republished in 1892 by Goddard Henry Orpen, under the title of *The Song of Dermot and the Earl* (Oxford, Clarendon Press). Similarly, Jourdain Fantosme, who was in the north of England in 1174, wrote an account of the wars between Henry II., his sons, William the Lion of Scotland and Louis VII., in 1173 and 1174 (*Chronicle of the reigns of Stephen ... III.*, ed. by Joseph Stevenson and Fr. Michel, London, 1886, pp. 202-307). Not one of these histories, however, is to be compared in value with *The History of William the Marshal, Count of Striguil and Pembroke*, regent of England from 1216–1219, which was found and subsequently edited by Paul Meyer (*Société de l'histoire de France*, 3 vols., 1891–1901). This masterpiece of historiography was composed in 1225 or 1226 by a professional poet of talent at the request of William, son of the marshal. It was compiled from the notes of the marshal's squire, John d'Early († 1230 or 1231), who shared all the vicissitudes of his master's life and was one of the executors of his will. This work is of great value for the history of the period 1186–1219, as the information furnished by John d'Early is either personal or obtained at first hand. In the part which deals with the period before 1186, it is true, there are various mistakes, due to the author's ignorance of contemporary history, but these slight blemishes are amply atoned for by the literary value of the work. The style is concise, the anecdotes are well told, the descriptions short and picturesque; the whole constitutes one of the most living pictures of medieval society. Very pale by the side of this work appear the *Chronique* of Peter of Langtoft, written between 1311 and 1320, and mainly of interest for the period 1294–1307 (ed. by T. Wright, London, 1866–1868); the *Chronique* of Nicholas Trevet (1258?–1328?), dedicated to Princess Mary, daughter of Edward I. (Duffus Hardy, *Descr. Catal.* III., 349-350); the *Scala Chronica* compiled by Thomas Gray of Heaton († *c.* 1369), which carries us to the year 1362–1363 (ed. by J. Stevenson, Maitland Club, Edinburgh, 1836); the *Black Prince*, a poem by the poet Chandos, composed about 1386, and relating the life of the Black Prince from 1346–1376 (re-edited by Francisque Michel, London and Paris, 1883); and, lastly, the different versions of the *Brutes*, the form and historical importance of which have been indicated by Paul Meyer (*Bulletin de la Société des Anciens Textes*, 1878, pp. 104-145), and by F. W. D. Brie (*Geschichte und Quellen der mittelenglischen Prosachronik, The Brute of England or The Chronicles of England*, Marburg, 1905).

Finally we may mention, as ancient history, the translation of Eutropius and Dares, by Geoffrey of Waterford (13th century), who gave also the *Secret des Secrets*, a translation from a work wrongly attributed to Aristotle, which belongs to the next division (*Rom.* xxiii. 314).

Didactic Literature.—This is the most considerable, if not the most interesting, branch of Anglo-Norman literature: it comprises a large number of works written chiefly with the object of giving both religious and profane instruction to Anglo-Norman lords and ladies. The following list gives the most important productions arranged in chronological order:—

Philippe de Thaun, *Comput*, *c.* 1119 (edited by E. Mall, Strassburg, 1873), poem on the calendar; *Bestiaire*, *c.* 1130 (ed. by E. Walberg, Paris, 1900; cf. G. Paris, *Rom.* xxxi. 175); *Lois de Guillaume le Conquérant* (redaction between 1150 and 1170, ed. by J. E. Matzke, Paris, 1899); *Oxford Psalter*, *c.* 1150 (Fr. Michel, *Libri Psalmorum versio antiqua gallica*, Oxford, 1860); *Cambridge Psalter*, *c.* 1160 (Fr. Michel, *Le Livre des Psaumes*, Paris, 1877); *London Psalter*, same as Oxford Psalter (cf. Beyer, *Zt. f. rom. Phil.* xi. 513-534; xii. 1-56); *Disticha Catonis*, translated by Everard de Kirkham and Elie de Winchester (Stengel, *Ausg. u. Abhandlungen*); *Le Roman de fortune*, summary of Boetius' *De consolatione philosophiae*, by Simon de Fresne (*Hist. lit.* xxviii. 408); *Quatre livres des rois*, translated into French in the 12th century, and imitated in England soon after (P. Schlösser, *Die Lautverhältnisse der quatre livres des rois*, Bonn, 1886; *Romania*, xvii. 124); *Donnei des Amanz*, the conversation of two lovers, overheard and carefully noted by the poet, of a purely didactic character, in which are included three interesting pieces, the first being an episode of the story of Tristram, the second a fable, *L'homme et le serpent*, the third a tale, *L'homme et l'oiseau*, which is the basis of the celebrated *Lai de l'oiselet* (*Rom.* xxv. 497); *Livre des Sibiles* (1160); *Enseignements Trebor*, by Robert de Ho (= Hoo, Kent, on the left bank of the Medway) [edited by Mary Vance Young, Paris; Picard, 101; cf. G. Paris, *Rom.* xxxii. 141]; *Lapidaire de Cambridge* (Pannier, *Les Lapidaires français*); Frère Angier de Ste. Frideswide, *Dialogues*, 29th of November 1212 (*Rom.* xii. 145-208, and xxix.; M. K. Pope, *Étude sur la langue de Frère Angier*, Paris, 1903); *Li dialoge Grégoire le pape*, ed. by Foerster, 1876; *Petit Plet*, by Chardri, *c.* 1216 (Koch, *Altfr Bibliothek*, i., and Mussafia, *Z. f. r. P.* iii. 591); *Petite philosophie*, *c.* 1225 (*Rom.* xv. 356; xxix. 72); *Histoire de Marie et de Jésus* (*Rom.* xvi. 248-262); *Poème sur l'Ancien Testament* (*Not. et Extr.* xxxiv. 1, 210; *Soc. Anc. Textes*, 1889, 73-74); *Le Corset* and *Le Miroir*, by Robert de Gretham (*Rom.* vii. 345; xv. 296); *Lumière as Lais*, by Pierre de Peckham, *c.* 1250 (*Rom.* xv. 287); an Anglo-Norman redaction of *Image du monde*, *c.* 1250 (*Rom.* xxi. 481); two Anglo-Norman versions of *Quatre sœurs* (Justice, Truth, Peace, Mercy), 13th century (ed. by Fr. Michel, *Psautier d'Oxford*, pp. 364-368, *Bulletin Soc. Anc. Textes*, 1886, 57; *Romania*, xv. 352); another *Comput* by Raüf de Lenham, 1256 (P. Meyer, *Archives des missions*, 2nd series iv. 154 and 160-164; *Rom.* xv. 285); *Le chastel d'amors*, by Robert Grosseteste or Greathead, bishop of

Lincoln (†1253) [ed. by Cooke, *Carmina Anglo-Normannica*, 1852, Caxton Society]; *Poème sur l'amour de Dieu et sur la haine du péché*, 13th century, second part (*Rom.* xxix. 5); *Le mariage des neuf filles du diable* (*Rom.* xxix. 54); *Ditie d'Urbain*, attributed without any foundation to Henry I. (P. Meyer, *Bulletin Soc. Anc. Textes*, 1880, p. 73 and *Romania* xxxii, 68); *Dialogue de l'évêque Saint Julien et son disciple* (*Rom.* xxix. 21); *Poème sur l'antichrist et le jugement dernier*, by Henri d'Arci (*Rom.* xxix. 78; *Not. et. Extr.* 35, i. 137). Wilham de Waddington produced at the end of the 13th century his *Manuel des péchés*, which was adapted in England by Robert of Brunne in his *Handlying Sinne* (1303) [*Hist. lit.* xxviii. 179-207; *Rom.* xxix. 5, 47-53]; see Furnivall, *Robert of Brunne's Handlying Synne* (Roxb.Club, 1862); in the 14th century we find Nicole Bozon's *Contes moralisés* (see above); *Traité de naturesse* (*Rom.* xiii. 508); *Sermons* in verse (P. Meyer, *op. cit.* xlv.); *Proverbes de bon enseignement* (*op. cit.* xlvi.). We have also a few handbooks on the teaching of French. Gautier de Biblesworth wrote such a treatise *à Madame Dyonise de Mountechensi pur aprise de langage* (Wright, *A Volume of Vocabularies*; P. Meyer, *Rec. d'anc. textes*, p. 360 and *Romania* xxxii, 22); *Orthographia gallica* (Stürzinger, *Altfr. Bibl.* 1884); *La manière de language*, written in 1396 (P. Meyer, *Rev. crit. d'hist. et de litt.* nos. compl. de 1870); *Un petit livre pour enseigner les enfants de leur entreparler comun françois*, *c.* 1399 (Stengel, *Z. für n. f. Spr. u. Litt.* i. 11). The important *Mirour de l'omme*, by John Gower, contains about 30,000 lines written in very good French at the end of the 14th century (Macaulay, *The Complete Works of John Gower*, i., Oxford, 1899).

Hagiography.—Among the numerous lives of saints written in Anglo-Norman the most important ones are the following, the list of which is given in chronological order:—*Voyage de Saint Brandan* (or *Brandain*), written in 1121, by an ecclesiastic for Queen Aelis of Louvain (*Rom. St.* i. 553-588; *Z. f. r. P.* ii. 438-459; *Rom.* xviii. 203. C. Wahlund, *Die altfr. Prosaübersetz. von Brendan's Meerfahrt*, Upsala, 1901); life of St Catherine by Clemence of Barking (*Rom.* xiii. 400, Jarnik, 1894); life of St Giles, *c.* 1170, by Guillaume de Berneville (*Soc. Anc. Textes fr.*, 1881; *Rom.* xi. and xxiii. 94); life of St Nicholas, life of Our Lady, by Wace (Delius, 1850; Stengel, *Cod. Digby*, 66); Uhlemann, *Gram. Krit. Studien zu Wace's Conception und Nicolas*, 1878; life of St George by Simon de Fresne (*Rom.* x. 319; J. E. Matzke, *Public. of the Mod. Lang. Ass. of Amer.* xvii. 1902; *Rom.* xxxiv. 148); *Expurgatoire de Ste. Patrice*, by Marie de France (Jenkins, 1894; Eckleben, *Aelteste Schilderung vom Fegefeuer d. H. Patricius*, 1851; Ph. de Felice, 1906); *La vie de St Edmund le Rei*, by Denis Pyramus, end of 12th century (*Memorials of St Edmund's Abbey*, edited by T. Arnold, ii. 1892; *Rom.* xxii. 170); Henri d'Arci's life of St Thais, poem on the Antichrist, *Visio S. Pauli* (P. Meyer, *Not. et Extr.* xxxv. 137-158); life of St Gregory the Great by Frère Angier, 30th of April 1214 (*Rom.* viii. 509-544; ix. 176; xviii. 201); life of St Modwenna, between 1225 and 1250 (Suchier, *Die dem Matthäus Paris zugeschriebene Vie de St Auban*, 1873, pp. 54-58); Fragments of a life of St Thomas Becket, *c.* 1230 (P. Meyer, *Soc. Anc. Text. fr.*, 1885); and another life of the same by Benoît of St Alban, 13th century (Michel, *Chron. des ducs de Normandie*; *Hist. Lit.* xxiii. 383); a life of Edward the Confessor, written before 1245 (Luard, *Lives of Edward the Confessor*, 1858; *Hist. Lit.* xxvii. 1), by an anonymous monk of Westminster; life of St Auban, *c.* 1250 (Suchier, *op. cit.*; Uhlemann, "Über die vie de St Auban in Bezug auf Quelle," &c. *Rom. St.* iv. 543-626; ed. by Atkinson, 1876). *The Vision of Tnudgal*, an Anglo-Norman fragment, is preserved in MS. 312, Trinity College, Dublin; the MS. is of the 14th century; the author seems to belong to the 13th (*La vision de Tondale*, ed. by Friedel and Kuno Meyer, 1906). In this category we may add the life of Hugh of Lincoln, 13th century (*Hist. Lit.* xxiii. 436; Child, *The English and Scottish Popular Ballads*, 1888, p. v; Wolter, *Bibl. Anglo-Norm.* ii. 115). Other lives of saints were recognized to be Anglo-Norman by Paul Meyer when examining the MSS. of the Welbeck library (*Rom.* xxxii. 637 and *Hist. Lit.* xxxiii. 338-378).

Lyric Poetry.—The only extant songs of any importance are the seventy-one *Ballads* of Gower (Stengel, *Gower's Minnesang*, 1886). The remaining songs are mostly of a religious character. Most of them have been discovered and published by Paul Meyer (*Bulletin de la Soc. Anc. Textes*, 1889; *Not. et Extr.* xxxiv; *Rom.* xiii. 518, t. xiv. 370; xv. p. 254, &c.). Although so few have come down to us such songs must have been numerous at one time, owing to the constant intercourse between English, French and Provençals of all classes. An interesting passage in *Piers Plowman* furnishes us with a proof of the extent to which these songs penetrated into England. We read of :

". . . dykers and deluers that doth here dedes ille,
And dryuen forth the longe day with 'Deu, vous saue,
Dame Emme!'" (Prologue, 223 f.)

One of the finest productions of Anglo-Norman lyric poetry written in the end of the 13th century, is the *Plainte d'amour* (Vising, Göteborg, 1905; *Romania* xiii. 507, xv. 292 and xxix. 4), and we may mention, merely as literary curiosities, various works of a lyrical character written in two languages, Latin and French, or English and French, or even in three languages, Latin, English and French. In *Early English Lyrics* (Oxford, 1907) we have a poem in which a lover sends to his mistress a love-greeting composed in three languages, and his learned friend replies in the same style (*De amico ad amicam*, *Responcio*, viii and ix).

Satire.—The popularity enjoyed by the *Roman de Renart* and the Anglo-Norman version of the *Riote du Monde* (*Z. f. rom. Phil.* viii. 275-289) in England is proof enough that the French spirit of satire was keenly appreciated. The clergy and the fair sex presented the most attractive target for the shots of the satirists. However, an Englishman raised his voice in favour of the ladies in a poem entitled *La Bonté des dames* (Meyer, *Rom.* xv. 315-339), and Nicole Bozon, after having represented "Pride" as a feminine being whom he supposes to be the daughter of Lucifer, and after having fiercely attacked the women of his day in the *Char d'Orgueil* (*Rom.* xiii. 516), also composed a *Bounté des femmes* (P. Meyer, *op. cit.* 33) in which he covers them with praise, commending their courtesy, their humility, their openness and the care with which they bring up their children. A few pieces of political satire show us French and English exchanging amenities on their mutual shortcomings. The *Roman des Français*, by André de Coutances, was written on the continent, and cannot be quoted as Anglo-Norman although it was composed before 1204 (cf. Gaston Paris: *Trois versions rimées de l'évangile de Nicodème*, *Soc. Anc. Textes*, 1885), it is a very spirited reply to French authors who had attacked the English.

Dramatic Literature.—This must have had a considerable influence on the development of the sacred drama in England, but none of the French plays acted in England in the 12th and 13th centuries has been preserved. *Adam*, which is generally considered to be an Anglo-Norman mystery of the 12th century, was probably written in France at the beginning of the 13th century (*Romania* xxxii. 637), and the so-called Anglo-Norman *Resurrection* belongs also to continental French. It is necessary to state that the earliest English moralities seem to have been imitations of the French ones.

BIBLIOGRAPHY.—Apart from the works already mentioned see generally: Scheibner, "Über die Herrschaft der frz. Sprache in England" (Annaberg, Progr. der Königlichen Realschule, 1880, 38 f.); Groeber, *Grundr. der romanischen Philologie*, ii. iii. (Strassburg, 1902); G. Paris, *La Litt. fr. au moyen âge* (1905); *Esquisse historique de la litt. fr. au moyen âge* (1907); *La Litt. norm. avant l'annexion 912–1204* (Paris, 1899); "L'Esprit normand en Angleterre," *La Poésie au moyen âge* (2nd series 45-74, Paris, 1906); Thomas Wright, *Biographia britannica literaria* (Anglo-Norman period, London, 1846); Ten Brink, *Geschichte der englischen Litteratur* (Berlin, 1877, i. 2); J. J. Jusserand, *Hist. litt. du peuple anglais* (2nd ed. 1895, vol. i.); W. H. Schofield, *English Literature from the Norman Conquest to Chaucer* (London, 1906); Johan Vising, *Franska Språket i England* (Göteborg, 1900, 1901, 1902). (L. Br.)

ANGLO-SAXON CHRONICLE. It is usual to speak of "the Anglo-Saxon Chronicle"; it would be more correct to say that there are four Anglo-Saxon Chronicles. It is true that these all grow out of a common stock, that in some even of their later entries two or more of them use common materials; but the same

may be said of several groups of medieval chronicles, which no one dreams of treating as single chronicles. Of this fourfold Chronicle there are seven MSS. in existence; *C.C.C. Cant.* 173 (A); *Cott. Tib.* A vi. (B); *Cott. Tib.* B i. (C); *Cott. Tib.* B iv. (D); *Bodl. Laud. Misc.* 636 (E); *Cott. Domitian* A viii. (F); *Cott. Otho* B xi. (G). Of these G is now a mere fragment, and it is known to have been a transcript of A. F is bilingual, the entries being given both in Saxon and Latin. It is interesting as a stage in the transition from the vernacular to the Latin chronicle; but it has little independent value, being a mere epitome, made at Canterbury in the 11th or 12th century, of a chronicle akin to E. B, as far as it goes (to 977), is identical with C, both having been copied from a common original, but A, C, D, E have every right to be treated as independent chronicles. The relations between the four vary very greatly in different parts, and the neglect of this consideration has led to much error and confusion. The common stock, out of which all grow, extends to 892. The present writer sees no reason to doubt that the idea of a national, as opposed to earlier local chronicles, was inspired by Alfred, who may even have dictated, or at least revised, the entries relating to his own campaigns; while for the earlier parts pre-existing materials, both oral and written, were utilized. Among the latter the chronological epitome appended to Bede's *Ecclesiastical History* may be specially mentioned. But even this common stock exists in two different recensions, in A, B, C, on the one hand, and D, E on the other. The main points of difference are that in D, E (1) a series of northern annals have been incorporated; (2) the Bede entries are taken, not from the brief epitome, but from the main body of the *Eccl. Hist.* The inference is that, shortly after the compiling of this Alfredian chronicle, a copy of it was sent to some northern monastery, probably Ripon, where it was expanded in the way indicated. Copies of this northernized Chronicle afterwards found their way to the south. The impulse given by Alfred was continued under Edward, and we have what may be called an official continuation of the history of the Danish wars, which, in B, C, D extends to 915, and in A to 924. After 915 B, C insert as a separate document a short register of Mercian affairs during the same period (902–924), which might be called the acts of Æthelflaed, the famous "Lady of the Mercians," while D has incorporated it, not very skilfully, with the official continuation. Neither of these documents exists in E. From 925 to 975 all the chronicles are very fragmentary; a few obits, three or four poems, among them the famous ballad on the battle of Brunanburh, make up the meagre tale of their common materials, which each has tried to supplement in its own way. A has inserted a number of Winchester entries, which prove that A is a Winchester book. And this local and scrappy character it retains to 1001, where it practically ends. At some subsequent time it was transferred bodily to Canterbury, where it received numerous interpolations in the earlier part, and a few later local entries which finally tail off into the Latin acts of Lanfranc. A may therefore be dismissed. C has added to the common stock one or two Abingdon entries, with which place the history of C is closely connected; while D and E have a second group of northern annals 901–966, E being however much more fragmentary than D, omitting, or not having access to, much both of the common and of the northern material which is found in D. From 983 to 1018 C, D and E are practically identical, and give a connected history of the Danish struggles under Æthelred II. This section was probably composed at Canterbury. From 1018 the relations of C, D, E become too complicated to be expressed by any formula; sometimes all three agree together, sometimes all three are independent; in other places each pair in turn agree against the third. It may be noted that C is strongly anti-Godwinist, while E is equally pro-Godwinist, D occupying an intermediate position. C extends to 1066, where it ends abruptly, and probably mutilated. D ends at 1079 and is certainly mutilated. In its later history D is associated with some place in the diocese of Worcester, probably Evesham. In its present form D is a comparatively late MS., none of it probably much earlier, and some of it later, than 1100. In the case of entries in the earlier part of the chronicles, which are peculiar to D, we cannot exclude the possibility that they may be late interpolations. E is continued to 1154. In its present form it is unquestionably a Peterborough book. The earlier part is full of Peterborough interpolations, to which place many of the later entries also refer. But (apart from the interpolations) it is only the entries after 1121, where the first hand in the MS. ends, which were actually composed at Peterborough. The section 1023–1067 certainly, and possibly also the section 1068–1121, was composed at St Augustine's, Canterbury; and the former is of extreme interest and value, the writer being in close contact with the events which he describes. The later parts of E show a great degeneration in language, and a querulous tone due to the sufferings of the native population under the harsh Norman rule; "but our debt to it is inestimable; and we can hardly measure what the loss to English history would have been, if it had not been written; or if, having been written, it had, like so many another English chronicle, been lost."

BIBLIOGRAPHY.—The above account is based on the introduction in vol. ii. of the Rev. C. Plummer's edition of *Two of the Saxon Chronicles Parallel* (Clarendon Press, 1892, 1899); to which the student may be referred for detailed arguments. The *editio princeps* of the Anglo-Saxon Chronicle was by Abraham Wheloc, professor of Arabic at Cambridge, where the work was printed (1643–1644). It was based mainly on the MS. called G above, and is the chief source of our knowledge of that MS. which perished, all but three leaves, in the Cottonian fire of 1723. Edmund Gibson of Queen's College, Oxford, afterwards bishop of London, published an edition in 1692. He used Wheloc's edition, and E, with collations or transcripts of B and F. Both Wheloc and Gibson give Latin translations. In 1823 appeared an edition by Dr Ingram, of Trinity College, Oxford, with an English translation. Besides A, B, E, F, Ingram used C and D for the first time. But both he and Gibson made the fatal error of trying to combine the disparate materials contained in the various chronicles in a single text. An improvement in this respect is seen in the edition made by Richard Price (d. 1833) for the first (and only) volume of *Monumenta Historica Britannica* (folio 1848). There is still, however, too much conflation, and owing to the plan of the volume, the edition only extends to 1066. A translation is appended. In 1861 appeared Benjamin Thorpe's six-text edition in the Rolls Series. Though not free from defects, this edition is absolutely indispensable for the study of the chronicles and the mutual relations of the different MSS. A second volume contains the translation. In 1865 the Clarendon Press published *Two Saxon Chronicles (A and E) Parallel, with supplementary extracts from the others*, by the Rev. John Earle. This edition has no translation, but in the notes and introduction a very considerable advance was made. On this edition is partly based the later edition by the Rev. C. Plummer, already cited above. In addition to the translations contained in the editions already mentioned, the following have been issued separately. The first translation into modern English was by Miss Anna Gurney, privately printed in 1819. This was largely based on Gibson's edition, and was in turn the basis of Dr Giles' translation, published in 1847, and often reprinted. The best translation is that by the Rev. Joseph Stevenson, in his series of *Church Historians of England* (1853). Up to the Conquest it is a revision of the translation contained in *Mon. Hist. Brit.* From that point it is an independent translation. (C. PL.)

ANGLO-SAXON LAW. 1. The body of legal rules and customs which obtained in England before the Norman conquest constitutes, with the Scandinavian laws, the most genuine expression of Teutonic legal thought. While the so-called "barbaric laws" (*leges barbarorum*) of the continent, not excepting those compiled in the territory now called Germany, were largely the product of Roman influence, the continuity of Roman life was almost completely broken in the island, and even the Church, the direct heir of Roman tradition, did not carry on a continuous existence: Canterbury was not a see formed in a Roman province in the same sense as Tours or Reims. One of the striking expressions of this Teutonism is presented by the language in which the Anglo-Saxon laws were written. They are uniformly worded in English, while continental laws, apart from the Scandinavian, are all in Latin. The English dialect in which the Anglo-Saxon laws have been handed down to us is in most cases a common speech derived from West Saxon—naturally enough as Wessex became the predominant English state, and the court of its kings the principal literary centre from which most of the compilers and scribes derived their dialect and spelling. Traces of Kentish speech may be detected, however, in the *Textus Roffensis*, the MS. of the Kentish laws, and Northumbrian dialectical peculiarities are also noticeable on some occasions,

while Danish words occur only as technical terms. At the conquest, Latin takes the place of English in the compilations made to meet the demand for Anglo-Saxon law texts as still applied in practice.

2. It is easy to group the Anglo-Saxon laws according to the manner of their publication. They would fall into three divisions: (1) laws and collections of laws promulgated by public authority; (2) statements of custom; (3) private compilations of legal rules and enactments. To the first division belong the laws of the Kentish kings, Æthelberht, Hlothhere and Eadric, Withraed; those of Ine of Wessex, of Alfred, Edward the Elder, Æthelstan,[1] Edmund, Edgar, Æthelred and Canute; the treaty between Alfred and Guthrum and the so-called treaty between Edward and Guthrum. The second division is formed by the convention between the English and the Welsh *Dunsaetas*, the law of the Northumbrian priests, the customs of the North people, the fragments of local custumals entered in Domesday Book. The third division would consist of the collections of the so-called *Pseudo-leges Canuti*, the laws of Edward the Confessor, of Henry I., and the great compilation of the *Quadripartitus*, then of a number of short notices and extracts like the fragments on the "wedding of a wife," on oaths, on ordeals, on the king's peace, on rural customs (*Rectitudines singularum personarum*), the treatises on the reeve (*gerefa*) and on the judge (*dema*), formulae of oaths, notions as to wergeld, &c. A fourth group might be made of the charters, as they are based on Old English private and public law and supply us with most important materials in regard to it. Looking somewhat deeper at the sources from which Old English law was derived, we shall have to modify our classification to some extent, as the external forms of publication, although important from the point of view of historical criticism, are not sufficient standards as to the juridical character of the various kinds of material. Direct statements of law would fall under the following heads, from the point of view of their legal origins: i. customary rules followed by divers communities capable of formulating law; ii. enactments of authorities, especially of kings; iii. private arrangements made under recognized legal rules. The first would comprise, besides most of the statements of custom included in the second division according to the first classification, a great many of the rules entered in collections promulgated by kings; most of the paragraphs of Æthelberht's, Hlothhere's, and Eadric's and Ine's laws, are popular legal customs that have received the stamp of royal authority by their insertion in official codes. On the other hand, from Withraed's and Alfred's laws downwards, the element of enactment by central authority becomes more and more prominent. The kings endeavour, with the help of secular and clerical witan, to introduce new rules and to break the power of long-standing customs (*e.g.* the precepts about the keeping of holidays, the enactments of Edmund restricting private vengeance, and the solidarity of kindreds as to feuds, and the like). There are, however, no outward signs enabling us to distinguish conclusively between both categories of laws in the codes, nor is it possible to draw a line between permanent laws and personal ordinances of single sovereigns, as has been attempted in the case of Frankish legislation.

3. Even in the course of a general survey of the legal lore at our disposal, one cannot help being struck by peculiarities in the distribution of legal subjects. Matters which seem to us of primary importance and occupy a wide place in our law-books are almost entirely absent in Anglo-Saxon laws or relegated to the background. While it is impossible to give here anything like a complete or exact survey of the field—a task rendered almost impossible by the arbitrary manner in which paragraphs are divided, by the difficulty of making Old English enactments fit into modern rubrics, and by the necessity of counting several times certain paragraphs bearing on different subjects—a brief statistical analysis of the contents of royal codes and laws may be found instructive.

We find roughly 419 paragraphs devoted to criminal law and procedure as against 91 concerned with questions of private law and civil procedure. Of the criminal law clauses, as many as 238 are taken up with tariffs of fines, while 80 treat of capital and corporal punishment, outlawry and confiscation, and 101 include rules of procedure. On the private law side 18 clauses apply to rights of property and possession, 13 to succession and family law, 37 to contracts, including marriage when treated as an act of sale; 18 touch on civil procedure. A subject which attracted special attention was the law of status, and no less than 107 paragraphs contain disposition dictated by the wish to discriminate between the classes of society. Questions of public law and administration are discussed in 217 clauses, while 197 concern the Church in one way or another, apart from purely ecclesiastical collections. In the public law division it is chiefly the power, interests and privileges of the king that are dealt with, in roughly 93 paragraphs, while local administration comes in for 39 and purely economic and fiscal matter for 13 clauses. Police regulations are very much to the fore and occupy no less than 72 clauses of the royal legislation. As to church matters, the most prolific group is formed by general precepts based on religious and moral considerations, roughly 115, while secular privileges conferred on the Church hold about 62, and questions of organization some 20 clauses.

The statistical contrasts are especially sharp and characteristic when we take into account the chronological sequence in the elaboration of laws. Practically the entire code of Æthelberht, for instance, is a tariff of fines for crimes, and the same subject continues to occupy a great place in the laws of Hlothhere and Eadric, Ine and Alfred, whereas it appears only occasionally in the treaties with the Danes, the laws of Withraed, Edward the Elder, Æthelstan, Edgar, Edmund and Æthelred. It reappears in some strength in the code of Canute, but the latter is chiefly a recapitulation of former enactments. The system of "compositions" or fines, paid in many cases with the help of kinsmen, finds its natural place in the ancient, tribal period of English history and loses its vitality later on in consequence of the growth of central power and of the scattering of maegths. Royalty and the Church, when they acquire the lead in social life, work out a new penal system based on outlawry, death penalties and corporal punishments, which make their first appearance in the legislation of Withraed and culminate in that of Æthelred and Canute.

As regards status, the most elaborate enactments fall into the period preceding the Danish settlements. After the treaties with the Danes, the tendency is to simplify distinctions on the lines of an opposition between twelvehynd-men and twyhynd-men, paving the way towards the feudal distinction between the free and the unfree. In the arrangements of the commonwealth the clauses treating of royal privileges are more or less evenly distributed over all reigns, but the systematic development of police functions, especially in regard to responsibility for crimes, the catching of thieves, the suppression of lawlessness, is mainly the object of 10th and 11th century legislation. The reign of Æthelred, which witnessed the greatest national humiliation and the greatest crime in English history, is also marked by the most lavish expressions of religious feeling and the most frequent appeals to morality. This sketch would, of course, have to be modified in many ways if we attempted to treat the unofficial fragments of customary law in the same way as the paragraphs of royal codes, and even more so if we were able to tabulate the indirect evidence as to legal rules. But, imperfect as such statistics may be, they give us at any rate some insight into the direction of governmental legislation.

4. The next question to be approached concerns the pedigree of Anglo-Saxon law and the latter's natural affinities. What is its position in the legal history of Germanic nations? How far has it been influenced by non-Germanic elements, especially by Roman and Canon law? The oldest Anglo-Saxon codes, especially the Kentish and the West Saxon ones, disclose a close relationship to the barbaric laws of Lower Germany—those of Saxons, Frisians, Thuringians. We find a division of social ranks which reminds us of the threefold gradation of Lower Germany

[1] The *Judicia civitatis Lundoniae* are a gild statute confirmed by King Æthelstan.

(edelings, frilings, lazzen—eorls, ceorls, laets), and not of the twofold Frankish one (*ingenui Franci*, *Romani*), nor of the minute differentiation of the Upper Germans and Lombards. In subsequent history there is a good deal of resemblance between the capitularies' legislation of Charlemagne and his successors on one hand, the acts of Alfred, Edward the Elder, Æthelstan and Edgar on the other, a resemblance called forth less by direct borrowing of Frankish institutions than by the similarity of political problems and condition. Frankish law becomes a powerful modifying element in English legal history after the Conquest, when it was introduced wholesale in royal and in feudal courts. The Scandinavian invasions brought in many northern legal customs, especially in the districts thickly populated with Danes. The Domesday survey of Lincolnshire, Nottinghamshire, Yorkshire, Norfolk, &c., shows remarkable deviations in local organization and justice (lagmen, sokes), and great peculiarities as to status (socmen, freemen), while from laws and a few charters we can perceive some influence on criminal law (*nidingsvaerk*), special usages as to fines (*lahslit*), the keeping of peace, attestation and sureties of acts (*faestermen*), &c. But, on the whole, the introduction of Danish and Norse elements, apart from local cases, was more important owing to the conflicts and compromises it called forth and its social results, than on account of any distinct trail of Scandinavian views in English law. The Scandinavian newcomers coalesced easily and quickly with the native population.

The direct influence of Roman law was not great during the Saxon period: we notice neither the transmission of important legal doctrines, chiefly through the medium of Visigothic codes, nor the continuous stream of Roman tradition in local usage. But indirectly Roman law did exert a by no means insignificant influence through the medium of the Church, which, for all its insular character, was still permeated with Roman ideas and forms of culture. The Old English "books" are derived in a roundabout way from Roman models, and the tribal law of real property was deeply modified by the introduction of individualistic notions as to ownership, donations, wills, rights of women, &c. Yet in this respect also the Norman Conquest increased the store of Roman conceptions by breaking the national isolation of the English Church and opening the way for closer intercourse with France and Italy.

5. It would be useless to attempt to trace in a brief sketch the history of the legal principles embodied in the documents of Anglo-Saxon law. But it may be of some value to give an outline of a few particularly characteristic subjects.

(*a*) The Anglo-Saxon legal system cannot be understood unless one realizes the fundamental opposition between folk-right and privilege. Folk-right is the aggregate of rules, formulated or latent but susceptible of formulation, which can be appealed to as the expression of the juridical consciousness of the people at large or of the communities of which it is composed. It is tribal in its origin, and differentiated, not according to boundaries between states, but on national and provincial lines. There may be the folk-right of West and East Saxons, of East Angles, of Kentish men, Mercians, Northumbrians, Danes, Welshmen, and these main folk-right divisions remain even when tribal kingdoms disappear and the people is concentrated in one or two realms. The chief centres for the formulation and application of folk-right were in the 10th and 11th centuries the shire-moots, while the witan of the realm generally placed themselves on the higher ground of State expediency, although occasionally using folk-right ideas. The older law of real property, of succession, of contracts, the customary tariffs of fines, were mainly regulated by folk-right; the reeves employed by the king and great men were supposed to take care of local and rural affairs according to folk-right. The law had to be declared and applied by the people itself in its communities, while the spokesmen of the people were neither democratic majorities nor individual experts, but a few leading men—the twelve eldest thanes or some similar quorum. Folk-right could, however, be broken or modified by special law or special grant, and the fountain of such privileges was the royal power. Alterations and exceptions were, as a matter of fact, suggested by the interested parties themselves, and chiefly by the Church. Thus a privileged land-tenure was created—bookland; the rules as to the succession of kinsmen were set at nought by concession of testamentary power and confirmations of grants and wills; special exemptions from the jurisdiction of the hundreds and special privileges as to levying fines were conferred. In process of time the rights originating in royal grants of privilege overbalanced, as it were, folk-right in many respects, and became themselves the starting-point of a new legal system—the feudal one.

(*b*) Another feature of vital importance in the history of Anglo-Saxon law is its tendency towards the preservation of peace. Society is constantly struggling to ensure the main condition of its existence—peace. Already in Æthelberht's legislation we find characteristic fines inflicted for breach of the peace of householders of different ranks—the ceorl, the eorl, and the king himself appearing as the most exalted among them. Peace is considered not so much a state of equilibrium and friendly relations between parties, but rather as the rule of a third within a certain region—a house, an estate, a kingdom. This leads on one side to the recognition of private authorities—the father's in his family, the master's as to servants, the lord's as to his personal or territorial dependents. On the other hand, the tendency to maintain peace naturally takes its course towards the strongest ruler, the king, and we witness in Anglo-Saxon law the gradual evolution of more and more stringent and complete rules in respect of the king's peace and its infringements.

(*c*) The more ancient documents of Anglo-Saxon law show us the individual not merely as the subject and citizen of a certain commonwealth, but also as a member of some group, all the fellows of which are closely allied in claims and responsibilities. The most elementary of these groups is the *maegth*, the association of agnatic and cognatic relations. Personal protection and revenge, oaths, marriage, wardship, succession, supervision over settlement, and good behaviour, are regulated by the law of kinship. A man's actions are considered not as exertions of his individual will, but as acts of the kindred, and all the fellows of the maegth are held responsible for them. What began as a natural alliance was used later as a means of enforcing responsibility and keeping lawless individuals in order. When the association of kinsmen failed, the voluntary associations—gilds—appeared as substitutes. The gild brothers associated in mutual defence and support, and they had to share in the payment of fines. The township and the hundred came also in for certain forms of collective responsibility, because they presented groups of people associated in their economic and legal interests.

(*d*) In course of time the natural associations get loosened and intermixed, and this calls forth the elaborate police legislation of the later Anglo-Saxon kings. Regulations are issued about the sale of cattle in the presence of witnesses. Enactments about the pursuit of thieves, and the calling in of warrantors to justify sales of chattels, are other expressions of the difficulties attending peaceful intercourse. Personal surety appears as a complement of and substitute for collective responsibility. The *hlaford* and his *hiredmen* are an institution not only of private patronage, but also of police supervision for the sake of laying hands on malefactors and suspected persons. The *landrica* assumes the same part in a territorial district. Ultimately the laws of the 10th and 11th centuries show the beginnings of the frankpledge associations, which came to act so important a part in the local police and administration of the feudal age.

The points mentioned are not many, but, apart from their intrinsic importance in any system of law, they are, as it were, made prominent by the documents themselves, as they are constantly referred to in the latter.

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ANGLO-SAXONS. The term "Anglo-Saxon" is commonly applied to that period of English history, language and literature which preceded the Norman Conquest. It goes back to the time of King Alfred, who seems to have frequently used the title *rex Anglorum Saxonum* or *rex Angul-Saxonum*. The origin of this title is not quite clear. It is generally believed to have arisen from the final union of the various kingdoms under Alfred in 886. Bede (*Hist. Eccl.* i. 15) states that the people of the more northern kingdoms (East Anglia, Mercia, Northumbria, &c.) belonged to the Angli, while those of Essex, Sussex and Wessex were sprung from the Saxons (*q.v.*), and those of Kent and southern Hampshire from the Jutes (*q.v.*). Other early writers, however, do not observe these distinctions, and neither in language nor in custom do we find evidence of any appreciable differences between the two former groups, though in custom Kent presents most remarkable contrasts with the other kingdoms. Still more curious is the fact that West Saxon writers regularly speak of their own nation as a part of the *Angelcyn* and of their language as *Englisc*, while the West Saxon royal family claimed to be of the same stock as that of Bernicia. On the other hand, it is by no means impossible that the distinction drawn by Bede was based solely on the names Essex (East Seaxan), East Anglia, &c. We need not doubt that the Angli and the Saxons were different nations originally; but from the evidence at our disposal it seems likely that they had practically coalesced in very early times, perhaps even before the invasion. At all events the term *Angli Saxones* seems to have first come into use on the continent, where we find it, nearly a century before Alfred's time, in the writings of Paulus Diaconus (Paul the Deacon). There can be little doubt, however, that there it was used to distinguish the Teutonic inhabitants of Britain from the Old Saxons of the continent.

See W. H. Stevenson, *Asser's Life of King Alfred* (Oxford, 1904, pp. 148 ff.); H. Munro Chadwick, *The Origin of the English Nation* (Cambridge, 1907); also BRITAIN, *Anglo-Saxon*. (H. M. C.)

ANGOLA, the general name of the Portuguese possessions on the west coast of Africa south of the equator. With the exception of the enclave of Kabinda (*q.v.*) the province lies wholly south of the river Congo. Bounded on the W. by the Atlantic Ocean, it extends along the coast from the southern bank of the Congo (6° S., 12° E.) to the mouth of the Kunene river (17° 18′ S., 11° 50′ E.). The coast-line is some 900 m. long. On the north the Congo forms for 80 m. the boundary separating Angola from the Congo Free State. The frontier thence (in 5° 52′ S.) goes due east to the Kwango river. The eastern boundary—dividing the Portuguese possessions from the Congo State and Barotseland (N.W. Rhodesia)—is a highly irregular line. On the south Angola borders German South-West Africa, the frontier being drawn somewhat S. of the 17th degree of S. latitude. The area of the province is about 480,000 sq. m. The population is estimated (1906) at 4,119,000.

The name Angola (a Portuguese corruption of the Bantu word *Ngola*) is sometimes confined to the 105 m. of coast, with its hinterland, between the mouths of the rivers Dande and Kwanza, forming the central portion of the Portuguese dominions in West Africa; in a looser manner Angola is used to designate all the western coast of Africa south of the Congo in the possession of Portugal; but the name is now officially applied to the whole of the province. Angola is divided into five districts: four on the coast, the fifth, Lunda, wholly inland, being the N.E. part of the province. Lunda is part of the old Bantu kingdom of Muata Yanvo, divided by international agreement between Portugal and the Congo Free State.

The coast divisions of Angola are Congo on the N. (from the river Congo to the river Loje), corresponding roughly with the limits of the "kingdom of Congo" (see *History* below); Loanda, which includes Angola in the most restricted sense mentioned above; Benguella and Mossamedes to the south. Mossamedes is again divided into two portions—the coast region and the hinterland, known as Huilla.

Physical Features.—The coast is for the most part flat, with occasional low cliffs and bluffs of red sandstone. There is but one deep inlet of the sea—Great Fish Bay (or Bahia dos Tigres), a little north of the Portuguese-German frontier. Farther north are Port Alexander, Little Fish Bay and Lobito Bay, while shallower bays are numerous. Lobito Bay has water sufficient to allow large ships to unload close inshore. The coast plain extends inland for a distance varying from 30 to 100 m. This region is in general sparsely watered and somewhat sterile. The approach to the great central plateau of Africa is marked by a series of irregular terraces. This intermediate mountain belt is covered with luxuriant vegetation. Water is fairly abundant, though in the dry season obtainable only by digging in the sandy beds of the rivers. The plateau has an altitude ranging from 4000 to 6000 ft. It consists of well-watered, wide, rolling plains, and low hills with scanty vegetation. In the east the tableland falls away to the basins of the Congo and Zambezi, to the south it merges into a barren sandy desert. A large number of rivers make their way westward to the sea; they rise, mostly, in the mountain belt, and are unimportant, the only two of any size being the Kwanza and the Kunene, separately noticed. The mountain chains which form the edge of the plateau, or diversify its surface, run generally parallel to the coast, as Tala Mugongo (4400 ft.), Chella and Vissecua (5250 ft. to 6500 ft.). In the district of Benguella are the highest points of the province, viz. Loviti (7780 ft.), in 12° 5′ S., and Mt. Elonga (7550 ft.). South of the Kwanza is the volcanic mountain Caculo-Cabaza (3300 ft.). From the tableland the Kwango and many other streams flow north to join the Kasai (one of the largest affluents of the Congo), which in its upper course forms for fully 300 m. the boundary between Angola and the Congo State. In the south-east part of the province the rivers belong either to the Zambezi system, or, like the Okavango, drain to Lake Ngami.

Geology.—The rock formations of Angola are met with in three distinct regions: (1) the littoral zone, (2) the median zone formed by a series of hills more or less parallel with the coast, (3) the central plateau. The central plateau consists of ancient crystalline rocks with granites overlain by unfossiliferous sandstones and conglomerates considered to be of Palaeozoic age. The outcrops are largely hidden under laterite. The median zone is composed largely of crystalline rocks with granites and some Palaeozoic unfossiliferous rocks. The littoral zone contains the only fossiliferous strata. These are of Tertiary and Cretaceous ages, the latter rocks resting on a reddish sandstone of older date. The Cretaceous rocks of the Dombe Grande region (near Benguella) are of Albian age and belong to the *Acanthoceras mamillari* zone. The beds containing *Schloenbachia inflata* are referable to the Gault. Rocks of Tertiary age are met with at Dombe Grande, Mossamedes and near Loanda. The sandstones with gypsum, copper and sulphur of Dombe are doubtfully considered to be of Triassic age. Recent eruptive rocks, mainly basalts, form a line

of hills almost bare of vegetation between Benguella and Mossamedes. Nepheline basalts and liparites occur at Dombe Grande. The presence of gum copal in considerable quantities in the superficial rocks is characteristic of certain regions.

Climate.—With the exception of the district of Mossamedes, the coast plains are unsuited to Europeans. In the interior, above 3300 ft., the temperature and rainfall, together with malaria, decrease. The plateau climate is healthy and invigorating. The mean annual temperature at São Salvador do Congo is 72·5° F.; at Loanda, 74·3°; and at Caconda, 67·2°. The climate is greatly influenced by the prevailing winds, which are W., S.W. and S.S.W. Two seasons are distinguished—the cool, from June to September; and the rainy, from October to May. The heaviest rainfall occurs in April, and is accompanied by violent storms.

Flora and Fauna.—Both flora and fauna are those characteristic of the greater part of tropical Africa. As far south as Benguella the coast region is rich in oil-palms and mangroves. In the northern part of the province are dense forests. In the south towards the Kunene are regions of dense thorn scrub. Rubber vines and trees are abundant, but in some districts their number has been considerably reduced by the ruthless methods adopted by native collectors of rubber. The species most common are various root rubbers, notably the *Carpodinus chylorrhiza*. This species and other varieties of carpodinus are very widely distributed. Landolphias are also found. The coffee, cotton and Guinea pepper plants are indigenous, and the tobacco plant flourishes in several districts. Among the trees are several which yield excellent timber, such as the tacula (*Pterocarpus tinctorius*), which grows to an immense size, its wood being blood-red in colour, and the Angola mahogany. The bark of the musuemba (*Albizzia coriaria*) is largely used in the tanning of leather. The mulundo bears a fruit about the size of a cricket ball covered with a hard green shell and containing scarlet pips like a pomegranate. The fauna includes the lion, leopard, cheetah, elephant, giraffe, rhinoceros, hippopotamus, buffalo, zebra, kudu and many other kinds of antelope, wild pig, ostrich and crocodile. Among fish are the barbel, bream and African yellow fish.

Inhabitants.—The great majority of the inhabitants are of Bantu-Negro stock with some admixture in the Congo district with the pure-negro type. In the south-east are various tribes of Bushmen. The best-known of the Bantu-Negro tribes are the Ba-Kongo (Ba-Fiot), who dwell chiefly in the north, and the Abunda (Mbunda, Ba-Bundo), who occupy the central part of the province, which takes its name from the Ngola tribe of Abunda. Another of these tribes, the Bangala, living on the west bank of the upper Kwango, must not be confounded with the Bangala of the middle Congo. In the Abunda is a considerable strain of Portuguese blood. The Ba-Lunda inhabit the Lunda district. Along the upper Kunene and in other districts of the plateau are settlements of Boers, the Boer population being about 2000. In the coast-towns the majority of the white inhabitants are Portuguese. The Mushi-Kongo and other divisions of the Ba-Kongo retain curious traces of the Christianity professed by them in the 16th and 17th centuries and possibly later. Crucifixes are used as potent fetish charms or as symbols of power passing down from chief to chief; whilst every native has a "Santu" or Christian name and is dubbed dom or dona. Fetishism is the prevailing religion throughout the province. The dwelling-places of the natives are usually small huts of the simplest constuction, used chiefly as sleeping apartments; the day is spent in an open space in front of the hut protected from the sun by a roof of palm or other leaves.

Chief Towns.—The chief towns are São Paulo de Loanda, the capital, Kabinda, Benguella and Mossamedes (*q.v.*). Lobito, a little north of Benguella, is a town which dates from 1905 and owes its existence to the bay of the same name having been chosen as the sea terminus of a railway to the far interior. Noki is on the southern bank of the Congo at the head of navigation from the sea, and close to the Congo Free State frontier. It is available for ships of large tonnage, and through it passes the Portuguese portion of the trade of the lower Congo. Ambriz—the only seaport of consequence in the Congo district of the province—is at the mouth of the Loje river, about 70 m. N. of Loanda. Novo Redondo and Egito are small ports between Loanda and Benguella. Port Alexander is in the district of Mossamedes and S. of the town of that name.

In the interior Humpata, about 95 m. from Mossamedes, is the chief centre of the Boer settlers; otherwise there are none but native towns containing from 1000 to 3000 inhabitants and often enclosed by a ring of sycamore trees. Ambaca and Malanje are the chief places in the fertile agricultural district of the middle Kwanza, S.E. of Loanda, with which they are in railway communication. São Salvador (pop. 1500) is the name given by the Portuguese to Bonza Congo, the chief town of the "kingdom of Congo." It stands 1840 ft. above sea-level and is about 160 m. inland and 100 S.E. of the river port of Noki, in 6° 15′ S. Of the cathedral and other stone buildings erected in the 16th century, there exist but scanty ruins. The city walls were destroyed in the closing years of the 19th century and the stone used to build government offices. There is a fort, built about 1850, and a small military force is at the disposal of the Portuguese resident. Bembe and Encoje are smaller towns in the Congo district south of São Salvador. Bihe, the capital of the plateau district of the same name forming the hinterland of Benguella, is a large caravan centre. Kangomba, the residence of the king of Bihe, is a large town. Caconda is in the hill country S.E. of Benguella.

Agriculture and Trade.—Angola is rich in both agricultural and mineral resources. Amongst the cultivated products are mealies and manioc, the sugar-cane and cotton, coffee and tobacco plants. The chief exports are coffee, rubber, wax, palm kernels and palm-oil, cattle and hides and dried or salt fish. Gold dust, cotton, ivory and gum are also exported. The chief imports are food-stuffs, cotton and woollen goods and hardware. Considerable quantities of coal come from South Wales. Oxen, introduced from Europe and from South Africa, flourish. There are sugar factories, where rum is also distilled and a few other manufactures, but the prosperity of the province depends on the "jungle" products obtained through the natives and from the plantations owned by Portuguese and worked by indentured labour, the labourers being generally "recruited" from the far interior. The trade of the province, which had grown from about £800,000 in 1870 to about £3,000,000 in 1905, is largely with Portugal and in Portuguese bottoms. Between 1893 and 1904 the percentage of Portuguese as compared with foreign goods entering the province increased from 43 to 201 %, a result due to the preferential duties in force.

The minerals found include thick beds of copper at Bembe, and deposits on the M'Brije and the Cuvo and in various places in the southern part of the province; iron at Ociras (on the Lucalla affluent of the Kwanza) and in Bailundo; petroleum and asphalt in Dande and Quinzao; gold in Lombije and Cassinga; and mineral salt in Quissama. The native blacksmiths are held in great repute.

Communications.—There is a regular steamship communication between Portugal, England and Germany, and Loanda, which port is within sixteen days' steam of Lisbon. There is also a regular service between Cape Town, Lobito and Lisbon and Southampton. The Portuguese line is subsidized by the government. The railway from Loanda to Ambaca and Malanje is known as the Royal Trans-African railway. It is of metre gauge, was begun in 1887 and is some 300 m. long. It was intended to carry the line across the continent to Mozambique, but when the line reached Ambaca (225 m.) in 1894 that scheme was abandoned. The railway had created a record in being the most expensive built in tropical Africa—£8942 per mile. A railway from Lobito Bay, 25 m. N. of Benguella, begun in 1904, runs towards the Congo-Rhodesia frontier. It is of standard African gauge (3 ft. 6 in.) and is worked by an English company. It is intended to serve the Katanga copper mines. Besides these two main railways, there are other short lines linking the seaports to their hinterland. Apart from the railways,

communication is by ancient caravan routes and by ox-wagon tracks in the southern district. Riding-oxen are also used. The province is well supplied with telegraphic communication and is connected with Europe by submarine cables.

Government and Revenue.—The administration of the province is carried on under a governor-general, resident at Loanda, who acts under the direction of the ministry of the colonies at Lisbon. At the head of each district is a local governor. Legislative powers, save those delegated to the governor-general, are exercised by the home government. Revenue is raised chiefly from customs, excise duties and direct taxation. The revenue (in 1904–1905 about £350,000) is generally insufficient to meet expenditure (in 1904–1905 over £490,000)—the balance being met by a grant from the mother country. Part of the extra expenditure is, however, on railways and other reproductive works.

History.—The Portuguese established themselves on the west coast of Africa towards the close of the 15th century. The river Congo was discovered by Diogo Cam or Cão in 1482. He erected a stone pillar at the mouth of the river, which accordingly took the title of Rio de Padrão, and established friendly relations with the natives, who reported that the country was subject to a great monarch, Mwani Congo or lord of Congo, resident at Bonza Congo. The Portuguese were not long in making themselves influential in the country. Gonçalo de Sousa was despatched on a formal embassy in 1490; and the first missionaries entered the country in his train. The king was soon afterwards baptized and Christianity was nominally established as the national religion. In 1534 a cathedral was founded at Bonza Congo (renamed São Salvador), and in 1560 the Jesuits arrived with Paulo Diaz de Novaes. Of the prosperity of the country the Portuguese have left the most glowing and indeed incredible accounts. It was, however, about this time ravaged by cannibal invaders (Bangala) from the interior, and Portuguese influence gradually declined. The attention of the Portuguese was, moreover, now turned more particularly to the southern districts of Angola. In 1627 the bishop's seat was removed to São Paulo de Loanda and São Salvador declined in importance. In the 18th century, in spite of hindrances from Holland and France, steps were taken towards re-establishing Portuguese authority in the northern regions; in 1758 a settlement was formed at Encoje; from 1784 to 1789 the Portuguese carried on a war against the natives of Mussolo (the district immediately south of Ambriz); in 1791 they built a fort at Quincollo on the Loje, and for a time they worked the mines of Bembe. Until, however, the "scramble for Africa" began in 1884, they possessed no fort or settlement on the coast to the north of Ambriz, which was first occupied in 1855. At São Salvador, however, the Portuguese continued to exercise influence. The last of the native princes who had real authority was a potentate known as Dom Pedro V. He was placed on the throne in 1855 with the help of a Portuguese force, and reigned over thirty years. In 1888 a Portuguese resident was stationed at Salvador, and the kings of Congo became pensioners of the government.

Angola proper, and the whole coast-line of what now constitutes the province of that name, was discovered by Diogo Cam during 1482 and the three following years. The first governor sent to Angola was Paulo Diaz, a grandson of Bartholomew Diaz, who reduced to submission the region south of the Kwanza nearly as far as Benguella. The city of Loanda was founded in 1576, Benguella in 1617. From that date the sovereignty of Portugal over the coast-line, from its present southern limit as far north as Ambriz (7° 50′ S.) has been undisputed save between 1640 and 1648, during which time the Dutch attempted to expel the Portuguese and held possession of the ports. Whilst the economic development of the country was not entirely neglected and many useful food products were introduced, the prosperity of the province was very largely dependent on the slave trade with Brazil, which was not legally abolished until 1830 and in fact continued for many years subsequently.

In 1884 Great Britain, which up to that time had steadily refused to acknowledge that Portugal possessed territorial rights north of Ambriz, concluded a treaty recognizing Portuguese sovereignty over both banks of the lower Congo; but the treaty, meeting with opposition in England and Germany, was not ratified. Agreements concluded with the Congo Free State, Germany and France in 1885–1886 (modified in details by subsequent arrangements) fixed the limits of the province, except in the S.E., where the frontier between Barotseland (N.W. Rhodesia) and Angola was determined by an Anglo-Portuguese agreement of 1891 and the arbitration award of the king of Italy in 1905 (see AFRICA: *History*). Up to the end of the 19th century the hold of Portugal over the interior of the province was slight, though its influence extended to the Congo and Zambezi basins. The abolition of the external slave trade proved very injurious to the trade of the seaports, but from 1860 onward the agricultural resources of the country were developed with increasing energy, a work in which Brazilian merchants took the lead. After the definite partition of Africa among the European powers, Portugal applied herself with some seriousness to exploit Angola and her other African possessions. Nevertheless, in comparison with its natural wealth the development of the country has been slow. Slavery and the slave trade continued to flourish in the interior in the early years of the 20th century, despite the prohibitions of the Portuguese government. The extension of authority over the inland tribes proceeded very slowly and was not accomplished without occasional reverses. Thus in September 1904 a Portuguese column lost over 300 men killed, including 114 Europeans, in an encounter with the Kunahamas on the Kunene, not far from the German frontier. The Kunahamas are a wild, raiding tribe and were probably largely influenced by the revolt of their southern neighbours, the Hereros, against the Germans. In 1905 and again in 1907 there was renewed fighting in the same region.

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ANGORA, or ENGURI. (1) A city of Turkey (anc. *Ancyra*) in Asia, capital of the vilayet of the same name, situated upon a steep, rocky hill, which rises 500 ft. above the plain, on the left bank of the Enguri Su, a tributary of the Sakaria (Sangarius), about 220 m. E.S.E. of Constantinople. The hill is crowned by the ruins of the old citadel, which add to the picturesqueness of the view; but the town is not well built, its streets being narrow and many of its houses constructed of sun-dried mud bricks; there are, however, many fine remains of Graeco-Roman and Byzantine architecture, the most remarkable being the temple of Rome and Augustus, on the walls of which is the famous *Monumentum Ancyranum* (see ANCYRA). Ancyra was the centre of the Tectosages, one of the three Gaulish tribes which settled in Galatia in the 3rd century B.C., and became the capital of the Roman province of Galatia when it was formally constituted in 25 B.C. During the Byzantine period, throughout which it occupied a position of great importance, it was captured by Persians and Arabs; then it fell into the hands of the Seljuk Turks, was held for eighteen years by the Latin Crusaders, and finally passed to the Ottoman Turks in 1360. In 1402 a great battle was fought in the vicinity of Angora, in which the Turkish sultan Bayezid was defeated and made prisoner by the Tatar conqueror Timur. In 1415 it was recovered by the Turks under Mahommed I., and since that period has

belonged to the Ottoman empire. In 1832 it was taken by the Egyptians under Ibrahim Pasha. Angora is connected with Constantinople by railway, and exports wool, mohair, grain and yellow berries. Mohair cloth is manufactured, and the town is noted for its honey and fruit. From 1639 to 1768 there was an agency of the Levant Company here; there is now a British consul. Pop. estimated at 28,000 (Moslems, 18,000; Christians, largely Roman Catholic Armenians, about 9400; Jews, 400).

(2) A Turkish vilayet in north-central Asia Minor, which includes most of the ancient Galatia. It is an agricultural country, depending for its prosperity on its grain, wool (average annual export, 4,400,000 lb), and the mohair obtained from the beautiful Angora goats (average annual clip, 3,300,000 lb). The fineness of the hair may perhaps be ascribed to some peculiarity in the atmosphere, for it is remarkable that the cats, dogs and other animals of the country are to a certain extent affected in the same way, and that they all lose much of their distinctive beauty when taken from their native districts. The only important industry is carpet-weaving at Kir-sheher and Kaisarieh. There are mines of silver, copper, lignite and salt, and many hot springs, including some of great repute medicinally. Average annual exports 1896–1898, £920,762; imports, £411,836. Pop. about 900,000 (Moslems, 765,000 to 800,000, the rest being Christians, with a few hundred Jews). (J. G. C. A.)

See C. Ritter, *Erdkunde von Asien* (vol. xviii., 1837–1839); V. Cuinet, *La Turquie d'Asie*, t. i. (1891); Murray's *Handbook to Asia Minor* (1895); and other works mentioned under ANCYRA.

ANGOULÊME, CHARLES DE VALOIS, DUKE OF (1573–1650), the natural son of Charles IX. of France and Marie Touchet, was born on the 28th of April 1573, at the castle of Fayet in Dauphiné. His father, dying in the following year, commended him to the care and favour of his brother and successor, Henry III., who faithfully fulfilled the charge. His mother married François de Balzac, marquis d'Entragues, and one of her daughters, Henriette, marchioness of Verneuil, afterwards became the mistress of Henry IV. Charles of Valois, was carefully educated, and was destined for the order of Malta. At the early age of sixteen he attained one of the highest dignities of the order, being made grand prior of France. Shortly after he came into possession of large estates left by Catherine de' Medici, from one of which he took his title of count of Auvergne. In 1591 he obtained a dispensation from the vows of the order of Malta, and married Charlotte, daughter of Henry, Marshal d'Amville, afterwards duke of Montmorency. In 1589 Henry III. was assassinated, but on his deathbed he commended Charles to the good-will of his successor Henry IV. By that monarch he was made colonel of horse, and in that capacity served in the campaigns during the early part of the reign. But the connexion between the king and the marchioness of Verneuil appears to have been very displeasing to Auvergne, and in 1601 he engaged in the conspiracy formed by the dukes of Savoy, Biron and Bouillon, one of the objects of which was to force Henry to repudiate his wife and marry the marchioness. The conspiracy was discovered; Biron and Auvergne were arrested and Biron was executed. Auvergne after a few months' imprisonment was released, chiefly through the influence of his half-sister, his aunt, the duchess of Angoulême and his father-in-law. He then entered into fresh intrigues with the court of Spain, acting in concert with the marchioness of Verneuil and her father d'Entragues. In 1604 d'Entragues and he were arrested and condemned to death; at the same time the marchioness was condemned to perpetual imprisonment in a convent. She easily obtained pardon, and the sentence of death against the other two was commuted into perpetual imprisonment. Auvergne remained in the Bastille for eleven years, from 1605 to 1616. A decree of the parlement (1606), obtained by Marguerite de Valois, deprived him of nearly all his possessions, including Auvergne, though he still retained the title. In 1616 he was released, was restored to his rank of colonel-general of horse, and despatched against one of the disaffected nobles, the duke of Longueville, who had taken Péronne. Next year he commanded the forces collected in the Île de France, and obtained some successes. In 1619 he received by bequest, ratified in 1620 by royal grant, the duchy of Angoulême. Soon after he was engaged on an important embassy to Germany, the result of which was the treaty of Ulm, signed July 1620. In 1627 he commanded the large forces assembled at the siege of La Rochelle; and some years after in 1635, during the Thirty Years' War, he was general of the French army in Lorraine. In 1636 he was made lieutenant-general of the army. He appears to have retired from public life shortly after the death of Richelieu in 1643. His first wife died in 1636, and in 1644 he married Françoise de Narbonne, daughter of Charles, baron of Mareuil. She had no children and survived her husband until 1713. Angoulême himself died on the 24th of September 1650. By his first wife he had three children: Henri, who became insane; Louis Emmanuel, who succeeded his father as duke of Angoulême and was colonel-general of light cavalry and governor of Provence; and François, who died in 1622.

The duke was the author of the following works:—(1) *Mémoires*, from the assassination of Henri III. to the battle of Arques (1589–1593), published at Paris by Boneau, and reprinted by Buchon in his *Choix de chroniques* (1836) and by Petitot in his *Mémoires* (1st series, vol. xliv.); (2) *Les Harangues, prononcés en assemblée de MM. les princes protestants d'Allemagne*, par Monseigneur le duc d' Angoulême (1620); (3) a translation of a Spanish work by Diego de Torres. To him has also been ascribed the work, *La générale et fidèle Rélation de tout ce qui s'est passé en l'isle de Ré, envoyée par le roi à la royne sa mère* (Paris, 1627).

ANGOULÊME, a city of south-western France, capital of the department of Charente, 83 m. N.N.E. of Bordeaux on the railway between Bordeaux and Poitiers. Pop. (1906) 30,040. The town proper occupies an elevated promontory, washed on the north by the Charente and on the south and west by the Anguienne, a small tributary of that river. The more important of the suburbs lie towards the east, where the promontory joins the main plateau, of which it forms the north-western extremity. The main line of the Orleans railway passes through a tunnel beneath the town. In place of its ancient fortifications Angoulême is encircled by boulevards known as the *Remparts*, from which fine views may be obtained in all directions. Within the town the streets are often dark and narrow, and, apart from the cathedral and the hôtel de ville, the architecture is of little interest. The cathedral of St Pierre (see CATHEDRAL), a church in the Byzantine-Romanesque style, dates from the 11th and 12th centuries, but has undergone frequent restoration, and was partly rebuilt in the latter half of the 19th century by the architect Paul Abadie. The façade, flanked by two towers with cupolas, is decorated with arcades filled in with statuary and sculpture, the whole representing the Last Judgment. The crossing is surmounted by a dome, and the extremity of the north transept by a fine square tower over 160 ft. high. The hôtel de ville, also by Abadie, is a handsome modern structure, but preserves two towers of the château of the counts of Angoulême, on the site of which it is built. It contains museums of paintings and archaeology. Angoulême is the seat of a bishop, a prefect, and a court of assizes. Its public institutions include tribunals of first instance and of commerce, a council of trade-arbitrators, a chamber of commerce and a branch of the Bank of France. It also has a lycée, training-colleges, a school of artillery, a library and several learned societies. It is a centre of the paper-making industry, with which the town has been connected since the 14th century. Most of the mills are situated on the banks of the watercourses in the neighbourhood of the town. The subsidiary industries, such as the manufacture of machinery and wire fabric, are of considerable importance. Iron and copper founding, brewing, tanning, and the manufacture of gunpowder, confectionery, heavy iron goods, gloves, boots and shoes and cotton goods are also carried on. Commerce is carried on in wine, brandy and building-stone.

Angoulême (*Iculisma*) was taken by Clovis from the Visigoths in 507, and plundered by the Normans in the 9th century. In 1360 it was surrendered by the peace of Bretigny to the English; they were, however, expelled in 1373 by the troops of Charles V., who granted the town numerous privileges. It suffered much during the Wars of Religion, especially in 1568 after its capture by the Protestants under Coligny.

The countship of Angoulême dated from the 9th century, the most important of the early counts being William Taillefer, whose descendants held the title till the end of the 12th century. Withdrawn from them on more than one occasion by Richard Coeur-de-Lion, it passed to King John of England on his marriage with Isabel, daughter of Count Adhémar, and by her subsequent marriage in 1220 to Hugh X. passed to the Lusignan family, counts of Marche. On the death of Hugh XIII. in 1302 without issue, his possessions passed to the crown. In 1394 the countship came to the house of Orleans, a member of which, Francis I., became king of France in 1515 and raised it to the rank of duchy in favour of his mother Louise of Savoy. The duchy afterwards changed hands several times, one of its holders being Charles of Valois, natural son of Charles IX. The last duke was Louis-Antoine, eldest son of Charles X., who died in 1844.

See A. F. Lièvre, *Angoulême: histoire, institutions et monuments* (Angoulême, 1885).

ANGOUMOIS, an old province of France, nearly corresponding to-day to the department of Charente. Its capital was Angoulême.

See *Essai d'une bibliothèque historique de l'Angoumois*, by E. Castaigne (1845).

ANGRA, or ANGRA DO HEROISMO ("Bay of Heroism," a name given it in 1829, to commemorate its successful defence against the Miguelist party), the former capital of the Portuguese archipelago of the Azores, and chief town of an administrative district, comprising the islands of Terceira, St George and Graciosa. Pop. (1900) 10,788. Angra is built on the south coast of Terceira in 38° 38′ N. and in 27° 13′ W. It is the headquarters of a military command, and the residence of a Roman Catholic bishop; its principal buildings are the cathedral, military college, arsenal and observatory. The harbour, now of little commercial or strategic importance, but formerly a celebrated naval station, is sheltered on the west and south-west by the promontory of Mt. Brazil; but it is inferior to the neighbouring ports of Ponta Delgada and Horta. The foreign trade is not large, and consists chiefly in the exportation of pineapples and other fruit. Angra served as a refuge for Queen Maria II. of Portugal from 1830 to 1833.

ANGRA PEQUENA, a bay in German South-West Africa, in 26° 38′ S., 15° E., discovered by Bartholomew Diaz in 1487. F. A. E. Lüderitz, of Bremen, established a trading station here in 1883, and his agent concluded treaties with the neighbouring chiefs, who ceded large tracts of country to the newcomers. On the 24th of April 1884 Lüderitz transferred his rights to the German imperial government, and on the following 7th of August a German protectorate over the district was proclaimed. (See AFRICA, § 5, and GERMAN SOUTH-WEST AFRICA.) Angra Pequena has been renamed by the Germans Lüderitz Bay, and the adjacent country is sometimes called Lüderitzland. The harbour is poor. At the head of the bay is a small town, whence a railway, begun in 1906, runs east in the direction of Bechuanaland. The surrounding country for many miles is absolute desert, except after rare but terrible thunderstorms, when the dry bed of the Little Fish river is suddenly filled with a turbulent stream, the water finding its way into the bay.

The islands off the coast of Angra Pequena, together with others north and south, were annexed to Great Britain in 1867 and added to Cape Colony in 1874. Seal Island and Penguin Island are in the bay; Ichaboe, Mercury, and Hollam's Bird islands are to the north; Halifax, Long, Possession, Albatross, Pomona, Plumpudding, and Roastbeef islands are to the south. On these islands are guano deposits; the most valuable is on Ichaboe Island.

ANGSTRÖM, ANDERS JONAS (1814–1874), Swedish physicist, was born on the 13th of August 1814 at Lögdö, Medelpad, Sweden. He was educated at Upsala University, where in 1839 he became *privat docent* in physics. In 1842 he went to Stockholm Observatory in order to gain experience in practical astronomical work, and in the following year he became observer at Upsala Observatory. Becoming interested in terrestrial magnetism he made many observations of magnetic intensity and declination in various parts of Sweden, and was charged by the Stockholm Academy of Sciences with the task, not completed till shortly before his death, of working out the magnetic data obtained by the Swedish frigate "Eugénie" on her voyage round the world in 1851–1853. In 1858 he succeeded Adolph Ferdinand Svanberg (1806–1857) in the chair of physics at Upsala, and there he died on the 21st of June 1874. His most important work was concerned with the conduction of heat and with spectroscopy. In his optical researches, *Optiska Undersökningar*, presented to the Stockholm Academy in 1853, he not only pointed out that the electric spark yields two superposed spectra, one from the metal of the electrode and the other from the gas in which it passes, but deduced from Euler's theory of resonance that an incandescent gas emits luminous rays of the same refrangibility as those which it can absorb. This statement, as Sir E. Sabine remarked when awarding him the Rumford medal of the Royal Society in 1872, contains a fundamental principle of spectrum analysis, and though for a number of years it was overlooked it entitles him to rank as one of the founders of spectroscopy. From 1861 onwards he paid special attention to the solar spectrum. He announced the existence of hydrogen, among other elements, in the sun's atmosphere in 1862, and in 1868 published his great map of the normal solar spectrum which long remained authoritative in questions of wave-length, although his measurements were inexact to the extent of one part in 7000 or 8000 owing to the metre which he used as his standard having been slightly too short. He was the first, in 1867, to examine the spectrum of the aurora borealis, and detected and measured the characteristic bright line in its yellow green region; but he was mistaken in supposing that this same line, which is often called by his name, is also to be seen in the zodiacal light.

His son, KNUT JOHAN ÅNGSTRÖM, was born at Upsala on the 12th of January 1857, and studied at the university of that town from 1877 to 1884. After spending a short time in Strassburg he was appointed lecturer in physics at Stockholm University in 1885, but in 1891 returned to Upsala, where in 1896 he became professor of physics. He especially devoted himself to investigations of the radiation of heat from the sun and its absorption by the earth's atmosphere, and to that end devised various delicate methods and instruments, including his electric compensation pyrheliometer, invented in 1893, and apparatus for obtaining a photographic representation of the infra-red spectrum (1895).

ANGUIER, FRANÇOIS (*c.* 1604–1669), and **MICHEL** (1612–1686), French sculptors, were two brothers, natives of Eu in Normandy. Their apprenticeship was served in the studio of Simon Guillain. The chief works of François are the monument to Cardinal de Bérulle, founder of the Carmelite order, in the chapel of the oratory at Paris, of which all but the bust has been destroyed, and the mausoleum of Henri II., last duc de Montmorency, at Moulins. To Michel are due the sculptures of the triumphal arch at the Porte St Denis, begun in 1674, to serve as a memorial for the conquests of Louis XIV. A marble group of the Nativity in the church of Val de Grâce was reckoned his masterpiece. From 1662 to 1667 he directed the progress of the sculpture and decoration in this church, and it was he who superintended the decoration of the apartments of Anne of Austria in the old Louvre. F. Fouquet also employed him for his château in Vaux.

See Henri Stein, *Les frères Anguier* (1889), with catalogue of works, and many references to original sources; Armand Sanson, *Deux sculpteurs Normands: les frères Anguier* (1889).

ANGUILLA, or SNAKE, a small island in the British Indies, part of the presidency of St Kitts-Nevis, in the colony of the Leeward Islands. Pop. (1901) 3890, mostly negroes. It is situated in 18° 12′ N. and 63° 5′ W., about 60 m. N.W. of St Kitts, is 16 m. long and has an area of 35 sq. m. The destruction of trees by charcoal-burners has resulted in the almost complete deforestation of the island. Nearly all the land is in the hands of peasant proprietors, who cultivate sweet potatoes, peas, beans, corn, &c., and rear sheep and goats. Cattle, phosphate of lime and salt, manufactured from a lake in the interior, are the principal

exports, the market for these being the neighbouring island of St Thomas.

ANGULATE (Lat. *angulus*, an angle), shaped with corners or angles; an adjective used in botany and zoology for the shape of stems, leaves and wings.

ANGUS, EARLS OF. Angus was one of the seven original earldoms of the Pictish kingdom of Scotland, said to have been occupied by seven brothers of whom Angus was the eldest. The Celtic line ended with Matilda (*fl.* 1240), countess of Angus in her own right, who married in 1243 Gilbert de Umfravill and founded the Norman line of three earls, which ended in 1381, the then holder of the title being summoned to the English parliament. Meanwhile John Stewart of Bonkyl, co. Berwick, had been created earl of Angus in a new line. This third creation ended with Margaret Stewart, countess of Angus in her own right, and widow of Thomas, 13th earl of Mar. By an irregular connexion with William, 1st earl of Douglas, who had married Mar's sister, she became the mother of George Douglas, 1st earl of Angus (*c.* 1380–1403), and secured a charter of her estates for her son, to whom in 1389 the title was granted by King Robert II. He was taken prisoner at Homildon Hill and died in England. The 5th earl was his great-grandson.

ARCHIBALD DOUGLAS, 5th earl of Angus (*c.* 1450–*c.* 1514), the famous "Bell the-Cat," was born about 1450 and succeeded his father, George the 4th earl, in 1462 or 1463. In 1481 he was made warden of the east marches, but the next year he joined the league against James III. and his favourite Robert Cochrane at Lauder, where he earned his nickname by offering to bell the cat, *i.e.* to deal with the latter, beginning the attack upon him by pulling his gold chain off his neck and causing him with others of the king's favourites to be hanged. Subsequently he joined Alexander Stewart, duke of Albany, in league with Edward IV. of England, on the 11th of February 1483, signing the convention at Westminster which acknowledged the overlordship of the English king. In March however they returned, outwardly at least, to their allegiance, and received pardons for their treason. Later Angus was one of the leaders in the rebellion against James in 1487 and 1488, which ended in the latter's death. He was made one of the guardians of the young king James IV. but soon lost influence, being superseded by the Homes and Hepburns, and the wardenship of the marches was given to Alexander Home. Though outwardly on good terms with James, he treacherously made a treaty with Henry VII. about 1489 or 1491, by which he undertook to govern his relations with James according to instructions from England, and to hand over Hermitage Castle, commanding the pass through Liddesdale into Scotland, on the condition of receiving English estates in compensation. In October 1491 he fortified his castle of Tantallon against James, but was obliged to submit and exchange his Liddesdale estate and Hermitage Castle for the lordship of Bothwell. In 1493 he was again in favour, received various grants of lands, and was made chancellor, which office he retained till 1498. In 1501 he was once more in disgrace and confined to Dumbarton Castle. After the disaster at Flodden in 1513, at which he was not present, but at which he lost his two eldest sons, Angus was appointed one of the counsellors of the queen regent. He died at the close of this year, or in 1514. He was married three times, and by his first wife had four sons and several daughters. His third son, Gavin Douglas, bishop of Dunkeld, is separately noticed.

ARCHIBALD DOUGLAS, the 6th earl (*c.* 1489–1557), son of George, master of Douglas, who was killed at Flodden, succeeded on his grandfather's death. In 1509 he had married Margaret (d. 1513), daughter of Patrick Hepburn, 1st earl of Bothwell; and in 1514 he married the queen dowager Margaret of Scotland, widow of James IV., and eldest sister of Henry VIII. By this latter act he stirred up the jealousy of the nobles and the opposition of the French party, and civil war broke out. He was superseded in the government on the arrival of John Stewart, duke of Albany, who was made regent. Angus withdrew to his estates in Forfarshire, while Albany besieged the queen at Stirling and got possession of the royal children; then he joined Margaret after her flight at Morpeth, and on her departure for London returned and made his peace with Albany in 1516. He met her once more at Berwick in June 1517, when Margaret returned to Scotland on Albany's departure in vain hopes of regaining the regency. Meanwhile, during Margaret's absence, Angus had formed a connexion with a daughter of the laird of Traquair. Margaret avenged his neglect of her by refusing to support his claims for power and by secretly trying through Albany to get a divorce. In Edinburgh Angus held his own against the attempts of James Hamilton, 1st earl of Arran, to dislodge him. But the return of Albany in 1521, with whom Margaret now sided against her husband, deprived him of power. The regent took the government into his own hands; Angus was charged with high treason in December, and in March 1522 was sent practically a prisoner to France, whence he succeeded in escaping to London in 1524. He returned to Scotland in November with promises of support from Henry VIII., with whom he made a close alliance. Margaret, however, refused to have anything to do with her husband. On the 23rd, therefore, Angus forced his way into Edinburgh, but was fired upon by Margaret and retreated to Tantallon. He now organized a large party of nobles against Margaret with the support of Henry VIII., and in February 1525 they entered Edinburgh and called a parliament. Angus was made a lord of the articles, was included in the council of regency, bore the king's crown on the opening of the session, and with Archbishop Beaton held the chief power. In March he was appointed lieutenant of the marches, and suppressed the disorder and anarchy on the border. In July the guardianship of the king was entrusted to him for a fixed period till the 1st of November, but he refused at its close to retire, and advancing to Linlithgow put to flight Margaret and his opponents. He now with his followers engrossed all the power, succeeded in gaining over some of his antagonists, including Arran and the Hamiltons, and filled the public offices with Douglases, he himself becoming chancellor. "None that time durst strive against a Douglas nor Douglas's man."[1] The young king James, now fourteen, was far from content under the tutelage of Angus, but he was closely guarded, and several attempts to effect his liberation were prevented, Angus completely defeating Lennox, who had advanced towards Edinburgh with 10,000 men in August, and subsequently taking Stirling. His successes were consummated by a pacification with Beaton, and in 1527 and 1528 he was busy in restoring order through the country. In the latter year, on the 11th of March, Margaret succeeded in obtaining her divorce from Angus, and about the end of the month she and her lover, Henry Stewart, were besieged at Stirling. A few weeks later, however, James succeeded in escaping from Angus's custody, took refuge with Margaret and Arran at Stirling, and immediately proscribed Angus and all the Douglases, forbidding them to come within seven miles of his person. Angus, having fortified himself in Tantallon, was attainted and his lands confiscated. Repeated attempts of James to subdue the fortress failed, and on one occasion Angus captured the royal artillery, but at length it was given up as a condition of the truce between England and Scotland, and in May 1529 Angus took refuge with Henry, obtained a pension and took an oath of allegiance, Henry engaging to make his restoration a condition of peace. Angus had been chiefly guided in his intrigues with England by his brother, Sir George Douglas of Pittendriech (*d.* 1552), master of Angus, a far cleverer diplomatist than himself. His life and lands were also declared forfeit, as were those of his uncle, Archibald Douglas of Kilspindie (*d.* 1535), who had been a friend of James and was known by the nickname of "Greysteel." These took refuge in exile. James avenged himself on such Douglases as lay within his power. Angus's third sister Janet, Lady Glamis, was summoned to answer the charge of communicating with her brothers, and on her failure to appear her estates were forfeited. In 1537 she was tried for conspiring against the king's life. She was found guilty and burnt on the Castle Hill, Edinburgh, on the 17th of July 1537. Her innocence

[1] Lindsay of Pitscottie (1814), ii. 314.

has been generally assumed, but Tytler (*Hist. of Scotland*, iv. pp. 433, 434) considered her guilty. Angus remained in England till 1542, joining in the attacks upon his countrymen on the border, while James refused all demands from Henry VIII. for his restoration, and kept firm to his policy of suppressing and extirpating the Douglas faction. On James V.'s death in 1542 Angus returned to Scotland, with instructions from Henry to accomplish the marriage between Mary and Edward. His forfeiture was rescinded, his estates restored, and he was made a privy councillor and lieutenant-general. In 1543 he negotiated the treaty of peace and marriage, and the same year he himself married Margaret, daughter of Robert, Lord Maxwell. Shortly afterwards strife between Angus and the regent Arran broke out, and in April 1544 Angus was taken prisoner. The same year Lord Hertford's marauding expedition, which did not spare the lands of Angus, made him join the anti-English party. He entered into a bond with Arran and others to maintain their allegiance to Mary, and gave his support to the mission sent to France to offer the latter's hand. In July 1544 he was appointed lieutenant of the south of Scotland, and distinguished himself on the 27th of February 1545 in the victory over the English at Ancrum Moor. He still corresponded with Henry VIII., but nevertheless signed in 1546 the act cancelling the marriage and peace treaty, and on the 10th of September commanded the van in the great defeat of Pinkie, when he again won fame. In 1548 the attempt by Lennox and Wharton to capture him and punish him for his duplicity failed, Angus escaping after his defeat to Edinburgh by sea, and Wharton being driven back to Carlisle. Under the regency of Mary of Lorraine his restless and ambitious character and the number of his retainers gave cause for frequent alarms to the government. On the 31st of August 1547 he resigned his earldom, obtaining a regrant *sibi et suis haeredibus masculis et suis assignatis quibuscumque*. His career was a long struggle for power and for the interests of his family, to which national considerations were completely subordinate. He died in January 1557. By Margaret Tudor he had Margaret, his only surviving legitimate child, who married Matthew, 4th earl of Lennox, and was mother of Lord Darnley. He was succeeded by his nephew David, son of Sir George Douglas of Pittendriech.

ARCHIBALD DOUGLAS, 8th earl, and earl of Morton (1555–1588), was the son of David, 7th earl. He succeeded to the title and estates in 1558, being brought up by his uncle, the 4th earl of Morton, a Presbyterian. In 1573 he was made a privy councillor and sheriff of Berwick, in 1574 lieutenant-general of Scotland, in 1577 warden of the west marches and steward of Fife, and in 1578 lieutenant-general of the realm. He gave a strong support to Morton during the attack upon the latter, made a vain attempt to rescue him, and was declared guilty of high treason on the 2nd of June 1581. He now entered into correspondence with the English government for an invasion of Scotland to rescue Morton, and on the latter's execution in June went to London, where he was welcomed by Elizabeth. After the raid of Ruthven in 1582 Angus returned to Scotland and was reconciled to James, but soon afterwards the king shook off the control of the earls of Mar and Gowrie, and Angus was again banished from the court. In 1584 he joined the rebellion of Mar and Glamis, but the movement failed, and the insurgents fled to Berwick. Later they took up their residence at Newcastle, which became a centre of Presbyterianism and of projects against the Scottish government, encouraged by Elizabeth, who regarded the banished lords as friends of the English and antagonists of the French interest. In February 1585 they came to London, and cleared themselves of the accusation of plotting against James's life; a plan was prepared for their restoration and for the overthrow of James Stewart, earl of Arran. In October they invaded Scotland and gained an easy victory over Arran, captured Stirling Castle with the king in November, and secured from James the restoration of their estates and the control of the government. In 1586 Angus was appointed warden of the marches and lieutenant-general on the border, and performed good services in restoring order; but he was unable to overcome the king's hostility to the establishment of Presbyterian government. In January 1586 he was granted the earldom of Morton with the lands entailed upon him by his uncle. He died on the 4th of August 1588. He was succeeded in the earldom by his cousin William, a descendant of the 5th earl. (For the Morton title, see MORTON, JAMES DOUGLAS, 4th EARL OF.)

WILLIAM DOUGLAS, 10th earl (*c.* 1554–1611), was the son of William, the 9th earl (1533–1591). He studied at St Andrews University and joined the household of the earl of Morton. Subsequently, while visiting the French court, he became a Roman Catholic, and was in consequence, on his return, disinherited and placed under restraint. Nevertheless he succeeded to his father's titles and estates in 1591, and though in 1592 he was disgraced for his complicity in Lord Bothwell's plot, he was soon liberated and performed useful services as the king's lieutenant in the north of Scotland. In July 1592, however, he was asking for help from Elizabeth in a plot with Erroll and other lords against Sir John Maitland, the chancellor, and protesting his absolute rejection of Spanish offers, while in October he signed the Spanish Blanks (see ERROLL, FRANCIS HAY, 9th EARL OF) and was imprisoned (on the discovery of the treason) in Edinburgh Castle on his return in January 1593. He succeeded on the 13th in escaping by the help of his countess, joining the earls of Huntly and Erroll in the north. They were offered an act of "oblivion" or "abolition" provided they renounced their religion or quitted Scotland. Declining these conditions they were declared traitors and "forfeited." They remained in rebellion, and in July 1594 an attack made by them on Aberdeen roused James's anger. Huntly and Erroll were subdued by James himself in the north, and Angus failed in an attempt upon Edinburgh in concert with the earl of Bothwell. Subsequently in 1597 they all renounced their religion, declared themselves Presbyterians, and were restored to their estates and honours. Angus was again included in the privy council, and in June 1598 was appointed the king's lieutenant in southern Scotland, in which capacity he showed great zeal and conducted the "Raid of Dumfries," as the campaign against the Johnstones was called. Not long afterwards, Angus, offended at the advancement of Huntly to a marquisate, recanted, resisted all the arguments of the ministers to bring him to a "better mind," and was again excommunicated in 1608. In 1609 he withdrew to France, and died in Paris on the 3rd of March 1611. He was succeeded by his son William, as 11th earl of Angus, afterwards 1st marquis of Douglas (1589–1660). The title is now held by the dukes of Hamilton.

AUTHORITIES.—*The Douglas Book*, by Sir W. Fraser (1885); *History of the House of Douglas and Angus*, by D. Hume of Godscroft (1748, legendary in some respects); *History of the House of Douglas*, by Sir H. Maxwell (1902).

ANGUSSOLA or ANGUSSCIOLA, **SOPHONISBA,** Italian portrait painter of the latter half of the 16th century, was born at Cremona about 1535, and died at Palermo in 1626. In 1560, at the invitation of Philip II., she visited the court of Madrid, where her portraits elicited great commendation. Vandyck is said to have declared that he had derived more knowledge of the true principles of his art from her conversation than from any other source. She painted several fine portraits of herself, one of which is at Althorp. A few specimens of her painting are to be seen at Florence and Madrid. She had three sisters, who were also celebrated artists.

ANHALT, a duchy of Germany, and a constituent state of the German empire, formed, in 1863, by the amalgamation of the two duchies Anhalt-Dessau-Cöthen and Anhalt-Bernburg, and comprising all the various Anhalt territories which were sundered apart in 1603. The country now known as Anhalt consists of two larger portions—Eastern and Western Anhalt, separated by the interposition of a part of Prussian Saxony—and of five enclaves surrounded by Prussian territory, viz. Alsleben, Mühlingen, Dornburg, Gödnitz and Tilkerode-Abberode. The eastern and larger portion of the duchy is enclosed by the Prussian government district of Potsdam (in the Prussian province of Brandenburg), and Magdeburg and Merseburg (belonging to the Prussian province of Saxony). The western

or smaller portion (the so-called Upper Duchy or Ballenstedt) is also enclosed by the two latter districts and, for a distance of 5 m. on the west, by the duchy of Brunswick. The western portion of the territory is undulating and in the extreme south-west, where it forms part of the Harz range, mountainous, the Ramberg peak attaining a height of 1900 ft. From the Harz the country gently shelves down to the Saale; and between this river and the Elbe there lies a fine tract of fertile country. The portion of the duchy lying east of the Elbe is mostly a flat sandy plain, with extensive pine forests, though interspersed, at intervals, by bog-land and rich pastures. The Elbe is the chief river, and intersecting the eastern portion of the duchy, from east to west, receives at Rosslau the waters of the Mulde. The navigable Saale takes a northerly direction through the western portion of the eastern part of the territory and receives, on the right, the Fuhne and, on the left, the Wipper and the Bode. The climate is on the whole mild, though somewhat inclement in the higher regions to the south-west. The area of the duchy is 906 sq. m., and the population in 1905 amounted to 328,007, a ratio of about 351 to the square mile. The country is divided into the districts of Dessau, Cöthen, Zerbst, Bernburg and Ballenstedt, of which that of Bernburg is the most, and that of Ballenstedt the least, populated. Of the towns, four, viz. Dessau, Bernburg, Cöthen and Zerbst, have populations exceeding 20,000. The inhabitants of the duchy, who mainly belong to the upper Saxon race, are, with the exception of about 12,000 Roman Catholics and 1700 Jews, members of the Evangelical (Union) Church. The supreme ecclesiastical authority is the consistory in Dessau; while a synod of 39 members, elected for six years, assembles at periods to deliberate on internal matters touching the organization of the church. The Roman Catholics are under the bishop of Paderborn. There are within the duchy four grammar schools (gymnasia), five semi-classical and modern schools, a teachers' seminary and four high-grade girls' schools. Of the whole surface, land under tillage amounts to about 60, meadowland to 7 and forest to 25%. The chief crops are corn (especially wheat), fruit, vegetables, potatoes, beet, tobacco, flax, linseed and hops. The land is well cultivated, and the husbandry on the royal domains and the large estates especially so. The pastures on the banks of the Elbe yield cattle of excellent quality. The forests are well stocked with game, such as deer and wild boar, and the open country is well supplied with partridges. The rivers yield abundant fish, salmon (in the Elbe), sturgeon and lampreys. The country is rich in lignite, and salt works are abundant. Of the manufactures of Anhalt, the chief are its sugar factories, distilleries, breweries and chemical works. Commerce is brisk, especially in raw products— corn, cattle, timber or wool. Coal (lignite), guano, oil and bricks are also articles of export. The trade of the country is furthered by its excellent roads, its navigable rivers and its railways (165 m.), which are worked in connexion with the Prussian system. There is a chamber of commerce in Dessau.

Constitution.—The duchy, by virtue of a fundamental law, proclaimed on the 17th of September 1859 and subsequently modified by various decrees, is a constitutional monarchy. The duke, who bears the title of "Highness," wields the executive power while sharing the legislation with the estates. The diet (*Landtag*) is composed of thirty-six members, of whom two are appointed by the duke, eight are representatives of landowners paying the highest taxes, two of the highest assessed members of the commercial and manufacturing classes, fourteen of the other electors of the towns and ten of the rural districts. The representatives are chosen for six years by indirect vote and must have completed their twenty-fifth year. The duke governs through a minister of state, who is the praeses of all the departments—finance, home affairs, education, public worship and statistics. The budget estimates for the financial year 1905–1906 placed the expenditure of the estate at £1,323,437. The public debt amounted on the 30th of June 1904 to £226,300. By convention with Prussia of 1867 the Anhalt troops form a contingent of the Prussian army. Appeal from the lower courts of the duchy lies to the appeal court at Naumburg in Prussian Saxony.

History.—During the 11th century the greater part of Anhalt was included in the duchy of Saxony, and in the 12th century it came under the rule of Albert the Bear, margrave of Brandenburg. Albert was descended from Albert, count of Ballenstedt, whose son Esico (d. 1059 or 1060) appears to have been the first to bear the title of count of Anhalt. Esico's grandson, Otto the Rich, count of Ballenstedt, was the father of Albert the Bear, by whom Anhalt was united with the mark of Brandenburg. When Albert died in 1170, his son Bernard, who received the title of duke of Saxony in 1180, became count of Anhalt. Bernard died in 1212, and Anhalt, separated from Saxony, passed to his son Henry, who in 1218 took the title of prince and was the real founder of the house of Anhalt. On Henry's death in 1252 his three sons partitioned the principality and founded respectively the lines of Aschersleben, Bernburg and Zerbst. The family ruling in Aschersleben became extinct in 1315, and this district was subsequently incorporated with the neighbouring bishopric of Halberstadt. The last prince of the line of Anhalt-Bernburg died in 1468 and his lands were inherited by the princes of the sole remaining line, that of Anhalt-Zerbst. The territory belonging to this branch of the family had been divided in 1396, and after the acquisition of Bernburg Prince George I. made a further partition of Zerbst. Early in the 16th century, however, owing to the death or abdication of several princes, the family had become narrowed down to the two branches of Anhalt-Cöthen and Anhalt-Dessau. Wolfgang, who became prince of Anhalt-Cöthen in 1508, was a stalwart adherent of the Reformation, and after the battle of Mühlberg in 1547 was placed under the ban and deprived of his lands by the emperor Charles V. After the peace of Passau in 1552 he bought back his principality, but as he was childless he surrendered it in 1562 to his kinsmen the princes of Anhalt-Dessau. Ernest I. of Anhalt-Dessau (d. 1516) left three sons, John II., George III., and Joachim, who ruled their lands together for many years, and who, like Prince Wolfgang, favoured the reformed doctrines, which thus became dominant in Anhalt. About 1546 the three brothers divided their principality and founded the lines of Zerbst, Plötzkau and Dessau. This division, however, was only temporary, as the acquisition of Cöthen, and a series of deaths among the ruling princes, enabled Joachim Ernest, a son of John II., to unite the whole of Anhalt under his rule in 1570.

Joachim Ernest died in 1586 and his five sons ruled the land in common until 1603, when Anhalt was again divided, and the lines of Dessau, Bernburg, Plötzkau, Zerbst and Cöthen were refounded. The principality was ravaged during the Thirty Years' War, and in the earlier part of this struggle Christian I. of Anhalt-Bernburg took an important part. In 1635 an arrangement was made by the various princes of Anhalt, which gave a certain authority to the eldest member of the family, who was thus able to represent the principality as a whole. This proceeding was probably due to the necessity of maintaining an appearance of unity in view of the disturbed state of European politics. In 1665 the branch of Anhalt-Cöthen became extinct, and according to a family compact this district was inherited by Lebrecht of Anhalt-Plötzkau, who surrendered Plötzkau to Bernburg, and took the title of prince of Anhalt-Cöthen. In the same year the princes of Anhalt decided that if any branch of the family became extinct its lands should be equally divided between the remaining branches. This arrangement was carried out after the death of Frederick Augustus of Anhalt-Zerbst in 1793, and Zerbst was divided between the three remaining princes. During these years the policy of the different princes was marked, perhaps intentionally, by considerable uniformity. Once or twice Calvinism was favoured by a prince, but in general the house was loyal to the doctrines of Luther. The growth of Prussia provided Anhalt with a formidable neighbour, and the establishment and practice of primogeniture by all branches of the family prevented further divisions of the principality. In 1806 Alexius of Anhalt-Bernburg was created a duke by the emperor Francis II., and after the dissolution of the Empire each of the three princes

took this title. Joining the Confederation of the Rhine in 1807, they supported Napoleon until 1813, when they transferred their allegiance to the allies; in 1815 they became members of the Germanic Confederation, and in 1828 joined, somewhat reluctantly, the Prussian *Zollverein*.

Anhalt-Cöthen was ruled without division by a succession of princes, prominent among whom was Louis (d. 1650), who was both a soldier and a scholar; and after the death of Prince Charles at the battle of Semlin in 1789 it passed to his son Augustus II. This prince sought to emulate the changes which had recently been made in France by dividing Cöthen into two departments and introducing the Code Napoléon. Owing to his extravagance he left a large amount of debt to his nephew and successor, Louis II., and on this account the control of the finances was transferred from the prince to the estates. Under Louis's successor Ferdinand, who was a Roman Catholic and brought the Jesuits into Anhalt, the state of the finances grew worse and led to the interference of the king of Prussia and to the appointment of a Prussian official. When the succeeding prince, Henry, died in 1847, this family became extinct, and according to an arrangement between the lines of Anhalt-Dessau and Anhalt-Bernburg, Cöthen was added to Dessau.

Anhalt-Bernburg had been weakened by partitions, but its princes had added several districts to their lands; and in 1812, on the extinction of a cadet branch, it was again united under a single ruler. The feeble rule of Alexander Charles, who became duke in 1834, and the disturbed state of Europe in the following decade, led to considerable unrest, and in 1849 Bernburg was occupied by Prussian troops. A number of abortive attempts were made to change the government, and as Alexander Charles was unlikely to leave any children, Leopold of Anhalt-Dessau took some part in the affairs of Bernburg. Eventually in 1859 a new constitution was established for Bernburg and Dessau jointly, and when Alexander Charles died in 1863 both were united under the rule of Leopold.

Anhalt-Dessau had been divided in 1632, but was quickly reunited; and in 1693 it came under the rule of Leopold I. (see ANHALT-DESSAU, LEOPOLD I., PRINCE OF), the famous soldier who was generally known as the "Old Dessauer." The sons of Leopold's eldest son were excluded from the succession on account of the marriage of their father being morganatic, and the principality passed in 1747 to his second son, Leopold II. The unrest of 1848 spread to Dessau, and led to the interference of the Prussians and to the establishment of the new constitution in 1859. Leopold IV., who reigned from 1817 to 1871, had the satisfaction in 1863 of reuniting the whole of Anhalt under his rule. He took the title of duke of Anhalt, summoned one *Landtag* for the whole of the duchy, and in 1866 fought for Prussia against Austria. Subsequently a quarrel over the possession of the ducal estates between the duke and the *Landtag* broke the peace of the duchy, but this was settled in 1872. In 1871 Anhalt became a state of the German Empire. Leopold IV. was followed by his son Frederick I., and on the death of this prince in 1904 his son Frederick II. became duke of Anhalt.

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ANHALT-DESSAU, LEOPOLD I., PRINCE OF (1676–1747), called the "Old Dessauer" (Alter Dessauer), general field marshal in the Prussian army, was the only surviving son of John George II., prince of Anhalt-Dessau, and was born on the 3rd of July 1676 at Dessau. From his earliest youth he was devoted to the profession of arms, for which he educated himself physically and mentally. He became colonel of a Prussian regiment in 1693, and in the same year his father's death placed him at the head of his own principality; thereafter, during the whole of his long life, he performed the duties of a sovereign prince and a Prussian officer. His first campaign was that of 1695 in the Netherlands, in which he was present at the siege of Namur. He remained in the field to the end of the war of 1697, the affairs of the principality being managed chiefly by his mother, Princess Henriette Catherine of Orange. In 1698 he married Anna Luise Föse, an apothecary's daughter of Dessau, in spite of his mother's long and earnest opposition, and subsequently he procured for her the rank of a princess from the emperor (1701). Their married life was long and happy, and the princess acquired an influence over the stern nature of her husband which she never ceased to exert on behalf of his subjects, and after the death of Leopold's mother she performed the duties of regent when he was absent on campaign. Often, too, she accompanied him into the field. Leopold's career as a soldier in important commands begins with the outbreak of the War of the Spanish Succession. He had made many improvements in the Prussian army, notably the introduction of the iron ramrod about 1700, and he now took the field at the head of a Prussian corps on the Rhine, serving at the sieges of Kaiserswerth and Venlo. In the following year (1703), having obtained the rank of lieutenant-general, Leopold took part in the siege of Bonn and distinguished himself very greatly in the battle of Höchstädt, in which the Austrians and their allies were defeated by the French under Marshal Villars (September 20, 1703). In the campaign of 1704 the Prussian contingent served under Prince Louis of Baden and subsequently under Eugene, and Leopold himself won great glory by his conduct at Blenheim. In 1705 he was sent with a Prussian corps to join Prince Eugene in Italy, and on the 16th of August he displayed his bravery at the hard-fought battle of Cassano. In the following year he added to his reputation in the battle of Turin, where he was the first to enter the hostile entrenchments (September 7, 1706). He served in one more campaign in Italy, and then went with Eugene to join Marlborough in the Netherlands, being present in 1709 at the siege of Tournay and the battle of Malplaquet. In 1710 he succeeded to the command of the whole Prussian contingent at the front, and in 1712, at the particular desire of the crown prince, Frederick William, who had served with him as a volunteer, he was made a general field marshal. Shortly before this he had executed a *coup de main* on the castle of Mörs, which was held by the Dutch in defiance of the claims of the king of Prussia to the possession. The operation was effected with absolute precision and the castle was seized without a shot being fired. In the earlier part of the reign of Frederick William I., the prince of Dessau was one of the most influential members of the Prussian governing circle. In the war with Sweden (1715) he accompanied the king to the front, commanded an army of 40,000 men, and met and defeated Charles XII. in a severe battle on the island of Rügen (November 16). His conduct of the siege of Stralsund which followed was equally skilful, and the great results of the war to Prussia were largely to be attributed to his leadership in the campaign. In the years of peace, and especially after a court quarrel (1725) and duel with General von Grumbkow, he devoted himself to the training of the Prussian army. The reputation it had gained in the wars of 1675 to 1715, though good, gave no hint of its coming glory, and it was even in 1740 accounted one of the minor armies of Europe. That it proved, when put to the test, to be by far the best military force existing, may be taken as the summary result of Leopold's work. The "Old Dessauer" was one of the sternest disciplinarians in an age of stern discipline, and the technical training of the infantry, under his hand, made them superior to all others in the proportion of five to three (see AUSTRIAN SUCCESSION, WAR OF THE). He was essentially an infantry soldier; in his time artillery did not decide battles, but he suffered the cavalry service, in which he felt little interest, to be comparatively neglected, with results which appeared at Mollwitz. Frederick the Great formed the cavalry of Hohenfriedberg and Leuthen himself, but had it not been for the incomparable infantry trained by the "Old Dessauer" he would never have had the opportunity of doing so. Thus Leopold, heartily supported by Frederick William, who was himself called the great drill-master of Europe, turned to good account the twenty years following the peace with Sweden. During this time two incidents in his career call for special mention: first, his intervention in the case of the crown prince Frederick, who was condemned to death for desertion, and his continued and finally successful efforts to

secure Frederick's reinstatement in the Prussian army; and secondly, his part in the War of the Polish Succession on the Rhine, where he served under his old chief Eugene and held the office of field marshal of the Empire.

With the death of Frederick William in 1740, Frederick succeeded to the Prussian throne, and a few months later took place the invasion and conquest of Silesia, the first act in the long Silesian wars and the test of the work of the "Old Dessauer's" lifetime. The prince himself was not often employed in the king's own army, though his sons held high commands under Frederick. The king, indeed, found Leopold, who was reputed, since the death of Eugene, the greatest of living soldiers, somewhat difficult to manage, and the prince spent most of the campaigning years up to 1745 in command of an army of observation on the Saxon frontier. Early in that year his wife died. He was now over seventy, but his last campaign was destined to be the most brilliant of his long career. A combined effort of the Austrians and Saxons to retrieve the disasters of the summer by a winter campaign towards Berlin itself led to a hurried concentration of the Prussians. Frederick from Silesia checked the Austrian main army and hastened towards Dresden. But before he had arrived, Leopold, no longer in observation, had decided the war by his overwhelming victory of Kesselsdorf (December 14, 1745). It was his habit to pray before battle, for he was a devout Lutheran. On this last field his words were, "O Lord God, let me not be disgraced in my old days. Or if Thou wilt not help me, do not help these scoundrels, but leave us to try it ourselves." With this great victory Leopold's career ended. He retired from active service, and the short remainder of his life was spent at Dessau, where he died on the 7th of April 1747.

He was succeeded by his son, LEOPOLD II., MAXIMILIAN, PRINCE OF ANHALT-DESSAU (1700–1751), who was one of the best of Frederick's subordinate generals, and especially distinguished himself by the capture of Glogau in 1741, and his generalship at Mollwitz, Chotusitz (where he was made general field marshal on the field of battle), Hohenfriedberg and Soor.

Another son, PRINCE DIETRICH OF ANHALT-DESSAU (d. 1769), was also a distinguished Prussian general.

But the most famous of the sons was PRINCE MORITZ OF ANHALT-DESSAU (1712–1760), who entered the Prussian army in 1725, saw his first service as a volunteer in the War of the Polish Succession (1734–35), and in the latter years of the reign of Frederick William held important commands. In the Silesian wars of Frederick II., Moritz, the ablest of the old Leopold's sons, greatly distinguished himself, especially at the battle of Hohenfriedberg (Striegau), 1745. At Kesselsdorf it was the wing led by the young Prince Moritz that carried the Austrian lines and won the "Old Dessauer's" last fight. In the years of peace preceding the Seven Years' War, Moritz was employed by Frederick the Great in the colonizing of the waste lands of Pomerania and the Oder Valley. When the king took the field again in 1756, Moritz was in command of one of the columns which hemmed in the Saxon army in the lines of Pirna, and he received the surrender of Rutowski's force after the failure of the Austrian attempts at relief. Next year Moritz underwent changes of fortune. At the battle of Kolin he led the left wing, which, through a misunderstanding with the king, was prematurely drawn into action and failed hopelessly. In the disastrous days which followed, Moritz was under the cloud of Frederick's displeasure. But the glorious victory of Leuthen (December 5, 1757) put an end to this. At the close of that day, Frederick rode down the lines and called out to General Prince Moritz, "I congratulate you, Herr Feldmarschall!" At Zorndorf he again distinguished himself, but at the surprise of Hochkirch fell wounded into the hands of the Austrians. Two years later, soon after his release, his wound proved mortal.

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ANHYDRITE, a mineral, differing chemically from the more commonly occurring gypsum in containing no water of crystallization, being anhydrous calcium sulphate, $CaSO_4$. It crystallizes in the orthorhombic system, and has three directions of perfect cleavage parallel to the three planes of symmetry. It is not isomorphous with the orthorhombic barium and strontium sulphates, as might be expected from the chemical formulae. Distinctly developed crystals are somewhat rare, the mineral usually presenting the form of cleavage masses. The hardness is 3½ and the specific gravity 2·9. The colour is white, sometimes greyish, bluish or reddish. On the best developed of the three cleavages the lustre is pearly, on other surfaces it is of the ordinary vitreous type.

Anhydrite is most frequently found in salt deposits with gypsum; it was, for instance, first discovered, in 1794, in a salt mine near Hall in Tirol. Other localities which produce typical specimens of the mineral, and where the mode of occurrence is the same, are Stassfurt in Germany, Aussee in Styria and Bex in Switzerland. At all these places it is only met with at some depth; nearer the surface of the ground it has been altered to gypsum owing to absorption of water.

From an aqueous solution calcium sulphate is deposited as crystals of gypsum, but when the solution contains an excess of sodium or potassium chloride anhydrite is deposited. This is one of the several methods by which the mineral has been prepared artificially, and is identical with its mode of origin in nature, the mineral having crystallized out in salt basins.

The name anhydrite was given by A. G. Werner in 1804, because of the absence of water, as contrasted with the presence of water in gypsum. Other names for the species are muriacite and karstenite; the former, an earlier name, being given under the impression that the substance was a chloride (muriate). A peculiar variety occurring as contorted concretionary masses is known as tripe-stone, and a scaly granular variety, from Vulpino, near Bergamo, in Lombardy, as vulpinite; the latter is cut and polished for ornamental purposes. (L. J. S.)

ANI (anc. *Abnicum*), an ancient and ruined Armenian city, in Russian Transcaucasia, government Erivan, situated at an altitude of 4390 ft., between the Arpa-chai (*Harpasus*) and a deep ravine. In 961 it became the capital of the Bagratid kings of Armenia, and when yielded to the Byzantine emperor (1046) it was a populous city, known traditionally as the "city with the 1001 churches." It was taken eighteen years later by the Seljuk Turks, five times by the Georgians between 1125 and 1209, in 1239 by the Mongols, and its ruin was completed by an earthquake in 1319. It is still surrounded by a double wall partly in ruins, and amongst the remains are a "patriarchal" church finished in 1010, two other churches, both of the 11th century, a fourth built in 1215, and a palace of large size.

See Brosset, *Les Ruines d'Ani* (1860–1861).

ANICETUS, pope *c.* 154–167. It was during his pontificate that St Polycarp visited the Roman Church.

ANICHINI, LUIGI, Italian engraver of seals and medals, a native of Ferrara, lived at Venice about 1550. Michelangelo pronounced his "Interview of Alexander the Great with the high-priest at Jerusalem," "the perfection of the art." His medals of Henry II. of France and Pope Paul III. are greatly valued.

ANILINE, PHENYLAMINE, or AMINOBENZENE, ($C_6H_5NH_2$), an organic base first obtained from the destructive distillation of indigo in 1826 by O. Unverdorben (*Pogg. Ann.*, 1826, 8, p. 397), who named it crystalline. In 1834, F. Runge (*Pogg. Ann.*, 1834, 31, p. 65; 32, p. 331) isolated from coal-tar a substance which produced a beautiful blue colour on treatment with chloride of lime; this he named kyanol or cyanol. In 1841, C. J. Fritzsche showed that by treating indigo with caustic potash it yielded an oil, which he named aniline, from the specific name of one of the

indigo-yielding plants, *Indigofera anil*, *anil* being derived from the Sanskrit *nīla*, dark-blue, and *nīlā*, the indigo plant. About the same time N. N. Zinin found that on reducing nitrobenzene, a base was formed which he named benzidam. A. W. von Hofmann investigated these variously prepared substances, and proved them to be identical, and thenceforth they took their place as one body, under the name aniline or phenylamine. Pure aniline is a basic substance of an oily consistence, colourless, melting at −8° and boiling at 184° C. On exposure to air it absorbs oxygen and resinifies, becoming deep brown in colour; it ignites readily, burning with a large smoky flame. It possesses a somewhat pleasant vinous odour and a burning aromatic taste; it is a highly acrid poison.

Aniline is a weak base and forms salts with the mineral acids. Aniline hydrochloride forms large colourless tables, which become greenish on exposure; it is the "aniline salt" of commerce. The sulphate forms beautiful white plates. Although aniline is but feebly basic, it precipitates zinc, aluminium and ferric salts, and on warming expels ammonia from its salts. Aniline combines directly with alkyl iodides to form secondary and tertiary amines; boiled with carbon disulphide it gives sulphocarbanilide (diphenyl thio-urea), $CS(NHC_6H_5)_2$, which may be decomposed into phenyl mustard-oil, C_6H_5CNS, and triphenyl guanidine, $C_6H_5N{:}\ C(NHC_6H_5)_2$. Sulphuric acid at 180° gives sulphanilic acid, $NH_2{\cdot}C_6H_4{\cdot}SO_3H$. Anilides, compounds in which the amino group is substituted by an acid radical, are prepared by heating aniline with certain acids; antifebrin or acetanilide is thus obtained from acetic acid and aniline. The oxidation of aniline has been carefully investigated. In alkaline solution azobenzene results, while arsenic acid produces the violet-colouring matter violaniline. Chromic acid converts it into quinone, while chlorates, in the presence of certain metallic salts (especially of vanadium), give aniline black. Hydrochloric acid and potassium chlorate give chloranil. Potassium permanganate in neutral solution oxidizes it to nitrobenzene, in alkaline solution to azobenzene, ammonia and oxalic acid, in acid solution to aniline black. Hypochlorous acid gives para-amino phenol and para-amino diphenylamine (E. Bamberger, *Ber.*, 1898, 31, p. 1522).

The great commercial value of aniline is due to the readiness with which it yields, directly or indirectly, valuable dyestuffs. The discovery of mauve in 1858 by Sir W. H. Perkin was the first of a series of dyestuffs which are now to be numbered by hundreds. Reference should be made to the articles DYEING, FUCHSINE, SAFRANINE, INDULINES, for more details on this subject. In addition to dyestuffs, it is a starting-product for the manufacture of many drugs, such as antipyrine, antifebrin, &c. Aniline is manufactured by reducing nitrobenzene with iron and hydrochloric acid and steam-distilling the product. The purity of the product depends upon the quality of the benzene from which the nitrobenzene was prepared. In commerce three brands of aniline are distinguished—aniline oil for blue, which is pure aniline; aniline oil for red, a mixture of equimolecular quantities of aniline and ortho- and para-toluidines; and aniline oil for safranine, which contains aniline and ortho-toluidine, and is obtained from the distillate (*échappés*) of the fuchsine fusion. Monomethyl and dimethyl aniline are colourless liquids prepared by heating aniline, aniline hydrochloride and methyl alcohol in an autoclave at 220°. They are of great importance in the colour industry. Monomethyl aniline boils at 193–195°; dimethyl aniline at 192°.

ANIMAL (Lat. *animalis*, from *anima*, breath, soul), a term first used as a noun or adjective to denote a living thing, but now used to designate one branch of living things as opposed to the other branch known as plants. Until the discovery of protoplasm, and the series of investigations by which it was established that the cell was a fundamental structure essentially alike in both animals and plants (see CYTOLOGY), there was a vague belief that plants, if they could really be regarded as animated creatures, exhibited at the most a lower grade of life. We know now that in so far as life and living matter can be investigated by science, animals and plants cannot be described as being alive in different degrees. Animals and plants are extremely closely related organisms, alike in their fundamental characters, and each grading into organisms which possess some of the characters of both classes or kingdoms (see PROTISTA). The actual boundaries between animals and plants are artificial; they are rather due to the ingenious analysis of the systematist than actually resident in objective nature. The most obvious distinction is that the animal cell-wall is either absent or composed of a nitrogenous material, whereas the plant cell-wall is composed of a carbohydrate material—cellulose. The animal and the plant alike require food to repair waste, to build up new tissue and to provide material which, by chemical change, may liberate the energy which appears in the processes of life. The food is alike in both cases; it consists of water, certain inorganic salts, carbohydrate material and proteid material. Both animals and plants take their water and inorganic salts directly as such. The animal cell can absorb its carbohydrate and proteid food only in the form of carbohydrate and proteid; it is dependent, in fact, on the pre-existence of these organic substances, themselves the products of living matter, and in this respect the animal is essentially a parasite on existing animal and plant life. The plant, on the other hand, if it be a green plant, containing chlorophyll, is capable, in the presence of light, of building up both carbohydrate material and proteid material from inorganic salts; if it be a fungus, devoid of chlorophyll, whilst it is dependent on pre-existing carbohydrate material and is capable of absorbing, like an animal, proteid material as such, it is able to build up its proteid food from material chemically simpler than proteid. On these basal differences are founded most of the characters which make the higher forms of animal and plant life so different. The animal body, if it be composed of many cells, follows a different architectural plan; the compact nature of its food, and the yielding nature of its cell-walls, result in a form of structure consisting essentially of tubular or spherical masses of cells arranged concentrically round the food-cavity. The relatively rigid nature of the plant cell-wall, and the attenuated inorganic food-supply of plants, make possible and necessary a form of growth in which the greatest surface is exposed to the exterior, and thus the plant body is composed of flattened laminae and elongated branching growths. The distinctions between animals and plants are in fact obviously secondary and adaptive, and point clearly towards the conception of a common origin for the two forms of life, a conception which is made still more probable by the existence of many low forms in which the primary differences between animals and plants fade out.

An animal may be defined as a living organism, the protoplasm of which does not secrete a cellulose cell-wall, and which requires for its existence proteid material obtained from the living or dead bodies of existing plants or animals. The common use of the word animal as the equivalent of mammal, as opposed to bird or reptile or fish, is erroneous.

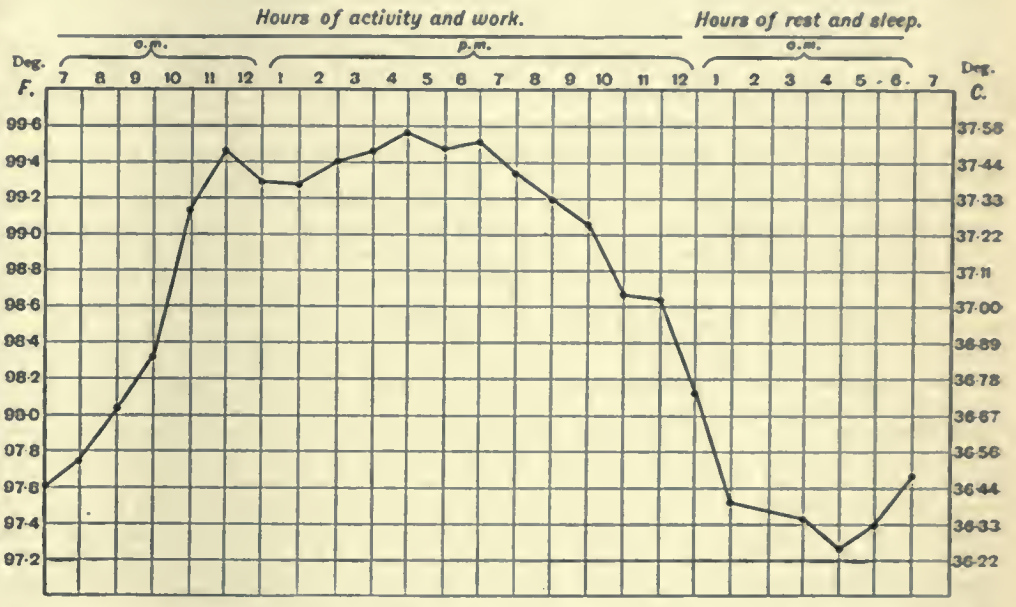
The classification of the animal kingdom is dealt with in the article ZOOLOGY. (P. C. M.)

ANIMAL HEAT. Under this heading is discussed the physiology of the temperature of the animal body.

The higher animals have within their bodies certain sources of heat, and also some mechanism by means of which both the production and loss of heat can be regulated. This is conclusively shown by the fact that both in summer and winter their mean temperature remains the same. But it was not until the introduction of thermometers that any exact data on the temperature of animals could be obtained. It was then found that local differences were present, since heat production and heat loss vary considerably in different parts of the body, although the circulation of the blood tends to bring about a mean temperature of the internal parts. Hence it is important to determine the temperature of those parts which most nearly approaches to that of the internal organs. Also for such results to be comparable they must be made in the same situation. The rectum gives most accurately the temperature of internal parts, or in women and some animals the vagina, uterus or bladder.

Occasionally that of the urine as it leaves the urethra may be of use. More usually the temperature is taken in the mouth, axilla or groin.

Warm and Cold Blooded Animals.—By numerous observations upon men and animals, John Hunter showed that the essential difference between the so-called warm-blooded and cold-blooded animals lies in the constancy of the temperature of the former, and the variability of the temperature of the latter. Those animals high in the scale of evolution, as birds and mammals, have a high temperature almost constant and independent of that of the surrounding air, whereas among the lower animals there is much variation of body temperature, dependent entirely on their surroundings. There are, however, certain mammals which are exceptions, being warm-blooded during the summer, but cold-blooded during the winter when they hibernate; such are the hedgehog, bat and dormouse. John Hunter suggested that two groups should be known as "animals of permanent heat at all atmospheres" and "animals of a heat variable with every atmosphere," but later Bergmann suggested that they should be known as "homoiothermic" and "poikilothermic" animals. But it must be remembered there is no hard and fast line between the two groups. Also, from work recently done by J. O. Wakelin Barratt, it has been shown that under certain pathological conditions a warm-blooded (homoiothermic) animal may become for a time cold-blooded (poikilothermic). He has shown conclusively that this condition exists in rabbits suffering from rabies during the last period of their life, the rectal temperature being then within a few degrees of the room temperature and varying with it. He explains this condition by the assumption that the nervous mechanism of heat regulation has become paralysed. The respiration and heart-rate being also retarded during this period, the resemblance to the condition of hibernation is considerable. Again, Sutherland Simpson has shown that during deep anaesthesia a warm-blooded animal tends to take the same temperature as that of its environment. He demonstrated that when a monkey is kept deeply anaesthetized with ether and is placed in a cold chamber, its temperature gradually falls, and that when it has reached a sufficiently low point (about 25° C. in the monkey), the employment of an anaesthetic is no longer necessary, the animal then being insensible to pain and incapable of being roused by any form of stimulus; it is, in fact, narcotized by cold, and is in a state of what may be called "artificial hibernation." Once again this is explained by the fact that the heat-regulating mechanism has been interfered with. Similar results have been obtained from experiments on cats. These facts—with many others—tend to show that the power of maintaining a constant temperature has been a gradual development, as Darwin's theory of evolution suggests, and that anything that interferes with the due working of the higher nerve-centres puts the animal back again, for the time being, on to a lower plane of evolution.



Variations in the Temperature of Man and some other Animals.—As stated above, the temperature of warm-blooded animals is maintained with but slight variation. In health under normal conditions the temperature of man varies between 36° C. and 38° C., or if the thermometer be placed in the axilla, between 36·25° C. and 37·5° C. In the mouth the reading would be from ·25° C. to 1·5° C. higher than this; and in the rectum some ·9° C. higher still. The temperature of infants and young children has a much greater range than this, and is susceptible of wide divergencies from comparatively slight causes.

Of the lower warm-blooded animals, there are some that appear to be cold-blooded at birth. Kittens, rabbits and puppies, if removed from their surroundings shortly after birth, lose their body heat until their temperature has fallen to within a few degrees of that of the surrounding air. But such animals are at birth blind, helpless and in some cases naked. Animals who are born when in a condition of greater development can maintain their temperature fairly constant. In strong, healthy infants a day or two old the temperature rises slightly, but in that of weakly, ill-developed children it either remains stationary or falls. The cause of the variable temperature in infants and young immature animals is the imperfect development of the nervous regulating mechanism.

The average temperature falls slightly from infancy to puberty and again from puberty to middle age, but after that stage is passed the temperature begins to rise again, and by about the eightieth year is as high as in infancy. A diurnal variation has been observed dependent on the periods of rest and activity, the maximum ranging from 10 A.M. to 6 P.M., the minimum from 11 P.M. to 3 A.M. Sutherland Simpson and J. J. Galbraith have recently done much work on this subject. In their first experiments they showed that in a monkey there is a well-marked and regular diurnal variation of the body temperature, and that by reversing the daily routine this diurnal variation is also reversed. The diurnal temperature curve follows the periods of rest and activity, and is not dependent on the incidence of day and night; in monkeys which are active during the night and resting during the day, the body temperature is highest at night and lowest through the day. They then made observations on the temperature of animals and birds of nocturnal habit, where the periods of rest and activity are naturally the reverse of the ordinary through habit and not from outside interference. They found that in nocturnal birds the temperature is highest during the natural period of activity (night) and lowest during the period of rest (day), but that the mean temperature is lower and the range less than in diurnal birds of the same size. That the temperature curve of diurnal birds is essentially similar to that of man and other homoiothermal animals, except that the maximum occurs earlier in the afternoon and the minimum earlier in the morning. Also that the curves obtained from rabbit, guinea-pig and dog were quite similar to those from man. The mean temperature of the female was higher than that of the male in all the species examined whose sex had been determined.

Meals sometimes cause a slight elevation, sometimes a slight depression—alcohol seems always to produce a fall. Exercise

and variations of external temperature within ordinary limits cause very slight change, as there are many compensating influences at work, which are discussed later. Even from very active exercise the temperature does not rise more than one degree, and if carried to exhaustion a fall is observed. In travelling from very cold to very hot regions a variation of less than one degree occurs, and the temperature of those living in the tropics is practically identical with those dwelling in the Arctic regions.

Limits compatible with Life.—There are limits both of heat and cold that a warm-blooded animal can bear, and other far wider limits that a cold-blooded animal may endure and yet live. The effect of too extreme a cold is to lessen metabolism, and hence to lessen the production of heat. Both katabolic and anabolic changes share in the depression, and though less energy is used up, still less energy is generated. This diminished metabolism tells first on the central nervous system, especially the brain and those parts concerned in consciousness. Both heart-beat and respiration-number become diminished,drowsiness supervenes, becoming steadily deeper until it passes into the sleep of death. Occasionally, however, convulsions may set in towards the end, and a death somewhat similar to that of asphyxia takes place. In some recent experiments on cats performed by Sutherland Simpson and Percy T. Herring, they found them unable to survive when the rectal temperature was reduced below 16° C. At this low temperature respiration became increasingly feeble, the heart-impulse usually continued after respiration had ceased, the beats becoming very irregular, apparently ceasing, then beginning again. Death appeared to be mainly due to asphyxia, and the only certain sign that it had taken place was the loss of knee jerks. On the other hand, too high a temperature hurries on the metabolism of the various tissues at such a rate that their capital is soon exhausted. Blood that is too warm produces dyspnoea and soon exhausts the metabolic capital of the respiratory centre. The rate of the heart is quickened, the beats then become irregular and finally cease. The central nervous system is also profoundly affected, consciousness may be lost, and the patient falls into a comatose condition, or delirium and convulsions may set in. All these changes can be watched in any patient suffering from an acute fever. The lower limit of temperature that man can endure depends on many things, but no one can survive a temperature of 45° C. (113° F.) or above for very long. Mammalian muscle becomes rigid with heat rigor at about 50° C., and obviously should this temperature be reached the sudden rigidity of the whole body would render life impossible. H. M. Vernon has recently done work on the death temperature and paralysis temperature (temperature of heat rigor) of various animals. He found that animals of the same class of the animal kingdom showed very similar temperature values, those from the Amphibia examined being 38·5° C., Fishes 39°, Reptilia 45°, and various Molluscs 46°. Also in the case of Pelagic animals he showed a relation between death temperature and the quantity of solid constituents of the body, *Cestus* having lowest death temperature and least amount of solids in its body. But in the higher animals his experiments tend to show that there is greater variation in both the chemical and physical characters of the protoplasm, and hence greater variation in the extreme temperature compatible with life.

Regulation of Temperature.—The heat of the body is generated by the chemical changes—those of oxidation—undergone not by any particular substance or in any one place, but by the tissues at large. Wherever destructive metabolism (katabolism) is going on, heat is being set free. When a muscle does work it also gives rise to heat, and if this is estimated it can be shown that the muscles alone during their contractions provide far more heat than the whole amount given out by the body. Also it must be remembered that the heart—also a muscle,—never resting, does in the 24 hours no inconsiderable amount of work, and hence must give rise to no inconsiderable amount of heat. From this it is clear that the larger proportion of total heat of the body is supplied by the muscles. These are essentially the "thermogenic tissues." Next to the muscles as heat generators come the various secretory glands, especially the liver, which appears never to rest in this respect. The brain also must be a source of heat, since its temperature is higher than that of the arterial blood with which it is supplied. Also a certain amount of heat is produced by the changes which the food undergoes in the alimentary canal before it really enters the body. But heat while continually being produced is also continually being lost by the skin, lungs, urine and faeces. And it is by the constant modification of these two factors, (1) heat production and (2) heat loss, that the constant temperature of a warm-blooded animal is maintained. Heat is lost to the body through the faeces and urine, respiration, conduction and radiation from the skin, and by evaporation of perspiration. The following are approximately the relative amounts of heat lost through these various channels (different authorities give somewhat different figures):—faeces and urine about 3, respiration about 20, skin (conduction, radiation and evaporation) about 77. Hence it is clear the chief means of loss are the skin and the lungs. The more air that passes in and out of the lungs in a given time, the greater the loss of heat. And in such animals as the dog, who do not perspire easily by the skin, respiration becomes far more important.

But for man the great heat regulator is undoubtedly the skin, which regulates heat loss by its vasomotor mechanism, and also by the nervous mechanism of perspiration. Dilatation of the cutaneous vascular areas leads to a larger flow of blood through the skin, and so tends to cool the body, and *vice versa*. Also the special nerves of perspiration can increase or lessen heat loss by promoting or diminishing the secretions of the skin. There are greater difficulties in the exact determination in the amount of heat produced, but there are certain well-known facts in connexion with it. A larger living body naturally produces more heat than a smaller one of the same nature, but the surface of the smaller, being greater in proportion to its bulk than that of the larger, loses heat at a more rapid rate. Hence to maintain the same constant bodily temperature, the smaller animal must produce a relatively larger amount of heat. And in the struggle for existence this has become so.

Food temporarily increases the production of heat, the rate of production steadily rising after a meal until a maximum is reached from about the 6th to the 9th hour. If sugar be included in the meal the maximum is reached earlier; if mainly fat, later. Muscular work very largely increases the production of heat, and hence the more active the body the greater the production of heat.

But all the arrangements in the animal economy for the production and loss of heat are themselves probably regulated by the central nervous system, there being a thermogenic centre —situated above the spinal cord, and according to some observers in the optic thalamus.

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ANIMAL WORSHIP, an ill-defined term, covering facts ranging from the worship of the real divine animal, commonly conceived as a "god-body," at one end of the scale, to respect for the bones of a slain animal or even the use of a respectful name for the living animal at the other end. Added to this, in many works on the subject we find reliance placed, especially for the African facts, on reports of travellers who were merely visitors to the regions on which they wrote.

Classification.—Animal cults may be classified in two ways: (A) according to their outward form; (B) according to their inward meaning, which may of course undergo transformations.

(A) There are two broad divisions: (1) all animals of a given species are sacred, perhaps owing to the impossibility of distinguishing the sacred few from the profane crowd; (2) one or a fixed number of a species are sacred. It is probable that the first of these forms is the primary one and the second in most cases a development from it due to (i.) the influence of other individual cults, (ii.) anthropomorphic tendencies, (iii.) the influence of chieftainship, hereditary and otherwise, (iv.) annual sacrifice of the sacred animal and mystical ideas connected therewith, (v.) syncretism, due either to unity of function or to a philosophic unification, (vi.) the desire to do honour to the species in the person of one of its members, and possibly other less easily traceable causes.

(B) Treating cults according to their meaning, which is not necessarily identical with the cause which first led to the deification of the animal in question, we can classify them under ten specific heads: (i.) pastoral cults; (ii.) hunting cults; (iii.) cults of dangerous or noxious animals; (iv.) cults of animals regarded as human souls or their embodiment; (v.) totemistic cults; (vi.) cults of secret societies, and individual cults of tutelary animals; (vii.) cults of tree and vegetation spirits; (viii.) cults of ominous animals; (ix.) cults, probably derivative, of animals associated with certain deities; (x.) cults of animals used in magic.

(i.) The pastoral type falls into two sub-types, in which the species (*a*) is spared and (*b*) sometimes receives special honour at intervals in the person of an individual. (See *Cattle*, *Buffalo*, below.)

(ii.) In hunting cults the species is habitually killed, but (*a*) occasionally honoured in the person of a single individual, or (*b*) each slaughtered animal receives divine honours. (See *Bear*, below.)

(iii.) The cult of dangerous animals is due (*a*) to the fear that the soul of the slain beast may take vengeance on the hunter, (*b*) to a desire to placate the rest of the species. (See *Leopard*, below.)

(iv.) Animals are frequently regarded as the abode, temporary or permanent, of the souls of the dead, sometimes as the actual souls of the dead. Respect for them is due to two main reasons: (*a*) the kinsmen of the dead desire to preserve the goodwill of their dead relatives; (*b*) they wish at the same time to secure that their kinsmen are not molested and caused to undergo unnecessary suffering. (See *Serpent*, below.)

(v.) One of the most widely found modes of showing respect to animals is known as totemism (see TOTEM AND TOTEMISM), but except in decadent forms there is but little positive worship; in Central Australia, however, the rites of the Wollunqua totem group are directed towards placating this mythical animal, and cannot be termed anything but religious ceremonies.

(vi.) In secret societies we find bodies of men grouped together with a single tutelary animal; the individual, in the same way, acquires the nagual or individual totem, sometimes by ceremonies of the nature of the bloodbond.

(vii.) Spirits of vegetation in ancient and modern Europe and in China are conceived in animal form. (See *Goat*, below.)

(viii.) The ominous animal or bird may develop into a deity. (See *Hawk*, below.)

(ix.) It is commonly assumed that the animals associated with certain deities are sacred because the god was originally theriomorphic; this is doubtless the case in certain instances; but Apollo Smintheus, Dionysus Bassareus and other examples seem to show that the god may have been appealed to for help and thus become associated with the animals from whom he protected the crops, &c.

(x.) The use of animals in magic may sometimes give rise to a kind of respect for them, but this is of a negative nature. See, however, articles by Preuss in *Globus*, vol. lxvii., in which he maintains that animals of magical influence are elevated into divinities.

Animal cults.

Bear.—The bear enjoys a large measure of respect from all savage races that come in contact with it, which shows itself in apologies and in festivals in its honour. The most important developments of the cult are in East Asia among the Siberian tribes; among the Ainu of Sakhalin a young bear is caught at the end of winter and fed for some nine months; then after receiving honours it is killed, and the people, who previously show marks of grief at its approaching fate, dance merrily and feast on its body. Among the Gilyaks a similar festival is found, but here it takes the form of a celebration in honour of a recently dead kinsman, to whom the spirit of the bear is sent. Whether this feature or a cult of the hunting type was the primary form, is so far an open question. There is a good deal of evidence to connect the Greek goddess Artemis with a cult of the bear; girls danced as "bears" in her honour, and might not marry before undergoing this ceremony. The bear is traditionally associated with Bern in Switzerland, and in 1832 a statue of Artio, a bear goddess, was dug up there.

Buffalo.—The Todas of S. India abstain from the flesh of their domestic animal, the buffalo; but once a year they sacrifice a bull calf, which is eaten in the forest by the adult males.

Cattle.—Cattle are respected by many pastoral peoples; they live on milk or game, and the killing of an ox is a sacrificial function. Conspicuous among Egyptian animal cults was that of the bull, Apis. It was distinguished by certain marks, and when the old Apis died a new one was sought; the finder was rewarded, and the bull underwent four months' education at Nilopolis. Its birthday was celebrated once a year; oxen, which had to be pure white, were sacrificed to it; women were forbidden to approach it when once its education was finished. Oracles were obtained from it in various ways. After death it was mummified and buried in a rock-tomb. Less widespread was the cult of the Mnevis, also consecrated to Osiris. Similar observances are found in our own day on the Upper Nile; the Nuba and Nuer worship the bull; the Angoni of Central Africa and the Sakalava of Madagascar keep sacred bulls. In India respect for the cow is widespread, but is of post-Vedic origin; there is little actual worship, but the products of the cow are important in magic.

Crow.—The crow is the chief deity of the Thlinkit Indians of N. W. America; and all over that region it is the chief figure in a group of myths, fulfilling the office of a culture hero who brings the light, gives fire to mankind, &c. Together with the eagle-hawk the crow plays a great part in the mythology of S.E. Australia.

Dog.—Actual dog-worship is uncommon; the Nosarii of western Asia are said to worship a dog; the Kalangs of Java had a cult of the red dog, each family keeping one in the house; according to one authority the dogs are images of wood which are worshipped after the death of a member of the family and burnt after a thousand days. In Nepal it is said that dogs are worshipped at the festival called Khicha Puja. Among the Harranians dogs were sacred, but this was rather as brothers of the mystae.

Elephant.—In Siam it is believed that a white elephant may contain the soul of a dead person, perhaps a Buddha; when one is taken the capturer is rewarded and the animal brought to the king to be kept ever afterwards; it cannot be bought or sold. It is baptized and fêted and mourned for like a human being at its death. In some parts of Indo-China the belief is that the soul of the elephant may injure people after death; it is therefore fêted by a whole village. In Cambodia it is held to bring luck to the kingdom. In Sumatra the elephant is regarded as a tutelary spirit. The cult of the white elephant is also found at Ennarea, southern Abyssinia.

Fish.—Dagon seems to have been a fish-god with human head and hands; his worshippers wore fish-skins. In the temples of Apollo and Aphrodite were sacred fish, which may point to a fish cult. Atargatis is said to have had sacred fish at Askelon, and from Xenophon we read that the fish of the Chalus were regarded as gods.

Goat.—Dionysus was believed to take the form of a goat, probably as a divinity of vegetation. Pan, Silenus, the Satyrs and the Fauns were either capriform or had some part of their bodies shaped like that of a goat. In northern Europe the wood spirit, Ljesche, is believed to have a goat's horns, ears and legs. In Africa the Bijagos are said to have a goat as their principal divinity.

Hare.—In North America the Algonquin tribes had as their chief deity a "mighty great hare" to whom they went at death. According to one account he lived in the east, according to another in the north. In his anthropomorphized form he was known as Menabosho or Michabo.

Hawk.—In North Borneo we seem to see the evolution of a

god in the three stages of the cult of the hawk among the Kenyahs, the Kayans and the sea Dyaks. The Kenyahs will not kill it, address to it thanks for assistance, and formally consult it before leaving home on an expedition; it seems, however, to be regarded as the messenger of the supreme god Balli Penyalong. The Kayans have a hawk-god, Laki Neho, but seem to regard the hawk as the servant of the chief god, Laki Tenangan. Singalang Burong, the hawk-god of the Dyaks, is completely anthropomorphized. He is god of omens and ruler of the omen birds; but the hawk is not his messenger, for he never leaves his house; stories are, however, told of his attending feasts in human form and flying away in hawk form when all was over.

Horse.—There is some reason to believe that Poseidon, like other water gods, was originally conceived under the form of a horse. In the cave of Phigalia Demeter was, according to popular tradition, represented with the head and mane of a horse, possibly a relic of the time when a non-specialized corn-spirit bore this form. Her priests were called Poloi (colts) in Laconia. In Gaul we find a horse-goddess, Epona; there are also traces of a horse-god, Rudiobus. The Gonds in India worship a horse-god, Koda Pen, in the form of a shapeless stone; but it is not clear that the horse is regarded as divine. The horse or mare is a common form of the corn-spirit in Europe.

Leopard.—The cult of the leopard is widely found in West Africa. Among the Ewe a man who kills one is liable to be put to death; no leopard skin may be exposed to view, but a stuffed leopard is worshipped. On the Gold Coast a leopard hunter who has killed his victim is carried round the town behind the body of the leopard; he may not speak, must besmear himself so as to look like a leopard and imitate its movements. In Loango a prince's cap is put upon the head of a dead leopard, and dances are held in its honour.

Lion.—The lion was associated with the Egyptian gods Rē and Horus; there was a lion-god at Baalbek and a lion-headed goddess Sekhet. The Arabs had a lion-god, Yaghuth. In modern Africa we find a lion-idol among the Balonda.

Lizard.—The cult of the lizard is most prominent in the Pacific, where it appears as an incarnation of Tangaloa. In Easter Island a form of the house-god is the lizard; it is also a tutelary deity in Madagascar.

Mantis.—Cagn is a prominent figure in Bushman mythology; the mantis and the caterpillar, Ngo, are his incarnations. It was called the "Hottentots' god" by early settlers.

Monkey.—In India the monkey-god, Hanuman, is a prominent figure; in orthodox villages monkeys are safe from harm. Monkeys are said to be worshipped in Togo. At Porto Novo, in French West Africa, twins have tutelary spirits in the shape of small monkeys.

Serpent.—The cult of the serpent is found in many parts of the Old World; it is also not unknown in America; in Australia, on the other hand, though many species of serpent are found, there does not appear to be any species of cult unless we include the Warramunga cult of the mythical Wollunqua totem animal, whom they seek to placate by rites. In Africa the chief centre of serpent worship was Dahomey; but the cult of the python seems to have been of exotic origin, dating back to the first quarter of the 17th century. By the conquest of Whydah the Dahomeyans were brought in contact with a people of serpent worshippers, and ended by adopting from them the cult which they at first despised. At Whydah, the chief centre, there is a serpent temple, tenanted by some fifty snakes; every python of the danh-gbi kind must be treated with respect, and death is the penalty for killing one, even by accident. Danh-gbi has numerous wives, who until 1857 took part in a public procession from which the profane crowd was excluded; a python was carried round the town in a hammock, perhaps as a ceremony for the expulsion of evils. The rainbow-god of the Ewe was also conceived to have the form of a snake; his messenger was said to be a small variety of boa; but only certain individuals, not the whole species, were sacred. In many parts of Africa the serpent is looked upon as the incarnation of deceased relatives; among the Amazulu, as among the Betsileo of Madagascar, certain species are assigned as the abode of certain classes; the Masai, on the other hand, regard each species as the habitat of a particular family of the tribe.

In America some of the Amerindian tribes reverence the rattlesnake as grandfather and king of snakes who is able to give fair winds or cause tempest. Among the Hopi (Moqui) of Arizona the serpent figures largely in one of the dances. The rattlesnake was worshipped in the Natchez temple of the sun; and the Aztec deity Quetzalcoatl was a serpent-god. The tribes of Peru are said to have adored great snakes in the pre-Inca days; and in Chile the Araucanians made a serpent figure in their deluge myth.

Over a large part of India there are carved representations of cobras (Nāgas) or stones as substitutes; to these human food and flowers are offered and lights are burned before the shrines. Among the Dravidians a cobra which is accidentally killed is burned like a human being; no one would kill one intentionally; the serpent-god's image is carried in an annual procession by a celibate priestess.

Serpent cults were well known in ancient Europe; there does not, it is true, appear to be much ground for supposing that Aesculapius was a serpent-god in spite of his connexion with serpents. On the other hand, we learn from Herodotus of the great serpent which defended the citadel of Athens; the Roman *genius loci* took the form of a serpent; a snake was kept and fed with milk in the temple of Potrimpos, an old Slavonic god. To this day there are numerous traces in popular belief, especially in Germany, of respect for the snake, which seems to be a survival of ancestor worship, such as still exists among the Zulus and other savage tribes; the "house-snake," as it is called, cares for the cows and the children, and its appearance is an omen of death, and the life of a pair of house-snakes is often held to be bound up with that of the master and mistress themselves. Tradition says that one of the Gnostic sects known as the Ophites caused a tame serpent to coil round the sacramental bread and worshipped it as the representative of the Saviour. See also SERPENT-WORSHIP.

Sheep.—Only in Africa do we find a sheep-god proper; Ammon was the god of Thebes; he was represented as ram-headed; his worshippers held the ram to be sacred; it was, however, sacrificed once a year, and its fleece formed the clothing of the idol.

Tiger.—The tiger is associated with Siva and Durga, but its cult is confined to the wilder tribes; in Nepal the tiger festival is known as Bagh Jatra, and the worshippers dance disguised as tigers. The Waralis worship Waghia the lord of tigers in the form of a shapeless stone. In Hanoi and Manchuria tiger-gods are also found.

Wolf.—Both Zeus and Apollo were associated with the wolf by the Greeks; but it is not clear that this implies a previous cult of the wolf. It is frequently found among the tutelary deities of North American dancing or secret societies. The Thlinkits had a god, Khanukh, whose name means "wolf," and worshipped a wolf-headed image.

AUTHORITIES.—For a fuller discussion and full references to these and other cults, that of the serpent excepted, see N. W. Thomas in Hastings' *Dictionary of Religions*; Frazer, *Golden Bough*; Campbell's *Spirit Basis of Belief and Custom*; Maclennan's *Studies* (series 2); V. Gennep, *Tabou et totémisme à Madagascar*. For the serpent, see Ellis, *Ewe-speaking Peoples*, p. 54; *Internat. Archiv*, xvii. 113; Tylor, *Primitive Culture*, ii. 239; Fergusson, *Tree and Serpent Worship*; Mähly, *Die Schlange im Mythus*; Staniland Wake, *Serpent Worship, &c.*; *16th Annual Report of the American Bureau of Ethnology*, p. 273, and bibliography, p. 312. For the bull, &c., in Egypt, see EGYPT: *Religion*. (N. W. T.)

ANIMÉ, an oleo-resin (said to be so called because in its natural state it is infested with insects) which is exuded from the locust tree, *Hymenaea coumaril*, and other species of *Hymenaea* growing in tropical South America. It is of a pale brown colour, transparent, brittle, and in consequence of its agreeable odour is used for fumigation and in perfumery. Its specific gravity varies from 1·054 to 1·057. It melts readily over the fire, and softens even with the heat of the mouth; it is insoluble in water, and nearly so in cold alcohol. It is allied to copal in its

nature and appearance, and is much used by varnish-makers. The name is also given to Zanzibar copal (*q.v.*).

ANIMISM (from *animus*, or *anima*, mind or soul), according to the definition of Dr E. B. Tylor, the doctrine of spiritual beings, including human souls; in practice, however, the term is often extended to include panthelism or animatism, the doctrine that a great part, if not the whole, of the inanimate kingdom, as well as all animated beings, are endowed with reason, intelligence and volition, identical with that of man. This latter theory, which in many cases is equivalent to personification, though it may be, like animism, a feature of the philosophy of peoples of low culture, should not be confused with it. But it is difficult in practice to distinguish the two phases of thought and no clear account of animatism can yet be given, largely on the ground that no people has yet been discovered which has not already developed to a greater or less extent an animistic philosophy. On theoretical grounds it is probable that animatism preceded animism; but savage thought is no more consistent than that of civilized man; and it may well be that animistic and panthelistic doctrines are held simultaneously by the same person. In like manner one portion of the savage explanation of nature may have been originally animistic, another part animatistic.

Origin.—Animism may have arisen out of or simultaneously with animatism as a primitive explanation of many different phenomena; if animatism was originally applied to non-human or inanimate objects, animism may from the outset have been in vogue as a theory of the nature of man. Lists of phenomena from the contemplation of which the savage was led to believe in animism have been given by Dr Tylor, Herbert Spencer, Mr Andrew Lang and others; an animated controversy arose between the former as to the priority of their respective lists. Among these phenomena are: trance (*q.v.*) and unconsciousness, sickness, death, clairvoyance (*q.v.*), dreams (*q.v.*), apparitions (*q.v.*) of the dead, wraiths, hallucinations (*q.v.*), echoes, shadows and reflections.

Primitive ideas on the subject of the soul, and at the same time the origin of them, are best illustrated by an analysis of the terms applied to it. Readers of Dante know the idea that the dead have no shadows; this was no invention of the poet's but a piece of traditionary lore; at the present day among the Basutos it is held that a man walking by the brink of a river may lose his life if his shadow falls on the water, for a crocodile may seize it and draw him in; in Tasmania, North and South America and classical Europe is found the conception that the soul — *σκιά*, *umbra*—is somehow identical with the shadow of a man. More familiar to the Anglo-Saxon race is the connexion between the soul and the breath; this identification is found both in Aryan and Semitic languages; in Latin we have *spiritus*, in Greek *pneuma*, in Hebrew *ruach*; and the idea is found extending downwards to the lowest planes of culture in Australia, America and Asia. For some of the Red Indians the Roman custom of receiving the breath of a dying man was no mere pious duty but a means of ensuring that his soul was transferred to a new body. Other familiar conceptions identify the soul with the liver (see OMEN) or the heart, with the reflected figure seen in the pupil of the eye, and with the blood. Although the soul is often distinguished from the vital principle, there are many cases in which a state of unconsciousness is explained as due to the absence of the soul; in South Australia *wilyamarraba* (without soul) is the word used for insensible. So too the autohypnotic trance of the magician or *shaman* is regarded as due to his visit to distant regions or the nether world, of which he brings back an account. Telepathy or clairvoyance (*q.v.*), with or without trance, must have operated powerfully to produce a conviction of the dual nature of man, for it seems probable that facts unknown to the automatist are sometimes discovered by means of crystal-gazing (*q.v.*), which is widely found among savages, as among civilized peoples. Sickness is often explained as due to the absence of the soul; and means are sometimes taken to lure back the wandering soul; when a Chinese is at the point of death and his soul is supposed to have already left his body, the patient's coat is held up on a long bamboo while a priest endeavours to bring the departed spirit back into the coat by means of incantations. If the bamboo begins to turn round in the hands of the relative who is deputed to hold it, it is regarded as a sign that the soul of the moribund has returned (see AUTOMATISM). More important perhaps than all these phenomena, because more regular and normal, was the daily period of sleep with its frequent concomitant of fitful and incoherent ideas and images. The mere immobility of the body was sufficient to show that its state was not identical with that of waking; when, in addition, the sleeper awoke to give an account of visits to distant lands, from which, as modern psychical investigations suggest, he may even have brought back veridical details, the conclusion must have been irresistible that in sleep something journeyed forth, which was not the body. In a minor degree revival of memory during sleep and similar phenomena of the sub-conscious life may have contributed to the same result. Dreams are sometimes explained by savages as journeys performed by the sleeper, sometimes as visits paid by other persons, by animals or objects to him; hallucinations, possibly more frequent in the lower stages of culture, must have contributed to fortify this interpretation, and the animistic theory in general. Seeing the phantasmic figures of friends at the moment when they were, whether at the point of death or in good health, many miles distant, must have led the savage irresistibly to the dualistic theory. But hallucinatory figures, both in dreams and waking life, are not necessarily those of the living; from the reappearance of dead friends or enemies primitive man was inevitably led to the belief that there existed an incorporeal part of man which survived the dissolution of the body. The soul was conceived to be a facsimile of the body, sometimes no less material, sometimes more subtle but yet material, sometimes altogether impalpable and intangible.

Animism and Eschatology.—The psychological side of animism has already been dealt with; almost equally important in primitive creeds is the eschatological aspect. In many parts of the world it is held that the human body is the seat of more than one soul; in the island of Nias four are distinguished, the shadow and the intelligence, which die with the body, a tutelary spirit, termed *begoe*, and a second which is carried on the head. Similar ideas are found among the Euahlayi of S.E. Australia, the Dakotas and many other tribes. Just as in Europe the ghost of a dead person is held to haunt the churchyard or the place of death, although more orthodox ideas may be held and enunciated by the same person as to the nature of a future life, so the savage, more consistently, assigns different abodes to the multiple souls with which he credits man. Of the four souls of a Dakota, one is held to stay with the corpse, another in the village, a third goes into the air, while the fourth goes to the land of souls, where its lot may depend on its rank in this life, its sex, mode of death or sepulture, on the due observance of funeral ritual, or many other points (see ESCHATOLOGY). From the belief in the survival of the dead arose the practice of offering food, lighting fires, &c., at the grave, at first, maybe, as an act of friendship or filial piety, later as an act of worship (see ANCESTOR WORSHIP). The simple offering of food or shedding of blood at the grave develops into an elaborate system of sacrifice; even where ancestor-worship is not found, the desire to provide the dead with comforts in the future life may lead to the sacrifice of wives, slaves, animals, &c., to the breaking or burning of objects at the grave or to the provision of the ferryman's toll, a coin put in the mouth of the corpse to pay the travelling expenses of the soul. But all is not finished with the passage of the soul to the land of the dead; the soul may return to avenge its death by helping to discover the murderer, or to wreak vengeance for itself; there is a widespread belief that those who die a violent death become malignant spirits and endanger the lives of those who come near the haunted spot; the woman who dies in child-birth becomes a *pontianak*, and threatens the life of human beings; and man resorts to magical or religious means of repelling his spiritual dangers.

Development of Animism.—If the phenomena of dreams were, as suggested above, of great importance for the development of animism, the belief, which must originally have been a doctrine of human psychology, cannot have failed to expand speedily into

a general philosophy of nature. Not only human beings but animals and objects are seen in dreams; and the conclusion would be that they too have souls; the same conclusion may have been reached by another line of argument; primitive psychology posited a spirit in a man to account, amongst other things, for his actions; a natural explanation of the changes in the external world would be that they are due to the operations and volitions of spirits.

Animal Souls.—But apart from considerations of this sort, it is probable that animals must, early in the history of animistic beliefs, have been regarded as possessing souls. Education has brought with it a sense of the great gulf between man and animals; but in the lower stages of culture this distinction is not adequately recognized, if indeed it is recognized at all. The savage attributes to animals the same ideas, the same mental processes as himself, and at the same time vastly greater power and cunning. The dead animal is credited with a knowledge of how its remains are treated and sometimes with a power of taking vengeance on the fortunate hunter. Powers of reasoning are not denied to animals nor even speech; the silence of the brute creation may be put down to their superior cunning. We may assume that man attributed a soul to the beasts of the field almost as soon as he claimed one for himself. It is therefore not surprising to find that many peoples on the lower planes of culture respect and even worship animals (see TOTEM; ANIMAL WORSHIP); though we need not attribute an animistic origin to all the developments, it is clear that the widespread respect paid to animals as the abode of dead ancestors, and much of the cult of dangerous animals, is traceable to this principle. With the rise of species, deities and the cult of individual animals, the path towards anthropomorphization and polytheism is opened and the respect paid to animals tends to lose its strict animistic character.

Plant Souls.—Just as human souls are assigned to animals, so primitive man often credits trees and plants with souls in both human or animal form. All over the world agricultural peoples practise elaborate ceremonies explicable, as Mannhardt has shown, on animistic principles. In Europe the corn spirit sometimes immanent in the crop, sometimes a presiding deity whose life does not depend on that of the growing corn, is conceived in some districts in the form of an ox, hare or cock, in others as an old man or woman; in the East Indies and America the rice or maize mother is a corresponding figure; in classical Europe and the East we have in Ceres and Demeter, Adonis and Dionysus, and other deities, vegetation gods whose origin we can readily trace back to the rustic corn spirit. Forest trees, no less than cereals, have their indwelling spirits; the fauns and satyrs of classical literature were goat-footed and the tree spirit of the Russian peasantry takes the form of a goat; in Bengal and the East Indies wood-cutters endeavour to propitiate the spirit of the tree which they cut down; and in many parts of the world trees are regarded as the abode of the spirits of the dead. Just as a process of syncretism has given rise to cults of animal gods, tree spirits tend to become detached from the trees, which are thenceforward only their abodes; and here again animism has begun to pass into polytheism.

Object Souls.—We distinguish between animate and inanimate nature, but this classification has no meaning for the savage. The river speeding on its course to the sea, the sun and moon, if not the stars also, on their never-ceasing daily round, the lightning, fire, the wind, the sea, all are in motion and therefore animate; but the savage does not stop short here; mountains and lakes, stones and manufactured articles, are for him alike endowed with souls like his own; he deposits in the tomb weapons and food, clothes and implements, broken, it may be, in order to set free their souls; or he attains the same result by burning them, and thus sending them to the Other World for the use of the dead man. Here again, though to a less extent than in tree cults, the theriomorphic aspect recurs; in the north of Europe, in ancient Greece, in China, the water or river spirit is horse or bull-shaped; the water monster in serpent shape is even more widely found, but it is less strictly the spirit of the water. The spirit of syncretism manifests itself in this department of animism too; the immanent spirit of the earlier period becomes the presiding genius or local god of later times, and with the rise of the doctrine of separable souls we again reach the confines of animism pure and simple.

Spirits in General.—Side by side with the doctrine of separable souls with which we have so far been concerned, exists the belief in a great host of unattached spirits; these are not immanent souls which have become detached from their abodes, but have every appearance of independent spirits. Thus, animism is in some directions little developed, so far as we can see, among the Australian aborigines; but from those who know them best we learn that they believe in innumerable spirits and bush bogies, which wander, especially at night, and can be held at bay by means of fire; with this belief may be compared the ascription in European folk belief of prophylactic properties to iron. These spirits are at first mainly malevolent; and side by side with them we find the spirits of the dead as hostile beings. At a higher stage the spirits of dead kinsmen are no longer unfriendly, nor yet all non-human spirits; as fetishes (see FETISHISM), naguals (see TOTEM), familiars, gods or demi-gods (for which and the general question see DEMONOLOGY), they enter into relations with man. On the other hand there still subsists a belief in innumerable evil spirits, which manifest themselves in the phenomena of possession (*q.v.*), lycanthropy (*q.v.*), disease, &c. The fear of evil spirits has given rise to ceremonies of expulsion of evils (see EXORCISM), designed to banish them from the community.

Animism and Religion.—Animism is commonly described as the most primitive form of religion; but properly speaking it is not a religion at all, for religion implies, at any rate, some form of emotion (see RELIGION), and animism is in the first instance an explanation of phenomena rather than an attitude of mind toward the cause of them, a philosophy rather than a religion. The term may, however, be conveniently used to describe the early stage of religion in which man endeavours to set up relations between himself and the unseen powers, conceived as spirits, but differing in many particulars from the gods of polytheism. As an example of this stage in one of its aspects may be taken the European belief in the corn spirit, which is, however, the object of magical rather than religious rites; Dr Frazer has thus defined the character of the animistic pantheon, " they are restricted in their operations to definite departments of nature; their names are general, not proper; their attributes are generic rather than individual; in other words, there is an indefinite number of spirits of each class, and the individuals of a class are much alike; they have no definitely marked individuality; no accepted traditions are current as to their origin, life and character." This stage of religion is well illustrated by the Red Indian custom of offering sacrifice to certain rocks, or whirlpools, or to the indwelling spirits connected with them; the rite is only performed in the neighbourhood of the object, it is an incident of a canoe or other voyage, and is not intended to secure any benefits beyond a safe passage past the object in question; the spirit to be propitiated has a purely local sphere of influence, and powers of a very limited nature. Animistic in many of their features too are the temporary gods of fetishism (*q.v.*), naguals or familiars, genii and even the dead who receive a cult. With the rise of a belief in departmental gods comes the age of polytheism; the belief in elemental spirits may still persist, but they fall into the background and receive no cult.

Animism and the Origin of Religion.—Two animistic theories of the origin of religion have been put forward, the one, often termed the " ghost theory," mainly associated with the name of Herbert Spencer, but also maintained by Grant Allen, refers the beginning of religion to the cult of dead human beings; the other, put forward by Dr E. B. Tylor, makes the foundation of all religion animistic, but recognizes the non-human character of polytheistic gods. Although ancestor-worship, or, more broadly, the cult of the dead, has in many cases overshadowed other cults or even extinguished them, we have no warrant, even in these cases, for asserting its priority, but rather the reverse; not only so, but in the majority of cases the pantheon is made up by a multitude of spirits in human, sometimes in animal form, which bear no signs of ever having been incarnate; sun gods and moon goddesses,

gods of fire, wind and water, gods of the sea, and above all gods of the sky, show no signs of having been ghost gods at any period in their history. They may, it is true, be associated with ghost gods, but in Australia it cannot even be asserted that the gods are spirits at all, much less that they are the spirits of dead men; they are simply magnified magicians, super-men who have never died; we have no ground, therefore, for regarding the cult of the dead as the origin of religion in this area; this conclusion is the more probable, as ancestor-worship and the cult of the dead generally cannot be said to exist in Australia.

The more general view that polytheistic and other gods are the elemental and other spirits of the later stages of animistic creeds, is equally inapplicable to Australia, where the belief seems to be neither animistic nor even animatistic in character. But we are hardly justified in arguing from the case of Australia to a general conclusion as to the origin of religious ideas in all other parts of the world. It is perhaps safest to say that the science of religions has no data on which to go, in formulating conclusions as to the original form of the objects of religious emotion; in this connexion it must be remembered that not only is it very difficult to get precise information of the subject of the religious ideas of people of low culture, perhaps for the simple reason that the ideas themselves are far from precise, but also that, as has been pointed out above, the conception of spiritual often approximates very closely to that of material. Where the soul is regarded as no more than a finer sort of matter, it will obviously be far from easy to decide whether the gods are spiritual or material. Even, therefore, if we can say that at the present day the gods are entirely spiritual, it is clearly possible to maintain that they have been spiritualized *pari passu* with the increasing importance of the animistic view of nature and of the greater prominence of eschatological beliefs. The animistic origin of religion is therefore not proven.

Animism and Mythology.—But little need be said on the relation of animism and mythology (*q.v.*). While a large part of mythology has an animistic basis, it is possible to believe, *e.g.* in a sky world, peopled by corporeal beings, as well as by spirits of the dead; the latter may even be entirely absent; the mythology of the Australians relates largely to corporeal, non-spiritual beings; stories of transformation, deluge and doom myths, or myths of the origin of death, have not necessarily any animistic basis. At the same time, with the rise of ideas as to a future life and spiritual beings, this field of mythology is immensely widened, though it cannot be said that a rich mythology is necessarily genetically associated with or combined with belief in many spiritual beings.

Animism in Philosophy.—The term "animism" has been applied to many different philosophical systems. It is used to describe Aristotle's view of the relation of soul and body held also by the Stoics and Scholastics. On the other hand monadology (Leibnitz) has also been termed animistic. The name is most commonly applied to vitalism, a view mainly associated with G. E. Stahl and revived by F. Bouillier (1813–1899), which makes life, or life and mind, the directive principle in evolution and growth, holding that all cannot be traced back to chemical and mechanical processes, but that there is a directive force which guides energy without altering its amount. An entirely different class of ideas, also termed animistic, is the belief in the world soul, held by Plato, Schelling and others.

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ANIMUCCIA, GIOVANNI, Italian musical composer, was born at Florence in the last years of the 15th century. At the request of St Filippo Neri he composed a number of *Laudi*, or hymns of praise, to be sung after sermon time, which have given him an accidental prominence in musical history, since their performance in St Filippo's Oratory eventually gave rise (on the disruption of 16th century schools of composition) to those early forms of "oratorio" that are not traceable to the Gregorian-polyphonic "Passions." St Filippo admired Animuccia so warmly that he declared he had seen the soul of his friend fly upwards towards heaven. In 1555 Animuccia was appointed *maestro di capella* at St Peter's, an office which he held until his death in 1571. He was succeeded by Palestrina, who had been his friend and probably his pupil. The manuscript of many of Animuccia's compositions is still preserved in the Vatican Library. His chief published works were *Madrigali e Motetti a quattro e cinque voci* (Ven. 1548) and *Il primo Libro di Messe* (Rom. 1567). From the latter Padre Martini has taken two specimens for his *Saggio di Contrapunto*. A mass from the *Primo Libro di Messe* on the *canto fermo* of the hymn *Conditor alme siderum* is published in modern notation in the *Anthologie des maîtres religieux primitifs* of the *Chanteurs de Saint Gervais*. It is solemn and noble in conception, and would be a great work but for a roughness which is more careless than archaic.

PAOLO ANIMUCCIA, a brother of Giovanni, was also celebrated as a composer; he is said by Fetis to have been *maestro di capella* at S. Giovanni in Laterano from the middle of January 1550 until 1552, and to have died in 1563.

ANISE (*Pimpinella Anisum*), an umbelliferous plant found in Egypt and the Levant, and cultivated on the continent of Europe for medicinal purposes. The officinal part of the plant is the fruit, which consists of two united carpels, called a cremocarp. It is known by the name of aniseed, and has a strong aromatic taste and a powerful odour. By distillation the fruit yields the volatile oil of anise, which is useful in the treatment of flatulence and colic in children. It may be given as *Aqua Anisi*, in doses of one or more ounces, or as the *Spiritus Anisi*, in doses of 5-20 minims. The main constituent of the oil (up to 90%) is anethol, $C_{10}H_{12}O$ or $C_6H_4[1\cdot4](OCH_3)(CH{:}CH{\cdot}CH_3)$. It also contains methyl chavicol, anisic aldehyde, anisic acid, and a terpene. Most of the oil of commerce, however, of which anethol is also the chief constituent, comes from *Illicium verum* (order *Magnoliaceae*, sub-order *Wintereae*), indigenous in N.E. China, the star-anise of *liqueur* makers. It receives its name from its flavour, and from its fruit spreading out like a star. The anise of the Bible (Matt. xxiii. 23) is *Anethum* or *Peucedanum graveolens*, *i.e.* dill (*q.v.*).

ANJAR, a fortified town of India, and the capital of a district of the same name in the native state of Cutch, in the presidency of Bombay. The country is dry and sandy, and entirely depends on well irrigation for its water supply. The town is situated nearly 10 miles from the Gulf of Cutch. It suffered severely from an earthquake in 1819, which destroyed a large number of houses, and occasioned the loss of several lives. In 1901 the population was 18,014. The town and district of Anjar were both ceded to the British in 1816, but in 1822 they were again transferred to the Cutch government in consideration of an annual money payment. Subsequently it was discovered that this obligation pressed heavily upon the resources of the native state, and in 1832 the pecuniary equivalent for Anjar, both prospectively and inclusive of the arrears which had accrued to that date, was wholly remitted by the British government.

ANJOU, the old name of a French territory, the political origin of which is traced to the ancient Gallic state of the *Andes*, on the lines of which was organized, after the conquest by Julius Caesar, the Roman *civitas* of the *Andecavi*. This was afterwards preserved as an administrative district under the Franks with the name first of *pagus*, then of *comitatus*, or countship of Anjou. This countship, the extent of which seems to have been practically identical with that of the ecclesiastical diocese of Angers, occupied the greater part of what is now the department of Maine-et-Loire, further embracing, to the north, Craon, Bazouges (Château-Gontier), Le Lude, and to the east, Château-la-Vallière and Bourgueil, while to the south, on the other hand, it included neither the present town of Montreuil-Bellay, nor Vihiers, Cholet, Beaupréau, nor the whole district lying to the west of the Ironne and Thouet, on the left bank of

the Loire, which formed the territory of the Mauges. It was bounded on the north by the countship of Maine, on the east by that of Touraine, on the south by that of Poitiers and by the Mauges, on the west by the countship of Nantes.

From the outset of the reign of Charles the Bald, the integrity of Anjou was seriously menaced by a two-fold danger: from Brittany and from Normandy. Lambert, a former count of Nantes, after devastating Anjou in concert with Nominoé, duke of Brittany, had by the end of the year 851 succeeded in occupying all the western part as far as the Mayenne. The principality, which he thus carved out for himself, was occupied, on his death, by Erispoé, duke of Brittany; by him it was handed down to his successors, in whose hands it remained till the beginning of the 10th century. All this time the Normans had not ceased ravaging the country; a brave man was needed to defend it, and finally towards 861, Charles the Bald entrusted it to Robert the Strong (*q.v.*), but he unfortunately met with his death in 866 in a battle against the Normans at Brissarthe. Hugh the Abbot succeeded him in the countship of Anjou as in most of his other duties, and on his death (886) it passed to Odo (*q.v.*), the eldest son of Robert the Strong, who, on his accession to the throne of France (888), probably handed it over to his brother Robert. In any case, during the last years of the 9th century, in Anjou as elsewhere the power was delegated to a viscount, Fulk the Red (mentioned under this title after 898), son of a certain Ingelgerius.

In the second quarter of the 10th century Fulk the Red had already usurped the title of count, which his descendants kept for three centuries. He was succeeded first by his son Fulk II. the Good (941 or 942–*c.* 960), and then by the son of the latter, Geoffrey I. *Grisegonelle* (Greytunic) (*c.* 960–21st of July 987), who inaugurated a policy of expansion, having as its objects the extension of the boundaries of the ancient countship and the reconquest of those parts of it which had been annexed by the neighbouring states; for, though western Anjou had been recovered from the dukes of Brittany since the beginning of the 10th century, in the east all the district of Saumur had already by that time fallen into the hands of the counts of Blois and Tours. Geoffrey Greytunic succeeded in making the count of Nantes his vassal, and in obtaining from the duke of Aquitaine the concession in fief of the district of Loudun. Moreover, in the wars of king Lothaire against the Normans and against the emperor Otto II. he distinguished himself by feats of arms which the epic poets were quick to celebrate. His son Fulk III. Nerra (*q.v.*) (21st of July 987–21st of June 1040) found himself confronted on his accession with a coalition of Odo I., count of Blois, and Conan I., count of Rennes. The latter having seized upon Nantes, of which the counts of Anjou held themselves to be suzerains, Fulk Nerra came and laid siege to it, routing Conan's army at Conquereuil (27th of June 992) and re-establishing Nantes under his own suzerainty. Then turning his attention to the count of Blois, he proceeded to establish a fortress at Langeais, a few miles from Tours, from which, thanks to the intervention of the king Hugh Capet, Odo failed to oust him. On the death of Odo I., Fulk seized Tours (996); but King Robert the Pious turned against him and took the town again (997). In 1016 a fresh struggle arose between Fulk and Odo II., the new count of Blois. Odo II. was utterly defeated at Pontlevoy (6th of July 1016), and a few years later, while Odo was besieging Montboyau, Fulk surprised and took Saumur (1026). Finally, the victory gained by Geoffrey Martel (*q.v.*) (21st of June 1040–14th of November 1060), the son and successor of Fulk, over Theobald III., count of Blois, at Nouy (21st of August 1044), assured to the Angevins the possession of the countship of Touraine. At the same time, continuing in this quarter also the work of his father (who in 1025 took prisoner Herbert Wake-Dog and only set him free on condition of his doing him homage), Geoffrey succeeded in reducing the countship of Maine to complete dependence on himself. During his father's life-time he had been beaten by Gervais, bishop of Le Mans (1038), but now (1047 or 1048) succeeded in taking the latter prisoner, for which he was excommunicated by Pope Leo IX. at the council of Reims (October 1049). In spite, however, of the concerted attacks of William the Bastard (the Conqueror), duke of Normandy, and Henry I., king of France, he was able in 1051 to force Maine to recognize his authority, though failing to revenge himself on William.

On the death of Geoffrey Martel (14th of November 1060) there was a dispute as to the succession. Geoffrey Martel, having no children, had bequeathed the countship to his eldest nephew, Geoffrey III. the Bearded, son of Geoffrey, count of Gâtinais, and of Ermengarde, daughter of Fulk Nerra. But Fulk le Réchin (the Cross-looking), brother of Geoffrey the Bearded, who had at first been contented with an appanage consisting of Saintonge and the *châtellenie* of Vihiers, having allowed Saintonge to be taken in 1062 by the duke of Aquitaine, took advantage of the general discontent aroused in the countship by the unskilful policy of Geoffrey to make himself master of Saumur (25th of February 1067) and Angers (4th of April), and cast Geoffrey into prison at Sablé. Compelled by the papal authority to release him after a short interval and to restore the countship to him, he soon renewed the struggle, beat Geoffrey near Brissac and shut him up in the castle of Chinon (1068). In order, however, to obtain his recognition as count, Fulk IV. Réchin (1068–14th of April 1109) had to carry on a long struggle with his barons, to cede Gâtinais to King Philip I., and to do homage to the count of Blois for Touraine. On the other hand, he was successful on the whole in pursuing the policy of Geoffrey Martel in Maine: after destroying La Flèche, by the peace of Blanchelande (1081), he received the homage of Robert "Courteheuse" ("Curthose"), son of William the Conqueror, for Maine. Later, he upheld Elias, lord of La Flèche, against William Rufus, king of England, and on the recognition of Elias as count of Maine in 1100, obtained for Fulk the Young, his son by Bertrade de Montfort, the hand of Eremburge, Elias's daughter and sole heiress.

Fulk V. the Young (14th of April 1109–1129) succeeded to the countship of Maine on the death of Elias (11th of July 1110); but this increase of Angevin territory came into such direct collision with the interests of Henry I., king of England, who was also duke of Normandy, that a struggle between the two powers became inevitable. In 1112 it broke out, and Fulk, being unable to prevent Henry I. from taking Alençon and making Robert, lord of Bellême, prisoner, was forced, at the treaty of Pierre Pecoulée, near Alençon (23rd of February 1113), to do homage to Henry for Maine. In revenge for this, while Louis VI. was overrunning the Vexin in 1118, he routed Henry's army at Alençon (November), and in May 1119 Henry demanded a peace, which was sealed in June by the marriage of his eldest son, William the Aetheling, with Matilda, Fulk's daughter. William the Aetheling having perished in the wreck of the "White Ship" (25th of November 1120), Fulk, on his return from a pilgrimage to the Holy Land (1120–1121), married his second daughter Sibyl, at the instigation of Louis VI., to William Clito, son of Robert Courteheuse, and a claimant to the duchy of Normandy, giving her Maine for a dowry (1122 or 1123). Henry I. managed to have the marriage annulled, on the plea of kinship between the parties (1123 or 1124). But in 1127 a new alliance was made, and on the 22nd of May at Rouen, Henry I. betrothed his daughter Matilda, widow of the emperor Henry V., to Geoffrey the Handsome, son of Fulk, the marriage being celebrated at Le Mans on the 2nd of June 1129. Shortly after, on the invitation of Baldwin II., king of Jerusalem, Fulk departed to the Holy Land for good, married Melisinda, Baldwin's daughter and heiress, and succeeded to the throne of Jerusalem (14th of September 1131). His eldest son, Geoffrey IV. the Handsome or "Plantagenet," succeeded him as count of Anjou (1129–7th of September 1151). From the first he tried to profit by his marriage, and after the death of Henry I. (1st of December 1135), laid the foundation of the conquest of Normandy by a series of campaigns: about the end of 1135 or the beginning of 1136 he entered that country and rejoined his wife, the countess Matilda, who had received the submission of Argentan, Domfront and Exmes. Having been abruptly recalled into Anjou by a revolt of his barons, he returned to the charge in September 1136 with a

strong army, including in its ranks William, duke of Aquitaine, Geoffrey, count of Vendôme, and William Talvas, count of Ponthieu, but after a few successes was wounded in the foot at the siege of Le Sap (October 1) and had to fall back. In May 1137 began a fresh campaign in which he devastated the district of Hiémois (round Exmes) and burnt Bazoches. In June 1138, with the aid of Robert of Gloucester, Geoffrey obtained the submission of Bayeux and Caen; in October he devastated the neighbourhood of Falaise; finally, in March 1141, on hearing of his wife's success in England, he again entered Normandy, when he made a triumphal procession through the country. Town after town surrendered: in 1141, Verneuil, Nonancourt, Lisieux, Falaise; in 1142, Mortain, Saint-Hilaire, Pontorson; in 1143, Avranches, Saint-Lô, Cérences, Coutances, Cherbourg; in the beginning of 1144 he entered Rouen, and on the 19th of January received the ducal crown in its cathedral. Finally, in 1149, after crushing a last attempt at revolt, he handed over the duchy to his son Henry "Curtmantel," who received the investiture at the hands of the king of France.

All the while that Fulk the Young and Geoffrey the Handsome were carrying on the work of extending the countship of Anjou, they did not neglect to strengthen their authority at home, to which the unruliness of the barons was a menace. As regards Fulk the Young we know only a few isolated facts and dates: about 1109 Doué and L'Île Bouchard were taken; in 1112 Brissac was besieged, and about the same time Eschivard of Preuilly subdued; in 1114 there was a general war against the barons who were in revolt, and in 1118 a fresh rising, which was put down after the siege of Montbazon; in 1123 the lord of Doué revolted, and in 1124 Montreuil-Bellay was taken after a siege of nine weeks. Geoffrey the Handsome, with his indefatigable energy, was eminently fitted to suppress the coalitions of his vassals, the most formidable of which was formed in 1129. Among those who revolted were Guy of Laval, Giraud of Montreuil-Bellay, the viscount of Thouars, the lords of Mirebeau, Amboise, Parthenay and Sablé. Geoffrey succeeded in beating them one after another, razed the keep of Thouars and occupied Mirebeau. Another rising was crushed in 1134 by the destruction of Candé and the taking of L'Île Bouchard. In 1136, while the count was in Normandy, Robert of Sablé put himself at the head of the movement, to which Geoffrey responded by destroying Briollay and occupying La Suze, and Robert of Sablé himself was forced to beg humbly for pardon through the intercession of the bishop of Angers. In 1139 Geoffrey took Mirebeau, and in 1142 Champtoceaux, but in 1145 a new revolt broke out, this time under the leadership of Elias, the count's own brother, who, again with the assistance of Robert of Sablé, laid claim to the countship of Maine. Geoffrey took Elias prisoner, forced Robert of Sablé to beat a retreat, and reduced the other barons to reason. In 1147 he destroyed Doué and Blaison. Finally in 1150 he was checked by the revolt of Giraud, lord of Montreuil-Bellay: for a year he besieged the place till it had to surrender; he then took Giraud prisoner and only released him on the mediation of the king of France.

Thus, on the death of Geoffrey the Handsome (7th of September 1151), his son Henry found himself heir to a great empire, strong and consolidated, to which his marriage with Eleanor of Aquitaine (May 1152) further added Aquitaine.

At length on the death of King Stephen, Henry was recognised as king of England (19th of December 1154). But then his brother Geoffrey, who had received as appanage the three fortresses of Chinon, Loudun and Mirebeau, tried to seize upon Anjou, on the pretext that, by the will of their father, Geoffrey the Handsome, all the paternal inheritance ought to descend to him, if Henry succeeded in obtaining possession of the maternal inheritance. On hearing of this, Henry, although he had sworn to observe this will, had himself released from his oath by the pope, and hurriedly marched against his brother, from whom in the beginning of 1156 he succeeded in taking Chinon and Mirebeau; and in July he forced Geoffrey to give up even his three fortresses in return for an annual pension. Henceforward Henry succeeded in keeping the countship of Anjou all his life; for though he granted it in 1168 to his son Henry "of the Short Mantle," when the latter became old enough to govern it, he absolutely refused to allow him to enjoy his power. After Henry II.'s death in 1189 the countship, together with the rest of his dominions, passed to his son Richard I. of England, but on the death of the latter in 1199, Arthur of Brittany (born in 1187) laid claim to the inheritance, which ought, according to him, to have fallen to his father Geoffrey, fourth son of Henry II., in accordance with the custom by which "the son of the eldest brother should succeed to his father's patrimony." He therefore set himself up in rivalry with John Lackland, youngest son of Henry II., and supported by Philip Augustus of France, and aided by William des Roches, seneschal of Anjou, he managed to enter Angers (18th of April 1199) and there have himself recognized as count of the three countships of Anjou, Maine and Touraine, for which he did homage to the king of France. King John soon regained the upper hand, for Philip Augustus having deserted Arthur by the treaty of Le Goulet (22nd of May 1200), John made his way into Anjou; and on the 18th of June 1200 was recognized as count at Angers. In 1202 he refused to do homage to Philip Augustus, who, in consequence, confiscated all his continental possessions, including Anjou, which was allotted by the king of France to Arthur. The defeat of the latter, who was taken prisoner at Mirebeau on the 1st of August 1202, seemed to ensure John's success, but he was abandoned by William des Roches, who in 1203 assisted Philip Augustus in subduing the whole of Anjou. A last effort on the part of John to possess himself of it, in 1214, led to the taking of Angers (17th of June), but broke down lamentably at the battle of La Roche-aux-Moines (2nd of July), and the countship was attached to the crown of France.

Shortly afterwards it was separated from it again, when in August 1246 King Louis IX. gave it as an appanage to his son Charles, count of Provence, soon to become king of Naples and Sicily (see NAPLES). Charles I. of Anjou, engrossed with his other dominions, gave little thought to Anjou, nor did his son Charles II. the Lame, who succeeded him on the 7th of January 1285. On the 16th of August 1290, the latter married his daughter Margaret to Charles of Valois, son of Philip III. the Bold, giving her Anjou and Maine for dowry, in exchange for the kingdoms of Aragon and Valentia and the countship of Barcelona given up by Charles. Charles of Valois at once entered into possession of the countship of Anjou, to which Philip IV. the Fair, in September 1297, attached a peerage of France. On the 16th of December 1325, Charles died, leaving Anjou to his eldest son Philip of Valois, on whose recognition as king of France (Philip VI.) on the 1st of April 1328, the countship of Anjou was again united to the crown. On the 17th of February 1332, Philip VI. bestowed it on his son John the Good, who, when he became king in turn (22nd of August 1350), gave the countship to his second son Louis I., raising it to a duchy in the peerage of France by letters patent of the 25th of October 1360. Louis I., who became in time count of Provence and king of Naples (see LOUIS I., king of Naples,) died in 1384, and was succeeded by his son Louis II., who devoted most of his energies to his kingdom of Naples, and left the administration of Anjou almost entirely in the hands of his wife, Yolande of Aragon. On his death (29th of April 1417) she took upon herself the guardianship of their young son Louis III., and in her capacity of regent defended the duchy against the English. Louis III., who also succeeded his father as king of Naples, died on the 15th of November 1434, leaving no children. The duchy of Anjou then passed to his cousin René, second son of Louis II. and Yolande of Aragon, and king of Naples and Sicily (see NAPLES).

Unlike his predecessors, who had rarely stayed long in Anjou, René from 1443 onwards paid long visits to it, and his court at Angers became one of the most brilliant in the kingdom of France. But after the sudden death of his son John in December 1470, René, for reasons which are not altogether clear, decided to move his residence to Provence and leave Anjou for good. After making an inventory of all his possessions, he left the duchy in October 1471, taking with him the most valuable of his

treasures. On the 22nd of July 1474 he drew up a will by which he divided the succession between his grandson René II. of Lorraine and his nephew Charles II., count of Maine. On hearing this, King Louis XI., who was the son of one of King René's sisters, seeing that his expectations were thus completely frustrated, seized the duchy of Anjou. He did not keep it very long, but became reconciled to René in 1476 and restored it to him, on condition, probably, that René should bequeath it to him. However that may be, on the death of the latter (10th of July 1480) he again added Anjou to the royal domain.

Later, King Francis I. again gave the duchy as an appanage to his mother, Louise of Savoy, by letters patent of the 4th of February 1515. On her death, in September 1531, the duchy returned into the king's possession. In 1552 it was given as an appanage by Henry II. to his son Henry of Valois, who, on becoming king in 1574, with the title of Henry III., conceded it to his brother Francis, duke of Alençon, at the treaty of Beaulieu near Loches (6th of May 1576). Francis died on the 10th of June 1584, and the vacant appanage definitively became part of the royal domain.

At first Anjou was included in the *gouvernement* (or military command) of Orléanais, but in the 17th century was made into a separate one. Saumur, however, and the Saumurois, for which King Henry IV. had in 1589 created an independent military governor-generalship in favour of Duplessis-Mornay, continued till the Revolution to form a separate *gouvernement*, which included, besides Anjou, portions of Poitou and Mirebalais. Attached to the *généralité* (administrative circumscription) of Tours, Anjou on the eve of the Revolution comprised five *élections* (judicial districts):—Angers, Beaugé, Saumur, Château-Gontier, Montreuil-Bellay and part of the *élections* of La Flèche and Richelieu. Financially it formed part of the so-called *pays de grande gabelle* (see GABELLE), and comprised sixteen special tribunals, or *greniers à sel* (salt warehouses):—Angers, Beaugé, Beaufort, Bourgueil, Candé, Château-Gontier, Cholet, Craon, La Flèche, Saint-Florent-le-Vieil, Ingrandes, Le Lude, Pouancé, Saint-Remy-la-Varenne, Richelieu, Saumur. From the point of view of purely judicial administration, Anjou was subject to the parlement of Paris; Angers was the seat of a presidial court, of which the jurisdiction comprised the *sénéchaussées* of Angers, Saumur, Beaugé, Beaufort and the duchy of Richelieu; there were besides presidial courts at Château-Gontier and La Flèche. When the Constituent Assembly, on the 26th of February 1790, decreed the division of France into departments, Anjou and the Saumurois, with the exception of certain territories, formed the department of Maine-et-Loire, as at present constituted.

AUTHORITIES.—(1) *Principal Sources*: The history of Anjou may be told partly with the aid of the chroniclers of the neighbouring provinces, especially those of Normandy (William of Poitiers, William of Jumièges, Ordericus Vitalis) and of Maine (especially *Actus pontificum Cenomannis in urbe degentium*). For the 10th, 11th and 12th centuries especially, there are some important texts dealing entirely with Anjou. The most important is the chronicle called *Gesta consulum Andegavorum*, of which only a poor edition exists (*Chroniques des comtes d'Anjou*, published by Marchegay and Salmon, with an introduction by E. Mabille, Paris, 1856–1871, collection of the *Société de l'histoire de France*). See also with reference to this text Louis Halphen, *Étude sur les chroniques des comtes d'Anjou et des seigneurs d'Amboise* (Paris, 1906). The above may be supplemented by some valuable annals published by Louis Halphen, *Recueil d'annales angevines et vendômoises* (Paris, 1903), (in the series *Collection de textes pour servir à l'étude et à l'enseignement de l'histoire*). For further details see Auguste Molinier, *Les Sources de l'histoire de France* (Paris, 1902), ii. 1276–1310, and the book of Louis Halphen mentioned below.

(2) *Works*: The *Art de vérifier les dates* contains a history of Anjou which is very much out of date, but has not been treated elsewhere as a whole. The 11th century only has been treated in detail by Louis Halphen, in *Le Comté d'Anjou au XIe siècle* (Paris, 1906), which has a preface with bibliography and an introduction dealing with the history of Anjou in the 10th century. For the 10th, 11th and 12th centuries, a good summary will be found in Kate Norgate, *England under the Angevin Kings* (2 vols., London, 1887). On René of Anjou, there is a book by A. Lecoy de la Marche, *Le Roi René* (2 vols., Paris, 1875). Lastly, the work of Célestin Port, *Dictionnaire historique, géographique et biographique de Maine-et-Loire* (3 vols., Paris and Angers, 1874–1878), and its small volume of *Préliminaires* (including a summary of the history of Anjou), contain, in addition to the biographies of the chief counts of Anjou, a mass of information concerning everything connected with Angevin history. (L. H.*)

ANKERITE, a member of the mineral group of rhombohedral carbonates. In composition it is closely related to dolomite, but differs from this in having magnesia replaced by varying amounts of ferrous and manganous oxides, the general formula being $Ca(Mg,Fe,Mn)(CO_3)_2$. Normal ankerite is $Ca_2MgFe(CO_3)_4$. The crystallographic and physical characters resemble those of dolomite and chalybite. The angle between the perfect rhombohedral cleavages is 73° 48′, the hardness 3½ to 4, and the specific gravity 2·9 to 3·1; but these will vary slightly with the chemical composition. The colour is white, grey or reddish.

Ankerite occurs with chalybite in deposits of iron-ore. It is one of the minerals of the dolomite-chalybite series, to which the terms brown-spar, pearl-spar and bitter-spar are loosely applied. It was first recognized as a distinct species by W. von Haidinger in 1825, and named by him after M. J. Anker of Styria. (L. J. S.)

ANKLAM, or ANCLAM, a town of Germany in the Prussian province of Pomerania, on the Peene, 5 m. from its mouth in the Kleines Haff, and 53 m. N.W. of Stettin, by the railway to Stralsund. Pop. (1900) 14,602. The fortifications of Anklam were dismantled in 1762 and have not since been restored, although the old walls are still standing; formerly, however, it was a town of considerable military importance, which suffered severely during the Thirty Years' and the Seven Years' Wars; and this fact, together with the repeated ravages of fire and of the plague, has made its history more eventful than is usually the case with towns of the same size. It does not possess any remarkable buildings, although it contains several, private as well as public, that are of a quaint and picturesque style of architecture. The church of St Mary (12th century) has a modern tower, 335 ft. high. The industries consist of iron-foundries and factories for sugar and soap; and there is a military school. The Peene is navigable up to the town, which has a considerable trade in its own manufactures, as well as in the produce of the surrounding country, while some shipbuilding is carried on in wharves on the river.

Anklam, formerly Tanglim, was originally a Slav fortress; it obtained civic rights in 1244 and joined the Hanseatic league. In 1648 it passed to Sweden, but in 1676 was retaken by Frederick William I. of Brandenburg, and after being plundered by the Russians in 1713 was ceded to Prussia by the peace of Stockholm in 1720.

ANKLE, or ANCLE (a word common, in various forms, to Teutonic languages, probably connected in origin with the Lat. *angulus*, or Gr. ἀγκύλος, bent), the joint which connects the foot with the leg (see JOINTS).

ANKOBER, a town in, and at one time capital of, the kingdom of Shoa, Abyssinia, 90 m. N.E. of Adis Ababa, in 9° 34′ N., 39° 54′ E., on a mountain about 8500 ft. above the sea. Ankober was made (*c.* 1890) by Menelek II. the place of detention of political prisoners. Pop. about 2000.

ANKYLOSIS, or ANCHYLOSIS (from Gr. ἀγκύλος, bent, crooked), a stiffness of a joint, the result of injury or disease. The rigidity may be complete or partial and may be due to inflammation of the tendinous or muscular structures outside the joint or of the tissues of the joint itself. When the structures outside the joint are affected, the term "false" ankylosis has been used in contradistinction to "true" ankylosis, in which the disease is within the joint. When inflammation has caused the joint-ends of the bones to be fused together the ankylosis is termed *osseous* or complete. Excision of a completely ankylosed shoulder or elbow may restore free mobility and usefulness to the limb. "Ankylosis" is also used as an anatomical term, bones being said to ankylose (or anchylose) when, from being originally distinct, they coalesce, or become so joined together that no motion can take place between them.

ANKYLOSTOMIASIS, or ANCHYLOSTOMIASIS (also called helminthiasis, "miners' anaemia," and in Germany *Wurmkrank-*

keit), a disease to which in recent years much attention has been paid, from its prevalence in the mining industry in England, France, Germany, Belgium, North Queensland and elsewhere. This disease (apparently known in Egypt even in very ancient times) caused a great mortality among the negroes in the West Indies towards the end of the 18th century; and through descriptions sent from Brazil and various other tropical and sub-tropical regions, it was subsequently identified, chiefly through the labours of Bilharz and Griesinger in Egypt (1854), as being due to the presence in the intestine of nematoid worms (*Ankylostoma duodenalis*) from one-third to half an inch long. The symptoms, as first observed among the negroes, were pain in the stomach, capricious appetite, pica (or dirt-eating), obstinate constipation followed by diarrhoea, palpitations, small and unsteady pulse, coldness of the skin, pallor of the skin and mucous membranes, diminution of the secretions, loss of strength and, in cases running a fatal course, dysentery, haemorrhages and dropsies. The parasites, which cling to the intestinal mucous membrane, draw their nourishment from the blood-vessels of their host, and as they are found in hundreds in the body after death, the disorders of digestion, the increasing anaemia and the consequent dropsies and other cachectic symptoms are easily explained. The disease was first known in Europe among the Italian workmen employed on the St Gotthard tunnel. In 1896, though previously unreported in Germany, 107 cases were registered there, and the number rose to 295 in 1900, and 1030 in 1901. In England an outbreak at the Dolcoath mine, Cornwall, in 1902, led to an investigation for the home office by Dr Haldane F.R.S. (see especially the Parliamentary Paper, numbered Cd. 1843), and since then discussions and inquiries have been frequent. A committee of the British Association in 1904 issued a valuable report on the subject. After the Spanish-American War American physicians had also given it their attention, with valuable results; see Stiles (*Hygienic Laboratory Bulletin*, No. 10, Washington, 1903). The American parasite described by Stiles, and called *Uncinaria americana* (whence the name Uncinariasis for this disease) differs slightly from the Ankylostoma. The parasites thrive in an environment of dirt, and the main lines of precaution are those dictated by sanitary science. Malefern, santonine, thymol and other anthelmintic remedies are prescribed.

ANNA, BALDASARRE, a painter who flourished during part of the 16th and 17th centuries. He was born at Venice, probably about 1560, and is said to have been of Flemish descent. The date of his death is uncertain, but he seems to have been alive in 1639. For a number of years he studied under Leonardo Corona, and on the death of that painter completed several works left unfinished by him. His own activity seems to have been confined to the production of pieces for several of the churches and a few private houses in Venice, and the old guide-books and descriptions of the city notice a considerable number of paintings by him. Scarcely any of these, however, have survived.

ANNA (Hindustani *ana*), an Indian penny, the sixteenth part of a rupee. The term belongs to the Mahommedan monetary system (see RUPEE). There is no coin of one anna, but there are half-annas of copper and two-anna pieces of silver. The term anna is frequently used to express a fraction. Thus an Anglo-Indian speaks of two annas of dark blood (an octoroon), a four-anna (quarter) crop, an eight-anna (half) gallop.

ANNA AMALIA (1739–1807), duchess of Saxe-Weimar, daughter of Charles I., duke of Brunswick-Wolfenbüttel, was born at Wolfenbüttel on the 24th of October 1739, and married Ernest, duke of Saxe-Weimar, 1756. Her husband died in 1758, leaving her regent for their infant son, Charles Augustus. During the protracted minority she administered the affairs of the duchy with the greatest prudence, strengthening its resources and improving its position in spite of the troubles of the Seven Years' War. She was a patroness of art and literature, and attracted to Weimar many of the most eminent men in Germany. Wieland was appointed tutor to her son; and the names of Herder, Goethe and Schiller shed an undying lustre on her court. In 1775 she retired into private life, her son having attained his majority. In 1788 she set out on a lengthened tour through Italy, accompanied by Goethe. She died on the 10th of April 1807. A memorial of the duchess is included in Goethe's works under the title *Zum Andenken der Fürstin Anna-Amalia*.

See F. Bornhak, *Anna Amalia Herzogin von Saxe-Weimar-Eisenach* (Berlin, 1892).

ANNABERG, a town of Germany, in the kingdom of Saxony, in the Erzgebirge, 1894 ft. above the sea, 6 m. from the Bohemian frontier, 18½ m. S. by E. from Chemnitz by rail. Pop. (1905) 16,811. It has three Evangelical churches, among them that of St Anne, built 1499–1525, a Roman Catholic church, several public monuments, among them those of Luther, of the famous arithmetician Adam Riese, and of Barbara Uttmann. Annaberg, together with the neighbouring suburb, Buchholz, is the chief seat of the braid and lace-making industry in Germany, introduced here by Barbara Uttmann in 1561, and further developed by Belgian refugees, who, driven from their country by the duke of Alva, settled here in 1590. The mining industry, for which the town was formerly also famous and which embraced tin, silver and cobalt, has now ceased. Annaberg has technical schools for lace-making, commerce and agriculture, in addition to high grade public schools for boys and girls.

ANNABERGITE, a mineral consisting of a hydrous nickel arsenate, $Ni_3(AsO_4)_2+8H_2O$, crystallizing in the monoclinic system and isomorphous with vivianite and erythrite. Crystals are minute and capillary and rarely met with, the mineral occurring usually as soft earthy masses and encrustations. A fine apple-green colour is its characteristic feature. It was long known (since 1758) under the name nickel-ochre; the name annabergite was proposed by H. J. Brooke and W. H. Miller in 1852, from Annaberg in Saxony, one of the localities of the mineral. It occurs with ores of nickel, of which it is a product of alteration. A variety, from Creetown in Kirkcudbrightshire, in which a portion of the nickel is replaced by calcium, has been called dudgeonite, after P. Dudgeon, who found it. (L. J. S.)

ANNA COMNENA, daughter of the emperor Alexius I. Comnenus, the first woman historian, was born on the 1st of December 1083. She was her father's favourite and was carefully trained in the study of poetry, science and Greek philosophy. But, though learned and studious, she was intriguing and ambitious, and ready to go to any lengths to gratify her longing for power. Having married an accomplished young nobleman, Nicephorus Bryennius, she united with the empress Irene in a vain attempt to prevail upon her father during his last illness to disinherit his son and give the crown to her husband. Still undeterred, she entered into a conspiracy to depose her brother after his accession; and when her husband refused to join in the enterprise, she exclaimed that "nature had mistaken their sexes, for he ought to have been the woman." The plot being discovered, Anna forfeited her property and fortune, though, by the clemency of her brother, she escaped with her life. Shortly afterwards, she retired into a convent and employed her leisure in writing the *Alexiad*—a history, in Greek, of her father's life and reign (1081–1118), supplementing the historical work of her husband. It is rather a family panegyric than a scientific history, in which the affection of the daughter and the vanity of the author stand out prominently. Trifling acts of her father are described at length in exaggerated terms, while little notice is taken of important constitutional matters. A determined opponent of the Latin church and an enthusiastic admirer of the Byzantine empire, Anna Comnena regards the Crusades as a danger both political and religious. Her models are Thucydides, Polybius and Xenophon, and her style exhibits the striving after Atticism characteristic of the period, with the result that the language is highly artificial. Her chronology especially is defective.

Editions in Bonn *Corpus Scriptorum Hist. Byz.*, by J. Schopen and A. Reifferscheid (1839–1878), with Du Cange's valuable commentary; and Teubner series, by A. Reifferscheid (1884). See also C. Krumbacher, *Geschichte der byzantinischen Literatur* (2nd ed. 1897); C. Neumann, *Griechische Geschichtschreiber im 12 Jahrhunderte* (1888); E. Oster, *Anna Komnena* (Rastatt, 1868–1871); Gibbon, *Decline and Fall*, ch. 48; Finlay, *Hist. of Greece*, iii. pp. 53. 128 (1877); P. Adam, *Princesses byzantines* (1893); Sir Walter Scott, *Count Robert of Paris*; L. du Sommerard, *Anne Comnène . . . Agnès de France* (1907); C. Diehl, *Figures byzantines* (1906).

ANNA LEOPOLDOVNA, sometimes called ANNA CARLOVNA (1718–1746), regent of Russia for a few months during the minority of her son Ivan, was the daughter of Catherine, sister of the empress Anne, and Charles Leopold, duke of Mecklenburg-Schwerin. In 1739 she married Anton Ulrich (d. 1775), son of Ferdinand Albert, duke of Brunswick, and their son Ivan was adopted in 1740 by the empress and proclaimed heir to the Russian throne. A few days after this proclamation the empress died, leaving directions regarding the succession, and appointing her favourite Ernest Biren, duke of Courland, as regent. Biren, however, had made himself an object of detestation to the Russian people, and Anna had little difficulty in overthrowing his power. She then assumed the regency, and took the title of grand-duchess, but she knew little of the character of the people with whom she had to deal, was utterly ignorant of the approved Russian mode of government, and speedily quarrelled with her principal supporters. In December 1741, Elizabeth, daughter of Peter the Great, who, from her habits, was a favourite with the soldiers, excited the guards to revolt, overcame the slight opposition that was offered, and was proclaimed empress. Ivan was thrown into prison, where he soon afterwards perished. Anna and her husband were banished to a small island in the river Dvina, where on the 18th of March 1746 she died in childbed.

ANNALISTS (from Lat. *annus*, year; hence *annales*, sc. *libri*, annual records), the name given to a class of writers on Roman history, the period of whose literary activity lasted from the time of the Second Punic War to that of Sulla. They wrote the history of Rome from the earliest times (in most cases) down to their own days, the events of which were treated in much greater detail. For the earlier period their authorities were state and family records—above all, the *annales maximi* (or *annales pontificum*), the official chronicle of Rome, in which the notable occurrences of each year from the foundation of the city were set down by the pontifex maximus. Although these annals were no doubt destroyed at the time of the burning of Rome by the Gauls, they were restored as far as possible and continued until the pontificate of P. Mucius Scaevola, by whom they were finally published in eighty books. Two generations of these annalists have been distinguished—an older and a younger. The older, which extends to 150 B.C., set forth, in bald, unattractive language, without any pretensions to style, but with a certain amount of trustworthiness, the most important events of each successive year. Cicero (*De Oratore*, ii. 12. 53), comparing these writers with the old Ionic logographers, says that they paid no attention to ornament, and considered the only merits of a writer to be intelligibility and conciseness. Their annals were a mere compilation of facts. The younger generation, in view of the requirements and criticism of a reading public, cultivated the art of composition and rhetorical embellishment. As a general rule the annalists wrote in a spirit of uncritical patriotism, which led them to minimize or gloss over such disasters as the conquest of Rome by Porsena and the compulsory payment of ransom to the Gauls, and to flatter the people by exaggerated accounts of Roman prowess, dressed up in fanciful language. At first they wrote in Greek, partly because a national style was not yet formed, and partly because Greek was the fashionable language amongst the educated, although Latin versions were probably published as well. The first of the annalists, the father of Roman history, as he has been called, was Q. FABIUS PICTOR (see FABIUS PICTOR); contemporary with him was L. CINCIUS ALIMENTUS, who flourished during the Hannibalic war.[1] Like Fabius Pictor, he wrote in Greek. He was taken prisoner by Hannibal (Livy xxi. 38), who is said to have given him details of the crossing of the Alps. His work embraced the history of Rome from its foundation down to his own days. With M. PORCIUS CATO (*q.v.*) historical composition in Latin began, and a livelier interest was awakened in the history of Rome. Among the principal writers of this class who succeeded Cato, the following may be mentioned. L. CASSIUS HEMINA (about 146), in the fourth book of his Annals, wrote on the Second Punic War. His researches went back to very early times; Pliny (*Nat. Hist.* xiii. 13 [27]) calls him *vetustissimus auctor annalium*. L. CALPURNIUS PISO, surnamed *Frugi* (see under PISO), wrote seven books of annals, relating the history of the city from its foundation down to his own times. Livy regards him as a less trustworthy authority than Fabius Pictor, and Niebuhr considers him the first to introduce systematic forgeries into Roman history. Q. CLAUDIUS QUADRIGARIUS (about 80 B.C.) wrote a history, in at least twenty-three books, which began with the conquest of Rome by the Gauls and went down to the death of Sulla or perhaps later. He was freely used by Livy in part of his work (from the sixth book onwards). A long fragment is preserved in Aulus Gellius (ix. 13), giving an account of the single combat between Manlius Torquatus and the Gaul. His language was antiquated and his style dry, but his work was considered important. VALERIUS ANTIAS, a younger contemporary of Quadrigarius, wrote the history of Rome from the earliest times, in a voluminous work consisting of seventy-five books. He is notorious for his wilful exaggeration, both in narrative and numerical statements. For instance, he asserts the number of the Sabine virgins to have been exactly 527; again, in a certain year when no Greek or Latin writers mention any important campaign, Antias speaks of a big battle with enormous casualties. Nevertheless, Livy at first made use of him as one of his chief authorities, until he became convinced of his untrustworthiness. C. LICINIUS MACER (died 66), who has been called the last of the annalists, wrote a voluminous work, which, although he paid great attention to the study of his authorities, was too rhetorical, and exaggerated the achievements of his own family. Having been convicted of extortion, he committed suicide (Cicero, *De Legibus*, i. 2, *Brutus*, 67; Plutarch, *Cicero*, 9).

The writers mentioned dealt with Roman history as a whole; some of the annalists, however, confined themselves to shorter periods. Thus, L. CAELIUS ANTIPATER (about 120) limited himself to the Second Punic War. His work was overloaded with rhetorical embellishment, which he was the first to introduce into Roman history. He was regarded as the most careful writer on the war with Hannibal, and one who did not allow himself to be blinded by partiality in considering the evidence of other writers (Cicero, *De Oratore*, ii. 12). Livy made great use of him in his third decade. SEMPRONIUS ASELLIO (about 100 B.C.), military tribune of Scipio Africanus at the siege of Numantia, composed *Rerum Gestarum Libri* in at least fourteen books. As he himself took part in the events he describes, his work was a kind of memoirs. He was the first of his class who endeavoured to trace the causes of events, instead of contenting himself with a bare statement of facts. L. CORNELIUS SISENNA (119–67), legate of Pompey in the war against the pirates, lost his life in an expedition against Crete. He wrote twenty-three books on the period between the Social War and the dictatorship of Sulla. His work was commended by Sallust (*Jugurtha*, 95), who, however, blames him for not speaking out sufficiently. Cicero remarks upon his fondness for archaisms (*Brutus*, 74. 259). Sisenna also translated the tales of Aristides of Miletus, and is supposed by some to have written a commentary on Plautus. The autobiography of Sulla may also be mentioned.

See C. W. Nitzsch, *Die römische Annalistik* (1873); H. Peter, *Zur Kritik der Quellen der älteren römischen Geschichte* (1879); L. O. Bröcker, *Moderne Quellenforscher und antike Geschichtschreiber* (1882); fragments in H. Peter, *Historicorum Romanorum Reliquiae* (1870, 1906), and *Historicorum Romanorum Fragmenta* (1883); also articles ROME, *History* (ancient) *ad fin.*, section "Authorities," and LIVY, where the use made of the annalists by the historian is discussed; Pauly-Wissowa, *Realencyclopädie*, art. "Annales"; the histories of Roman Literature by M. Schanz and Teuffel-Schwabe; Mommsen, *Hist. of Rome* (Eng. tr.), bk. ii. ch. 9, bk. iii. ch. 14, bk. iv. ch. 13, bk. v. ch. 12; C. Wachsmuth, *Einleitung in das Studium der alten Geschichte* (1895); H. Peter, bibliography of the subject in Bursian's *Jahresbericht*, cxxvi. (1906). (J. H. F.)

[1] He is not to be confused with L. Cincius, the author of various political and antiquarian treatises (*de Fastis*, *de Comitiis*, *de Priscis Verbis*), who lived in the Augustan age, to which period Mommsen, considering them a later fabrication, refers the Greek annals of L. Cincius Alimentus.

ANNALS (*Annales*, from *annus*, a year), a concise historical record in which events are arranged chronologically, year by year. The chief sources of information in regard to the annals of ancient Rome are two passages in Cicero (*De Oratore*, ii. 12. 52) and in Servius (*ad Aen.* i. 373) which have been the subject of much discussion. Cicero states that from the earliest period down to the pontificate of Publius Mucius Scaevola (*c.* 131 B.C.), it was usual for the pontifex maximus to record on a white tablet (*album*), which was exhibited in an open place at his house, so that the people might read it, first, the name of the consuls and other magistrates, and then the noteworthy events that had occurred during the year (*per singulos dies*, as Servius says). These records were called in Cicero's time the *Annales Maximi*. After the pontificate of Publius, the practice of compiling annals was carried on by various unofficial writers, of whom Cicero names Cato, Pictor and Piso. The *Annales* have been generally regarded as the same with the *Commentarii Pontificum* cited by Livy, but there seems reason to believe that the two were distinct, the *Commentarii* being fuller and more circumstantial. The nature of the distinction between annals and history is a subject that has received more attention from critics than its intrinsic importance deserves. The basis of discussion is furnished chiefly by the above-quoted passage from Cicero, and by the common division of the work of Tacitus into *Annales* and *Historiae*. Aulus Gellius, in the *Noctes Atticae* (v. 18), quotes the grammarian Verrius Flaccus, to the effect that history, according to its etymology (*ἱστορεῖν*, *inspicere*, to inquire in person), is a record of events that have come under the author's own observation, while annals are a record of the events of earlier times arranged according to years. This view of the distinction seems to be borne out by the division of the work of Tacitus into the *Historiae*, relating the events of his own time, and the *Annales*, containing the history of earlier periods. It is more than questionable, however, whether Tacitus himself divided his work under these titles. The probability is, either that he called the whole *Annales*, or that he used neither designation. (See TACITUS, CORNELIUS.)

In the middle ages, when the order of the liturgical feasts was partly determined by the date of Easter, the custom was early established in the Western Church of drawing up tables to indicate that date for a certain number of years or even centuries. These Paschal tables were thin books in which each annual date was separated from the next by a more or less considerable blank space. In these spaces certain monks briefly noted the important events of the year. It was at the end of the 7th century and among the Anglo-Saxons that the compiling of these Annals was first begun. Introduced by missionaries on the continent, they were re-copied, augmented and continued, especially in the kingdom of Austrasia. In the 9th century, during the great movement termed the Carolingian Renaissance, these Annals became the usual form of contemporary history; it suffices to mention the *Annales Einhardi*, the *Annales Laureshamenses* (or "of Lorsch"), and the *Annales S. Bertini*, officially compiled in order to preserve the memory of the more interesting acts of Charlemagne, his ancestors and his successors. Arrived at this stage of development, the Annals now began to lose their primitive character, and henceforward became more and more indistinguishable from the Chronicles.

In modern literature the title annals has been given to a large number of standard works which adhere more or less strictly to the order of years. The best known are the *Annales Ecclesiastici*, written by Cardinal Baronius as a rejoinder to and refutation of the *Historia ecclesiastica* or "Centuries" of the Protestant theologians of Magdeburg (12 vols., published at Rome from 1788 to 1793; Baronius's work stops at the year 1197). In the 19th century the annalistic form was once more employed, either to preserve year by year the memory of passing events (*Annual Register*, *Annuaire de la Revue des deux mondes*, &c.) or in writing the history of obscure medieval periods (*Jahrbücher der deutschen Geschichte*, *Jahrbücher des deutschen Reiches*, Richter's *Reichsannalen*, &c.). (C. B.*)

ANNAM, or ANAM, a country of south-eastern Asia, now forming a French protectorate, part of the peninsula of Indo-China. (See INDO-CHINA, FRENCH). It is bounded N. by Tongking, E. and S.E. by the China Sea, S.W. by Cochin-China, and W. by Cambodia and Laos. It comprises a sinuous strip of territory measuring between 750 and 800 m. in length, with an approximate area of 52,000 sq. m. The population is estimated at about 6,124,000

The country consists chiefly of a range of plateaus and wooded mountains, running north and south and declining on the coast to a narrow band of plain varying between 12 and 50 m. in breadth. The mountains are cut transversely by short narrow valleys, through which run rivers, most of which are dry in summer and torrential in winter. The Song-Ma and the Song-Ca in the north, and the Song-Ba, Don-Nai and Se-Bang-Khan in the south, are alone of any size. The chief harbour is that afforded by the bay of Tourane at the centre of the coast-line. South of this point the coast curves outwards and is broken by peninsulas and indentations; to the north it is concave and bordered in many places by dunes and lagoons.

Climate.—In Annam the rainy season begins during September and lasts for three or four months, corresponding with the north-east monsoon and also with a period of typhoons. During the rains the temperature varies from 59° or even lower to 75° F. June, July and August are the hottest months, the thermometer often reaching 85° or 90°, though the heat of the day is to some degree compensated by the freshness of the nights. The south-west monsoon which brings rain in Cochin-China coincides with the dry season in Annam, the reason probably being that the mountains and lofty plateaus separating the two countries retain the precipitation.

Ethnography.—The Annamese, or, to use the native term, the *Giao-chi*, are the predominant people not only in Annam but in the lowland and cultivated parts of Tongking and in Cochin-China and southern Cambodia. According to their own annals and traditions they once inhabited southern China, a theory which is confirmed by many of their habits and physical characteristics; the race has, however, been modified by crossings with the Chams and other of the previous inhabitants of Indo-China.

The Annamese is the worst-built and ugliest of all the Indo-Chinese who belong to the Mongolian race. He is scarcely of middle height and is shorter and less vigorous than his neighbours. His complexion is tawny, darker than that of the Chinese, but clearer than that of the Cambodian; his hair is black, coarse and long; his skin is thick; his forehead low; his skull slightly depressed at the top, but well developed at the sides. His face is flat, with highly protruding cheek-bones, and is lozenge-shaped or eurygnathous to a degree that is nowhere exceeded. His nose is not only the flattest, but also the smallest among the Indo-Chinese; his eyes are rarely oblique; his mouth is large and his lips thick; his teeth are blackened and his gums destroyed by the constant use of the betel-nut, the areca-nut and lime. His neck is short, his shoulders slope greatly, his body is thick-set and wanting in suppleness. Another peculiarity is a separation of the big toe from the rest, greater than is found in any other people, and sufficiently general and well marked to serve as an ethnographic test. The Annamese of Cochin-China are weaker and smaller than those of Tongking, probably as a result of living amid marshy rice-fields. The Annamese of both sexes wear wide trousers, a long, usually black tunic with narrow sleeves and a dark-coloured turban, or in the case of the lower classes, a wide straw hat; they either go bare-foot or wear sandals or Chinese boots. The typical Annamese dwelling is open to the gaze of the passer-by during the day; at night a sort of partition of bamboo is let down. The roof is supported on wooden pillars and walls are provided only at the sides. The house consists principally of one large room opening on the front verandah and containing the altar of the family's ancestors, a table in the centre and couches placed against the wall. The chief elements of the native diet are rice, fish and poultry; vegetables and pork are also eaten. The family is the base of the social system in Annam and is ruled by its head, who is also priest and judge.

Polygamy is permitted but rarely practised, and the wife enjoys a position of some freedom.

Though fond of ease the Annamese are more industrious than the neighbouring peoples. Theatrical and musical entertainments are popular among them. They show much outward respect for superiors and parents, but they are insincere and incapable of deep emotion. They cherish great love of their native soil and native village and cannot remain long from home. A proneness to gambling and opium-smoking, and a tinge of vanity and deceitfulness, are their less estimable traits. On the whole they are mild and easy-going and even apathetic, but the facility with which they learn is remarkable. Like their neighbours the Cambodians and the Chinese, the Annamese have a great respect for the dead, and ancestor worship constitutes the national religion. The learned hold the doctrine of Confucius, and Buddhism, alloyed with much popular superstition, has some influence. Like the Chinese the Annamese bury their dead.

Among the savage tribes of the interior there is scarcely any idea of God and their superstitious practices can scarcely be considered as the expression of a definite religious idea. Roman Catholics number about 420,000. In the midst of the Annamese live Cambodians and immigrant Chinese, the latter associated together according to the districts from which they come and carrying on nearly all the commerce of the country. In the forests and mountains dwell tribes of savages, chiefly of Indonesian origin, classed by the Annamese under the name *Moïs* or "savages." Some of these tribes show traces of Malay ancestry. Of greater historical interest are the Chams, who are to be found for the most part in southern Annam and in Cambodia, and who, judging from the numerous remains found there, appear to have been the masters of the coast region of Cochin-China and Annam till they succumbed before the pressure of the Khmers of Cambodia and the Annamese. They are taller, more muscular, and more supple than the Annamese. Their language is derived from Malay, and while some of the Chams are Mussulmans, the dominant religion is Brahmanism, and more especially the worship of Siva. Their women have a high reputation for virtue, which, combined with the general bright and honest character of the whole people, differentiates them from the surrounding nations.

Evidently derived from the Chinese, of which it appears to be a very ancient dialect, the Annamese language is composed of monosyllables, of slightly varied articulation, expressing different ideas according to the tone in which they are pronounced. It is quite impossible to connect with our musical system the utterance of the sounds of which the Chinese and Annamese languages are composed. What is understood by a" tone " in this language is distinguished in reality, not by the number of sonorous vibrations which belong to it, but rather by a use of the vocal apparatus special to each. Thus, the sense will to a native be completely changed according as the sound is the result of an aspiration or of a simple utterance of the voice. Thence the difficulty of substituting our phonetic alphabet for the ideographic characters of the Chinese, as well as for the ideophonetic writing partly borrowed by the Annamese from the letters of the celestial empire. To the Jesuit missionaries is due the introduction of an ingenious though very complicated system, which has caused remarkable progress to be made in the employment of phonetic characters. By means of six accents, one bar and a crotchet it is possible to note with sufficient precision the indications of tone without which the Annamese words have no sense for the natives.

Agriculture and other Industries.—The cultivation of rice, which is grown mainly in the small deltas along the coast and in some districts gives two crops annually, and fishing, together with fish-salting and the preparation of nuoc-mam, a sauce made from decaying fish, constitute the chief industries of Annam.

Silk spinning and weaving are carried on on antiquated lines, and silkworms are reared in a desultory fashion. Besides rice, the products of the country include tea, tobacco, cotton, cinnamon, precious woods and rubber; coffee, pepper, sugar-canes and jute are cultivated to a minor extent. The exports (total value in 1905 £237,010) comprise tea, raw silk and small quantities of cotton, rice and sugar-cane. The imports (£284,824 in 1905) include rice, iron goods, flour, wine, opium and cotton goods. There are coal-mines at Nong-Son, near Tourane, and gold, silver, lead, iron and other metals occur in the mountains. Trade, which is in the hands of the Chinese, is for the most part carried on by sea, the chief ports being Tourane and Qui-Nhon, which are open to European commerce.

Administration.—Annam is ruled in theory by its emperor, assisted by the "*comat*" or secret council, composed of the heads of the six ministerial departments of the interior, finance, war, ritual, justice and public works, who are nominated by himself. The resident superior, stationed at Hué, is the representative of France and the virtual ruler of the country. He presides over a council (*Conseil de Protectorat*) composed of the chiefs of the French services in Annam, together with two members of the "*comat*"; this body deliberates on questions of taxation affecting the budget of Annam and on local public works. A native governor (*tong-doc* or *tuan-phu*), assisted by a native staff, administers each of the provinces into which the country is divided, and native officials of lower rank govern the areas into which these provinces are subdivided. The governors take their orders from the imperial government, but they are under the eye of French residents. Native officials are appointed by the court, but the resident superior has power to annul an appointment. The mandarinate or official class is recruited from all ranks of the people by competitive examination. In the province of Tourane, a French tribunal alone exercises jurisdiction, but it administers native law where natives are concerned. Outside this territory the native tribunals survive. The Annamese village is self-governing. It has its council of notables, forming a sort of oligarchy which, through the medium of a mayor and two subordinates, directs the interior affairs of the community—policing, recruiting, the assignment and collection of taxes, &c.—and has judicial power in less important suits and crimes. More serious cases come within the purview of the *an-sat*, a judicial auxiliary of the governor. An assembly of notables from villages grouped together in a canton chooses a cantonal representative, who is the mouthpiece of the people and the intermediary between the government and its subjects. The direct taxes, which go to the local budget of Annam, consist primarily of a poll-tax levied on all males over eighteen and below sixty years of age, and of a land-tax levied according to the quality and the produce of the holding.

The following table summarizes the local budget of Annam for the years 1899 and 1904:—

—	*Receipts.*	*Expenditure.*
1899	£203,082 (direct taxes, £171,160)	£175,117
1904	£247,435 („ „ £219,841)	£232,480

In 1904 the sum allocated to the expenses of the court, the royal family and the native administration, the members of which are paid by the crown, was £85,000, the chief remaining heads of expenditure being the government house and residencies (£39,709), the native guard (£32,609) and public works (£24,898).

Education is available to every person in the community. The primary school, in which the pupils learn only Chinese writing and the precepts of Confucius, stands at the base of this system. Next above this is the school of the district capital, where a half-yearly examination takes place, by means of which are selected those eligible for the course of higher education given at the capital of the province in a school under the direction of a *doc-hoc*, or inspector of studies. Finally a great triennial competition decides the elections. The candidate whose work is notified as *très bien* is admitted to the examinations at Hué, which qualify for the title of doctor and the holding of administrative offices. The education of a mandarin includes local history, cognizance of the administrative rites, customs, laws and prescriptions of the country, the ethics of Confucius, the rules

of good breeding, the ceremonial of official and social life, and the practical acquirements necessary to the conduct of public or private business. Annamese learning goes no farther. It includes no scientific idea, no knowledge of the natural sciences, and neglects even the most rudimentary instruction conveyed in a European education. The complications of Chinese writing greatly hamper education. The Annamese mandarin must be acquainted with Chinese, since he writes in Chinese characters. But the character being ideographic, the words which express them are dissimilar in the two languages, and official text is read in Chinese by a Chinese, in Annamese by an Annamese.

The chief towns of Annam are Hué (pop. about 42,000), seat both of the French and native governments, Tourane (pop. about 4000), Phan-Thiet (pop. about 20,000) in the extreme south, Qui-Nhon, and Fai-Fo, a commercial centre to the south of Tourane. A road following the coast from Cochin-China to Tongking, and known as the "Mandarin road," passes through or near the chief towns of the provinces and forms the chief artery of communication in the country apart from the railways (see INDO-CHINA, FRENCH).

History.—The ancient tribe of the Giao-chi, who dwelt on the confines of S. China, and in what is now Tongking and northern Annam, are regarded by the Annamese as their ancestors, and tradition ascribes to their first rulers descent from the Chinese imperial family. These sovereigns were succeeded by another dynasty, under which, at the end of the 3rd century B.C., the Chinese invaded the country, and eventually established there a supremacy destined to last, with little intermission, till the 10th century A.D. In 968 Dinh-Bo-Lanh succeeded in ousting the Chinese and founded an independent dynasty of Dinh. Till this period the greater part of Annam had been occupied by the Chams, a nation of Hindu civilization, which has left many monuments to testify to its greatness, but the encroachment of the Annamese during the next six centuries at last left to it only a small territory in the south of the country. Three lines of sovereigns followed that of Dinh, under the last of which, about 1407, Annam again fell under the Chinese yoke. In 1428 an Annamese general Lê-Loi succeeded in freeing the country once more, and founded a dynasty which lasted till the end of the 18th century. During the greater part of this period, however, the titular sovereigns were mere puppets, the reality of power being in the hands of the family of Trinh in Tongking and that of Nguyen in southern Annam, which in 1568 became a separate principality under the name of Cochin-China. Towards the end of the 18th century a rebellion overthrew the Nguyen, but one of its members, Gia-long, by the aid of a French force, in 1801 acquired sway over the whole of Annam, Tongking and Cochin-China. This force was procured for him by Pigneau de Béhaine, bishop of Adran, who saw in the political condition of Annam a means of establishing French influence in Indo-China and counterbalancing the English power in India. Before this, in 1787, Gia-long had concluded a treaty with Louis XVI., whereby in return for a promise of aid he ceded Tourane and Pulo-Condore to the French. That treaty marks the beginning of French influence in Indo-China.

See also Legrand de la Liraye, *Notes historiques sur la nation annamite* (Paris, 1866?); C. Gosselin, *L'Empire d'Annam* (Paris, 1904); E. Sombsthay, *Cours de législation et d' administration annamites* (Paris, 1898).

ANNAN, a royal, municipal and police burgh of Dumfriesshire, Scotland, on the Annan, nearly 2 m. from its mouth, 15 m. from Dumfries by the Glasgow & South-Western railway. It has a station also on the Caledonian railway company's branch line from Kirtlebridge to Brayton (Cumberland), which crosses the Solway Firth at Seafield by a viaduct, 1¼ m. long, constructed of iron pillars girded together by poles, driven through the sand and gravel into the underlying bed of sandstone. Annan is a well-built town, red sandstone being the material mainly used. Among its public buildings is the excellent academy of which Thomas Carlyle was a pupil. The river Annan is crossed by a stone bridge of three arches dating from 1824, and by a railway bridge. The Harbour Trust, constituted in 1897, improved the shipping accommodation, and vessels of 300 tons approach close to the town. The principal industries include cotton and rope manufactures, bacon-curing, distilling, tanning, shipbuilding, sandstone quarrying, nursery-gardening and salmon-fishing. Large marine engineering works are in the vicinity. Annan is a burgh of considerable antiquity. Roman remains exist in the neighbourhood, and the Bruces, lords of Annandale, the Baliols, and the Douglases were more or less closely associated with it. During the period of the Border lawlessness the inhabitants suffered repeatedly at the hands of moss-troopers and through the feuds of rival families, in addition to the losses caused by the English and Scots wars. Edward Irving was a native of the town. With Dumfries, Kirkcudbright, Lochmaben and Sanquhar, Annan unites in sending one member to parliament. Annan Hill commands a beautiful prospect. Population (1901) 5805.

ANNA PERENNA, an old Roman deity of the circle or "ring" of the year, as the name (*per annum*) clearly indicates. Her festival fell on the full moon of the first month (March 15), and was held at the grove of the goddess at the first milestone on the Via Flaminia. It was much frequented by the city *plebs*, and Ovid describes vividly the revelry and licentiousness of the occasion (*Fasti*, iii. 523 foll.). From Macrobius we learn (*Sat.* i. 12. 6) that sacrifice was made to her "ut annare perannareque commode liceat," *i.e.* that the circle of the year may be completed happily. This is all we know for certain about the goddess and her cult; but the name naturally suggested myth-making, and Anna became a figure in stories which may be read in Ovid (*l.c.*) and in Silius Italicus (8.50 foll.). The coarse myth told by Ovid, in which Anna plays a trick on Mars when in love with Minerva, is probably an old Italian folk-tale, poetically applied to the persons of these deities when they became partially anthropomorphized under Greek influence. (W. W. F.*)

ANNAPOLIS, a city and seaport of Maryland, U.S.A., the capital of the state, the county seat of Anne Arundel county, and the seat of the United States Naval Academy; situated on the Severn river about 2 m. from its entrance into Chesapeake Bay, 26 m. S. by E. from Baltimore and about the same distance E. by N. from Washington. Pop. (1890) 7604; (1900) 8525, of whom 3002 were negroes; (1910 census) 8609. Annapolis is served by the Washington, Baltimore & Annapolis (electric) and the Maryland Electric railways, and by the Baltimore & Annapolis steamship line. On an elevation near the centre of the city stands the state house (the corner stone of which was laid in 1772), with its lofty white dome (200 ft.) and pillared portico. Close by are the state treasury building, erected late in the 17th century for the House of Delegates; Saint Anne's Protestant Episcopal church, in later colonial days a state church, a statue of Roger B. Taney (by W.H. Rinehart), and a statue of Baron Johann de Kalb. There are a number of residences of 18th century architecture, and the names of several of the streets—such as King George's, Prince George's, Hanover, and Duke of Gloucester—recall the colonial days. The United States Naval Academy was founded here in 1845. Annapolis is the seat of Saint John's College, a non-sectarian institution supported in part by the state; it was opened in 1789 as the successor of King William's School, which was founded by an act of the Maryland legislature in 1696 and was opened in 1701. Its principal building, McDowell Hall, was originally intended for a governor's mansion; although £4000 current money was appropriated for its erection in 1742, it was not completed until after the War of Independence. In 1907 the college became the school of arts and sciences of the university of Maryland.

Annapolis, at first called Providence, was settled in 1649 by Puritan exiles from Virginia. Later it bore in succession the names of Town at Proctor's, Town at the Severn, Anne Arundel Town, and finally in 1694, Annapolis, in honour of Princess Anne, who at the time was heir to the throne of Great Britain. In 1694 also, soon after the overthrow of the Catholic government of the lord proprietor, it was made the seat of the new government as well as a port of entry, and it has since remained the capital of Maryland; but it was not until 1708 that it was incorporated as a city. From the middle of the 18th century until the War of

Independence, Annapolis was noted for its wealthy and cultivated society. The *Maryland Gazette*, which became an important weekly journal, was founded by Jonas Green in 1745; in 1769 a theatre was opened; during this period also the commerce was considerable, but declined rapidly after Baltimore, in 1780, was made a port of entry, and now oyster-packing is the city's only important industry. Congress was in session in the state house here from the 26th of November 1783 to the 3rd of June 1784, and it was here on the 23rd of December 1783 that General Washington resigned his commission as commander-in-chief of the Continental Army. In 1786 a convention, to which delegates from all the states of the Union were invited, was called to meet in Annapolis to consider measures for the better regulation of commerce (see ALEXANDRIA, Va.); but delegates came from only five states (New York, Pennsylvania, Virginia, New Jersey, and Delaware), and the convention—known afterward as the "Annapolis Convention,"—without proceeding to the business for which it had met, passed a resolution calling for another convention to meet at Philadelphia in the following year to amend the articles of confederation; by this Philadelphia convention the present Constitution of the United States was framed.

See D. Ridgely, *Annals of Annapolis from 1649 until the War of 1812* (Baltimore, 1841); S. A. Shafer, "Annapolis, Ye Ancient City," in L. P. Powell's *Historic Towns of the Southern States* (New York, 1900); and W. Eddis, *Letters from America* (London, 1792).

ANNAPOLIS, a town of Nova Scotia, capital of Annapolis county and up to 1750 of the entire peninsula of Nova Scotia; situated on an arm of the Bay of Fundy, at the mouth of the Annapolis river, 95 m. W. of Halifax; and the terminus of the Windsor & Annapolis railway. Pop. (1901) 1019. It is one of the oldest settlements in North America, having been founded in 1604 by the French, who called it Port Royal. It was captured by the British in 1710, and ceded to them by the treaty of Utrecht in 1713, when the name was changed in honour of Queen Anne. It possesses a good harbour, and the beauty of the surrounding country makes it a favourite summer resort. The town is surrounded by apple orchards and in May miles of blossoming trees make a beautiful sight. The fruit, which is excellent in quality, is the principal export of the region.

ANN ARBOR, a city and the county-seat of Washtenaw county, Michigan, U.S.A., on the Huron river, about 38 m. W. of Detroit. Pop. (1890) 9431; (1900) 14,509, of whom 2329 were foreign-born; (1910) 14,817. It is served by the Michigan Central and the Ann Arbor railways, and by an electric line running from Detroit to Jackson and connecting with various other lines. Ann Arbor is best known as the seat of the university of Michigan, opened in 1837. The city has many attractive residences, and the residential districts, especially in the east and south-east parts of the city, command picturesque views of the Huron valley. Ann Arbor is situated in a productive agricultural and fruit-growing region. The river provides good water-power, and among the manufactures are agricultural implements, carriages, furniture (including sectional book-cases), pianos and organs, pottery and flour. In 1824 Ann Arbor was settled, laid out as a town, chosen for the county-seat, and named in honour of Mrs Ann Allen and Mrs Ann Rumsey, the wives of two of the founders. It was incorporated as a village in 1833, and was first chartered as a city in 1851.

ANNATES (Lat. *annatae*, from *annus*, "year"), also known as "first-fruits" (Lat. *primitiae*), in the strictest sense of the word, the whole of the first year's profits of a spiritual benefice which, in all countries of the Roman obedience, were formerly paid into the papal treasury. This custom was only of gradual growth. The *jus deportuum*, *annalia* or *annatae*, was originally the right of the bishop to claim the first year's profits of the living from a newly inducted incumbent, of which the first mention is found under Pope Honorius (d. 1227), but which had its origin in a custom, dating from the 6th century, by which those ordained to ecclesiastical offices paid a fee or tax to the ordaining bishop. The earliest records show the *annata* to have been, sometimes a privilege conceded to the bishop for a term of years, sometimes a right based on immemorial precedent. In course of time the popes, under stress of financial crises, claimed the privilege for themselves, though at first only temporarily. Thus, in 1305, Clement V. claimed the first-fruits of all vacant benefices in England, and in 1319 John XXII. those of all Christendom vacated within the next two years. In those cases the rights of the bishops were frankly usurped by the Holy See, now regarded as the ultimate source of the episcopal jurisdiction; the more usual custom was for the pope to claim the first-fruits only of those benefices of which he had reserved the patronage to himself. It was from these claims that the papal annates, in the strict sense, in course of time developed.

These annates may be divided broadly into three classes, though the chief features are common to all: (1) the *servitia communia* or *servitia Camerae Papae*, *i.e.* the payment into the papal treasury by every abbot and bishop, on his induction, of one year's revenue of his new benefice. The *servitia communia* are traceable to the *oblatio* paid to the pope when consecrating bishops as metropolitan or patriarch. When, in the middle of the 13th century, the consecration of bishops became established as the sole right of the pope, the oblations of all bishops of the West were received by him and, by the close of the 14th century, these became fixed at one year's revenue.[1] A small additional payment, as a kind of notarial fee, was added (*servitia minuta*). (2) The *jus deportuum*, *fructus medii temporis*, or *annalia*, *i.e.* the annates due to the bishop, but in the case of "reserved" benefices paid by him to the Holy See. (3) The *quindennia*, *i.e.* annates payable, under a bull of Paul II. (1469), by benefices attached to a corporation, every fifteen years and not at every presentation.

The system of annates was at no time worked with absolute uniformity and completeness throughout the various parts of the church owning obedience to the Holy See, and it was never willingly submitted to by the clergy. Disagreements and disputes were continual, and the easy expedient of rewarding the officials of the Curia and increasing the papal revenue by "reserving" more and more benefices was met by repeated protests, such as that of the bishops and barons of England (the chief sufferers), headed by Robert Grosseteste of Lincoln, at the council of Lyons in 1245.[2] The subject, indeed, frequently became one of national interest, on account of the alarming amount of specie which was thus drained away, and hence numerous enactments exist in regard to it by the various national governments. In England the collection and payment of annates to the pope was prohibited in 1531 by statute. At that time the sum amounted to about £3000 a year. In 1534 the annates were, along with the supremacy over the church in England, bestowed on the crown; but in February 1704 they were appropriated by Queen Anne to the assistance of the poorer clergy, and thus form what has since been known as "Queen Anne's Bounty" (*q.v.*). The amount to be paid was originally regulated by a valuation made under the direction of Pope Innocent IV. by Walter, bishop of Norwich, in 1254, later by one instituted under commission from Nicholas III. in 1292, which in turn was superseded in 1535 by the valuation, made by commissioners appointed by Henry VIII., known as the *King's Books*, which was confirmed on the accession of Elizabeth and is still that by which the clergy are rated. In France, in spite of royal edicts—like those of Charles VI., Charles VII., Louis XI., and Henry II.—and even denunciations of the Sorbonne, at least the custom of paying the *servitia communia* held its ground till the famous decree of the 4th of August during the Revolution of 1789. In Germany it was decided by the concordat of Constance, in 1418, that bishoprics and abbacies should pay the *servitia* according to the valuation of the Roman chancery in two half-yearly instalments. Those reserved benefices only were to pay the *annalia* which were rated above twenty-four gold florins; and as none were so rated, whatever their annual value may have been, the *annalia* fell into disuse. A

[1] For cases see du Cange, *Glossarium*, s. *Servitium Camerae Papae*; J. C. L. Gieseler, *Eccles. Hist.*, vol. iii. div. iii., notes to p. 181, &c. (Eng. trans., Edinburgh, 1853).

[2] Durandus (Guillaume Durand), in his *de modo generalis concilii celebrandi*, represents contemporary clerical hostile opinion and attacks the corruptions of the officials of the Curia.

similar convenient fiction also led to their practical abrogation in France, Spain and Belgium. The council of Basel (1431–1443) wished to abolish the *servitia*, but the concordat of Vienna (1448) confirmed the Constance decision, which, in spite of the efforts of the congress of Ems (1786) to alter it, still remains nominally in force. As a matter of fact, however, the revolution caused by the secularization of the ecclesiastical states in 1803 practically put an end to the system, and the *servitia* have either been commuted *via gratiae* to a moderate fixed sum under particular concordats, or are the subject of separate negotiation with each bishop on his appointment. In Prussia, where the bishops receive salaries as state officials, the payment is made by the government.

In Scotland *annat* or *ann* is half a year's stipend allowed by the Act 1672, *c.* 13, to the executors of a minister of the Church of Scotland above what was due to him at the time of his death. This is neither assignable by the clergyman during his life, nor can it be seized by his creditors.

ANNE (1665–1714), queen of Great Britain and Ireland, second daughter of James, duke of York, afterwards James II., and of Anne Hyde, daughter of the 1st earl of Clarendon, was born on the 6th of February 1665. She suffered as a child from an affection of the eyes, and was sent to France for medical treatment, residing with her grandmother, Henrietta Maria, and on the latter's death with her aunt, the duchess of Orleans, and returning to England in 1670. She was brought up, together with her sister Mary, by the direction of Charles II., as a strict Protestant, and as a child she made the friendship of Sarah Jennings (afterwards duchess of Marlborough), thus beginning life under the two influences which were to prove the most powerful in her future career. In 1678 she accompanied Mary of Modena to Holland, and in 1679 joined her parents abroad and afterwards in Scotland. On the 28th of July 1683 she married Prince George of Denmark, brother of King Christian V., an unpopular union because of the French proclivities of the bridegroom's country, but one of great domestic happiness, the prince and princess being conformable in temper and both preferring retirement and quiet to life in the great world. Sarah Churchill became Anne's lady of the bedchamber, and, by the latter's desire to mark their mutual intimacy and affection, all deference due to her rank was abandoned and the two ladies called each other Mrs Morley and Mrs Freeman.

On the 6th of February 1685 James became king of England. In 1687 a project of settling the crown on the princess, to the exclusion of Mary, on the condition of Anne's embracing Roman Catholicism, was rendered futile by her pronounced attachment to the Church of England, and beyond sending her books and papers James appears to have made no attempt to coerce his daughter into a change of faith,[1] and to have treated her with kindness, while the birth of his son on the 10th of June 1688 made the religion of his daughters a matter of less political importance. Anne was not present on the occasion, having gone to Bath, and this gave rise to a belief that the child was spurious; but it is most probable that James's desire to exclude all Protestants from affairs of state was the real cause. "I shall never now be satisfied," Anne wrote to Mary, "whether the child be true or false. It may be it is our brother, but God only knows . . . one cannot help having a thousand fears and melancholy thoughts, but whatever changes may happen you shall ever find me firm to my religion and faithfully yours."[2] In later years, however, she had no doubt that the Old Pretender was her brother. During the events immediately preceding the Revolution Anne kept in seclusion. Her ultimate conduct was probably influenced by the Churchills; and though forbidden by James to pay Mary a projected visit in the spring of 1688, she corresponded with her, and was no doubt aware of William's plans. Her position was now a very critical and painful one. She refused to show any sympathy with the king after William had landed in November, and wrote, with the advice of the Churchills, to the prince, declaring her approval of his action.[3] Churchill abandoned the king on the 24th, Prince George on the 25th, and when James returned to London on the 26th he found that Anne and her lady-in-waiting had during the previous night followed their husbands' examples. Escaping from Whitehall by a back staircase they put themselves under the care of the bishop of London, spent one night in his house, and subsequently arrived on the 1st of December at Nottingham, where the princess first made herself known and appointed a council. Thence she passed through Leicester, Coventry and Warwick, finally entering Oxford, where she met Prince George, in triumph, escorted by a large company. Like Mary, she was reproached for showing no concern at the news of the king's flight, but her justification was that "she never loved to do anything that looked like an affected constraint." She returned to London on the 19th of December, when she was at once visited by William. Subsequently the Declaration of Rights settled the succession of the crown upon her after William and Mary and their children.

Meanwhile Anne had suffered a series of maternal disappointments. Between 1684 and 1688 she had miscarried four times and given birth to two children who died infants. On the 24th of July 1689, however, the birth of a son, William, created duke of Gloucester, who survived his infancy, gave hopes that heirs to the throne under the Bill of Rights might be forthcoming. But Anne's happiness was soon troubled by quarrels with the king and queen. According to the duchess of Marlborough the two sisters, who had lived hitherto while apart on extremely affectionate terms, found no enjoyment in each other's society. Mary talked too much for Anne's comfort, and Anne too little for Mary's satisfaction. But money appears to have been the first and real cause of ill-feeling. The granting away by William of the private estate of James, amounting to £22,000 a year, to which Anne had some claim, was made a grievance, and a factious motion brought forward in the House to increase her civil list pension of £30,000, which she enjoyed in addition to £20,000 under her marriage settlement, greatly displeased William and Mary, who regarded it as a plot to make Anne independent and the chief of a separate interest in the state, while their resentment was increased by the refusal of Anne to restrain the action of her friends, and by its success. The Marlboroughs had been active in the affair and had benefited by it, the countess (as she then was) receiving a pension of £1000, and their conduct was noticed at court. The promised Garter was withheld from Marlborough, and the incensed "Mrs Morley" in her letters to "Mrs Freeman" styled the king "Caliban" or the "Dutch Monster." At the close of 1691 Anne had declared her approval of the naval expedition in favour of her father, and expressed grief at its failure.[4] According to the doubtful *Life of James*, she wrote to him on the 1st of December a "most penitential and dutiful" letter, and henceforward kept up with him a "fair correspondence."[5] The same year the breach between the royal sisters was made final by the dismissal of Marlborough, justly suspected of Jacobite intrigues, from all his appointments. Anne took the part of her favourites with great zeal against the court, though in all probability unaware of Marlborough's treason; and on the dismissal of the countess from her household by the king and queen she refused to part with her, and retired with Lady Marlborough to the duke of Somerset's residence at Sion House. Anne was now in disgrace. She was deprived of her guard of honour, and Prince George, on entering Kensington Palace, received no salute, though the drums beat loudly on his departure.[6] Instructions were given that the court expected no one to pay his respects, and no attention in the provinces was to be shown to their rank. In May, Marlborough was arrested on a charge of high treason which subsequently broke down, and Anne persisted in regarding his disgrace as a personal injury to herself. In August 1693, however,

[1] See also *Hist. MSS. Comm.*, *MSS. of Duke of Rutland at Belvoir*, ii. 109.

[2] Dalrymple's *Memoirs*, ii. 175.

[3] Dalrymple's *Memoirs*, ii. 249.

[4] Lord Ailesbury's *Memoirs*, 293.

[5] Macpherson i. 241; Clarke's *Life of James II.*, ii. 476. The letter, which is only printed in fragments, is not in Anne's style, and if genuine was probably dictated by the Churchills.

[6] Luttrell ii. 366, 376.

the two sisters were temporarily reconciled, and on the occasion of Mary's last illness and death Anne showed an affectionate consideration.

The death of Mary weakened William's position and made it necessary to cultivate good relations with the princess. She was now treated with every honour and civility, and finally established with her own court at St James's Palace. At the same time William kept her in the background and refrained from appointing her regent during his absence. In March 1695 Marlborough was allowed to kiss the king's hands, and subsequently was made the duke of Gloucester's governor and restored to his employments. In return Anne gave her support to William's government, though about this time, in 1696—according to James, in consequence of the near prospect of the throne—she wrote to her father asking for his leave to wear the crown at William's death, and promising its restoration at a convenient opportunity.[1] The unfounded rumour that William contemplated settling the succession after his death on James's son, provided he were educated a Protestant in England, may possibly have alarmed her.[2] Meanwhile, since the birth of the duke of Gloucester, the princess had experienced six more miscarriages, and had given birth to two children who only survived a few hours, and the last maternal hope flickered out on the death of the young prince on the 29th of July 1700. Henceforth Anne signs herself in her letters to Lady Marlborough as "your poor unfortunate" as well as "faithful Morley." In default of her own issue, Anne's personal choice would probably have inclined at this time to her own family at St Germains, but the necessity of maintaining the Protestant succession caused the enactment of the Act of Settlement in 1701, and the substitution of the Hanoverian branch. She wore mourning for her father in 1701, and before his death James is said to have written to his daughter asking for her protection for his family; but the recognition of his son by Louis XIV. as king of England effectually prevented any good offices to which her feelings might have inclined her.

On the 8th of March 1702 Anne became, by King William's death, queen of Great Britain, being crowned on the 23rd of April. Her reign was destined to be one of the most brilliant in the annals of England. Splendid military triumphs crushed the hereditary national foe. The Act of Union with Scotland constituted one of the strongest foundations of the future empire. Art and literature found a fresh renascence.

In her first speech to parliament, like George III. afterwards, Anne declared her "heart to be entirely English," words which were resented by some as a reflection on the late king. A ministry, mostly Tory, with Godolphin at its head, was established. She obtained a grant of £700,000 a year, and hastened to bestow a pension of £100,000 on her husband, whom she created generalissimo of her forces and lord high admiral, while Marlborough obtained the Garter, with the captain-generalship and other prizes, including a dukedom, and the duchess was made mistress of the robes with the control of the privy purse. The queen showed from the first a strong interest in church matters, and declared her intention to keep church appointments in her own hands. She detested equally Roman Catholics and dissenters, showed a strong leaning towards the high-church party, and gave zealous support to the bill forbidding occasional conformity. In 1704 she announced to the Commons her intention of granting to the church the crown revenues, amounting to about £16,000 or £17,000 a year, from tenths and first-fruits (paid originally by the clergy to the pope, but appropriated by the crown in 1534), for the increase of poor livings; her gift, under the name of "Queen Anne's Bounty," still remaining as a testimony of her piety. This devotion to the church, the strongest of all motives in Anne's conduct, dictated her hesitating attitude towards the two great parties in the state. The Tories had for this reason her personal preference, while the Whigs, who included her powerful favourites the Marlboroughs, identified their interests with the war and its glorious successes, the queen slowly and unwillingly, but inevitably, gravitating towards the latter.

In December, the archduke Charles visited Anne at Windsor and was welcomed as the king of Spain. In 1704 Anne acquiesced in the resignation of Lord Nottingham, the leader of the high Tory party. In the same year the great victory of Blenheim further consolidated the power of the Whigs and increased the influence of Marlborough, upon whom Anne now conferred the manor of Woodstock. Nevertheless, she declared in November to the duchess that whenever things leaned towards the Whigs, "I shall think the church is beginning to be in danger." Next year she supported the election of the Whig speaker, John Smith, but long resisted the influence and claims of the *Junto*, as the Whig leaders, Somers, Halifax, Orford, Wharton and Sunderland, were named. In October she was obliged to appoint Cowper, a Whig, lord chancellor, with all the ecclesiastical patronage belonging to the office. Marlborough's successive victories, and especially the factious conduct of the Tories, who in November 1705 moved in parliament that the electress Sophia should be invited to England, drove Anne farther to the side of the Whigs. But she opposed for some time the inclusion in the government of Sunderland, whom she especially disliked, only consenting at Marlborough's intercession in December 1706, when various other offices and rewards were bestowed upon Whigs, and Nottingham with other Tories was removed from the council. She yielded, after a struggle, also to the appointment of Whigs to bishoprics, the most mortifying submission of all. In 1708 she was forced to dismiss Harley, who, with the aid of Mrs Masham, had been intriguing against the government and projecting the creation of a third party. Abigail Hill, Mrs Masham, a cousin of the duchess of Marlborough, had been introduced by the latter as a poor relation into Anne's service, while still princess of Denmark. The queen found relief in the quiet and respectful demeanour of her attendant, and gradually came to prefer her society to that of the termagant and tempestuous duchess. Abigail, however, soon ventured to talk "business," and in the summer of 1707 the duchess discovered to her indignation that her protégée had already undermined her influence with the queen and had become the medium of Harley's intrigue. The strength of the Whigs at this time and the necessities of the war caused the retirement of Harley, but he remained Anne's secret adviser and supporter against the faction, urging upon her "the dangers to the crown as well as to the church and monarchy itself from their counsels and actions,"[3] while the duchess never regained her former influence. The inclusion in the cabinet of Somers, whom she especially disliked as the hostile critic of Prince George's admiralty administration, was the subject of another prolonged struggle, ending again in the queen's submission after a futile appeal to Marlborough in October 1708, to which she brought herself only to avoid a motion from the Whigs for the removal of the prince, then actually on his deathbed. His death on the 28th of October was felt deeply by the queen, and opened the way for the inclusion of more Whigs. But no reconciliation with the duchess took place, and in 1709 a further dispute led to an angry correspondence, the queen finally informing the duchess of the termination of their friendship, and the latter drawing up a long narrative of her services, which she forwarded to Anne together with suitable passages on the subject of friendship and charity transcribed from the Prayer Book, the *Whole Duty of Man* and from Jeremy Taylor.[4] Next year Anne's desire to give a regiment to Hill, Mrs Masham's brother, led to another ineffectual attempt in retaliation to displace the new favourite, and the queen showed her antagonism to the Whig administration on the occasion of the prosecution of Sacheverell. She was present at his trial and was publicly acclaimed by the mob as his supporter, while the Tory divine was consoled immediately on the expiration of his sentence with the living of St Andrew's, Holborn. Subsequently the duchess, in a final interview which she had forced upon the queen, found her tears and reproaches

[1] Macpherson i. 257; Clarke's *James II.*, ii. 559. See also Shrewsbury's anonymous correspondent in *Hist. MSS. Comm. Ser.; MSS. Duke of Buccleugh at Montagu House*, ii. 169.

[2] Macaulay iv. 799 *note*.

[3] Swift's *Mem. on the Change of the Ministry*.

[4] *Conduct of the Duchess of Marlborough*, p. 225.

unavailing. In her anger she had told the queen she wished for no answer, and she was now met by a stony and exasperating silence, broken only by the words constantly repeated, "You desired no answer and you shall have none."

The fall of the Whigs, now no longer necessary on account of the successful issue of the war, to accomplish which Harley had long been preparing and intriguing, followed; and their attempt to prolong hostilities from party motives failed. A friend of Harley, the duke of Shrewsbury, was first appointed to office, and subsequently the great body of the Whigs were displaced by Tories, Harley being made chancellor of the exchequer and Henry St John secretary of state. The queen was rejoiced at being freed from what she called a long captivity, and the new parliament was returned with a Tory majority. On the 17th of January 1711, in spite of Marlborough's efforts to ward off the blow, the duchess was compelled to give up her key of office. The queen was now able once more to indulge in her favourite patronage of the church, and by her influence an act was passed in 1712 for building fifty new churches in London. Later, in 1714, she approved of the Schism Bill. She gave strong support to Harley, now earl of Oxford and lord treasurer, in the intrigues and negotiations for peace. Owing to the alliance between the Tory Lord Nottingham and the Whigs, on the condition of the support by the latter of the bill against occasional conformity passed in December 1711, the defeated Whigs maintained a majority in the Lords, who declared against any peace which left Spain to the Bourbons. To break down this opposition Marlborough was dismissed on the 31st from all his employments, while the House of Lords was "swamped" by Anne's creation of twelve peers,[1] including Mrs Masham's husband. The queen's conduct was generally approved, for the nation was now violently adverse to the Whigs and war party; and the peace of Utrecht was finally signed on the 31st of March 1713, and proclaimed on the 5th of May in London.

As the queen's reign drew to its close, rumours were rife on the great subject of the succession to the throne. Various Jacobite appointments excited suspicion. Both Oxford and Bolingbroke were in communication with the Pretender's party, and on the 27th of July Oxford, who had gradually lost influence and quarrelled with Bolingbroke, resigned, leaving the supreme power in the hands of the latter. Anne herself had a natural feeling for her brother, and had shown great solicitude concerning his treatment when a price had been set on his head at the time of the Scottish expedition in 1708. On the 3rd of March 1714 James wrote to Anne, Oxford and Bolingbroke, urging the necessity of taking steps to secure his succession, and promising, on the condition of his recognition, to make no further attempts against the queen's government; and in April a report was circulated in Holland that Anne had secretly determined to associate James with her in the government. The wish expressed by the Whigs, that a member of the electoral family should be invited to England, had already aroused the queen's indignation in 1708; and now, in 1714, a writ of summons for the electoral prince as duke of Cambridge having been obtained, Anne forbade the Hanoverian envoy, Baron Schütz, her presence, and declared all who supported the project her enemies; while to a memorial on the same subject from the electress Sophia and her grandson in May, Anne replied in an angry letter, which is said to have caused the death of the electress on the 8th of June, requesting them not to trouble the peace of her realm or diminish her authority.

These demonstrations, however, were the outcome not of any returning partiality for her own family, but of her intense dislike, in which she resembled Queen Elizabeth, of any "successor," "it being a thing I cannot bear to have any successor here though but for a week"; and in spite of some appearances to the contrary, it is certain that religion and political wisdom kept Anne firm to the Protestant succession.[2] She had maintained a friendly correspondence with the court of Hanover since 1705, and in 1706 had bestowed the Garter on the electoral prince and created him duke of Cambridge; while the Regency Act provided for the declaration of the legal heir to the crown by the council immediately on the queen's death, and a further enactment naturalized the electress and her issue. In 1708, on the occasion of the Scottish expedition, notwithstanding her solicitude for his safety, she had styled James in her speech closing the session of parliament as "a popish pretender bred up in the principles of the most arbitrary government." The duchess of Marlborough stated in 1713 that all the time she had known "that thing" (as she now called the queen), "she had never heard her speak a favourable word of him."[3] No answer appears to have been sent to James's letter in 1714; on the contrary, a proclamation was issued (June 23) for his apprehension in case of his arrival in England. On the 27th of April Anne gave a solemn assurance of her fidelity to the Hanoverian succession to Sir William Dawes, archbishop of York; in June she sent Lord Clarendon to Hanover to satisfy the elector.

The sudden illness and death of the queen now frustrated any schemes which Bolingbroke or others might have been contemplating. On the 27th, the day of Oxford's resignation, the discussions concerning his successor detained the council sitting in the queen's presence till two o'clock in the morning, and on retiring Anne was instantly seized with fatal illness. Her adherence to William in 1688 had been a principal cause of the success of the Revolution, and now the final act of her life was to secure the Revolution settlement and the Protestant succession. During a last moment of returning consciousness, and by the advice of the whole council, who had been joined on their own initiative by the Whig dukes Argyll and Somerset, she placed the lord treasurer's staff in the hands of the Whig duke of Shrewsbury, and measures were immediately taken for assuring the succession of the elector. Her death took place on the 1st of August, and the security felt by the public, and perhaps the sense of perils escaped by the termination of the queen's life, were shown by a considerable rise in the national stocks. She was buried on the south side of Henry VII.'s chapel in Westminster Abbey, in the same tomb as her husband and children. The elector of Hanover, George Louis, son of the electress Sophia (daughter of Elizabeth, daughter of James I.), peacefully succeeded to the throne as George I. (*q.v.*).

According to her physician Arbuthnot, Anne's life was shortened by the "scene of contention among her servants. I believe sleep was never more welcome to a weary traveller than death was to her." By character and temperament unfitted to stand alone, her life had been unhappy and tragical from its isolation. Separated in early years from her parents and sister, her one great friendship had proved only baneful and ensnaring. Marriage had only brought a mournful series of infant funerals. Constant ill-health and suffering had darkened her career. The claims of family attachment, of religion, of duty, of patriotism and of interest, had dragged her in opposite directions, and her whole life had been a prey to jealousies and factions which closed around her at her accession to the throne, and surged to their height when she lay on her deathbed. The modern theory of the relations between the sovereign and the parties, by which the former identifies himself with the faction for the time in power while maintaining his detachment from all, had not then been invented; and Anne, like her Hanoverian successors, maintained the struggle, though without success, to rule independently, finding support in Harley. During the first year of her reign she made known that she was "resolved not to follow the example of her predecessor in making use of a few of her subjects to oppress the rest. She will be queen of all her subjects, and would have all the parties and distinctions of former reigns ended and buried in hers."[4] Her motive for getting rid of the Whigs was not any real dislike of their administration, but the wish to escape from the domination of the party,[5] and on the advent

[1] For their names see Hume and Smollett's *Hist.* (Hughes, 1854) viii. 110.

[2] See also *Hist. MSS. Comm. Ser.* Rep. vii. App. 246b.

[3] *Ibid. Portland MSS.* v. 338.

[4] Sir J. Leveson-Gower to Lord Rutland, *Hist. MSS. Comm., Duke of Rutland's MSS.* ii. 173.

[5] See Bolingbroke's *Letter to Sir W. Wyndham.*

to power of the Tories she carefully left some Whigs in their employments, with the aim of breaking up the party system and acting upon what was called "a moderate scheme." She attended debates in the Lords and endeavoured to influence votes. Her struggles to free herself from the influence of factions only involved her deeper; she was always under the domination of some person or some party, and she could not rise above them and show herself the leader of the nation like Elizabeth.

Anne was a women of small ability, of dull mind, and of that kind of obstinacy which accompanies weakness of character. According to the duchess she had "a certain knack of sticking to what had been dictated to her to a degree often very disagreeable, and without the least sign of understanding or judgment."[1] "I desire you would not have so ill an opinion of me," Anne writes to Oxford, "as to think when I have determined anything in my mind I will alter it."[2] Burnet considered that "she laid down the splendour of a court too much," which was "as it were abandoned." She dined alone after her husband's death, but it was reported by no means abstemiously, the royal family being characterized in the lines:—

"King William thinks all,
Queen Mary talks all,
Prince George drinks all,
And Princess Anne eats all."[3]

She took no interest in the art, the drama or the literature of her day. But she possessed the homely virtues; she was deeply religious, attached to the Church of England and concerned for the efficiency of the ministry. One of the first acts of her reign was a proclamation against vice, and Lord Chesterfield regretted the strict morality of her court. Instances abound of her kindness and consideration for others. Her moderation towards the Jacobites in Scotland, after the Pretender's expedition in 1708, was much praised by Saint Simon. She showed great forbearance and generosity towards the duchess of Marlborough in the face of unexampled provocation, and her character was unduly disparaged by the latter, who with her violent and coarse nature could not understand the queen's self-restraint in sorrow, and describes her as "very hard" and as "not apt to cry." According to her small ability she served the state well, and was zealous and conscientious in the fulfilment of public duties, in which may be included touching for the king's evil, which she revived. Marlborough testifies to her energy in finding money for the war. She surrendered £10,000 a year for public purposes, and in 1706 she presented £30,000 to the officers and soldiers who had lost their horses. Her contemporaries almost unanimously record her excellence and womanly virtues; and by Dean Swift, no mild critic, she is invariably spoken of with respect, and named in his will as of "ever glorious, immortal and truly pious memory, the real nursing-mother of her kingdoms." She deserves her appellation of "Good Queen Anne," and notwithstanding her failings must be included among the chief authors and upholders of the great Revolution settlement. Her person was described by Spanheim, the Prussian ambassador, as handsome though inclining to stoutness, with black hair, blue eyes and good features, and of grave aspect.

Anne's husband, Prince George (1653–1708), was the second son of Frederick III., king of Denmark. Before marrying Anne he had been a candidate for the throne of Poland. He was created earl of Kendal and duke of Cumberland in 1689. Some censure, which was directed against the prince in his capacity as lord high admiral, was terminated by his death. In religion George remained a Lutheran, and in general his qualities tended to make him a good husband rather than a soldier or a statesman.

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ANNE (1693–1740), empress of Russia, second daughter of Tsar Ivan V., Peter the Great's imbecile brother, and Praskovia Saltuikova. Her girlhood was passed at Ismailovo near Moscow, with her mother, an ignorant, bigoted tsaritsa of the old school, who neglected and even hated her daughters. Peter acted as a second father to the Ivanovs, as Praskovia and her family were called. In 1710 he married Anne to Frederick William, duke of Courland, who died of surfeit on his journey home from St Petersburg. The reluctant young widow was ordered to proceed on her way to Mittau to take over the government of Courland, with the Russian resident, Count Peter Bestuzhev, as her adviser. He was subsequently her lover, till supplanted by Biren (*q.v.*). Anne's residence at Mittau was embittered by the utter inadequacy of her revenue, which she keenly felt. It was therefore with joy that she at once accepted the Russian crown, as the next heir, after the death of Peter II. (January 30, 1730), when it was offered to her by the members of the supreme privy council, even going so far as to subscribe previously nine articles which would have reduced her from an absolute to a very limited monarch. On the 26th of February she made her public entry into Moscow under strict surveillance. On the 8th of March a *coup d'état*, engineered by a party of her personal friends, overthrew the supreme privy council and she was hailed as autocrat. Her government, on the whole, was prudent, beneficial and even glorious; but it was undoubtedly severe and became at last universally unpopular. This was due in the main to the outrageous insolence of her all-powerful favourite Biren, who hated the Russian nobility and trampled upon them mercilessly. Fortunately, Biren was sufficiently prudent not to meddle with foreign affairs or with the army, and these departments in the able hands of two other foreigners, who thoroughly identified themselves with Russia, Andrei Osterman (*q.v.*) and Burkhardt Münnich (*q.v.*) did great things in the reign of Anne. The chief political events of the period were the War of the Polish Succession and the second[4] Crimean War. The former was caused by the reappearance of Stanislaus Leszczynski as a candidate for the Polish throne after the death of Augustus II. (February 1, 1733). The interests of Russia would not permit her to recognize a candidate dependent directly on France and indirectly upon Sweden and Turkey, all three powers being at that time opposed to Russia's "system." She accordingly united with Austria to support the candidature of the late king's son, Augustus of Saxony. So far as Russia was concerned, the War of the Polish Succession was quickly over. Much more important was the Crimean War of 1736–39. This war marks the beginning of that systematic struggle on the part of Russia to recover her natural and legitimate southern boundaries. It lasted

[1] *Private Correspondence*, ii. 120.
[2] *Hist. MSS. Comm., MSS. of Marq. of Bath at Longleat*, i. 237.
[3] *Notes and Queries*, xi. 254.
[4] Vasily Golitsuin's expedition under the regency of Sophia was the first Crimean War (1687–89).

four years and a half, and cost her a hundred thousand men and millions of roubles; and though invariably successful, she had to be content with the acquisition of a single city (Azov) with a small district at the mouth of the Don. Yet more had been gained than was immediately apparent. In the first place, this was the only war hitherto waged by Russia against Turkey which had not ended in crushing disaster. Münnich had at least dissipated the illusion of Ottoman invincibility, and taught the Russian soldier that 100,000 janissaries and spahis were no match, in a fair field, for half that number of grenadiers and hussars. In the second place the Tatar hordes had been well nigh exterminated. In the third place Russia's signal and unexpected successes in the Steppe had immensely increased her prestige on the continent. "This court begins to have a great deal to say in the affairs of Europe," remarked the English minister, Sir Claudius Rondeau, a year later.

The last days of Anne were absorbed by the endeavour to strengthen the position of the heir to the throne, the baby cesarevich Ivan, afterwards Ivan VI., the son of the empress's niece, Anna Leopoldovna, against the superior claims of her cousin the cesarevna Elizabeth. The empress herself died three months later (28th of October 1740). Her last act was to appoint Biren regent during the infancy of her great-nephew.

Anne was a grim, sullen woman, frankly sensual, but as well-meaning as ignorance and vindictiveness would allow her to be. But she had much natural good sense, was a true friend and, in her more cheerful moments, an amiable companion. Lady Rondeau's portrait of the empress shows her to the best advantage. She is described as a large woman, towering above all the cavaliers of her court, but very well shaped for her size, easy and graceful in her person, of a majestic bearing, but with an awfulness in her countenance which revolted those who disliked her.

See R. Nisbet Bain, *The Pupils of Peter the Great* (London, 1897); *Letters from a lady who resided some years in Russia* (*i.e.* Lady Rondeau) (London, 1775); Christoph Hermann Manstein, *Mémoires sur la Russie* (Amsterdam, 1771; English edition, London, 1856); Gerhard Anton von Halem, *Lebensschreibung des Feldm. B. C. Grafen von Münnich* (Oldenburg, 1803); Claudius Rondeau, *Diplomatic Despatches from Russia, 1728–1739* (St Petersburg, 1889–1892). (R. N. B.)

ANNE OF BRITTANY (1477–1514), daughter of Francis II., duke of Brittany, and Marguerite de Foix. She was scarcely twelve years old when she succeeded her father as duchess on the 9th of September 1488. Charles VIII. aimed at establishing his authority over her; Alain d'Albret wished to marry her; Jean de Rohan claimed the duchy; and her guardian, the marshal de Rieux, was soon in open revolt against his sovereign. In 1489 the French army invaded Brittany. In order to protect her independence, Anne concluded an alliance with Maximilian of Austria, and soon married him by proxy (December 1489). But Maximilian was incapable of defending her, and in 1491 the young duchess found herself compelled to treat with Charles VIII. and to marry him. The two sovereigns made a reciprocal arrangement as to their rights and pretensions to the crown of Brittany, but in the event of Charles predeceasing her, Anne undertook to marry the heir to the throne. Nevertheless, in 1492, after the conspiracy of Jean de Rohan, who had endeavoured to hand over the duchy to the king of England, Charles VIII. confirmed the privileges of Brittany, and in particular guaranteed to the Bretons the right of paying only those taxes to which the assembly of estates consented. After the death of Charles VIII. in 1498, without any children, Anne exercised the sovereignty in Brittany, and in January 1499 she married Louis XII., who had just repudiated Joan of France. The marriage contract was ostensibly directed in favour of the independence of Brittany, for it declared that Brittany should revert to the second son or to the eldest daughter of the two sovereigns, and, failing issue, to the natural heirs of the duchess. Until her death Anne occupied herself personally with the administration of the duchy. In 1504 she caused the treaty of Blois to be concluded, which assured the hand of her daughter, Claude of France, to Charles of Austria (the future emperor, Charles V.), and promised him the possession of Brittany, Burgundy and the county of Blois. But this unpopular treaty was broken, and the queen had to consent to the betrothal of Claude to Francis of Angoulême, who in 1515 became king of France as Francis I. Thus the definitive reunion of Brittany and France was prepared.

See A. de la Borderie, *Choix de documents inédits sur le règne de la duchesse Anne en Bretagne* (Rennes, 1866 and 1902)—extracts from the *Mémoires de la Société Archéologique du département d'Ille-et-Vilaine*, vols. iv. and vi. (1866 and 1868); Leroux de Lincy, *Vie de la reine Anne de Bretagne* (1860–1861); A. Dupuy, *La Réunion de la Bretagne à la France* (1880); A. de la Borderie, *La Bretagne aux derniers siècles du moyen âge* (1893), and *La Bretagne aux temps modernes* (1894). (H. Sz.)

ANNE OF CLEVES (1515–1557), fourth wife of Henry VIII., king of England, daughter of John, duke of Cleves, and Mary, only daughter of William, duke of Juliers, was born on the 22nd of September 1515. Her father was the leader of the German Protestants, and the princess, after the death of Jane Seymour, was regarded by Cromwell as a suitable wife for Henry VIII. She had been brought up in a narrow retirement, could speak no language but her own, had no looks, no accomplishments and no dowry, her only recommendations being her proficiency in needlework, and her meek and gentle temper. Nevertheless her picture, painted by Holbein by the king's command (now in the Louvre, a modern copy at Windsor), pleased Henry and the marriage was arranged, the treaty being signed on the 24th of September 1539. The princess landed at Deal on the 27th of December; Henry met her at Rochester on the 1st of January 1540, and was so much abashed at her appearance as to forget to present the gift he had brought for her, but nevertheless controlled himself sufficiently to treat her with courtesy. The next day he expressed openly his dissatisfaction at her looks; "she was no better than a Flanders mare." The attempt to prove a pre-contract with the son of the duke of Lorraine broke down, and Henry was forced to resign himself to the sacrifice. On the wedding morning, however, the 6th of January 1540, he declared that no earthly thing would have induced him to marry her but the fear of driving the duke of Cleves into the arms of the emperor. Shortly afterwards Henry had reason to regret the policy which had identified him so closely with the German Protestantism, and denied reconciliation with the emperor. Cromwell's fall was the result, and the chief obstacle to the repudiation of his wife being thus removed, Henry declared the marriage had not been and could not be consummated; and did not scruple to cast doubts on his wife's honour. On the 9th of July the marriage was declared null and void by convocation, and an act of parliament to the same effect was passed immediately. Henry soon afterwards married Catherine Howard. On first hearing of the king's intentions, Anne swooned away, but on recovering, while declaring her case a very hard and sorrowful one from the great love which she bore to the king, acquiesced quietly in the arrangements made for her by Henry, by which she received lands to the value of £4000 a year, renounced the title of queen for that of the king's sister, and undertook not to leave the kingdom. In a letter to her brother, drawn up by Gardiner by the king's direction, she acknowledged the unreality of the marriage and the king's kindness and generosity. Anne spent the rest of her life happily in England at Richmond or Bletchingley, occasionally visiting the court, and being described as joyous as ever, and wearing new dresses every day! An attempt to procure her reinstalment on the disgrace of Catherine Howard failed, and there was no foundation for the report that she had given birth to a child of which Henry was the reputed father. She was present at the marriage of Henry with Catherine Parr and at the coronation of Mary. She died on the 28th of July 1557 at Chelsea, and was buried in Westminster Abbey.

See *Lives of the Queens of England*, by A. Strickland, iii. (1851); *The Wives of Henry VIII.*, by M. Hume (1905); *Henry VIII.*, by A. F. Pollard (1905); *Four Original Documents relating to the Marriage of Henry VIII. to Anne of Cleves*, ed. by E. and G. Goldsmid (1886); for the pseudo Anne of Cleves see *Allgemeine deutsche Biographie*, i. 467. (P. C. Y.)

ANNE OF DENMARK (1574–1619), queen of James I. of England and VI. of Scotland, daughter of King Frederick II. of Denmark and Norway and of Sophia, daughter of Ulric III., duke of Mecklenburg, was born on the 12th of December 1574. On the 20th of August 1589, in spite of Queen Elizabeth's opposition,

she was married by proxy to King James, without dower, the alliance, however, settling definitely the Scottish claims to the Orkney and Shetland Islands. Her voyage to Scotland was interrupted by a violent storm—for the raising of which several Danish and Scottish witches were burned or executed—which drove her on the coast of Norway, whither the impatient James came to meet her, the marriage taking place at Opslo (now Christiania) on the 23rd of November. The royal couple, after visiting Denmark, arrived in Scotland in May 1590. The position of queen consort to a Scottish king was a difficult and perilous one, and Anne was attacked in connexion with various scandals and deeds of violence, her share in which, however, is supported by no evidence. The birth of an heir to the throne (Prince Henry) in 1594 strengthened her position and influence; but the young prince, much to her indignation, was immediately withdrawn from her care and entrusted to the keeping of the earl and countess of Mar at Stirling Castle; in 1595 James gave a written command, forbidding them in case of his death to give up the prince to the queen till he reached the age of eighteen. The king's intention was, no doubt, to secure himself and the prince against the unruly nobles, though the queen's Roman Catholic tendencies were probably another reason for his decision. Brought up a Lutheran, and fond of pleasure, she had shown no liking for Scottish Calvinism, and soon incurred rebukes on account of her religion, "vanity," absence from church, "night waking and balling." She had become secretly inclined to Roman Catholicism, and attended mass with the king's connivance. On the death of Queen Elizabeth, on the 24th of March 1603, James preceded her to London. Anne took advantage of his absence to demand possession of the prince, and, on the "flat refusal" of the countess of Mar, fell into a passion, the violence of which occasioned a miscarriage and endangered her life. In June she followed the king to England (after distributing all her effects in Edinburgh among her ladies) with the prince and the coffin containing the body of her dead infant, and reached Windsor on the 2nd of July, where amidst other forms of good fortune she entered into the possession of Queen Elizabeth's 6000 dresses.

On the 24th of July Anne was crowned with the king, when her refusal to take the sacrament according to the Anglican use created some sensation. She communicated on one occasion subsequently and attended Anglican service occasionally; but she received consecrated objects from Pope Clement VIII., continued to hear mass, and, according to Galluzzi, supported the schemes for the conversion of the prince of Wales and of England, and for the prince's marriage with a Roman Catholic princess, which collapsed on his death in 1612. She was claimed as a convert by the Jesuits.[1] Nevertheless on her deathbed, when she was attended by the archbishop of Canterbury and the bishop of London, she used expressions which were construed as a declaration of Protestantism. Notwithstanding religious differences she lived in great harmony and affection with the king, latterly, however, residing mostly apart. She helped to raise Buckingham to power in the place of Somerset, maintained friendly relations with him, and approved of his guidance and control of the king. In spite of her birth and family she was at first favourably inclined to Spain, disapproved of her daughter Elizabeth's marriage with the elector palatine, and supported the Spanish marriages for her sons, but subsequently veered round towards France. She used all her influence in favour of the unfortunate Raleigh, answering his petition to her for protection with a personal letter of appeal to Buckingham to save his life. "She carrieth no sway in state matters," however, it was said of her in 1605, "and, *praeter rem uxoriam*, hath no great reach in other affairs." "She does not mix herself up in affairs, though the king tells her anything she chooses to ask, and loves and esteems her."[2] Her interest in state matters was only occasional, and secondary to the pre-occupations of court festivities, masks, progresses, dresses, jewels, which she much enjoyed; the court being, says Wilson—whose severity cannot entirely suppress his admiration—"a continued maskarado, where she and her ladies, like so many nymphs or Nereides, appeared . . . to the ravishment of the beholders," and "made the night more glorious than the day." Occasionally she even joined in the king's sports, though here her only recorded exploit was her accidental shooting of James's "most principal and special hound," Jewel. Her extravagant expenditure, returned by Salisbury in 1605 at more than £50,000 and by Chamberlain at her death at more than £84,000, was unfavourably contrasted with the economy of Queen Elizabeth; in spite of large allowances and grants of estates which included Oatlands, Greenwich House and Nonsuch, it greatly exceeded her income, her debts in 1616 being reckoned at nearly £10,000, while her jewelry and her plate were valued at her death at nearly half a million. Anne died after a long illness on the 2nd of March 1619, and was buried in Westminster Abbey. She was generally regretted. The severe Wilson, while rebuking her gaieties, allows that she was "a good woman," and that her character would stand the most prying investigation. She was intelligent and tactful, a faithful wife, a devoted mother and a staunch friend. Besides several children who died in infancy she had Henry, prince of Wales, who died in 1612, Charles, afterwards King Charles I., and Elizabeth, electress palatine and queen of Bohemia.

[1] *Fasti S. J.*, by P. Joannis Drews (pub. 1723), p. 160.
[2] *Cal. of St. Pap.—Venetian*, x. 513.

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(P. C. Y.)

ANNE OF FRANCE (1460–1522), dame de Beaujeu, was the eldest daughter of Louis XI. and Charlotte of Savoy. Louis XI. betrothed her at first to Nicholas of Anjou, and afterwards offered her hand successively to Charles the Bold, to the duke of Brittany, and even to his own brother, Charles of France. Finally she married Pierre de Beaujeu, a younger brother of the duke of Bourbon. Before his death Louis XI. entrusted to Pierre de Beaujeu and Anne the entire charge of his son, Charles VIII., a lad of thirteen; and from 1483 to 1492 the Beaujeus exercised a virtual regency. Anne was a true daughter of Louis XI. Energetic, obstinate, cunning and unscrupulous, she inherited, too, her father's avarice and rapacity. Although they made some concessions, the Beaujeus succeeded in maintaining the results of the previous reign, and in triumphing over the feudal intrigues and coalitions, as was seen from the meeting of the estates general in 1484, and the results of the "Mad War" (1485) and the war with Brittany (1488); and in spite of the efforts of Maximilian of Austria they concluded the marriage of Charles VIII. and Anne, duchess of Brittany (1491). But a short time afterwards the king disengaged himself completely from their tutelage, to the great detriment of the kingdom. In 1488 Pierre de Beaujeu had succeeded to the Bourbonnais, the last great fief of France. He died in 1503, but Anne survived him twenty years. From her establishments at Moulins and Chantelle in the Bourbonnais she continued henceforth vigorously to defend the Bourbon cause against the royal family. Anne's only daughter, Suzanne, had married in 1505 her cousin, Charles of Bourbon, count of Montpensier, the future constable; and the question of the succession of Suzanne, who died in 1521, was the determining factor of the treason of the constable de Bourbon (1523). Anne had died some months before, on the 14th of November 1522.

See P. Pelicier, *Essai sur le gouvernement de la Dame de Beaujeu* (Chartres, 1882).

(J. I.)

ANNEALING, HARDENING AND TEMPERING. Annealing (from the prefix *an*, and the old English *ælan*, to burn or bake; the meaning has probably also been modified from the French *nieler*, to enamel black on gold or silver, from the med. Lat. *nigellare*, to make black; cf. *niello*) is a process of treating a metal or alloy by heat with the object of imparting to it a certain condition of ductility, extensibility, or a certain grade of softness or hardness, with all that is involved in and follows from those

conditions. The effect may be mechanical only, or a chemical change may take place also. Sometimes the causes are obvious, in other cases they are more or less obscure. But of the actual facts, and the immense importance of this operation as well as of the related ones of tempering and hardening in shop processes, there is no question.

When the treatment is of a mechanical character only, there can be no reasonable doubt that the common belief is correct, namely, that the metallic crystals or fibres undergo a molecular rearrangement of some kind. When it is of a chemical character, the process is one of cementation, due to the occlusion of gases in the molecules of the metals.

Numerous examples of annealing due to molecular rearrangement might be selected from the extensive range of workshop operations. The following are a few only:—when a boiler-maker bends the edges of a plate of steel or iron by hammer blows (flanging), he does so in successive stages (heats), at each of which the plate has to be reheated, with inevitable cooling down during the time work is being done upon it. The result is that the plate becomes brittle over the parts which have been subjected to this treatment; and this brittleness is not uniformly distributed, but is localized, and is a source of weakness, inducing a liability to crack. If, however, the plate when finished is raised to a full red heat, and allowed to cool down away from access of cool air, as in a furnace, or underneath wood ashes, it resumes its old ductility. The plate has been annealed, and is as safe as it was before it was flanged. Again, when a sheet of thin metal is forced to assume a shape very widely different from its original plane aspect, as by hammering, or by drawing out in a press—a cartridge case being a familiar example—it is necessary to anneal it several times during the progress of the operation. Without such annealing it would never arrive at the final stage desired, but would become torn asunder by the extension of its metallic fibres. Cutting tools are made of steel having sufficient carbon to afford capacity for hardening. Before the process is performed, the condition in which the carbon is present renders the steel so hard and tough as to render the preliminary turning or shaping necessary in many cases (*e.g.* in milling cutters) a tedious operation. To lessen this labour, the steel is first annealed. In this case it is brought to a low red heat, and allowed to cool away from the air. It can then be machined with comparative ease and be subsequently hardened or tempered. When a metallic structure has endured long service a state of fatigue results. Annealing is, where practicable, resorted to in order to restore the original strength. A familiar illustration is that of chains which are specially liable to succumb to constant overstrain if continued for only a year or two. This is so well known that the practice is regularly adopted of annealing the chains at regular intervals. They are put into a clear hot furnace and raised to a low red heat, continued for a few hours, and then allowed to cool down in the furnace after the withdrawal of the source of heat. Before the annealing the fracture of a link would be more crystalline than afterwards.

In these examples, and others of which these are typical, two conditions are essential, one being the grade of temperature, the other the cooling. The temperature must never be so high as to cause the metal to become overheated, with risk of burning, nor so low as to prevent the penetration of the substance with a good volume of heat. It must also be continued for sufficient time. More than this cannot be said. Each particular piece of work requires its own treatment and period, and nothing but experience of similar work will help the craftsman. The cooling must always be gradual, such as that which results from removing the source of heat, as by drawing a furnace fire, or covering with non-conducting substances.

The chemical kind of annealing is specifically that employed in the manufacture of malleable cast iron. In this process, castings are made of white iron,—a brittle quality which has its carbon wholly in the combined state. These castings, when subjected to heat for a period of ten days or a fortnight, in closed boxes, in the presence of substances containing oxygen, become highly ductile. This change is due to the absorption of the carbon by the oxygen in the cementing material, a comparatively pure soft iron being left behind. The result is that the originally hard, brittle castings after this treatment may be cut with a knife, and be bent double and twisted into spirals without fracturing.

The distinction between *hardening* and *tempering* is one of degree only, and both are of an opposite character to annealing. Hardening, in the shop sense, signifies the making of a piece of steel about as hard as it can be made—"glass hard"—while tempering indicates some stage in an infinite range between the fully hardened and the annealed or softened condition. As a matter of convenience only, hardening is usually a stage in the work of tempering. It is easier to harden first, and "let down" to the temper required, than to secure the exact heat for tempering by raising the material to it. This is partly due to the long established practice of estimating temperature by colour tints; but this is being rapidly invaded by new methods in which the temper heat is obtained in furnaces provided with pyrometers, by means of which exact heat regulation is readily secured, and in which the heating up is done gradually. Such furnaces are used for hardening balls for bearings, cams, small toothed wheels and similar work, as well as for tempering springs, milling cutters and other kinds of cutting tools. But for the cutting tools having single edges, as used in engineers' shops, the colour test is still generally retained.

In the practice of hardening and tempering tools by colour, experience is the only safe guide. Colour tints vary with degrees of light; steels of different brands require different treatment in regard to temperature and quenching; and steels even of identical chemical composition do not always behave alike when tempered. Every fresh brand of steel has, therefore, to be treated at first in a tentative and experimental fashion in order to secure the best possible results. The larger the masses of steel, and the greater the disparity in dimensions of adjacent parts, the greater is the risk of cracking and distortion. Excessive length and the presence of keen angles increase the difficulties of hardening. The following points have to be observed in the work of hardening and tempering.

A grade of steel must be selected of suitable quality for the purpose for which it has to be used. There are a number of such grades, ranging from about 1½ to ½ % content of carbon, and each having its special utility. Overheating must be avoided, as that burns the steel and injures or ruins it. A safe rule is never to heat any grade of steel to a temperature higher than that at which experience proves it will take the temper required. Heating must be regular and thorough throughout, and must therefore be slowly done when dealing with thick masses. Contact with sulphurous fuel must be avoided. Baths of molten alloys of lead and tin are used when very exact temperatures are required, and when articles have thick and thin parts adjacent. But the gas furnaces have the same advantages in a more handy form. Quenching is done in water, oil, or in various hardening mixtures, and sometimes in solids. Rain water is the principal hardening agent, but various saline compounds are often added to intensify its action. Water that has been long in use is preferred to fresh. Water is generally used cold, but in many cases it is warmed to about 80° F., as for milling cutters and taps, warmed water being less liable to crack the cutters than cold. Oil is preferred to water for small springs, for guns and for many cutters. Mercury hardens most intensely, because it does not evaporate, and so does lead or wax for the same reason; water evaporates, and in the spheroidal state, as steam, leaves contact with the steel. This is the reason why long and large objects are moved vertically about in the water during quenching, to bring them into contact with fresh cold water.

There is a good deal of mystery affected by many of the hardeners, who are very particular about the composition of their baths, various oils and salts being used in an infinity of combinations. Many of these are the result of long and successful experience, some are of the nature of "fads." A change of bath may involve injury to the steel. The most difficult articles to

harden are springs, milling cutters, taps, reamers. It would be easy to give scores of hardening compositions.

Hardening is performed the more efficiently the more rapidly the quenching is done. In the case of thick objects, however, especially milling cutters, there is risk of cracking, due to the difference of temperature on the outside and in the central body of metal. Rapid hardening is impracticable in such objects. This is the cause of the distortion of long taps and reamers, and of their cracking, and explains why their teeth are often protected with soft soap and other substances.

The presence of the body of heat in a tool is taken advantage of in the work of tempering. The tool, say a chisel, is dipped, a length of 2 in. or more being thus hardened and blackened. It is then removed, and a small area rubbed rapidly with a bit of grindstone, observations being made of the changing tints which gradually appear as the heat is communicated from the hot shank to the cooled end. The heat becomes equalized, and at the same time the approximate temperature for quenching for temper is estimated by the appearance of a certain tint; at that instant the article is plunged and allowed to remain until quite cold. For every different class of tool a different tint is required.

" Blazing off " is a particular method of hardening applied to small springs. The springs are heated and plunged in oils, fats, or tallow, which is burned off previous to cooling in air, or in the ashes of the forge, or in oil, or water usually. They are hardened, reheated and tempered, and the tempering by blazing off is repeated for heavy springs. The practice varies almost infinitely with dimensions, quality of steel, and purpose to which the springs have to be applied.

The range of temper for most cutting tools lies between a pale straw or yellow, and a light purple or plum colour. The corresponding range of temperatures is about 430° F. to 530° F., respectively. " Spring temper " is higher, from dark purple to blue, or 550° F. to 630° F. In many fine tools the range of temperature possible between good and poor results lies within from 5° to 10° F.

There is another kind of hardening which is of a superficial character only—" case hardening." It is employed in cases where toughness has to be combined with durability of surface. It is a cementation process, practised on wrought iron and mild steel, and applied to the link motions of engines, to many pins and studs, eyes of levers, &c. The articles are hermetically luted in an iron box, packed with nitrogenous and saline substances such as potash, bone dust, leather cuttings, and salt. The box is placed in a furnace, and allowed to remain for periods of from twelve to thirty-six hours, during which period the surface of the metal, to a depth of $\frac{1}{8}\frac{1}{2}$ to $\frac{1}{16}$ in., is penetrated by the cementing materials, and converted into steel. The work is then thrown into water and quenched.

A muffle furnace, employed for annealing, hardening and tempering is shown in fig. 1; the heat being obtained by means

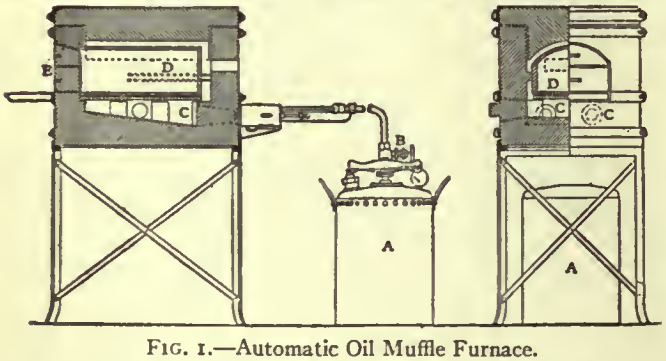


FIG. 1.—Automatic Oil Muffle Furnace.

of petroleum, which is contained in the tank A, and is kept under pressure by pumping at intervals with the wooden handle, so that when the valve B is opened the oil is vaporized by passing through a heating coil at the furnace entrance, and when ignited burns fiercely as a gas flame. This passes into the furnace through the two holes, C, C, and plays under and up around the muffle D, standing on a fireclay slab. The doorway is closed by two fireclay blocks at E. A temperature of over 2000° F. can be obtained in furnaces of this class, and the heat is of course under perfect control.

A reverberatory type of gas furnace, shown in fig. 2, differs from the oil furnace in having the flames brought down through the roof, by pipes A,A,A, playing on work laid on the fireclay slab B, thence passing under this and out through the elbow-

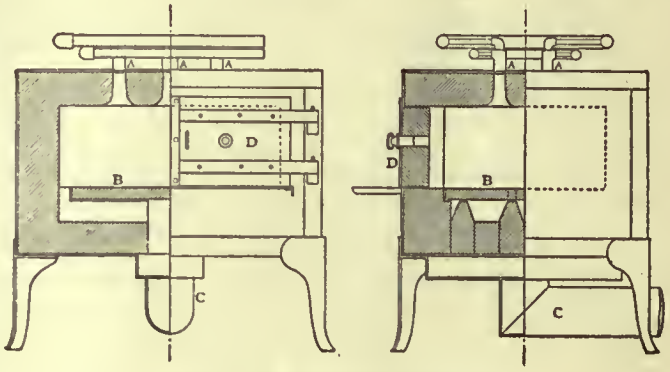


FIG. 2.—Reverberatory Furnace.

pipe C. The hinged doors, D, give a full opening to the interior of the furnace. It will be noticed in both these furnaces (by Messrs Fletcher, Russell & Co., Ltd.) that the iron casing is a mere shell, enclosing very thick firebrick linings, to retain the heat effectively. (J. G. H.)

ANNECY, the chief town of the department of Haute Savoie in France. Pop. (1906) 10,763. It is situated at a height of 1470 ft., at the northern end of the lake of Annecy, and is 25 m. by rail N.E. of Aix les Bains. The surrounding country presents many scenes of beauty. The town itself is a pleasant residence, and contains a 16th century cathedral church, an 18th century bishop's palace, a 14th–16th century castle (formerly the residence of the counts of the Genevois), and the reconstructed convent of the Visitation, wherein now reposes the body of St François de Sales (born at the castle of Sales, close by, in 1567; died at Lyons in 1622), who held the see from 1602 to 1622. There is also a public library, with 20,000 volumes, and various scientific collections, and a public garden, with a statue of the chemist Berthollet (1748–1822), who was born not far off. The bishop's see of Geneva was transferred hither in 1535, after the Reformation, but suppressed in 1801, though revived in 1822. There are factories of linen and cotton goods, and of felt hats, paper mills, and a celebrated bell foundry at Annecy le Vieux. This last-named place existed in Roman times. Annecy itself was in the 10th century the capital of the counts of the Genevois, from whom it passed in 1401 to the counts of Savoy, and became French in 1860 on the annexation of Savoy.

The LAKE OF ANNECY is about 9 m. in length by 2 m. in breadth, its surface being 1465 ft. above the level of the sea. It discharges its waters, by means of the Thioux canal, into the Fier, a tributary of the Rhone. (W. A. B. C.)

ANNELIDA, a name derived from J. B. P. Lamarck's term *Annélides*, now used to denote a major phylum or division of coelomate invertebrate animals. Annelids are segmented worms, and differ from the Arthropoda (*q.v.*), which they closely resemble in many respects, by the possession of a portion of the coelom traversed by the alimentary canal. In the latter respect, and in the fact that they frequently develop by a metamorphosis, they approach the Mollusca (*q.v.*), but they differ from that group notably in the occurrence of metameric segmentation affecting many of the systems of organs. The body-wall is highly muscular and, except in a few probably specialized cases, possesses chitinous spines, the setae, which are secreted by the ectoderm and are embedded in pits of the skin. They possess a modified anterior end, frequently with special sense organs, forming a head, a segmented nervous system, consisting of a pair of anterior, dorsally-placed ganglia, a ring surrounding the

alimentary canal, and a double ventral ganglionated chain, a definite vascular system, an excretory system consisting of nephridia, and paired generative organs formed from the coelomic epithelium. They are divided as follows: (1) Haplodrili (*q.v.*) or Archiannelida; (2) Chaetopoda (*q.v.*); (3) Myzostomida (*q.v.*), probably degenerate Polychaeta; (4) Hirudinea (see CHAETOPODA and LEECH); (5) Echiuroidea (*q.v.*). (P. C. M.)

ANNET, PETER (1693–1769), English deist, is said to have been born at Liverpool. A schoolmaster by profession, he became prominent owing to his attacks on orthodox theologians, and his membership of a semi-theological debating society, the Robin Hood Society, which met at the "Robin Hood and Little John" in Butcher Row. To him has been attributed a work called *A History of the Man after God's own Heart* (1761), intended to show that George II. was insulted by a current comparison with David. The book is said to have inspired Voltaire's *Saul*. It is also attributed to one John Noorthouck (Noorthook). In 1763 he was condemned for blasphemous libel in his paper called the *Free Enquirer* (nine numbers only). After his release he kept a small school in Lambeth, one of his pupils being James Stephen (1758–1832), who became master in Chancery. Annet died on the 18th of January 1769. He stands between the earlier philosophic deists and the later propagandists of Paine's school, and "seems to have been the first freethought lecturer" (J. M. Robertson); his essays (*A Collection of the Tracts of a certain Free Enquirer*, 1739–1745) are forcible but lack refinement. He invented a system of shorthand (2nd ed., with a copy of verses by Joseph Priestley).

ANNEXATION (Lat. *ad*, to, and *nexus*, joining), in international law, the act by which a state adds territory to its dominions; the term is also used generally as a synonym for acquisition. The assumption of a protectorate over another state, or of a sphere of influence, is not strictly annexation, the latter implying the complete displacement in the annexed territory of the government or state by which it was previously ruled. Annexation may be the consequence of a voluntary cession from one state to another, or of conversion from a protectorate or sphere of influence, or of mere occupation in uncivilized regions, or of conquest. The cession of Alsace-Lorraine to Germany by France, although brought about by the war of 1870, was for the purposes of international law a voluntary cession. Under the treaty of the 17th of December 1885, between the French republic and the queen of Madagascar, a French protectorate was established over this island. In 1896 this protectorate was converted by France into an annexation, and Madagascar then became "French territory." The formal annexation of Bosnia-Herzegovina by Austria (Oct. 5, 1908) was an unauthorized conversion of an "occupation" authorized by the Treaty of Berlin (1878), which had, however, for years operated as a *de facto* annexation. A recent case of conquest was that effected by the South African War of 1899–1902, in which the Transvaal republic and the Orange Free State were extinguished, first *de facto* by occupation of the whole of their territory, and then *de jure* by terms of surrender entered into by the Boer generals acting as a government.

By annexation, as between civilized peoples, the annexing state takes over the whole succession with the rights and obligations attaching to the ceded territory, subject only to any modifying conditions contained in the treaty of cession. These, however, are binding only as between the parties to them. In the case of the annexation of the territories of the Transvaal republic and Orange Free State, a rather complicated situation arose out of the facts, on the one hand, that the ceding states closed their own existence and left no recourse to third parties against the previous ruling authority, and, on the other, that, having no means owing to the *de facto* British occupation, of raising money by taxation, the dispossessed governments raised money by selling certain securities, more especially a large holding of shares in the South African Railway Company, to neutral purchasers. The British government repudiated these sales as having been made by a government which the British government had already displaced. The question of at what point, in a war of conquest, the state succession becomes operative is one of great delicacy. As early as the 6th of January 1900, the high commissioner at Cape Town issued a proclamation giving notice that H. M. government would "not recognize as valid or effectual" any conveyance, transfer or transmission of any property made by the government of the Transvaal republic or Orange Free State subsequently to the 10th of October 1899, the date of the commencement of the war. A proclamation forbidding transactions with a state which might still be capable of maintaining its independence could obviously bind only those subject to the authority of the state issuing it. Like paper blockades (see BLOCKADE) and fictitious occupations of territory, such premature proclamations are viewed by international jurists as not being *jure gentium*. The proclamation was succeeded, on the 9th of March 1900, by another of the high commissioner at Cape Town, reiterating the notice, but confining it to "lands, railways, mines or mining rights." And on the 1st of September 1900 Lord Roberts proclaimed at Pretoria the annexation of the territories of the Transvaal republic to the British dominions. That the war continued for nearly two years after this proclamation shows how fictitious the claim of annexation was. The difficulty which arose out of the transfer of the South African Railway shares held by the Transvaal government was satisfactorily terminated by the purchase by the British government of the total capital of the company from the different groups of shareholders (see on this case, Sir Thomas Barclay, *Law Quarterly Review*, July 1905; and Professor Westlake, in the same *Review*, October 1905).

In a judgment of the judicial committee of the privy council in 1899 (*Cooke* v. *Sprigg*, A.C. 572), Lord Chancellor Halsbury made an important distinction as regards the obligations of state succession. The case in question was a claim of title against the crown, represented by the government of Cape Colony. It was made by persons holding a concession of certain rights in eastern Pondoland from a native chief. Before the grantees had taken up their grant by acts of possession, Pondoland was annexed to Cape Colony. The colonial government refused to recognize the grant on different grounds, the chief of them being that the concession conferred no legal rights before the annexation and therefore could confer none afterwards, a sufficiently good ground in itself. The judicial committee, however, rested its decision chiefly on the allegation that the acquisition of the territory was an act of state and that "no municipal court had authority to enforce such an obligation" as the duty of the new government to respect existing titles. "It is no answer," said Lord Halsbury, "to say that by the ordinary principles of international law private property is respected by the sovereign which accepts the cession and assumes the duties and legal obligations of the former sovereign with respect to such private property within the ceded territory. All that can be meant by such a proposition is that according to the well-understood rules of international law a change of sovereignty by cession ought not to affect private property, but no municipal tribunal has authority to enforce such an obligation. And if there is either an express or a well-understood bargain between the ceding potentate and the government to which the cession is made that private property shall be respected, that is only a bargain which can be enforced by sovereign against sovereign in the ordinary course of diplomatic pressure." In an editorial note on this case the *Law Quarterly Review* of Jan. 1900 (p. 1), dissenting from the view of the judicial committee that "no municipal tribunal has authority to enforce such an obligation," the writer observes that "we can read this only as meant to lay down that, on the annexation of territory even by peaceable cession, there is a total abeyance of justice until the will of the annexing power is expressly made known; and that, although the will of that power is commonly to respect existing private rights, there is no rule or presumption to that effect of which any court must or indeed can take notice." So construed the doctrine is not only contrary to international law, but according to so authoritative an exponent of the common law as Sir F. Pollock, there is no warrant for it in English common law.

An interesting point of American constitutional law has arisen out of the cession of the Philippines to the United States, through the fact that the federal constitution does not lend itself to the

exercise by the federal congress of unlimited powers, such as are vested in the British parliament. The sole authority for the powers of the federal congress is a written constitution with defined powers. Anything done in excess of those powers is null and void. The Supreme Court of the United States, on the other hand, has declared that, by the constitution, a government is ordained and established "for the United States of America" and not for countries outside their limits (*Ross's Case*, 140 U.S. 453, 464), and that no such power to legislate for annexed territories as that vested in the British crown in council is enjoyed by the president of the United States (*Field* v. *Clark*, 143 U.S. 649, 692). Every detail connected with the administration of the territories acquired from Spain under the treaty of Paris (December 10, 1898) has given rise to minute discussion.

See Carman F. Randolph, *Law and Policy of Annexation* (New York and London, 1901); Charles Henry Butler, *Treaty-making Power of the United States* (New York, 1902), vol. i. p. 79 et seq. (T. Ba.)

ANNICERIS, a Greek philosopher of the Cyrenaic school. There is no certain information as to his date, but from the statement that he was a disciple of Paraebates it seems likely that he was a contemporary of Alexander the Great. A follower of Aristippus, he denied that pleasure is the general end of human life. To each separate action there is a particular end, namely the pleasure which actually results from it Secondly, pleasure is not merely the negation of pain, inasmuch as death ends all pain and yet cannot be regarded as pleasure. There is, however, an absolute pleasure in certain virtues such as belong to the love of country, parents and friends. In these relations a man will have pleasure, even though it may result in painful and even fatal consequences. Friendship is not merely for the satisfaction of our needs, but is in itself a source of pleasure. He maintains further, in opposition to most of the Cyrenaic school, that wisdom or prudence alone is an insufficient guarantee against error. The wise man is he who has acquired a habit of wise action; human wisdom is liable to lapses at any moment. Diogenes Laertius says that Anniceris ransomed Plato from Dionysius, tyrant of Syracuse, for twenty minas. If we are right in placing Anniceris in the latter half of the 4th century, it is clear that the reference here is to an earlier Anniceris, who, according to Aelian, was a celebrated charioteer.

ANNING, MARY (1799–1847), English fossil-collector, the daughter of Richard Anning, a cabinet-maker, was born at Lyme Regis in May 1799. Her father was one of the earliest collectors and dealers in fossils, obtained chiefly from the Lower Lias in that famous locality. When but a child in 1811 she discovered the first specimen of *Ichthyosaurus* which was brought into scientific notice; in 1821 she found remains of a new saurian, the *Plesiosaurus*, and in 1828 she procured, for the first time in England, remains of a pterodactyl (*Dimorphodon*). She died on the 9th of March 1847.

ANNISTON, a city and the county seat of Calhoun county, Alabama, U.S.A., in the north-eastern part of the state, about 63 m. E. by N. of Birmingham. Pop. (1890) 9998; (1900), 9695, of whom 3669 were of negro descent; (1910 census) 12,794. Anniston is served by the Southern, the Seaboard Air Line, and the Louisville & Nashville railways. The city is situated on the slope of Blue Mountain, a chain of the Blue Ridge, and is a health resort. It is the seat of the Noble Institute (for girls), established in 1886 by Samuel Noble (1834–1888), a wealthy iron-founder, and of the Alabama Presbyterian College for Men (1905). There are vast quantities of iron ore in the vicinity of the city, the Coosa coal-fields being only 25 m. distant. Anniston is an important manufacturing city, the principal industries being the manufacture of iron, steel and cotton. In 1905 the city's factory products were valued at $2,525,455. An iron furnace was established on the site of Anniston during the Civil War, but it was destroyed by the federal troops in 1865; and in 1872 it was rebuilt on a much larger scale. The city was founded in 1872 as a private enterprise, by the Woodstock Iron Company, organized by Samuel Noble and Gen. Daniel Tyler (1799–1882); but it was not opened for general settlement until twelve years later. It was chartered as a city in 1879.

ANNO, or Hanno, **SAINT** (*c.* 1010–1075), archbishop of Cologne, belonged to a Swabian family, and was educated at Bamberg. He became confessor to the emperor Henry III., who appointed him archbishop of Cologne in 1056. He took a prominent part in the government of Germany during the minority of King Henry IV., and was the leader of the party which in 1062 seized the person of Henry, and deprived his mother, the empress Agnes, of power. For a short time Anno exercised the chief authority in the kingdom, but he was soon obliged to share this with Adalbert, archbishop of Bremen, retaining for himself the supervision of Henry's education and the title of *magister*. The office of chancellor of the kingdom of Italy was at this period regarded as an appanage of the archbishopric of Cologne, and this was probably the reason why Anno had a considerable share in settling the papal dispute in 1064. He declared Alexander II. to be the rightful pope at a synod held at Mantua in May 1064, and took other steps to secure his recognition. Returning to Germany, he found the chief power in the hands of Adalbert, and as he was disliked by the young king, he left the court but returned and regained some of his former influence when Adalbert fell from power in 1066. He succeeded in putting down a rising against his authority in Cologne in 1074, and it was reported he had allied himself with William the Conqueror, king of England, against the emperor. Having cleared himself of this charge, Anno took no further part in public business, and died at Cologne on the 4th of December 1075. He was buried in the monastery of Siegburg and was canonized in 1183 by Pope Lucius III. He was a founder of monasteries and a builder of churches, advocated clerical celibacy and was a strict disciplinarian. He was a man of great energy and ability, whose action in recognizing Alexander II. was of the utmost consequence for Henry IV. and for Germany.

There is a *Vita Annonis*, written about 1100, by a monk of Siegburg, but this is of slight value. It appears in the *Monumenta Germaniae historica: Scriptores*, Bd. xi. (Hanover and Berlin, 1826–1892). There is an "Epistola ad monachos Malmundarienses" by Anno in the *Neues Archiv der Gesellschaft für ältere deutsche Geschichtskunde*, Bd. xiv. (Hanover, 1876 seq.). See also the *Annolied*, or *Incerti poetae Teutonici rhythmus de S. Annone*, written about 1180, and edited by J. Kehrein (Frankfort, 1865); Th. Lindner, *Anno II. der Heilige, Erzbischof von Köln* (Leipzig, 1869).

ANNOBON, or Anno Bom, an island in the Gulf of Guinea, in 1° 24′ S. and 5° 35′ E., belonging to Spain. It is 110 m. S.W. of St Thomas. Its length is about 4 m., its breadth 2, and its area 6¾ sq. m. Rising in some parts nearly 3000 ft. above the sea, it presents a succession of beautiful valleys and steep mountains, covered with rich woods and luxuriant vegetation. The inhabitants, some 3000 in number, are negroes and profess belief in the Roman Catholic faith. The chief town and residence of the governor is called St Antony (San Antonio de Praia). The roadstead is tolerably safe, and passing vessels take advantage of it in order to obtain water and fresh provisions, of which Annobon contains an abundant supply. The island was discovered by the Portuguese on the 1st of January 1473, from which circumstance it received its name (= New Year). Annobon, together with Fernando Po, was ceded to Spain by the Portuguese in 1778. The islanders revolted against their new masters and a state of anarchy ensued, leading, it is averred, to an arrangement by which the island was administered by a body of five natives, each of whom held the office of governor during the period that elapsed till ten ships touched at the island. In the latter part of the 19th century the authority of Spain was re-established.

ANNONA (from Lat. *annus*, year), in Roman mythology, the personification of the produce of the year. She is represented in works of art, often together with Ceres, with a *cornucopia* (horn of plenty) in her arm, and a ship's prow in the background, indicating the transport of grain over the sea. She frequently occurs on coins of the empire, standing between a *modius* (corn-measure) and the prow of a galley, with ears of corn in one hand and a *cornucopia* in the other; sometimes she holds a rudder or an anchor. The Latin word itself has various meanings: (1) the produce of the year's harvest; (2) all means of

subsistence, especially grain stored in the public granaries for provisioning the city; (3) the market-price of commodities, especially corn; (4) a direct tax in kind, levied in republican times in several provinces, chiefly employed in imperial times for distribution amongst officials and the support of the soldiery.

In order to ensure a supply of corn sufficient to enable it to be sold at a very low price, it was procured in large quantities from Umbria, Etruria and Sicily. Almost down to the times of the empire, the care of the corn-supply formed part of the aedile's duties, although in 440 B.C. (if the statement in Livy iv. 12, 13 is correct, which is doubtful) the senate appointed a special officer, called *praefectus annonae*, with greatly extended powers. As a consequence of the second Punic War, Roman agriculture was at a standstill; accordingly, recourse was had to Sicily and Sardinia (the first two Roman provinces) in order to keep up the supply of corn; a tax of one-tenth was imposed on it, and its export to any country except Italy forbidden. The price at which the corn was sold was always moderate; the corn law of Gracchus (123 B.C.) made it absurdly low, and Clodius (58 B.C.) bestowed it gratuitously. The number of the recipients of this free gift grew so enormously, that both Caesar and Augustus were obliged to reduce it. From the time of Augustus to the end of the empire the number of those who were entitled to receive a monthly allowance of corn on presenting a ticket was 200,000. In the 3rd century, bread formed the dole. A *praefectus annonae* was appointed by Augustus to superintend the corn-supply; he was assisted by a large staff in Rome and the provinces, and had jurisdiction in all matters connected with the corn-market. The office lasted till the latest times of the empire.

ANNONAY, a town of south-eastern France, in the north of the department of Ardèche, 50 m. S. of Lyons by the Paris-Lyons railway. Pop. (1906) 15,403. Annonay is built on the hill overlooking the meeting of the deep gorges of the Déôme and the Cance, the waters of which supply power to the factories of the town. By means of a dam across the Ternay, an affluent of the Déôme, to the north-west of the town, a reservoir is provided, in which an additional supply of water, for both industrial and domestic purposes, is stored. At Annonay there is an obelisk in honour of the brothers Montgolfier, inventors of the balloon, who were natives of the place. A tribunal of commerce, a board of trade-arbitrators, a branch of the Bank of France, and chambers of commerce and of arts and manufactures are among the public institutions. Annonay is the principal industrial centre of its department, the chief manufactures being those of leather, especially for gloves, paper, silk and silk goods, and flour. Chemical manures, glue, gelatine, brushes, chocolate and candles are also produced.

ANNOY (like the French *ennui*, a word traced by etymologists to a Lat. phrase, *in odio esse*, to be "in hatred" or hateful of someone), to vex or affect with irritation. In the sense of "nuisance," the noun "annoyance," apart from its obvious meaning, is found in the English "Jury of Annoyance" appointed by an act of 1754 to report upon obstructions in the highways.

ANNUITY (from Lat. *annus*, a year), a periodical payment, made annually, or at more frequent intervals, either for a fixed term of years, or during the continuance of a given life, or a combination of lives. In technical language an annuity is said to be payable for an assigned *status*, this being a general word chosen in preference to such words as "time," "term" or "period," because it may include more readily either a term of years certain, or a life or combination of lives. The magnitude of the annuity is the sum to be paid (and received) in the course of each year. Thus, if £100 is to be received each year by a person, he is said to have "an annuity of £100." If the payments are made half-yearly, it is sometimes said that he has "a half-yearly annuity of £100"; but to avoid ambiguity, it is more commonly said he has an annuity of £100, payable by half-yearly instalments. The former expression, if clearly understood, is preferable on account of its brevity. So we may have quarterly, monthly, weekly, daily annuities, when the annuity is payable by quarterly, monthly, weekly or daily instalments. An annuity is considered as accruing during each instant of the status for which it is enjoyed, although it is only payable at fixed intervals. If the enjoyment of an annuity is postponed until after the lapse of a certain number of years, the annuity is said to be deferred. If an annuity, instead of being payable at the end of each year, half-year, &c., is payable in advance, it is called an annuity-due.

If an annuity is payable for a term of years independent of any contingency, it is called an *annuity certain*; if it is to continue for ever, it is called a *perpetuity*; and if in the latter case it is not to commence until after a term of years, it is called a *deferred perpetuity*. An annuity depending on the continuance of an assigned life or lives, is sometimes called a life annuity; but more commonly the simple term "annuity" is understood to mean a life annuity, unless the contrary is stated. A life annuity, to cease in any event after a certain term of years, is called a *temporary annuity*. The holder of an annuity is called an annuitant, and the person on whose life the annuity depends is called the nominee.

If not otherwise stated, it is always understood that an annuity is payable yearly, and that the annual payment (or rent, as it is sometimes called) is £1. It is, however, customary to consider the annual payment to be, not £1, but simply 1, the reader supplying whatever monetary unit he pleases, whether pound, dollar, franc, Thaler, &c.

The annuity is the totality of the payments to be made (and received), and is so understood by all writers on the subject; but some have also used the word to denote an individual payment (or rent), speaking, for instance, of the first or second year's annuity,—a practice which is calculated to introduce confusion and should therefore be carefully avoided.

Instances of perpetuities are the dividends upon the public stocks in England, France and some other countries. Thus, although it is usual to speak of £100 consols, the reality is the yearly dividend which the government pays by quarterly instalments. The practice of the French in this, as in many other matters, is more logical. In speaking of their public funds (*rentes*) they do not mention the ideal capital sum, but speak of the annuity or annual payment that is received by the public creditor. Other instances of perpetuities are the incomes derived from the debenture stocks of railway companies, also the feu-duties commonly payable on house property in Scotland. The number of years' purchase which the perpetual annuities granted by a government or a railway company realize in the open market, forms a very simple test of the credit of the various governments or railways.

Terminable Annuities are employed in the system of British public finance as a means of reducing the National Debt (*q.v.*). This result is attained by substituting for a perpetual annual charge (or one lasting until the capital which it represents can be paid off *en bloc*), an annual charge of a larger amount, but lasting for a short term. The latter is so calculated as to pay off, during its existence, the capital which it replaces, with interest at an assumed or agreed rate, and under specified conditions. The practical effect of the substitution of a terminable annuity for an obligation of longer currency is to bind the present generation of citizens to increase its own obligations in the present and near future in order to diminish those of its successors. This end might be attained in other ways; for instance, by setting aside out of revenue a fixed annual sum for the purchase and cancellation of debt (Pitt's method, in intention), or by fixing the annual debt charge at a figure sufficient to provide a margin for reduction of the principal of the debt beyond the amount required for interest (Sir Stafford Northcote's method), or by providing an annual surplus of revenue over expenditure (the "Old Sinking Fund"), available for the same purpose. All these methods have been tried in the course of British financial history, and the second and third of them are still employed; but on the whole the method of terminable annuities has been the one preferred by chancellors of the exchequer and by parliament.

Terminable annuities, as employed by the British government, fall under two heads:—(*a*) Those issued to, or held by private

persons; (*b*) those held by government departments or by funds under government control. The important difference between these two classes is that an annuity under (*a*), once created, cannot be modified except with the holder's consent, *i.e.* is practically unalterable without a breach of public faith; whereas an annuity under (*b*) can, if necessary, be altered by inter-departmental arrangement under the authority of parliament. Thus annuities of class (*a*) fulfil most perfectly the object of the system as explained above; while those of class (*b*) have the advantage that in times of emergency their operation can be suspended without any inconvenience or breach of faith, with the result that the resources of government can on such occasions be materially increased, apart from any additional taxation. For this purpose it is only necessary to retain as a charge on the income of the year a sum equal to the (smaller) perpetual charge which was originally replaced by the (larger) terminable charge, whereupon the difference between the two amounts is temporarily released, while ultimately the increased charge is extended for a period equal to that for which it is suspended. Annuities of class (*a*) were first instituted in 1808, but are at present mainly regulated by an act of 1829. They may be granted either for a specified life, or two lives, or for an arbitrary term of years; and the consideration for them may take the form either of cash or of government stock, the latter being cancelled when the annuity is set up. Annuities (*b*) held by government departments date from 1863. They have been created in exchange for permanent debt surrendered for cancellation, the principal operations having been effected in 1863, 1867, 1870, 1874, 1883 and 1899. Annuities of this class do not affect the public at all, except of course in their effect on the market for government securities. They are merely financial operations between the government, in its capacity as the banker of savings banks and other funds, and itself, in the capacity of custodian of the national finances. Savings bank depositors are not concerned with the manner in which government invests their money, their rights being confined to the receipt of interest and the repayment of deposits upon specified conditions. The case is, however, different as regards forty millions of consols (included in the above figures), belonging to suitors in chancery, which were cancelled and replaced by a terminable annuity in 1883. As the liability to the suitors in that case was for a specified amount of stock, special arrangements were made to ensure the ultimate replacement of the precise amount of stock cancelled.

Annuity Calculations.—The mathematical theory of life annuities is based upon a knowledge of the rate of mortality among mankind in general, or among the particular class of persons on whose lives the annuities depend. It involves a mathematical treatment too complicated to be dealt with fully in this place, and in practice it has been reduced to the form of tables, which vary in different places, but which are easily accessible. The history of the subject may, however, be sketched. Abraham Demoivre, in his *Annuities on Lives*, propounded a very simple law of mortality which is to the effect that, out of 86 children born alive, 1 will die every year until the last dies between the ages of 85 and 86. This law agreed sufficiently well at the middle ages of life with the mortality deduced from the best observations of his time; but, as observations became more exact, the approximation was found to be not sufficiently close. This was particularly the case when it was desired to obtain the value of joint life, contingent or other complicated benefits. Therefore Demoivre's law is entirely devoid of practical utility. No simple formula has yet been discovered that will represent the rate of mortality with sufficient accuracy.

The rate of mortality at each age is, therefore, in practice usually determined by a series of figures deduced from observation; and the value of an annuity at any age is found from these numbers by means of a series of arithmetical calculations. The mortality table here given is an example of modern use.

The first writer who is known to have attempted to obtain, on correct mathematical principles, the value of a life annuity, was Jan De Witt, grand pensionary of Holland and West Friesland. Our knowledge of his writings on the subject is derived from two papers contributed by Frederick Hendriks to the *Assurance Magazine*, vol. ii. p. 222, and vol. iii. p. 93. The former of these contains a translation of De Witt's report upon the value of life annuities, which was prepared in consequence of the resolution passed by the states-general, on the 25th of April 1671, to negotiate funds by life annuities, and which was distributed to the members on the 30th of July 1671. The latter contains the translation of a number of letters addressed by De Witt to Burgomaster Johan Hudde, bearing dates from September 1670 to October 1671. The existence of De Witt's report was well known among his contemporaries, and Hendriks collected a number of extracts from various authors referring to it; but the

TABLE OF MORTALITY—HM, HEALTHY LIVES—MALE.

Number Living and Dying at each Age, out of 10,000 *entering at Age* 10.

Age.	Living.	Dying.	Age.	Living.	Dying.
10	10,000	79	54	6791	129
11	9,921	0	55	6662	153
12	9,921	40	56	6509	150
13	9,881	35	57	6359	152
14	9,846	40	58	6207	156
15	9,806	22	59	6051	153
16	9,784	0	60	5898	184
17	9,784	41	61	5714	186
18	9,743	59	62	5528	191
19	9,684	68	63	5337	200
20	9,616	56	64	5137	206
21	9,560	67	65	4931	215
22	9,493	59	66	4716	220
23	9,434	73	67	4496	220
24	9,361	64	68	4276	237
25	9,297	48	69	4039	246
26	9,249	64	70	3793	213
27	9,185	60	71	3580	222
28	9,125	71	72	3358	268
29	9,054	67	73	3090	243
30	8,987	74	74	2847	300
31	8,913	65	75	2547	241
32	8,848	74	76	2306	245
33	8,774	73	77	2061	224
34	8,701	76	78	1837	226
35	8,625	71	79	1611	219
36	8,554	75	80	1392	196
37	8,479	81	81	1196	191
38	8,398	87	82	1005	173
39	8,311	88	83	832	172
40	8,223	81	84	660	119
41	8,142	85	85	541	117
42	8,057	87	86	424	92
43	7,970	84	87	332	72
44	7,886	93	88	260	74
45	7,793	97	89	186	36
46	7,696	96	90	150	34
47	7,600	107	91	116	36
48	7,493	106	92	80	36
49	7,387	113	93	44	29
50	7,274	120	94	15	0
51	7,154	124	95	15	5
52	7,030	120	96	10	10
53	6,910	119			

report is not contained in any collection of his works extant, and had been entirely lost for 180 years, until Hendriks discovered it among the state archives of Holland in company with the letters to Hudde. It is a document of extreme interest, and (notwithstanding some inaccuracies in the reasoning) of very great merit, more especially considering that it was the very first document on the subject that was ever written.

It appears that it had long been the practice in Holland for life annuities to be granted to nominees of any age, in the constant proportion of double the rate of interest allowed on stock; that is to say, if the towns were borrowing money at 6 %, they would be willing to grant a life annuity at 12 %, and so on. De Witt states that "annuities have been sold, even in the present century, first at six years' purchase, then at seven and eight; and that the majority of all life annuities now current at the country's expense were obtained at nine years' purchase"; but that the price had been increased in the course of a few years from eleven years' purchase to twelve, and from twelve to

fourteen. He also states that the rate of interest had been successively reduced from 6½ to 5%, and then to 4%. The principal object of his report is to prove that, taking interest at 4%, a life annuity was worth at least sixteen years' purchase; and, in fact, that an annuitant purchasing an annuity for the life of a young and healthy nominee at sixteen years' purchase, made an excellent bargain. It may be mentioned that he argues that it is more to the advantage, both of the country and of the private investor, that the public loans should be raised by way of grant of life annuities rather than perpetual annuities. It appears conclusively from De Witt's correspondence with Hudde, that the rate of mortality assumed as the basis of his calculations was deduced from careful examination of the mortality that had actually prevailed among the nominees on whose lives annuities had been granted in former years. De Witt appears to have come to the conclusion that the probability of death is the same in any half-year from the age of 3 to 53 inclusive; that in the next ten years, from 53 to 63, the probability is greater in the ratio of 3 to 2; that in the next ten years, from 63 to 73, it is greater in the ratio of 2 to 1; and in the next seven years, from 73 to 80, it is greater in the ratio of 3 to 1; and he places the limit of human life at 80. If a mortality table of the usual form is deduced from these suppositions, out of 212 persons alive at the age of 3, 2 will die every year up to 53, 3 in each of the ten years from 53 to 63, 4 in each of the next ten years from 63 to 73, and 6 in each of the next seven years from 73 to 80, when all will be dead.

De Witt calculates the value of an annuity in the following way. Assume that annuities on 10,000 lives each ten years of age, which satisfy the Hm mortality table, have been purchased. Of these nominees 79 will die before attaining the age of 11, and no annuity payment will be made in respect of them; none will die between the ages of 11 and 12, so that annuities will be paid for one year on 9921 lives; 40 attain the age of 12 and die before 13, so that two payments will be made with respect to these lives. Reasoning in this way we see that the annuities on 35 of the nominees will be payable for three years; on 40 for four years, and so on. Proceeding thus to the end of the table, 15 nominees attain the age of 95, 5 of whom die before the age of 96, so that 85 payments will be paid in respect of these 5 lives. Of the survivors all die before attaining the age of 97, so that the annuities on these lives will be payable for 86 years. Having previously calculated a table of the values of annuities certain for every number of years up to 86, the value of all the annuities on the 10,000 nominees will be found by taking 40 times the value of an annuity for 2 years, 35 times the value of an annuity for 3 years, and so on—the last term being the value of 10 annuities for 86 years—and adding them together; and the value of an annuity on one of the nominees will then be found by dividing by 10,000. Before leaving the subject of De Witt, we may mention that we find in the correspondence a distinct suggestion of the law of mortality that bears the name of Demoivre. In De Witt's letter, dated the 27th of October 1671 (*Ass. Mag.* vol. iii. p. 107), he speaks of a "provisional hypothesis" suggested by Hudde, that out of 80 young lives (who, from the context, may be taken as of the age 6) about 1 dies annually. In strictness, therefore, the law in question might be more correctly termed Hudde's than Demoivre's.

De Witt's report being thus of the nature of an unpublished state paper, although it contributed to its author's reputation, did not contribute to advance the exact knowledge of the subject; and the author to whom the credit must be given of first showing how to calculate the value of an annuity on correct principles is Edmund Halley. He gave the first approximately correct mortality table (deduced from the records of the numbers of deaths and baptisms in the city of Breslau), and showed how it might be employed to calculate the value of an annuity on the life of a nominee of any age (see *Phil. Trans.* 1693; *Ass. Mag.* vol. xviii.).

Previously to Halley's time, and apparently for many years subsequently, all dealings with life annuities were based upon mere conjectural estimates. The earliest known reference to any estimate of the value of life annuities rose out of the requirements of the Falcidian law, which (40 B.C.) was adopted in the Roman empire, and which declared that a testator should not give more than three-fourths of his property in legacies, so that at least one-fourth must go to his legal representatives. It is easy to see how it would occasionally become necessary, while this law was in force, to value life annuities charged upon a testator's estate. Aemilius Macer (A.D. 230) states that the method which had been in common use at that time was as follows:—From the earliest age until 30 take 30 years' purchase, and for each age after 30 deduct 1 year. It is obvious that no consideration of compound interest can have entered into this estimate; and it is easy to see that it is equivalent to assuming that all persons who attain the age of 30 will certainly live to the age of 60, and then certainly die. Compared with this estimate, that which was propounded by the praetorian prefect Ulpian was a great improvement. His table is as follows:—

Age.	Years' Purchase.	Age.	Years' Purchase.
Birth to 20	30	45 to 46	14
20 „ 25	28	46 „ 47	13
25 „ 30	25	47 „ 48	12
30 „ 35	22	48 „ 49	11
35 „ 40	20	49 „ 50	10
40 „ 41	19	50 „ 55	9
41 „ 42	18	55 „ 60	7
42 „ 43	17	60 and upwards	5
43 „ 44	16		
44 „ 45	15		

Here also we have no reason to suppose that the element of interest was taken into consideration; and the assumption, that between the ages of 40 and 50 each addition of a year to the nominee's age diminishes the value of the annuity by one year's purchase, is equivalent to assuming that there is no probability of the nominee dying between the ages of 40 and 50. Considered, however, simply as a table of the average duration of life, the values are fairly accurate. At all events, no more correct estimate appears to have been arrived at until the close of the 17th century.

The mathematics of annuities has been very fully treated in Demoivre's *Treatise on Annuities* (1725); Simpson's *Doctrine of Annuities and Reversions* (1742); P. Gray, *Tables and Formulae*; Baily's *Doctrine of Life Annuities*; there are also innumerable compilations of *Valuation Tables* and *Interest Tables*, by means of which the value of an annuity at any age and any rate of interest may be found. See also the article INTEREST, and especially that on INSURANCE.

Commutation tables, aptly so named in 1840 by Augustus De Morgan (see his paper "On the Calculation of Single Life Contingencies," *Assurance Magazine*, xii. 328), show the proportion in which a benefit due at one age ought to be changed, so as to retain the same value and be due at another age. The earliest known specimen of a commutation table is contained in William Dale's *Introduction to the Study of the Doctrine of Annuities*, published in 1772. A full account of this work is given by F. Hendriks in the second number of the *Assurance Magazine*, pp. 15–17. William Morgan's *Treatise on Assurances*, 1779, also contains a commutation table. Morgan gives the table as furnishing a convenient means of checking the correctness of the values of annuities found by the ordinary process. It may be assumed that he was aware that the table might be used for the direct calculation of annuities; but he appears to have been ignorant of its other uses.

The first author who fully developed the powers of the table was John Nicholas Tetens, a native of Schleswig, who in 1785, while professor of philosophy and mathematics at Kiel, published in the German language an *Introduction to the Calculation of Life Annuities and Assurances*. This work appears to have been quite unknown in England until F. Hendriks gave, in the first number of the *Assurance Magazine*, pp. 1-20 (Sept. 1850), an account of it, with a translation of the passages describing the construction and use of the commutation table, and a sketch

of the author's life and writings, to which we refer the reader who desires fuller information. It may be mentioned here that Tetens also gave only a specimen table, apparently not imagining that persons using his work would find it extremely useful to have a series of commutation tables, calculated and printed ready for use.

The use of the commutation table was independently developed in England—apparently between the years 1788 and 1811—by George Barrett, of Petworth, Sussex, who was the son of a yeoman farmer, and was himself a village schoolmaster, and afterwards farm steward or bailiff. It has been usual to consider Barrett as the originator in England of the method of calculating the values of annuities by means of a commutation table, and this method is accordingly sometimes called Barrett's method. (It is also called the commutation method and the columnar method.) Barrett's method of calculating annuities was explained by him to Francis Baily in the year 1811, and was first made known to the world in a paper written by the latter and read before the Royal Society in 1812.

By what has been universally considered an unfortunate error of judgment, this paper was not recommended by the council of the Royal Society to be printed, but it was given by Baily as an appendix to the second issue (in 1813) of his work on life annuities and assurances. Barrett had calculated extensive tables, and with Baily's aid attempted to get them published by subscription, but without success; and the only printed tables calculated according to his manner, besides the specimen tables given by Baily, are the tables contained in Babbage's *Comparative View of the various Institutions for the Assurance of Lives*, 1826.

In the year 1825 Griffith Davies published his *Tables of Life Contingencies*, a work which contains, among others, two tables, which are confessedly derived from Baily's explanation of Barrett's tables.

Those who desire to pursue the subject further can refer to the appendix to Baily's *Life Annuities and Assurances*, De Morgan's paper "On the Calculation of Single Life Contingencies," *Assurance Magazine*, xii. 348-349; Gray's *Tables and Formulae*, chap. viii.; the preface to Davies's *Treatise on Annuities*; also Hendriks's papers in the *Assurance Magazine*, No. 1, p. 1, and No. 2, p. 12; and in particular De Morgan's "Account of a Correspondence between Mr George Barrett and Mr Francis Baily," in the *Assurance Magazine*, vol. iv. p. 185.

The principal commutation tables published in England are contained in the following works:—David Jones, *Value of Annuities and Reversionary Payments*, issued in parts by the Useful Knowledge Society, completed in 1843; Jenkin Jones, *New Rate of Mortality*, 1843; G. Davies, *Treatise on Annuities*, 1825 (issued 1855); David Chisholm, *Commutation Tables*, 1858; Neison's *Contributions to Vital Statistics*, 1857; Jardine Henry, *Government Life Annuity Commutation Tables*, 1866 and 1873; *Institute of Actuaries Life Tables*, 1872; R. P. Hardy, *Valuation Tables*, 1873; and Dr William Farr's contributions to the sixth (1844), twelfth (1849), and twentieth (1857) *Reports* of the Registrar General in England (English Tables, 1, 2), and to the *English Life Table*, 1864.

The theory of annuities may be further studied in the discussions in the English *Journal of the Institute of Actuaries*. The institute was founded in the year 1848, the first sessional meeting being held in January 1849. Its establishment has contributed in various ways to promote the study of the theory of life contingencies. Among these may be specified the following:—Before it was formed, students of the subject worked for the most part alone, and without any concert; and when any person had made an improvement in the theory, it had little chance of becoming publicly known unless he wrote a formal treatise on the whole subject. But the formation of the institute led to much greater interchange of opinion among actuaries, and afforded them a ready means of making known to their professional associates any improvements, real or supposed, that they thought they had made. Again, the discussions which follow the reading of papers before the institute have often served, first, to bring out into bold relief differences of opinion that were previously unsuspected, and afterwards to soften down those differences,—to correct extreme opinions in every direction, and to bring about a greater agreement of opinion on many important subjects. In no way, probably, have the objects of the institute been so effectually advanced as by the publication of its *Journal*. The first number of this work, which was originally called the *Assurance Magazine*, appeared in September 1850, and it has been continued quarterly down to the present time. It was originated by the public spirit of two well-known actuaries (Mr Charles Jellicoe and Mr Samuel Brown), and was adopted as the organ of the Institute of Actuaries in the year 1852, and called the *Assurance Magazine and Journal of the Institute of Actuaries*, Mr Jellicoe continuing to be the editor,—a post he held until the year 1867, when he was succeeded by Mr T. B. Sprague (who contributed to the 9th edition of this *Encyclopaedia* an elaborate article on "Annuities," on which the above account is based). The name was again changed in 1866, the words "Assurance Magazine" being dropped; but in the following year it was considered desirable to resume these, for the purpose of showing the continuity of the publication, and it is now called the *Journal of the Institute of Actuaries and Assurance Magazine*. This work contains not only the papers read before the institute (to which have been appended of late years short abstracts of the discussions on them), and many original papers which were unsuitable for reading, together with correspondence, but also reprints of many papers published elsewhere, which from various causes had become difficult of access to the ordinary reader, among which may be specified various papers which originally appeared in the *Philosophical Transactions*, the *Philosophical Magazine*, the *Mechanics' Magazine*, and the *Companion to the Almanac*; also translations of various papers from the French, German, and Danish. Among the useful objects which the continuous publication of the *Journal* of the institute has served, we may specify in particular two:—that any supposed improvement in the theory was effectually submitted to the criticisms of the whole actuarial profession, and its real value speedily discovered; and that any real improvement, whether great or small, being placed on record, successive writers have been able, one after the other, to take it up and develop it, each commencing where the previous one had left off.

ANNULAR, ANNULATE, &c. (Lat. *annulus*, a ring), ringed. "Annulate" is used in botany and zoology in connexion with certain plants, worms, &c. (see ANNELIDA), either marked with rings or composed of ring-like segments. The word "annulated" is also used in heraldry and architecture. An annulated cross is one with the points ending in an "annulet" (an heraldic ring, supposed to be taken from a coat of mail), while the annulet in architecture is a small fillet round a column, which encircles the lower part of the Doric capital immediately above the neck or trachelium. The word "annulus" (for "ring") is itself used technically in geometry, astronomy, &c., and the adjective "annular" corresponds. An *annular space* is that between an inner and outer ring. The *annular finger* is the ring finger. An *annular eclipse* is an eclipse of the sun in which the visible part of the latter completely encircles the dark body of the moon; for this to happen, the centres of the sun and moon, and the point on the earth where the observer is situated, must be collinear. Certain nebulae having the form of a ring are also called "annular."

ANNUNCIATION, the announcement made by the angel Gabriel to the Virgin Mary of the incarnation of Christ (Luke i. 26-38). The Feast of the Annunciation in the Christian Church is celebrated on the 25th of March. The first authentic allusions to it are in a canon of the council of Toledo (656), and another of the council of Constantinople "in Trullo" (692), forbidding the celebration of all festivals in Lent, excepting the Lord's day and the Feast of the Annunciation. An earlier origin has been claimed for it on the ground that it is mentioned in sermons of Athanasius and of Gregory Thaumaturgus, but both of these documents are now admitted to be spurious. A synod held at Worcester, England (1240), forbade all servile work on this feast day. See further LADY DAY.

ANNUNZIO, GABRIELE D' (1863), Italian novelist and poet, of Dalmatian extraction, was born at Pescara (Abruzzi) in 1863. The first years of his youth were spent in the freedom of the open fields; at sixteen he was sent to school in Tuscany. While still at school he published a small volume of verses called *Primo Vere* (1879), in which, side by side with some almost brutal imitations of Lorenzo Stecchetti, the then fashionable poet of *Postuma*, were some translations from the Latin, distinguished by such agile grace that Giuseppe Chiarini on reading them brought the unknown youth before the public in an enthusiastic article. The young poet then went to Rome, where he was received as one of their own by the *Cronaca Bizantina* group (see CARDUCCI). Here he published *Canto Nuovo* (1882), *Terra Vergine* (1882), *L' Intermezzo di Rime* (1883), *Il Libro delle Vergini* (1884), and the greater part of the short stories that were afterwards collected under the general title of *San Pantaleone* (1886). In *Canto Nuovo* we have admirable poems full of pulsating youth and the promise of power, some descriptive

of the sea and some of the Abruzzi landscape, commented on and completed in prose by *Terra Vergine*, the latter a collection of short stories dealing in radiant language with the peasant life of the author's native province. With the *Intermezzo di Rime* we have the beginning of d'Annunzio's second and characteristic manner. His conception of style was new, and he chose to express all the most subtle vibrations of voluptuous life. Both style and contents began to startle his critics; some who had greeted him as an *enfant prodige*—Chiarini amongst others—rejected him as a perverter of public morals, whilst others hailed him as one bringing a current of fresh air and the impulse of a new vitality into the somewhat prim, lifeless work hitherto produced.

Meanwhile the Review of Angelo Sommaruga perished in the midst of scandal, and his group of young authors found itself dispersed. Some entered the teaching career and were lost to literature, others threw themselves into journalism. Gabriele d'Annunzio took this latter course, and joined the staff of the *Tribuna*. For this paper, under the pseudonym of "Duca Minimo," he did some of his most brilliant work, and the articles he wrote during that period of originality and exuberance would well repay being collected. To this period of greater maturity and deeper culture belongs *Il Libro d' Isotta* (1886), a love poem, in which for the first time he drew inspiration adapted to modern sentiments and passions from the rich colours of the Renaissance. *Il Libro d' Isotta* is interesting also, because in it we find most of the germs of his future work, just as in *Intermezzo melico* and in certain ballads and sonnets we find descriptions and emotions which later went to form the aesthetic contents of *Il Piacere*, *Il Trionfo della Morte*, and *Elegie Romane* (1892).

D' Annunzio's first novel *Il Piacere* (1889)—translated into English as *The Child of Pleasure*—was followed in 1891 by *L' Innocente* (*The Intruder*), and in 1892 by *Giovanni Episcopo*. These three novels created a profound impression. *L' Innocente*, admirably translated into French by Georges Herelle, brought its author the notice and applause of foreign critics. His next work, *Il Trionfo della Morte* (*The Triumph of Death*) (1894), was followed at a short distance by *Le Vergini della Roccio* (1896) and *Il Fuoco* (1900), which in its descriptions of Venice is perhaps the most ardent glorification of a city existing in any language.

D' Annunzio's poetic work of this period, in most respects his finest, is represented by *Il Poema Paradisiaco* (1893), the *Odi Navali* (1893), a superb attempt at civic poetry, and *Laudi* (1900).

A later phase of d' Annunzio's work is his dramatic production, represented by *Il Sogno di un mattino di primavera* (1897), a lyrical fantasia in one act; his *Citta Morta* (1898), written for Sarah Bernhardt, which is certainly among the most daring and original of modern tragedies, and the only one which by its unity, persistent purpose, and sense of fate seems to continue in a measure the traditions of the Greek theatre. In 1898 he wrote his *Sogno di un Pomeriggio d' Autunno* and *La Gioconda*; in the succeeding year *La Gloria*, an attempt at contemporary political tragedy which met with no success, probably through the audacity of the personal and political allusions in some of its scenes; and then *Francesca da Rimini* (1901), a perfect reconstruction of medieval atmosphere and emotion, magnificent in style, and declared by one of the most authoritative Italian critics—Edoardo Boutet—to be the first real although not perfect tragedy which has ever been given to the Italian theatre.

The work of d' Annunzio, although by many of the younger generation injudiciously and extravagantly admired, is almost the most important literary work given to Italy since the days when the great classics welded her varying dialects into a fixed language. The psychological inspiration of his novels has come to him from many sources—French, Russian, Scandinavian, German—and in much of his earlier work there is little fundamental originality. His creative power is intense and searching, but narrow and personal; his heroes and heroines are little more than one same type monotonously facing a different problem at a different phase of life. But the faultlessness of his style and the wealth of his language have been approached by none of his contemporaries, whom his genius has somewhat paralysed. In his later work, when he begins drawing his inspiration from the traditions of bygone Italy in her glorious centuries, a current of real life seems to run through the veins of his personages. And the lasting merit of d' Annunzio, his real value to the literature of his country, consists precisely in that he opened up the closed mine of its former life as a source of inspiration for the present and of hope for the future, and created a language, neither pompous nor vulgar, drawn from every source and district suited to the requirements of modern thought, yet absolutely classical, borrowed from none, and, independently of the thought it may be used to express, a thing of intrinsic beauty. As his sight became clearer and his purpose strengthened, as exaggerations, affectations, and moods dropped away from his conceptions, his work became more and more typically Latin work, upheld by the ideal of an Italian Renaissance.

ANOA, the native name of the small wild buffalo of Celebes, *Bos* (*Bubalus*) *depressicornis*, which stands but little over a yard at the shoulder, and is the most diminutive of all wild cattle. It is nearly allied to the larger Asiatic buffaloes, showing the same reversal of the direction of the hair on the back. The horns are peculiar for their upright direction and comparative straightness, although they have the same triangular section as in other buffaloes. White spots are sometimes present below the eyes, and there may be white markings on the legs and back; and the absence or presence of these white markings may be indicative of distinct races. The horns of the cows are very small. The nearest allies of the anoa appear to be certain extinct buffaloes, of which the remains are found in the Siwalik Hills of northern India. In habits the animal appears to resemble the Indian buffalo.

ANODYNE (from Gr. *ἀν-*, privative, and *ὀδύνη*, pain), a cause which relieves pain. The term is commonly applied to medicines which lessen the sensibility of the brain or nervous system, such as morphia, &c.

ANOINTING, or greasing with oil, fat, or melted butter, a process employed ritually in all religions and among all races, civilized or savage, partly as a mode of ridding persons and things of dangerous influences and diseases, especially of the demons (Persian *drug*, Greek *κῆρες*, Armenian *dev*) which are or cause those diseases; and partly as a means of introducing into things and persons a sacramental or divine influence, a holy emanation, spirit or power. The riddance of an evil influence is often synonymous with the introduction of the good principle, and therefore it is best to consider first the use of anointing in consecrations.

The Australian natives believed that the virtues of one killed could be transferred to survivors if the latter rubbed themselves with his caul-fat. So the Arabs of East Africa anoint themselves with lion's fat in order to gain courage and inspire the animals with awe of themselves. Such rites are often associated with the actual eating of the victim whose virtues are coveted. Human fat is a powerful charm all over the world; for, as R. Smith points out, after the blood the fat was peculiarly the vehicle and seat of life. This is why fat of a victim was smeared on a sacred stone, not only in acts of homage paid to it, but in the actual consecration thereof. In such cases the influence of the god, communicated to the victim, passed with the unguent into the stone. But the divinity could by anointing be transferred into men no less than into stones; and from immemorial antiquity, among the Jews as among other races, kings were anointed or greased, doubtless with the fat of the victims which, like the blood, was too holy to be eaten by the common votaries.

Butter made from the milk of the cow, the most sacred of animals, is used for anointing in the Hindu religion. A newly-built house is smeared with it, so are demoniacs, care being taken to smear the latter downwards from head to foot.

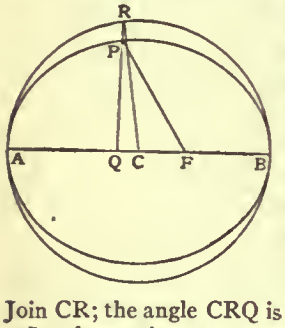
In the Christian religion, especially where animal sacrifices, together with the cult of totem or holy animals, have been given up, it is usual to hallow the oil used in ritual anointings with

special prayers and exorcisms; oil from the lamps lit before the altar has a peculiar virtue of its own, perhaps because it can be burned to give light, and disappears to heaven in doing so. In any case oil has ever been regarded as the aptest symbol and vehicle of the holy and illuminating spirit. For this reason the catechumens are anointed with holy oil both before and after baptism; the one act (of eastern origin) assists the expulsion of the evil spirits, the other (of western origin), taken in conjunction with imposition of hands, conveys the spirit and retains it in the person of the baptized. In the postbaptismal anointing the oil was applied to the organs of sense, to the head, heart, and midriff. Such ritual use of oil as a σφραγίς or seal may have been suggested in old religions by the practice of keeping wine fresh in jars and amphorae by pouring on a top layer of oil; for the spoiling of wine was attributed to the action of demons of corruption, against whom many ancient formulae of aversion or exorcism still exist.

The holy oil, chrism, or μύρον, as the Easterns call it, was prepared and consecrated on Maundy Thursday, and in the Gelasian sacramentary the formula used runs thus: "Send forth, O Lord, we beseech thee, thy Holy Spirit the Paraclete from heaven into this fatness of oil, which thou hast deigned to bring forth out of the green wood for the refreshing of mind and body; and through thy holy benediction may it be for all who anoint with it, taste it, touch it, a safeguard of mind and body, of soul and spirit, for the expulsion of all pains, of every infirmity, of every sickness of mind and body. For with the same thou hast anointed priests, kings, and prophets and martyrs with this thy chrism, perfected by thee, O Lord, blessed, abiding within our bowels in the name of our Lord Jesus Christ."

In various churches the dead are anointed with holy oil, to guard them against the vampires or ghouls which ever threaten to take possession of dead bodies and live in them. In the Armenian church, as formerly in many Greek churches, a cross is not holy until the Spirit has been formally led into it by means of prayer and anointing with holy oil. A new church is anointed at its four corners, and also the altar round which it is built; similarly tombs, church gongs, and all other instruments and utensils dedicated to cultual uses. In churches of the Greek rite a little of the old year's chrism is left in the jar to communicate its sanctity to that of the new. (F. C. C.)

ANOMALY (from Gr. ἀνωμαλία, unevenness, derived from ἀν-, privative, and ὁμαλός, even), a deviation from the common rule. In astronomy the word denotes the angular distance of a body from the pericentre of the orbit in which it is moving. Let AB be the major axis of the orbit, B the pericentre, F the focus or centre of motion, P the position of the body. The anomaly is then the angle BFP which the radius vector makes with the major axis. This is the actual or *true anomaly*. *Mean anomaly* is the anomaly which the body would have if it moved from the pericentre around F with a uniform angular motion such that its revolution would be completed in its actual time (see Orbit). *Eccentric anomaly* is defined thus:—Draw the circumscribing circle of the elliptic orbit around the centre C of the orbit. Drop the perpendicular RPQ through P, the position of the planet, upon the major axis. Join CR; the angle CRQ is then the eccentric anomaly.



In the ancient astronomy the anomaly was taken as the angular distance of the planet from the point of the farthest recession from the earth.

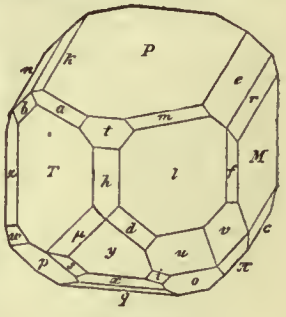
Kepler's Problem, namely, that of finding the co-ordinates of a planet at a given time, which is equivalent—given the mean anomaly—to that of determining the true anomaly, was solved approximately by Kepler, and more completely by Wallis, Newton and others.

The anomalistic revolution of a planet or other heavenly body is the revolution between two consecutive passages through the pericentre. Starting from the pericentre, it is completed on the return to the pericentre. If the pericentre is fixed, this is an actual revolution; but if it moves the anomalistic revolution is greater or less than a complete circumference.

An *Anomalistic year* is the time (365 days, 6 hours, 13 minutes, 48 seconds) in which the earth (and similarly for any other planet) passes from perihelion to perihelion, or from any given value of the anomaly to the same again. Owing to the precession of the equinoxes it is longer than a tropical or sidereal year by 25 minutes and 2·3 seconds. An *Anomalistic month* is the time in which the moon passes from perigee to perigee, &c.

For the mathematics of Kepler's problem see E. W. Brown, *Lunar Theory* (Cambridge 1896), or the work of Watson or of Bauschinger on Theoretical Astronomy.

ANORTHITE, an important mineral of the felspar group, being one of the end members of the plagioclase (*q.v.*) series. It is a calcium and aluminium silicate, $CaAl_2Si_2O_8$, and crystallizes in the anorthic system. Like all the felspars, it possesses two cleavages, one perfect and the other less so, here inclined to one another at an angle of 85° 50′. The colour is white, greyish or reddish, and the crystals are transparent to translucent. The hardness is 6–6½, and the specific gravity 2·75.


Anorthite.

Anorthite is an essential constituent of many basic igneous rocks, such as gabbro and basalt, also of some meteoric stones. The best developed crystals are those which accompany mica, augite, sanidine, &c., in the ejected blocks of metamorphosed limestone from Monte Somma, the ancient portion of Mount Vesuvius; these are perfectly colourless and transparent, and are bounded by numerous brilliant faces. Distinctly developed crystals are also met with in the basalts of Japan, but are usually rare at other localities.

The name anorthite was given to the Vesuvian mineral by G. Rose in 1823, on account of its anorthic crystallization. The species had, however, been earlier described by the comte de Bournon under the name indianite, this name being applied to a greyish or reddish granular mineral forming the matrix of corundum from the Carnatic in India. Several unimportant varieties have been distinguished. (L. J. S.)

ANQUETIL, LOUIS PIERRE (1723–1808), French historian, was born in Paris, on the 21st of February 1723. He entered the congregation of Sainte-Geneviève, where he took holy orders and became professor of theology and literature. Later, he became director of the seminary at Reims, where he wrote his *Histoire civile et politique de Reims* (3 vols., 1756–1757), perhaps his best work. He was then director of the college of Senlis, where he composed his *Esprit de la Ligue ou histoire politique des troubles de la Fronde pendant le XVIe et le XVIIe siècles* (1767). During the Reign of Terror he was imprisoned at St Lazare; there he began his *Précis de l'histoire universelle*, afterwards published in nine volumes. On the establishment of the national institute he was elected a member of the second group (moral and political sciences), and was soon afterwards employed in the office of the ministry of foreign affairs, profiting by his experience to write his *Motifs des guerres et des traités de paix sous Louis XIV., Louis XV. et Louis XVI.* He is said to have been asked by Napoleon to write his *Histoire de France* (14 vols., 1805), a mediocre compilation at second or third hand, with the assistance of de Mézeray and of Paul François Velly (1709–1759). This work, nevertheless, passed through numerous editions, and by it his name is remembered. He died on the 6th of September 1808.

ANQUETIL DUPERRON, ABRAHAM HYACINTHE (1731–1805), French orientalist, brother of Louis Pierre Anquetil, the historian, was born in Paris on the 7th of December 1731. He was educated for the priesthood in Paris and Utrecht, but his taste for Hebrew, Arabic, Persian, and other languages of the East

developed into a passion, and he discontinued his theological course to devote himself entirely to them. His diligent attendance at the Royal Library attracted the attention of the keeper of the manuscripts, the Abbé Sallier, whose influence procured for him a small salary as student of the oriental languages. He had lighted on some fragments of the *Vendidad Sade*, and formed the project of a voyage to India to discover the works of Zoroaster. With this end in view he enlisted as a private soldier, on the 2nd of November 1754, in the Indian expedition which was about to start from the port of L'Orient. His friends procured his discharge, and he was granted a free passage, a seat at the captain's table, and a salary, the amount of which was to be fixed by the governor of the French settlement in India. After a passage of six months, Anquetil landed, on the 10th of August 1755, at Pondicherry. Here he remained a short time to master modern Persian, and then hastened to Chandernagore to acquire Sanskrit. Just then war was declared between France and England; Chandernagore was taken, and Anquetil returned to Pondicherry by land. He found one of his brothers at Pondicherry, and embarked with him for Surat; but, with a view of exploring the country, he landed at Mahé and proceeded on foot. At Surat he succeeded, by perseverance and address in his intercourse with the native priests, in acquiring a sufficient knowledge of the Zend and Pahlavi languages to translate the liturgy called the *Vendidad Sade* and some other works. Thence he proposed going to Benares, to study the language, antiquities, and sacred laws of the Hindus; but the capture of Pondicherry obliged him to quit India. Returning to Europe in an English vessel, he spent some time in London and Oxford, and then set out for France. He arrived in Paris on the 14th of March 1762 in possession of one hundred and eighty oriental manuscripts, besides other curiosities. The Abbé Barthélemy procured for him a pension, with the appointment of interpreter of oriental languages at the Royal Library. In 1763 he was elected an associate of the Academy of Inscriptions, and began to arrange for the publication of the materials he had collected during his eastern travels. In 1771 he published his *Zend-Avesta* (3 vols.), containing collections from the sacred writings of the fire-worshippers, a life of Zoroaster, and fragments of works ascribed to him. In 1778 he published at Amsterdam his *Législation orientale*, in which he endeavoured to prove that the nature of oriental despotism had been greatly misrepresented. His *Recherches historiques et géographiques sur l'Inde* appeared in 1786, and formed part of Thieffenthaler's *Geography of India*. The Revolution seems to have greatly affected him. During that period he abandoned society, and lived in voluntary poverty on a few pence a day. In 1798 he published *L'Inde en rapport avec l'Europe* (Hamburg, 2 vols.), which contained much invective against the English, and numerous misrepresentations. In 1802–1804 he published a Latin translation (2 vols.) from the Persian of the *Oupnek'hat* or *Upanishada*. It is a curious mixture of Latin, Greek, Persian, Arabic, and Sanskrit. He died in Paris on the 17th of January 1805.

See *Biographie universelle*; Sir William Jones, *Works* (vol. x., 1807); and the *Miscellanies* of the Philobiblon Society (vol. iii., 1856–1857). For a list of his scattered writings see Quérard, *La France littéraire*.

ANSA (from Lat. *ansa*, a handle), in astronomy, one of the apparent ends of the rings of Saturn as seen in perspective from the earth: so-called because, in the earlier telescopes, they looked like handles projecting from the planet. In anatomy the word is applied to nervous structures which resemble loops. In archaeology it is used for the engraved and ornamented handle of a vase, which has often survived when the vase itself, being less durable, has disappeared.

ANSBACH, or ANSPACH, originally *Onolzbach*, a town of Germany, in the kingdom of Bavaria, on the Rezat, 27 m. by rail S.W. of Nuremberg, and 90 m. N. of Munich. Pop. (1900) 17,555. It contains a palace, once the residence of the margraves of Anspach, with fine gardens; several churches, the finest of which are those dedicated to St John, containing the vault of the former margraves, and St Gumbert; a gymnasium; a picture gallery; a municipal museum and a special technical school. Ansbach possesses monuments to the poets August, Count von Platen-Hallermund, and Johann Peter Uz, who were born here, and to Kaspar Hauser, who died here. The chief manufactures are machinery, toys, woollen, cotton, and half-silk stuffs, embroideries, earthenware, tobacco, cutlery and playing cards. There is considerable trade in grain, wool and flax. In 1791 the last margrave of Anspach sold his principality to Frederick William II., king of Prussia; it was transferred by Napoleon to Bavaria in 1806, an act which was confirmed by the congress of Vienna in 1815.

ANSDELL, RICHARD (1815–1885), English painter, was born in Liverpool, and first exhibited at the Royal Academy in 1840. He was a painter of genre, chiefly animal and sporting pictures, and he became very popular, being elected A.R.A. in 1861 and R.A. in 1870. His "Stag at Bay" (1846), "The Combat" (1847), and "Battle of the Standard" (1848), represent his best work, in which he showed himself a notable follower of Landseer.

ANSELM (*c.* 1033–1109), archbishop of Canterbury, was born at Aosta in Piedmont. His family was accounted noble, and was possessed of considerable property. Gundulph, his father, was by birth a Lombard, and seems to have been a man of harsh and violent temper; his mother, Ermenberga, was a prudent and virtuous woman, from whose careful religious training the young Anselm derived much benefit. At the age of fifteen he desired to enter a convent, but he could not obtain his father's consent. Disappointment brought on an illness, on his recovery from which he seems for a time to have given up his studies, and to have plunged into the gay life of the world. During this time his mother died, and his father's harshness became unbearable. He left home, and with only one attendant crossed the Alps, and wandered through Burgundy and France. Attracted by the fame of his countryman, Lanfranc, then prior of Bec, he entered Normandy, and, after spending some time at Avranches, settled at the monastery of Bec. There, at the age of twenty-seven, he became a monk; three years later, when Lanfranc was promoted to the abbacy of Caen, he was elected prior. This office he held for fifteen years, and then, in 1078, on the death of Herlwin, the warrior monk who had founded the monastery, he was made abbot. Under his rule Bec became the first seat of learning in Europe, a result due not more to his intellectual powers than to the great moral influence of his noble character and kindly discipline. It was during these quiet years at Bec that Anselm wrote his first philosophical and religious works, the dialogues on Truth and Freewill, and the two celebrated treatises, the *Monologion* and *Proslogion*.

Meanwhile the convent had been growing in wealth, as well as in reputation, and had acquired considerable property in England, which it became the duty of Anselm occasionally to visit. By his mildness of temper and unswerving rectitude, he so endeared himself to the English that he was looked upon and desired as the natural successor to Lanfranc, then archbishop of Canterbury. But on the death of that great man, the ruling sovereign, William Rufus, seized the possessions and revenues of the see, and made no new appointment. About four years after, in 1092, on the invitation of Hugh, earl of Chester, Anselm with some reluctance, for he feared to be made archbishop, crossed to England. He was detained by business for nearly four months, and when about to return, was refused permission by the king. In the following year William fell ill, and thought his death was at hand. Eager to make atonement for his sin with regard to the archbishopric, he nominated Anselm to the vacant see, and after a great struggle compelled him to accept the pastoral staff of office. After obtaining dispensation from his duties in Normandy, Anselm was consecrated in 1093. He demanded of the king, as the conditions of his retaining office, that he should give up all the possessions of the see, accept his spiritual counsel, and acknowledge Urban as pope in opposition to the anti-pope, Clement. He only obtained a partial consent to the first of these, and the last involved him in a serious difficulty with the king. It was a rule of the church that the consecration of metropolitans could not be completed without their receiving

the *pallium* from the hands of the pope. Anselm, accordingly, insisted that he must proceed to Rome to receive the pall. But William would not permit this; he had not acknowledged Urban, and he maintained his right to prevent any pope being acknowledged by an English subject without his permission. A great council of churchmen and nobles, held to settle the matter, advised Anselm to submit to the king, but failed to overcome his mild and patient firmness. The matter was postponed, and William meanwhile privately sent messengers to Rome, who acknowledged Urban and prevailed on him to send a legate to the king bearing the archiepiscopal pall. A partial reconciliation was then effected, and the matter of the pall was compromised. It was not given by the king, but was laid on the altar at Canterbury, whence Anselm took it.

Little more than a year after, fresh trouble arose with the king, and Anselm resolved to proceed to Rome and seek the counsel of his spiritual father. With great difficulty he obtained a reluctant permission to leave, and in October 1097 he set out for Rome. William immediately seized on the revenues of the see, and retained them to his death. Anselm was received with high honour by Urban, and at a great council held at Bari, he was put forward to defend the doctrine of the procession of the Holy Ghost against the representatives of the Greek Church. But Urban was too politic to embroil himself with the king of England, and Anselm found that he could obtain no substantial result. He withdrew from Rome, and spent some time at the little village of Schiavi, where he finished his treatise on the atonement, *Cur Deus homo*, and then retired to Lyons.

In 1100 William was killed, and Henry, his successor, at once recalled Anselm. But Henry demanded that he should again receive from him in person investiture in his office of archbishop, thus making the dignity entirely dependent on the royal authority. Now, the papal rule in the matter was plain; all homage and lay investiture were strictly prohibited. Anselm represented this to the king; but Henry would not relinquish a privilege possessed by his predecessors, and proposed that the matter should be laid before the Holy See. The answer of the pope reaffirmed the law as to investiture. A second embassy was sent, with a similar result. Henry, however, remained firm, and at last, in 1103, Anselm and an envoy from the king set out for Rome. The pope, Paschal, reaffirmed strongly the rule of investiture, and passed sentence of excommunication against all who had infringed the law, except Henry. Practically this left matters as they were, and Anselm, who had received a message forbidding him to return to England unless on the king's terms, withdrew to Lyons, where he waited to see if Paschal would not take stronger measures. At last, in 1105, he resolved himself to excommunicate Henry. His intention was made known to the king through his sister, and it seriously alarmed him, for it was a critical period in his affairs. A meeting was arranged, and a reconciliation between them effected. In 1106 Anselm crossed to England, with power from the pope to remove the sentence of excommunication from the illegally invested churchmen. In 1107 the long dispute as to investiture was finally ended by the king resigning his formal rights. The remaining two years of Anselm's life were spent in the duties of his archbishopric. He died on the 21st of April 1109. He was canonized in 1494 by Alexander VI.

Anselm may, with some justice, be considered the first scholastic philosopher and theologian. His only great predecessor, Scotus Erigena, had more of the speculative and mystical element than is consistent with a schoolman; but in Anselm are found that recognition of the relation of reason to revealed truth, and that attempt to elaborate a rational system of faith, which form the special characteristics of scholastic thought. His constant endeavour is to render the contents of the Christian consciousness clear to reason, and to develop the intelligible truths interwoven with the Christian belief. The necessary preliminary for this is the possession of the Christian consciousness. "He who does not believe will not experience; and he who has not experienced will not understand." That faith must precede knowledge is reiterated by him. "*Neque enim quaero intelligere ut credam, sed credo ut intelligam. Nam et hoc credo, quia, nisi credidero, non intelligam.*" ("Nor do I seek to understand that I may believe, but I believe that I may understand. For this too I believe, that unless I first believe, I shall not understand.") But after the faith is held fast, the attempt must be made to demonstrate by reason the truth of what we believe. It is wrong not to do so. "*Negligentiae mihi esse videtur, si, postquam confirmati sumus in fide, non studemus quod credimus, intelligere.*" ("I hold it to be a failure in duty if after we have become steadfast in the faith we do not strive to understand what we believe.") To such an extent does he carry this demand for rational explanation that, at times, it seems as if he claimed for unassisted intelligence the power of penetrating even to the mysteries of the Christian faith. On the whole, however, the qualified statement is his real view; merely rational proofs are always, he affirms, to be tested by Scripture. (*Cur Deus homo*, i. 2 and 38; *De Fide Trin.* 2.)

The groundwork of his theory of knowledge is contained in the tract *De Veritate*, in which, from the consideration of truth as in knowledge, in willing, and in things, he rises to the affirmation of an absolute truth, in which all other truth participates. This absolute truth is God himself, who is therefore the ultimate ground or principle both of things and of thought. The notion of God comes thus into the foreground of the system; before all things it is necessary that it should be made clear to reason, that it should be demonstrated to have real existence. This demonstration is the substance of the *Monologion* and *Proslogion*. In the first of these the proof rests on the ordinary grounds of realism, and coincides to some extent with the earlier theory of Augustine, though it is carried out with singular boldness and fulness. Things, he says, are called good in a variety of ways and degrees; this would be impossible if there were not some absolute standard, some good in itself, in which all relative goods participate. Similarly with such predicates as great, just; they involve a certain greatness and justice. The very existence of things is impossible without some one Being, by whom they are. This absolute Being, this goodness, justice, greatness, is God. Anselm was not thoroughly satisfied with this reasoning; it started from *a posteriori* grounds, and contained several converging lines of proof. He desired to have some one short demonstration. Such a demonstration he presented in the *Proslogion*; it is his celebrated ontological proof. God is that being than whom none greater can be conceived. Now, if that than which nothing greater can be conceived existed only in the intellect, it would not be the absolutely greatest, for we could add to it existence in reality. It follows, then, that the being than whom nothing greater can be conceived, *i.e.* God, necessarily has real existence. This reasoning, in which Anselm partially anticipated the Cartesian philosophers, has rarely seemed satisfactory. It was opposed at the time by the monk Gaunilo, in his *Liber pro Insipiente*, on the ground that we cannot pass from idea to reality. The same criticism is made by several of the later schoolmen, among others by Aquinas, and is in substance what Kant advances against all ontological proof. Anselm replied to the objections of Gaunilo in his *Liber Apologeticus*. The existence of God being thus held proved, he proceeds to state the rational grounds of the Christian doctrines of creation and of the Trinity. With reference to this last, he says we cannot know God from himself, but only after the analogy of his creatures; and the special analogy used is the self-consciousness of man, its peculiar double nature, with the necessary elements, memory and intelligence, representing the relation of the Father to the Son. The mutual love of these two, proceeding from the relation they hold to one another, symbolizes the Holy Spirit. The further theological doctrines of man, original sin, free will, are developed, partly in the *Monologion*, partly in other mixed treatises. Finally, in his greatest work, *Cur Deus homo*, he undertakes to make plain, even to infidels, the rational necessity of the Christian mystery of the atonement. The theory rests on three positions: that satisfaction is necessary on account of God's honour and justice; that such satisfaction can be given only by the peculiar personality

of the God-man; that such satisfaction is really given by the voluntary death of this infinitely valuable person. The demonstration is, in brief, this. All the actions of men are due to the furtherance of God's glory; if, then, there be sin, *i.e.* if God's honour be wounded, man of himself can give no satisfaction. But the justice of God demands satisfaction; and as an insult to infinite honour is in itself infinite, the satisfaction must be infinite, *i.e.* it must outweigh all that is not God. Such a penalty can only be paid by God himself, and, as a penalty for man, must be paid under the form of man. Satisfaction is only possible through the God-man. Now this God-man, as sinless, is exempt from the punishment of sin; His passion is therefore voluntary, not given as due. The merit of it is therefore infinite; God's justice is thus appeased, and His mercy may extend to man. This theory has exercised immense influence on the form of church doctrine. It is certainly an advance on the older patristic theory, in so far as it substitutes for a contest between God and Satan, a contest between the goodness and justice of God; but it puts the whole relation on a merely legal footing, gives it no ethical bearing, and neglects altogether the consciousness of the individual to be redeemed. In this respect it contrasts unfavourably with the later theory of Abelard.

Anselm's speculations did not receive, in the middle ages, the respect and attention justly their due. This was probably due to their unsystematic character, for they are generally tracts or dialogues on detached questions, not elaborate treatises like the great works of Albert, Aquinas, and Erigena. They have, however, a freshness and philosophical vigour, which more than makes up for their want of system, and which raises them far above the level of most scholastic writings.

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Works: The best edition of St Anselm's complete works is that of Dom Gerberon (Paris, 1675); reprinted with many notes in 1712; incorporated by J. Migne in his *Patrologia Latina*, tomi clviii.-clix. (Paris, 1853–1854). Migne's reprint contains many errors. The *Cur Deus homo* may be best studied in the editions published by D. Nutt (London, 1885) and by Griffith (1898). The *Mariale*, or poems in honour of the Blessed Virgin, has been carefully edited by P. Ragey (Tournai, 1885); the *Monologion* and *Proslogion*, by C. E. Ubaghs (Louvain, 1854; Eng. trans. by S. N. Deane, Chicago, 1903); the *Meditationes*, many of which are wrongly attributed to Anselm, have been frequently reprinted, and were included in Methuen's *Library of Devotion* (London, 1903).

The best criticism of Anselm's philosophical works is by J. M. Rigg (London, 1896), and Domet de Vorges (*Grands Philosophes* series, Paris, 1901). For a complete bibliography, see A. Vacant's *Dictionnaire de théologie*.

ANSELM, of Laon (d. 1117), French theologian, was born of very humble parents at Laon before the middle of the 11th century. He is said to have studied under St Anselm at Bec. About 1076 he taught with great success at Paris, where, as the associate of William of Champeaux, he upheld the realistic side of the scholastic controversy. Later he removed to his native place, where his school for theology and exegetics rapidly became the most famous in Europe. He died in 1117. His greatest work, an interlinear gloss on the Scriptures, was one of the great authorities of the middle ages. It has been frequently reprinted. Other commentaries apparently by him have been ascribed to various writers, principally to the great Anselm. A list of them, with notice of Anselm's life, is contained in the *Histoire littéraire de la France*, x. 170–189.

The works are collected in Migne's *Patrologia Latina*, tome 162; some unpublished *Sententiae* were edited by G. Lefèvre (Milan, 1894), on which see Hauréau in the *Journal des savants* for 1895.

ANSELME (Father Anselme of the Virgin Mary) (1625–1694), French genealogist, was born in Paris in 1625. As a layman his name was Pierre Guibours. He entered the order of the barefooted Augustinians on the 31st of March 1644, and it was in their monastery (called the Couvent des Petits Pères, near the church of Notre-Dame des Victoires) that he died, on the 17th of January 1694. He devoted his entire life to genealogical studies. In 1663 he published *Le Palais de l'honneur*, which besides giving the genealogy of the houses of Lorraine and Savoy, is a complete treatise on heraldry, and in 1664 *Le Palais de la gloire*, dealing with the genealogy of various illustrious French and European families. These books made friends for him, the most intimate among whom, Honoré Caille, seigneur du Fourny (1630–1713), persuaded him to publish his *Histoire généalogique de la maison royale de France, et des grands officiers de la couronne* (1674, 2 vols. 4); after Father Anselme's death, Honoré Caille collected his papers,and brought out a new edition of this highly important work in 1712. The task was taken up and continued by two other friars of the Couvent des Petits Pères, Father Ange de Sainte-Rosalie (François Raffard, 1655–1726), and Father Simplicien (Paul Lucas, 1683–1759), who published the first and second volumes of the third edition in 1726. This edition consists of nine volumes folio; it is a genealogical and chronological history of the royal house of France, of the peers, of the great officers of the crown and of the king's household, and of the ancient barons of the kingdom. The notes were generally compiled from original documents, references to which are usually given, so that they remain useful to the present day. The work of Father Anselme, his collaborators and successors, is even more important for the history of France than is Dugdale's *Baronage of England* for the history of England. (C. B.*)

ANSON, GEORGE ANSON, BARON (1697–1762), British admiral, was born on the 23rd of April 1697. He was the son of William Anson of Shugborough in Staffordshire, and his wife Isabella Carrier, who was the sister-in-law of Lord Chancellor Macclesfield, a relationship which proved very useful to the future admiral. George Anson entered the navy in February 1712, and by rapid steps became lieutenant in 1716, commander in 1722, and post-captain in 1724. In this rank he served twice on the North American station as captain of the "Scarborough" and the "Squirrel" from 1724 to 1730 and from 1733 to 1735. In 1737 he was appointed to the "Centurion," 60, on the eve of war with Spain, and when hostilities had begun he was chosen to command as commodore the squadron which was sent to attack her possessions in South America in 1740. The original scheme was ambitious, and was not carried out. Anson's squadron, which sailed later than had been intended, and was very ill-fitted, consisted of six ships, which were reduced by successive disasters to his flagship the "Centurion." The lateness of the season forced him to round Cape Horn in very stormy weather, and the navigating instruments of the time did not allow of exact observation. Two of his vessels failed to round the Horn, another, the "Wager," was wrecked in the Golfo de Pañas on the coast of Chile. By the time Anson reached the island of Juan Fernandez in June 1741, his six ships had been reduced to three, while the strength of his crews had fallen from 961 to 335. In the absence of any effective Spanish force on the coast he was able to harass the enemy, and to capture the town of Paita on the 13th–15th of November 1741. The steady diminution of his crew by sickness, and the worn-out state of his remaining consorts, compelled him at last to collect all the survivors in the "Centurion." He rested at the island of Tinian, and then made his way to Macao in November 1742. After considerable difficulties with the Chinese, he sailed again with his one remaining vessel to cruise for one of the richly laden galleons which conducted the trade between Mexico and the Philippines. The indomitable perseverance he had shown during one of the most arduous voyages in the history of sea adventure was rewarded by the capture of an immensely rich prize, the "Nuestra Señora de Covadonga," which was met off Cape Espiritu Santo on the 20th of June 1743. Anson took his prize back to Macao, sold her cargo to the Chinese, keeping the specie, and sailed for England, which he reached by the Cape of Good Hope on the 15th of June 1744. The prize-money earned by the capture of the galleon had made him a rich man for life, and under the influence of irritation caused by the

refusal of the admiralty to confirm a captain's commission he had given to one of his officers, Anson refused the rank of rear-admiral, and was prepared to leave the service. His fame would stand nearly as high as it does if he had done so, but he would be a far less important figure in the history of the navy. By the world at large he is known as the commander of the voyage of circumnavigation, in which success was won by indomitable perseverance, unshaken firmness, and infinite resource. But he was also the severe and capable administrator who during years of hard work at the admiralty did more than any other to raise the navy from the state of corruption and indiscipline into which it had fallen during the first half of the eighteenth century. Great anger had been caused in the country by the condition of the fleet as revealed in the first part of the war with France and Spain, between 1739 and 1747. The need for reform was strongly felt, and the politicians of the day were conscious that it would not be safe to neglect the popular demand for it. In 1745 the duke of Bedford, the new first lord, invited Anson to join the admiralty with the rank of rear-admiral of the white. As subordinate under the duke, or Lord Sandwich, and as first lord himself, Anson was at the admiralty with one short break from 1745 till his death in 1762. His chiefs in the earlier years left him to take the initiative in all measures of reform, and supported him in their own interest. After 1751 he was himself first lord, except for a short time in 1756 and 1757. At his suggestion, or with his advice, the naval administration was thoroughly overhauled. The dockyards were brought into far better order, and though corruption was not banished, it was much reduced. The navy board was compelled to render accounts, a duty it had long neglected. A system of regulating promotion to flag rank, which has been in the main followed ever since, was introduced. The Navy Discipline Act was revised in 1749, and remained unaltered till 1865. Courts martial were put on a sound footing. Inspections of the fleet and the dockyards were established, and the corps of Marines was created in 1755. The progressive improvement which raised the navy to the high state of efficiency it attained in later years dates from Anson's presence at the admiralty. In 1747 he, without ceasing to be a member of the board, commanded the Channel fleet which on the 3rd of May scattered a large French convoy bound to the East, and West Indies, in an action off Cape Finisterre. Several men-of-war and armed French Indiamen were taken, but the overwhelming superiority of Anson's fleet (fourteen men-of-war, to six men-of-war and four Indiamen) in the number and weight of ships deprives the action of any strong claim to be considered remarkable. In society Anson seems to have been cold and taciturn. The sneers of Horace Walpole, and the savage attack of Smollett in *The Adventures of an Atom*, are animated by personal or political spite. Yet they would not have accused him of defects from which he was notoriously free. In political life he may sometimes have given too ready assent to the wishes of powerful politicians. He married the daughter of Lord Chancellor Hardwicke on the 27th of April 1748. There were no children of the marriage. His title of Baron Anson of Soberton was given him in 1747, but became extinct on his death. The title of Viscount Anson was, however, created in 1806 in favour of his great-nephew, the grandson of his sister Janetta and Mr Sambrook Adams, whose father had assumed the name and arms of Anson. The earldom of Lichfield was conferred on the family in the next generation. A fine portrait of the admiral by Reynolds is in the possession of the earl of Lichfield, and there are copies in the National Portrait Gallery and at Greenwich. Anson's promotions in flag rank were: rear-admiral in 1745, vice-admiral in 1746, and admiral in 1748. In 1749 he became vice-admiral of Great Britain, and in 1761 admiral of the fleet. He died on the 6th of June 1762.

A life of Lord Anson, inaccurate in some details but valuable and interesting, was published by Sir John Barrow in 1839. The standard account of his voyage round the world is that by his chaplain Richard Walter, 1748, often reprinted. A share in the work has been claimed on dubious grounds for Benjamin Robins, the mathematician. Another and much inferior account was published in 1745 by Pascoe Thomas, the schoolmaster of the "Centurion." (D. H.)

ANSON, SIR WILLIAM REYNELL, BART. (1843–), English jurist, was born on the 14th of November 1843, at Walberton, Sussex, son of the second baronet. Educated at Eton and Balliol College, Oxford, he took a first class in the final classical schools in 1866, and was elected to a fellowship of All Souls in the following year. In 1869 he was called to the bar, and went the home circuit until 1873, when he succeeded to the baronetcy. In 1874 he became Vinerian reader in English law at Oxford, a post which he held until he became, in 1881, warden of All Souls College. He identified himself both with local and university interests; he became an alderman of the city of Oxford in 1892, chairman of quarter sessions for the county in 1894, was vice-chancellor of the university in 1898–1899, and chancellor of the diocese of Oxford in 1899. In that year he was returned, without opposition, as M.P. for the university in the Liberal Unionist interest, and consequently resigned the vice-chancellorship. In parliament he preserved an active interest in education, being a member of the newly created consultative committee of the Board of Education in 1900, and in 1902 he became parliamentary secretary. He took an active part in the foundation of a school of law at Oxford, and his volumes on *The Principles of the English Law of Contract* (1884, 11th ed. 1906), and on *The Law and Custom of the Constitution* in two parts, "The Parliament" and "The Crown" (1886–1892, 3rd ed. 1907, pt. i. vol. ii.), are standard works.

ANSONIA, a city of New Haven county, Connecticut, U.S.A., coextensive with the township of the same name, on the Naugatuck river, immediately N. of Derby and about 12 m. N.W. of New Haven. It is served by the New York, New Haven & Hartford railway, and by interurban electric lines running N., S. and E. Pop. (1900) 12,681, of whom 4296 were foreign born; (1910 census) 15,152. Land area about 5·4 sq. m. The city has extensive manufactures of heavy machinery, electric supplies, brass and copper products and silk goods. In 1905 the capital invested in manufacturing was $7,625,864, and the value of the products was $19,132,455. Ansonia, Derby and Shelton form one of the most important industrial communities in the state. The city, settled in 1840 and named in honour of the merchant and philanthropist, Anson Green Phelps (1781–1853), was originally a part of the township of Derby; it was chartered as a borough in 1864 and as a city in 1893, when the township of Ansonia, which had been incorporated in 1889, and the city were consolidated.

ANSTED, DAVID THOMAS (1814–1880), English geologist, was born in London on the 5th of February 1814. He was educated at Jesus College, Cambridge, and after taking his degree of M.A. in 1839 was elected to a fellowship of the college. Inspired by the teachings of Adam Sedgwick, his attention was given to geology, and in 1840 he was elected professor of geology in King's College, London, a post which he held until 1853. Meanwhile he became a fellow of the Royal Society in 1844, and from that date until 1847 he was vice-secretary of the Geological Society and edited its *Quarterly Journal*. The practical side of geology now came to occupy his chief attention, and he visited various parts of Europe and the British Islands as a consulting geologist and mining engineer. He was also in 1868 and for many years examiner in physical geography to the science and art department. He died at Melton near Woodbridge, on the 13th of May 1880.

PUBLICATIONS.—*Geology, Introductory, Descriptive and Practical* (2 vols., 1844); *The Ionian Islands* (1863); *The Applications of Geology to the Arts and Manufactures* (1865); *Physical Geography* (1867); *Water and Water Supply* (Surface Water) (1878); and *The Channel Islands* (with R. G. Latham) (1862).

ANSTEY, CHRISTOPHER (1724–1805), English poet, was the son of the rector of Brinkley, Cambridgeshire, where he was born on the 31st of October 1724. He was educated at Eton and King's College, Cambridge, where he distinguished himself for his Latin verses. He became a fellow of his college (1745), but the degree of M.A. was withheld from him, owing to the offence caused by a speech made by him beginning: "Doctores sine doctrina, magistri artium sine artibus, et baccalaurei baculo potius quam lauro digni." In 1754 he succeeded to the family

estates and left Cambridge; and two years later he married the daughter of Felix Calvert of Albury Hall, Herts. For some time Anstey published nothing of any note, though he cultivated letters as well as his estates. Some visits to Bath, however, where later, in 1770, he made his permanent home, resulted in 1766 in his famous rhymed letters, *The New Bath Guide* or *Memoirs of the B . . . r . . . d [Blunderhead] Family . . .*, which had immediate success, and was enthusiastically praised for its original kind of humour by Walpole and Gray. The *Election Ball, in Poetical Letters from Mr Inkle at Bath to his Wife at Gloucester* (1776) sustained the reputation won by the Guide. Anstey's other productions in verse and prose are now forgotten. He died on the 3rd of August 1805. His *Poetical Works* were collected in 1808 (2 vols.) by the author's son John (d. 1819), himself author of *The Pleader's Guide* (1796), in the same vein with the *New Bath Guide*.

ANSTRUTHER (locally pronounced *Anster*), a seaport of Fifeshire, Scotland. It comprises the royal and police burghs of Anstruther Easter (pop. 1190), Anstruther Wester (501) and Kilrenny (2542), and lies 9 m. S.S.E. of St Andrews, having a station on the North British railway company's branch line from Thornton Junction to St Andrews. The chief industries include coast and deep-sea fisheries, shipbuilding, tanning, the making of cod-liver oil and fish-curing. The harbour was completed in 1877 at a cost of £80,000. The two Anstruthers are divided only by a small stream called Dreel Burn. James Melville (1556–1614), nephew of the more celebrated reformer, Andrew Melville, who was minister of Kilrenny, has given in his *Diary* a graphic account of the arrival at Anstruther of a weather-bound ship of the Armada, and the tradition of the intermixture of Spanish and Fifeshire blood still prevails in the district. Anstruther fair supplied William Tennant (1784–1848), who was born and buried in the town, with the subject of his poem of "Anster Fair." Sir James Lumsden, a soldier of fortune under Gustavus Adolphus, who distinguished himself in the Thirty Years' War, was born in the parish of Kilrenny about 1598. David Martin (1737–1798), the painter and engraver; Thomas Chalmers (1780–1847), the great divine; and John Goodsir (1814–1867), the anatomist, were natives of Anstruther. Little more than a mile to the west lies the royal and police burgh of Pittenweem (Gaelic, "the hollow of the cave"), a quaint old fishing town (pop. 1863), with the remains of a priory. About 2 m. still farther westwards is the fishing town of St Monans or Abercromby (pop. 1898), with a fine old Gothic church, picturesquely perched on the rocky shore. These fisher towns on the eastern and south-eastern coasts of Fifeshire furnish artists with endless subjects. Archibald Constable (1774–1827), Sir Walter Scott's publisher, was born in the parish of Carnbee, about 3 m. to the north of Pittenweem. The two Anstruthers, Kilrenny and Pittenweem unite with St Andrews, Cupar and Crail, in sending one member to parliament.

ANSWER (derived from *and*, against, and the same root as *swear*), originally a solemn assertion in opposition to some one or something, and thus generally any counter-statement or defence, a reply to a question or objection, or a correct solution of a problem. In English law, the "answer" in pleadings was, previous to the Judicature Acts 1873–1875, the statement of defence, especially as regards the facts and not the law. Its place is now taken by a "statement of defence." "Answer" is the term still applied in divorce proceedings to the reply of the respondent (see PLEADING). The famous Latin *Responsa Prudentum* ("answers of the learned") were the accumulated views of many successive generations of Roman lawyers, a body of legal opinion which gradually became authoritative. In music an "answer" is the technical name in counterpoint for the repetition by one part or instrument of a theme proposed by another.

ANT (O. Eng. *æmete*, from Teutonic *a*, privative, and *maitan*, cut or bite off, *i.e.* "the biter off"; *æmete* in Middle English became differentiated in dialect use to *amete*, then *amte*, and so *ant*, and also to *emete*, whence the synonym "emmet," now only used provincially, "ant" being the general literary form). The fact that the name of the ant has come down in English from a thousand years ago shows that this class of insects impressed the old inhabitants of England as they impressed the Hebrews and Greeks. The social instincts and industrious habits of ants have always made them favourite objects of study, and a vast amount of literature has accumulated on the subject of their structure and their modes of life.

Characters.—An ant is easily recognized both by the casual observer and by the student of insects. Ants form a distinct and natural family (*Formicidae*) of the great order *Hymenoptera*, to which bees, wasps and sawflies also belong. The insects of this order have mandibles adapted for biting, and two pairs of membranous wings are usually present; the first abdominal segment (propodeum) becomes closely associated with the fore-body (thorax), of which it appears to form a part. In all ants the second (apparently the first) abdominal segment is very markedly constricted at its front and hind edges, so that it forms a "node" at the base of the hind-body (fig. 1), and in many ants the third abdominal segment is similarly "nodular" in form (fig. 3, *b*, *c*,). It is this peculiar "waist" that catches the eye of the observer, and makes the insects so easy of recognition. Another conspicuous and well-known feature of ants is the wingless condition of the "workers," as the specialized females, with undeveloped ovaries, which form the largest proportion of the population of ant-communities, are called. Such "workers" are essential to the formation of a social community of Hymenoptera, and their wingless condition among the ants shows that their specialization has been carried further in this family than among the wasps and bees. Further, while among wasps and bees we find some solitary and some social genera, the ants as a family are social, though some

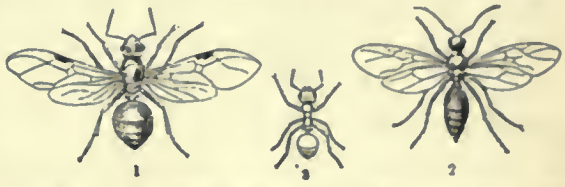


FIG. 1.—Wood Ant (*Formica rufa*). 1, Queen; 2, male; 3, worker.

aberrant species are dependent on the workers of other ants. It is interesting and suggestive that in a few families of digging Hymenoptera (such as the *Mutillidae*), allied to the ants, the females are wingless. The perfect female or "queen" ants (figs. 1, *1*, 3, *a*) often cast their wings (fig. 3,*b*) after the nuptial flight; in a few species the females, and in still fewer the males, never develop wings. (For the so-called "white ants," which belong to an order far removed from the *Hymenoptera*, see TERMITE.)

Structure.—The head of an ant carries a pair of elbowed feelers, each consisting of a minute basal and an elongate second segment, forming the stalk or "scape," while from eight to eleven short segments make up the terminal "flagellum." These segments are abundantly supplied with elongate tooth-like projections connected with nerve-endings probably olfactory in function. The brain is well developed and its "mushroom-bodies" are exceptionally large. The mandibles, which are frequently used for carrying various objects, are situated well to the outside of the maxillae, so that they can be opened and shut without interfering with the latter. The peculiar form and arrangement of the anterior abdominal segments have already been described. The fourth abdominal segment is often very large, and forms the greater part of the hind-body; this segment is markedly constricted at its basal (forward) end, where it is embraced by the small third segment. In many of those ants whose third abdominal segment forms a second "node," the basal dorsal region of the fourth segment is traversed by a large number of very fine transverse striations; over these the sharp hinder edge of the third segment can be scraped to and fro, and the result is a stridulating organ which gives rise to a note of very high pitch. For the appreciation of the sounds made by these stridulators, the ants are furnished with delicate organs of hearing (chordotonal organs) in the head, in the three thoracic and two of the abdominal segments and in the shins of the legs.

The hinder abdominal segments and the stings of the queens and workers resemble those of other stinging Hymenoptera. But there are several subfamilies of ants whose females have the lancets of the sting useless for piercing, although the poison-glands are functional, their secretion being ejected by the insect, when occasion may arise, from the greatly enlarged reservoir, the reduced sting acting as a squirt.

Nests.—The nests of different kinds of ants are constructed in very different situations; many species (*Lasius*, for example) make underground nests; galleries and chambers being hollowed out in the soil, and opening by small holes on the surface, or protected above by a large stone. The wood ant (*Formica rufa*, fig. 1) piles up a heap of leaves, twigs and other vegetable refuse, so arranged as to form an orderly series of galleries, though the structure appears at first sight a chaotic heap. Species of *Camponotus* and many other ants tunnel in wood. In tropical countries ants sometimes make their nests in the hollow thorns of trees or on leaves; species with this habit are believed to make a return to the tree for the shelter that it affords by protecting it from the ravages of other insects, including their own leaf-cutting relations.

Early Stages.—The larvae of ants (fig. 3, *e*) are legless and helpless maggots with very small heads (fig. 3, *f*), into whose mouths the requisite food has to be forced by the assiduous "nurse" workers. The maggots are tended by these nurses with the greatest care, and carried to those parts of the nest most favourable for their health and growth. When fully grown, the maggot spins an oval silken cocoon within which it pupates (fig. 3, *g*). These cocoons, which may often be seen carried between the mandibles of the workers, are the "ants' eggs" prized as food for fish and pheasants. The workers of a Ceylonese ant (*Oecophylla smaragdina*) are stated by D. Sharp to hold the maggots between their mandibles and induce them to spin together the leaves of trees from which they form their shelters, as the adult ants have no silk-producing organs.

Origin of Societies.—Ant-colonies are founded either by a single female or by several in association. The foundress of the nest lays eggs and at first feeds and rears the larvae, the earliest of which develop into workers. C. Janet observed that in a nest of *Lasius alienus*, established by a single female, the first workers emerged from their cocoons on the 102nd day. These workers then take on themselves the labour of the colony, some collecting food, which they transfer to their comrades within the nest whose duty is to tend and feed the larvae. The foundress-queen is now waited on by the workers, who supply her with food and spare her all cares of work, so that henceforth she may devote her whole energies to egg-laying. The population of the colony increases fast, and a well-grown nest contains several "queens" and males, besides a large number of workers. One of the most interesting features of ant-societies is the dimorphism or polymorphism that may often be seen among the workers, the same species being represented by two or more forms. Thus the British "wood ant" (*Formica rufa*) has a smaller and a larger race of workers ("minor" and "major" forms), while in *Ponera* we find a blind race of workers and another race provided with eyes, and in *Atta*, *Eciton* and other genera, four or five forms of workers are produced, the largest of which, with huge heads and elongate trenchant mandibles, are known as the "soldier" caste. The development of such diversely-formed insects as the offspring of the unmodified females which show none of their peculiarities raises many points of difficulty for students in heredity. It is thought that the differences are, in part at least, due to differences in the nature of the food supplied to larvae, which are apparently all alike. But the ovaries of worker ants are in some cases sufficiently developed for the production of eggs, which may give rise parthenogenetically to male, queen or worker offspring.

Food.—Different kinds of ants vary greatly in the substances which they use for food. Honey forms the staple nourishment of many ants, some of the workers seeking nectar from flowers, working it up into honey within their stomachs and regurgitating it so as to feed their comrades within the nest, who, in their turn, pass it on to the grubs. A curious specialization of certain workers in connexion with the transference of honey has been demonstrated by H. C. McCook in the American genus *Myrmecocystus*, and by later observers in Australian and African species of *Plagiolepis* and allied genera. The workers in question remain within the nest, suspended by their feet, and serve as living honey-pots for the colony, becoming so distended by the supplies of honey poured into their mouths by their foraging comrades that their abdomens become sub-globular, the pale intersegmental membrane being tightly stretched between the widely-separated dark sclerites. The "nurse" workers in the nest can then draw their supplies from these "honey-pots." Very many ants live by preying upon various insects, such as the British "red ants" with well-developed stings (*Myrmica rubra*), and the notorious "driver ants" of Africa and America, the old-world species of which belong to *Dorylus* and allied genera, and the new-world species to *Eciton* (fig. 2, *2*, *3*). In these ants the difference between the large, heavy, winged males and females, and the small, long-legged, active workers, is so great, that various forms of the same species have been often referred to distinct genera; in *Eciton*, for example, the female has a single petiolate abdominal segment, the worker two. The workers of these ants range over the country in large armies, killing and carrying off all the insects and spiders that they find and sometimes attacking vertebrates. They have been known to enter human dwellings, removing all the verminous insects contained therein. These driver ants shelter in temporary nests made in

FIG. 2.—Leaf-cutting and Foraging Ants. 1, *Atta cephalus*; 2, *Eciton drepanophora*; 3, *Eciton erratica*.

hollow trees or similar situations, where the insects may be seen, according to T. Belt, "clustered together in a dense mass like a great swarm of bees hanging from the roof."

The harvesting habits of certain ants have long been known, the subterranean store-houses of Mediterranean species of *Aphaenogaster* having been described by J. T. Moggridge and A. Forel, and the complex industries of the Texan *Pogonomyrmex barbatus* by H. C. McCook and W. M. Wheeler. The colonies of *Aphaenogaster* occupy nests extending over an area of fifty to a hundred square yards several feet below the surface of the ground. Into these underground chambers the ants carry seeds of grasses and other plants of which they accumulate large stores. The species of *Pogonomyrmex* strip the husks from the seeds and carry them out of the nest, making a refuse heap near the entrance. The seeds are harvested from various grasses, especially from *Aristida oligantha*, a species known as "ant rice," which often grows in quantity close to the site selected for the nest, but the statement that the ants deliberately sow this grass is an error, due, according to Wheeler, to the sprouting of germinating seeds which the ants have turned out of their store-chambers.

Perhaps no ants have such remarkable habits as those of the genus *Atta*,—the leaf-cutting ants of tropical America (fig. 2, *1*). There are several forms of worker in these species, some with enormous heads, which remain in the underground nests, while their smaller comrades scour the country in search of suitable trees, which they ascend, biting off small circular pieces from the leaves, and carrying them off to the nests. Their labour often results in the complete defoliation of the tree. The tracks along which the ants carry the leaves to their nests are often in part subterranean. H. C. McCook describes an almost straight tunnel, nearly 450 ft. long, made by *Atta fervens*.

Within the nest, the leaves are cut into very minute fragments and gathered into small spherical heaps forming a spongy mass, which—according to the researches of A. Möller—serves as the substratum for a special fungus (*Rozites gongylophora*), the staple food of the ants. The insects cultivate their fungus, weeding out

mould and bacterial growths, and causing the appearance, on the surface of their "mushroom garden," of numerous small white bodies formed by swollen ends of the fungus hyphae. When the fungus is grown elsewhere than in the ants' nest it produces gonidia instead of the white masses on which the ants feed, hence it seems that these masses are indeed produced as the result of some unknown cultural process. Other genera of South American ants—*Apterostigma* and *Cyphomyrmex*—make similar fungal cultivations, but they use wood, grain or dung as the substratum instead of leaf fragments. Each kind of ant is so addicted to its own particular fungal food that it refuses disdainfully, even when hungry, the produce of an alien nest.

Guests of Ants.—Many ants feed largely and some almost entirely on the saccharine secretions of other insects, the best known of which are the Aphides (plant-lice or "green-fly"). This consideration leads us to one of the most remarkable and fascinating features of ant-communities—the presence in the nests of insects and other small arthropods, which are tended and cared for by the ants as their "guests," rendering to the ants in return the sweet food which they desire. The relation between ants and aphids has often been compared to that between men and milch cattle. Sir J. Lubbock (Lord Avebury) states that the common British yellow ants (*Lasius flavus*) collect flocks of root-feeding aphids in their underground nests, protect them, build earthen shelters over them, and take the greatest care of their eggs. Other ants, such as the British black garden species (*L. niger*), go after the aphids that frequent the shoots of plants. Many species of aphid migrate from one plant to another at certain stages in their life-cycle when their numbers have very largely increased, and F. M. Webster has observed ants, foreseeing this emigration, to carry aphids from apple trees to grasses. It has been shown by M. Büsgen that the sweet secretion (honey-dew) of the aphids is not derived, as generally believed, from the paired cornicles on the fifth abdominal segment, but from the intestine, whence it exudes in drops and is swallowed by the ants.

Besides the aphids, other insects, such as scale insects (*Coccidae*), caterpillars of blue butterflies (*Lycaenidae*), and numerous beetles, furnish the ants with nutrient secretions. The number of species of beetles that inhabit ants' nests is almost incredibly large, and most of these are never found elsewhere, being blind, helpless and dependent on the ants' care for protection and food; these beetles belong for the most part to the families *Pselaphidae*, *Paussidae* and *Staphylinidae*. Spring-tails and bristle-tails (order *Aptera*) of several species also frequent ants' nests. While some of these "guest" insects produce secretions that furnish the ants with food, some seem to be useless inmates of the nest, obtaining food from the ants and giving nothing in return. Others again play the part of thieves in the ant society; C. Janet observed a small bristle-tail (*Lepismima*) to lurk beneath the heads of two *Lasius* workers, while one passed food to the other, in order to steal the drop of nourishment and to make off with it. The same naturalist describes the association with *Lasius* of small mites (*Antennophorus*) which are carried about by the worker ants, one of which may have a mite beneath her mouth, and another on either side of her abdomen. On patting their carrier or some passing ant, the mites are supplied with food, no service being rendered by them in return for the ants' care. Perhaps the ants derive from these seemingly useless guests the same satisfaction as we obtain by keeping pet animals. Recent advance in our knowledge of the guests and associates of ants is due principally to E. Wasmann, who has compiled a list of nearly 1500 species of insects, arachnids and crustaceans, inhabiting ants' nests. The warmth, shelter and abundant food in the nests, due both to the fresh supplies brought in by the ants and to the large amount of waste matter that accumulates, must prove strongly attractive to the various "guests." Some of the inmates of ants' nests are here for the purpose of preying upon the ants or their larvae, so that we find all kinds of relations between the owners of the nests and their companions, from mutual benefit to active hostility.

Among these associations or guests other species of ants are not wanting. For example, a minute species (*Solenopsis fugax*) lives in a compound nest with various species of *Formica*, forming narrow galleries which open into the larger galleries of its host. The *Solenopsis* can make its way into the territory of the *Formica* to steal the larvae which serve it as food, but the *Formica* is too large to pursue the thief when it returns to its own galleries.

Slaves.—Several species of ants are found in association with another species which stands to them in the relation of slave to master. *Formica sanguinea* is a well-known European slave-making ant that inhabits England; its workers raid the nests of *F. fusca* and other species, and carry off to their own nests pupae from which workers are developed that live contentedly as slaves of their captors. *F. sanguinea* can live either with or without slaves, but another European ant (*Polyergus rufescens*) is so dependent on its slaves—various species of *Formica*—that its workers are themselves unable to feed the larvae. The remarkable genus *Anergates* has no workers, and its wingless males and females are served by communities of *Tetramorium cespitum* (fig. 3).

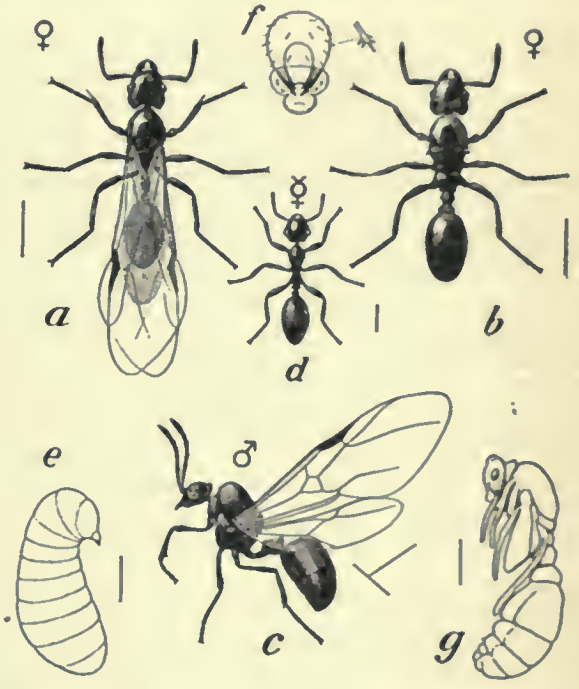


FIG. 3.—Ant, *Tetramorium cespitum* (Linn.). *a*, Female; *b*, female after loss of wings; *c*, male; *d*, worker; *e*, larva; *g*, pupa (magnified four times); *f*, head of larva more highly magnified. After Marlatt, *Bull.* 4 (n.s.) *Div. Ent. U. S. Dept. Agriculture.*

Senses and Intelligence of Ants.—That ants possess highly developed senses and the power of communicating with one another has long been known to students of their habits; the researches of P. Huber and Sir J. Lubbock (Lord Avebury) on these subjects are familiar to all naturalists. The insects are guided by light, being very sensitive to ultra-violet rays, and also by scent and hearing. Recent experiments by A. M. Fielde show that an ant follows her own old track by a scent exercised by the tenth segment of the feeler, recognizes other inmates of her nest by a sense of smell resident in the eleventh segment, is guided to the eggs, maggots and pupae, which she has to tend, by sensation through the eighth and ninth segments, and appreciates the general smell of the nest itself by means of organs in the twelfth segment. Lubbock's experiments of inducing ants to seek objects that had been removed show that they are guided by scent rather than by sight, and that any disturbance of their surroundings often causes great uncertainty in their actions. Ants invite one another to work, or ask for food from

one another, by means of pats with the feelers; and they respond to the solicitations of their guest-beetles or mites, who ask for food by patting the ants with their feet. In all probability the actions of ants are for the most part instinctive or reflex, and some observers, such as A. Bethe, deny them all claim to psychical qualities. But it seems impossible to doubt that in many cases ants behave in a manner that must be considered intelligent, that they can learn by experience and that they possess memory. Lubbock goes so far as to conclude the account of his experiments with the remark that "It is difficult altogether to deny them the gift of reason . . . their mental powers differ from those of men, not so much in kind as in degree." Wasmann considers that ants are neither miniature human beings nor mere reflex automata, and most students of their habits will probably accept this intermediate position as the most satisfactory. C. L. Morgan sums up a discussion on Lubbock's experiments in which the ants failed to utilize particles of earth for bridge-making, with the suggestive remark that "What these valuable experiments seem to show is that the ant, probably the most intelligent of all insects, has no claim to be regarded as a rational being." Nevertheless, ants can teach "rational beings" many valuable lessons.

BIBLIOGRAPHY.—The literature on ants is so vast that it is only possible to refer the reader to a few of the most important works on the family. Pierre Huber's *Traité des mœurs des fourmis indigènes* (Genève, 1810) is the most famous of the older memoirs. H. W. Bates, *A Naturalist on the Amazons*; T. Belt, *A Naturalist in Nicaragua*; H. C. McCook, *Agricultural Ant of Texas* (Philadelphia, 1880); and A. Möller's paper in *Botan. Mitt. aus den Tropen*, (1893), contain classical observations on American species. Sir J. Lubbock's (Lord Avebury) *Ants, Bees and Wasps* (London, 1882), dealing with British and European species, has been followed by numerous important papers by A. Forel and C. Emery in various Swiss and German periodicals, and especially by C. Janet in his *Études sur les fourmis, les guêpes et les abeilles* (Paris, &c., 1893–1904). Forel (*Ann. Soc. Ent. Belg.* xlvii., 1893, *Journ. Bomnay N. H. Soc.* 1900–1903, and *Biologia Cent. Americana*) and Emery (*Zool. Jahrb. Syst.* viii., 1896) have written on the classification of the *Formicidae*. Among recent American writers on habit may be mentioned W. M. Wheeler (*American Naturalist*, 1900–1902) and A. M. Fielde (*Proc. Acad. Sci. Philadelphia*, 1901); E. Wasmann (*Kritisches Verzeichniss der myrmecophilen und termitophilen Arthropoden*, Berlin, 1894, and 3me *Congrès Intern. Zool.* 1895) is the great authority on ant-guests and associates. D. Sharp's general account of ants in the *Cambridge Nat. Hist.* (vol. vi., 1898) is excellent. For discussions on intelligence see A. Bethe, *Journ. f. d. ges. Physiol.* lxx. (1898); Wasmann, *Die psychischen Fähigkeiten der Ameisen* (Stuttgart, 1899); C. Ll. Morgan, *Animal Behaviour* (London, 1900.)

(G. H. C.)

ANTAE (a Lat. plural word, possibly from *ante*, before), an architectural term given to slightly projecting pilaster strips which terminate the winged walls of the naos of a Greek temple. They owe their origin to the vertical posts of timber employed in the primitive palaces or temples of Greece, as at Tiryns and in the Heraeum at Olympia, to carry the roof timbers, as no reliance could be placed on the walls built with unburnt brick or in rubble masonry with clay mortar. When between these winged walls there are columns to carry the architrave, so as to form a porch, the latter is said to be in-antis. (See TEMPLE.)

ANTAEUS, in Greek mythology, a giant of Libya, the son of Poseidon and Gaea. He compelled all strangers passing through the country to wrestle with him, and as, when thrown, he derived fresh strength from each successive contact with his mother earth, he proved invincible. With the skulls of those whom he had slain he built a temple to his father. Heracles, in combat with him, discovered the source of his strength, and lifting him up from the earth crushed him to death (Apollodorus ii. 5; Hyginus, *Fab.* 31). The struggle between Antaeus and Heracles is a favourite subject in ancient sculpture.

ANTALCIDAS, Spartan soldier and diplomatist. In 393 (or 392 B.C.) he was sent to Tiribazus, satrap of Sardis, to undermine the friendly relations then existing between Athens and Persia by offering to recognize Persian claims to the whole of Asia Minor. The Athenians sent an embassy under Conon to counteract his efforts. Tiribazus, who was favourable to Sparta, threw Conon into prison, but Artaxerxes II. (Mnemon) disapproved and recalled his satrap. In 388 Antalcidas, then commander of the Spartan fleet, accompanied Tiribazus to the Persian court, and secured the active assistance of Persia against Athens. The success of his naval operations in the neighbourhood of the Hellespont was such that Athens was glad to accept terms of peace (the "Peace of Antalcidas"), by which (1) the whole of Asia Minor, with the islands of Clazomenae and Cyprus, was recognized as subject to Persia, (2) all other Greek cities—so far as they were not under Persian rule—were to be independent, except Lemnos, Imbros and Scyros, which were to belong, as formerly, to the Athenians. The terms were announced to the Greek envoys at Sardis in the winter 387–386, and were finally accepted by Sparta in 386. Antalcidas continued in favour with Artaxerxes, until the annihilation of Spartan supremacy at Leuctra diminished his influence. A final mission to Persia, probably in 367, was a failure, and Antalcidas, deeply chagrined and fearful of the consequences, is said to have starved himself to death. (See SPARTA.)

ANTANÀNARÌVO, *i.e.* "town of a thousand" (Fr. spelling *Tananarive*), the capital of Madagascar, situated centrally as regards the length of the island, but only about 90 m. distant from the eastern coast, in 18° 55′ S., 47° 30′ E. It is 135 m. W.S.W. of Tamatave, the principal seaport of the island, with which it is connected by railway, and for about 60 m. along the coast lagoons, a service of small steamers. The city occupies a commanding position, being chiefly built on the summit and slopes of a long and narrow rocky ridge, which extends north and south for about 2½ m., dividing to the north in a Y-shape, and rising at its highest point to 690 ft. above the extensive rice plain to the west, which is itself 4060 ft. above sea-level. For long only the principal village of the Hova chiefs, Antananarivo advanced in importance as those chiefs made themselves sovereigns of the greater part of Madagascar, until it became a town of some 80,000 inhabitants. Until 1869 all buildings within the city proper were of wood or rush, but even then it possessed several timber palaces of considerable size, the largest being 120 ft. high. These crown the summit of the central portion of the ridge; and the largest palace, with its lofty roof and towers, is the most conspicuous object from every point of view. Since the introduction of stone and brick, the whole city has been rebuilt and now contains numerous structures of some architectural pretension, the royal palaces, the houses formerly belonging to the prime minister and nobles, the French residency, the Anglican and Roman Catholic cathedrals, several stone churches, as well as others of brick, colleges, schools, hospitals, courts of justice and other government buildings, and hundreds of good dwelling-houses. Since the French conquest in 1895 good roads have been constructed throughout the city, broad flights of steps connect places too steep for the formation of carriage roads, and the central space, called Andohalo, has become a handsome *place*, with walks and terraces, flower-beds and trees. A small park has been laid out near the residency, and the planting of trees and the formation of gardens in various parts of the city give it a bright and attractive appearance. Water is obtained from springs at the foot of the hill, but it is proposed to bring an abundant supply from the river Ikopa, which skirts the capital to the south and west. The population, including that of the suburbs, is 69,000 (1907). The city is guarded by two forts built on hills to the east and south-west respectively. Including an Anglican and a Roman Catholic cathedral, there are about fifty churches in the city and its suburbs, as well as a Mahommedan mosque.

(J. St.*)

ʿANTARA IBN SHADDĀD, Arabian poet and warrior of the 6th century, was famous both for his poetry and his adventurous life. His chief poem is contained in the *Moʿallakāt*. The account of his life forms the basis of a long and extravagant romance. His father Shaddād was a soldier, his mother Zabūba a negro slave. Neglected at first, he soon claimed attention and respect for himself, and by his remarkable personal qualities and courage in battle he gained his freedom and the acknowledgment of his father. He took part in the great war between the related tribes of Abs and Dhubyān, which began over a contest of horses and was named after them the war of Dāhis and Ghabrā.

He died in a fight against the tribe of Ṭai. His poems, which are chiefly concerned with fighting or with his love for Abla, are published in W. Ahlwardt's *The Diwans of the six ancient Arabic Poets* (London, 1870); they have also been published separately at Beirût (1888). As regards their genuineness, cf. W. Ahlwardt's *Bemerkungen über die Aechtheit der alten arabischen Gedichte* (Greifswald, 1872), pp. 50 ff. *The Romance of 'Antar* (Sîrat 'Antar ibn Shaddâd) is a work which was long handed down by oral tradition only, has grown to immense proportions and has been published in 32 vols. at Cairo, 1307 (A.D. 1889), and in 10 vols. at Beirût, 1871. It was partly translated by Terrick Hamilton under the title *'Antar, a Bedoueen Romance* (4 vols., London, 1820).

For an account of the poet and his works see H. Thorbeckes, *Antarah, ein vorislamischer Dichter* (Leipzig, 1867), and cf. the *Book of Songs* (see ABULFARAJ), vol. vii. pp. 148-153. (G. W. T.)

ANTARCTIC (Gr. ἀντί, opposite, and ἄρκτος, the Bear, the northern constellation of *Ursa Major*), the epithet applied to the region (including both the ocean and the lands) round the South Pole. The Antarctic circle is drawn at 66° 30′ S., but polar conditions of climate, &c., extend considerably north of the area thus enclosed. (See POLAR REGIONS.)

ANTEATER, a term applied to several mammals, but (zoologically at any rate) specially indicating the tropical American anteaters of the family *Myrmecophagidae* (see EDENTATA). The typical and largest representative of the group is the great anteater or ant-bear (*Myrmecophaga jubata*), an animal measuring 4 ft. in length without the tail, and 2 ft. in height at the shoulder. Its prevailing colour is grey, with a broad black band, bordered with white, commencing on the chest, and passing obliquely over the shoulder, diminishing gradually in breadth as it approaches the loins, where it ends in a point. It is extensively distributed in the tropical parts of South and Central America, frequenting low swampy savannas, along the banks of rivers, and the depths of the humid forests, but is nowhere abundant. Its food consists mainly of termites, to obtain which it opens their nests with its powerful sharp anterior claws, and as the insects swarm to the damaged part of their dwelling, it draws them into its mouth by means of its long, flexible, rapidly moving tongue covered with glutinous saliva. The great anteater is terrestrial in habits, not burrowing underground like armadillos. Though generally an inoffensive animal, when attacked it can defend itself vigorously and effectively with its sabre-like anterior claws. The female produces a single young at a birth. The tamandua anteaters, as typified by *Tamandua* (or *Uroleptes*) *tetradactyla*, are much smaller than the great anteater, and differ essentially from it in their habits, being mainly arboreal. They inhabit the dense primeval forests of South and Central America. The usual colour is yellowish-white, with a broad black lateral band, covering nearly the whole of the side of the body.

The little or two-toed anteater (*Cyclopes* or *Cycloturus didactylus*) is a native of the hottest parts of South and Central America, and about the size of a rat, of a general yellowish colour, and exclusively arboreal in its habits. The name scaly anteater is applied to the pangolin (*q.v.*); the banded anteater (*Myrmecobius fasciatus*) is a marsupial, and the spiny anteater (*Echidna*) is one of the monotremes (see MARSUPIALIA and MONOTREMATA).

ANTE-CHAPEL, the term given to that portion of a chapel which lies on the western side of the choir screen. In some of the colleges at Oxford and Cambridge the ante-chapel is carried north and south across the west end of the chapel, constituting a western transept or narthex. This model, based on Merton College chapel (13th century), of which only chancel and transept were built though a nave was projected, was followed at Wadham, New and Magdalen Colleges, Oxford, in the new chapel of St John's College, Cambridge, and in Eton College. In Jesus College, Cambridge, the transept and a short nave constitute the ante-chapel; in Clare College an octagonal vestibule serves the same purpose; and in Christ's, Trinity and King's Colleges, Cambridge, the ante-chapel is a portion of the main chapel, divided off from the chancel by the choir screen.

ANTE-CHOIR, the term given to the space enclosed in a church between the outer gate or railing of the rood screen and the door of the screen; sometimes there is only one rail, gate or door, but in Westminster Abbey it is equal in depth to one bay of the nave. The ante-choir is also called the "fore choir."

ANTE-FIXAE (from Lat. *antefigere*, to fasten before), the vertical blocks which terminate the covering tiles of the roof of a Greek temple; as spaced they take the place of the cymatium and form a cresting along the sides of the temple. The face of the ante-fixae was richly carved with the anthemion (*q.v.*) ornament.

ANTELOPE, a zoological name which, so far as can be determined, appears to trace its origin, through the Latin, to *Panthalops*, the old Coptic, and *Anthalops*, the late Greek name of the fabled unicorn. Its adoption by the languages of Europe cannot apparently be traced farther back than the 4th century of our era, at which date it was employed to designate an imaginary animal living on the banks of the Euphrates. By the earlier English naturalists, and afterwards by Buffon, it was, however, applied to the Indian blackbuck, which is thus entitled to rank as *the* antelope. It follows that the subfamily typified by this species, in which are included the gazelles, is the one to which alone the term antelopes should be applied if it were employed in a restricted and definable sense.

Although most people have a general vague idea of what constitutes an "antelope," yet the group of animals thus designated is one that does not admit of accurate limitations or definition. Some, for instance, may consider that the chamois and the so-called white goat of the Rocky Mountains are entitled to be included in the group; but this is not the view held by the authors of the *Book of Antelopes* referred to below; and, as a matter of fact, the term is only a vague designation for a number of more or less distinct groups of hollow-horned ruminants which do not come under the designation of cattle, sheep or goats; and in reality there ought to be a distinct English group-name for each subfamily into which "antelopes" are subdivided.

The great majority of antelopes, exclusive of the doubtful chamois group (which, however, will be included in the present article), are African, although the gazelles are to a considerable extent an Asiatic group. They include ruminants varying in size from a hare to an ox; and comprise about 150 species, although this number is subject to considerable variation according to personal views as to the limitations of species and races. No true antelopes are American, the prongbuck (*Antilocapra*), which is commonly called "antelope" in the United States, representing a distinct group; while, as already mentioned, the Rocky Mountain or white goat stands on the borderland between antelopes and goats.

The first group, or *Tragelaphinae*, is represented by the African elands (*Taurotragus*), bongo (*Boöcercus*), kudus (*Strepsiceros*) and bushbucks or harnessed antelopes (*Tragelaphus*), and the Indian nilgai (*Boselaphus*). Except in the bongo and elands, horns are present only in the males, and these are angulated and generally spirally twisted, and without rings. The muzzle is naked, small glands are present on the face below the eyes, and the tail is comparatively long. The colours are often brilliant; white spots and stripes being prevalent. The harnessed antelopes, or bushbucks, are closely allied to the kudus, from which they chiefly differ by the spiral formed by the horns generally having fewer turns. They include some of the most brilliantly coloured of all antelopes; the ornamentation taking the form of vertical white lines and rows of spots. Usually the sexes differ in colour. Whereas most of the species have hoofs of normal shape, in some, such as the nakong, or situtunga (*Tragelaphus spekei*), these are greatly elongated, in order to be suited for walking in soft mud, and these have accordingly been separated as *Limnotragus*. The last-named species spends most of its time in water, where it may be observed not infrequently among the reeds with all but its head and horns submerged. The true or smaller bushbucks, represented by the widely spread *Tragelaphus scriptus*, with several local races (fig. 1) are sometimes separated as *Sylvicapra*,

leaving the genus *Tragelaphus* to be represented by the larger *T. angasi* and its relatives. The genus *Strepsiceros* is represented by the true or great kudu (*S. capensis* or *S. strepsiceros*), fig. 2, ranging from the Cape to Somaliland, and the smaller *S. imberbis* of North-East Africa, which has no throat-fringe. The large and brightly coloured bongo (*Boöcercus euryceros*) of the equatorial forest-districts serves in some respects to connect the bushbucks with the elands, having horns in both sexes, and a tufted tail, but a brilliant orange coat with vertical white stripes. Still larger are the elands, of which the typical *Taurotragus oryx* of the Cape is uniformly sandy-coloured, although stripes appear in the more northern *T. o. livingstonei*; while the black-necked eland (*T. derbianus*) of Senegambia and the Bahr-el-Ghazal district is a larger and more brilliantly coloured animal. The small horns and bluish-grey colour of the adult bulls serve to distinguish the Indian nilgai (*q.v.*), *Boselaphus tragocamelus*, from the other members of the subfamily.

FIG. 1.—Female Bushbuck (*Tragelaphus scriptus*).

The second group, which is mainly African, but also represented in Syria, is that of the *Hippotraginae*, typified by the sable antelope (*Hippotragus niger*) and roan antelope (*H. equinus*), but also including the oryxes (*Oryx*) and addax. These are for the most part large antelopes, with long cylindrical horns, which are present in both sexes, hairy muzzles, no face-glands, long tufted tails and tall thick molars of the ox-type. In *Hippotragus* the stout and thickly ringed horns rise vertically from a ridge above the eyes at an obtuse angle to the plane of the lower part of the face, and then sweep backwards in a bold curve; while there are tufts of long white hairs near the eyes. The sable antelope is a southern species in which both sexes are black or

FIG. 2.—Male Kudu (*Strepsiceros capensis*).

blackish when adult; while the lighter-coloured and larger roan antelope has a much wider distribution. The South African blauwbok (*H. leucophaeus*) is extinct. In the addax (*Addax nasomaculatus*), which is a distinct species common to North Africa and Syria, the ringed horns form an open spiral ascending in the plane of the face, and there is long, shaggy, dark hair on the fore-quarters in winter. The various species of oryx differ from *Hippotragus* by the absence of the white eye-tufts, and by the horns sloping backwards in the plane of the face. In the South African gemsbuck (*Oryx gazella*), fig. 3, the East African beisa or true oryx (*O. beisa*), and the white Arabian (*O. beatrix*) the horns are straight, but in the North African white oryx or algazel (*O. leucoryx* or *O. algazal*) they are scimitar-shaped; the colour of this species being white and pale chestnut (see ADDAX, ORYX, and SABLE ANTELOPE).

The third subfamily is the *Antilopinae*, the members of which have a much wider geographical range than either of the foregoing groups. The subfamily is characterized by the narrow crowns of the molars, which are similar to those of sheep, and the hairy muzzle. Generally there are face-glands below the eyes; and the tail is moderate or short. Pits are present in the forehead of the skull, and the horns are ringed for part of their length, with a compressed base; their form being often lyrate, but sometimes spiral. Lateral hoofs are generally present.

Gazelles (*Gazella*), which form by far the largest genus of the subfamily, are inhabitants of open and frequently more or less desert districts. They are mostly of a sandy colour, with dark and light markings on the face, and often a dark band on the flanks. The horns are more or less lyrate, and generally developed in both sexes; there are frequently brushes of hair on the knees. Gazelles may be divided into groups. The one to which the North African *G. dorcas* belongs is characterized by the presence of

FIG. 3.—Gemsbuck, or Cape Oryx (*Oryx gazella*).

lyrate or sub-lyrate horns in both sexes, and by the white of the buttocks not extending on to the haunches. Nearly allied is the group including the Indian *G. bennetti* and the Arabian *G. arabica*, in which the horns have a somewhat S-shaped curvature in profile. In the group represented by the African *G. granti*, *G. thomsoni*, *G. mohr*, &c., the white of the buttocks often sends a prolongation on to the flanks, the horns are long and the size is large. Lastly, the Central Asian *G. gutturosa*, *G. subgutturosa* and *G. picticaudata* form a group in which the females are hornless and the face-markings inconspicuous or wanting.

The South African springbuck (*Antidorcas euchore*) is nearly related to the gazelles, from which it is distinguished by the presence on the middle line of the loins of an evertible pouch, lined with long white hairs capable of erection. It has also one premolar tooth less in the lower jaw. Formerly these beautiful antelopes existed in countless numbers on the plains of South Africa, and were in the habit of migrating in droves which completely filled entire valleys. Now they are comparatively rare.

The dibatag or Clarke's gazelle (*Ammodorcas clarkei*), of Somaliland, forms a kind of connecting link between the true gazelles and the gerenuk, this being especially shown in the skull. The face has the ordinary gazelle-markings; but the rather short horns—which are wanting in the female—have a peculiar upward and forward curvature, unlike that obtaining in the gazelles

and somewhat resembling that of the reedbuck. The neck is longer and more slender than in ordinary gazelles, and the tail is likewise relatively long. Although local, these animals are fairly common in the interior of Somaliland, where they are known by the name of dibatag. In running, the head and neck are thrown backwards, while the tail is turned forwards over the back.

The East African gerenuk (*q.v.*), or Waller's gazelle (*Lithocranius walleri*), of which two races have been named, is a very remarkable ruminant, distinguished not only by its exceedingly elongated neck and limbs, but also by the peculiar hooked form of the very massive horns of the bucks, the dense structure and straight profile of the skull, and the extreme slenderness of the lower jaw.

A still more aberrant gazelle is a small North-East African species known as the beira (*Dorcatragus melanotis*), with very short horns, large hoofs and a general appearance recalling that of some of the members of the subfamily *Neotraginae*, although in other respects gazelle-like. The blackbuck (*Antilope cervicapra* or *A. bezoartica*) of India, a species taking its name from the deep black coat assumed by the adult bucks, and easily recognized by the graceful, spirally twisted horns ornamenting the heads of that sex, is now the sole representative of the genus *Antilope*, formerly taken to embrace the whole of the true antelopes. Large face-glands are characteristic of the species, which inhabits the open plains of India in large herds. They leap high in the air, like the springbuck, when on the move.

With the palla (*q.v.*), or impala (*Aepyceros melampus*), we reach an exclusively African genus, characterized by the lyrate horns of the bucks, the absence of lateral hoofs, and the presence of a pair of glands with black tufts of hair on the hind-feet.

The sheep-like saiga (*q.v.*), *Saiga tatarica*, of the Kirghiz steppes stands apart from all other antelopes by its curiously puffed and trunk-like nose, which can be wrinkled up when the animal is feeding and has the nostrils opening downwards. More or less nearly related to the saiga is the chiru (*q.v.*), *Pantholops hodgsoni*, of Tibet, characterized by the long upright black horns of the bucks, and the less convex nose, in which the nostrils open anteriorly instead of downwards.

The *Neotraginae* (or *Nanotraginae*) form an exclusively African group of small-sized antelopes divided into several, for the most part nearly related, genera. Almost the only characters they possess in common are the short and spike-like horns of the bucks, which are ringed at the base, with smooth tips, and the large size of the face-gland, which opens by a circular aperture. *Neotragus* is represented by the pigmy royal antelope (*N. pygmaeus*) of Guinea; *Hylarnus* includes one species from Cameroon and a second from the Semliki forest; while *Nesotragus* comprises the East African suni antelopes, *N. moschatus* and *N. livingstonianus*. All three might, however, well be included in *Neotragus*. The royal antelope is the smallest of the Bovidae.

The steinbok (*Rhaphiceros campestris*) and the *grysbok* (*R. melanotis*) are the best-known representatives of a group characterized by the vertical direction of the horns and the small gland-pit in the skull; lateral hoofs being absent in the first-named and present in the second. A bare gland-patch behind the ear serves to distinguish the oribis or ourebis, as typified by *Oribia montana* of the Cape; lateral hoofs being present and the face-pit large.

From all the preceding the tiny dik-diks (*Madoqua*) of North-East Africa differ by their hairy noses, expanded in some species into short trunks; while the widely spread klipspringer (*q.v.*), *Oreotragus saltator*, with its several local races, is unfailingly distinguishable by its rounded blunt hoofs and thick, brittle, golden-flecked hair.

In some respects connecting the last group with the *Cervicaprinae* is the rhebok, or vaal-rhebok (*Pelea capreolus*), a grey antelope of the size of a roebuck, with small upright horns in the bucks recalling those of the last group, and small lateral hoofs, but no face-glands. In size and several structural features it approximates to the more typical *Cervicaprinae*, as represented by the reedbuck (*Cervicapra*), and the waterbucks and kobs (*Cobus* or *Kobus*), all of which are likewise African. These are medium-sized or large antelopes with naked muzzles, narrow sheep-like upper molars, fairly long tails, rudimentary or no face-glands, and pits in the frontal bones of the skull. Reedbuck (*q.v.*), or rietbok (*Cervicapra*), are foxy-red antelopes ranging in size from a fallow-deer to a roe, with thick bushy tails, forwardly curving black horns, and a bare patch of glandular skin behind each ear. They keep to open country near water. The waterbuck (*q.v.*), *Cobus*, on the other hand, actually seek refuge from pursuit in the water. They have heavily fringed necks, tufted tails, long lyrate horns in the bucks (fig. 4) but no glandular ear-patches. The true waterbuck (*C. ellipsiprymnus*), and the defassa or sing-sing (*C. defassa*), are the two largest species, equal in size to red deer, and grey or reddish in colour. Of the smaller forms or kobs, *C. maria* and *C. leucotis* of the swamps of the White Nile are characterized by the black coats of the adult bucks; the West African *C. cob*, and its East African representative *C. thomasi*, are wholly red antelopes of the size of

FIG. 4.—Waterbuck (*Cobus ellipsiprymnus*).

roedeer; the lichi or lechwe (*C. lichi*) is characterized by its long horns, black fore-legs and superior size; while the puku (*C. vardoni*), which is also a swamp-loving species from South-Central Africa, differs from the three preceding species by the fore-legs being uniformly foxy.

The duikers, or duikerboks (*Cephalophus*), of Africa, which range in size from a large hare to a fallow-deer, typify the subfamily *Cephalophinae*, characterized by the spike-like horns of the bucks, the elongated aperture of the face-glands, the naked muzzle, the relatively short tail, and the square-crowned upper molars; lateral hoofs being present. In the duikers themselves the single pair of horns is set in the midst of a tuft of long hairs, and the face-gland opens in a long naked line on the side of the face above the muzzle. The group is represented in India by the chousingha or four-horned antelope (*Tetraceros quadricornis*). generally distinguished by the feature from which it takes its name (see DUIKER).

The last section of the true antelopes is the *Bubalinae*, represented by the hartebeest (*q.v.*), *Bubalis*, blesbok and sassaby (*Damaliscus*), and the gnu (*q.v.*) or wildebeest (*Connochaetes*, also called *Catoblepas*), all being African with the exception of one or two hartebeests which range into Syria. All these are large and generally more or less uniformly coloured antelopes with horns in both sexes, long and more or less hairy tails, high withers, small face-glands, naked muzzles, tall, narrow upper molars, and the absence of pits in the frontal bones. The long face, high crest for the horns, which are ringed, lyrate and more or less strongly angulated, and the moderately long tail, are the distinctive features of the hartebeests. They are large red

antelopes (fig. 5), often with black markings on the face and limbs. In *Damaliscus*, which includes, among many other species, the blesbok and bontebok (*D. albifrons* and *D. pygargus*) and the sassaby or bastard hartebeest (*D. lunatus*), the face is shorter, and the horns straighter and set on a less elevated crest. The colour, too, of these antelopes tends in many cases to purple, with white markings. From the hartebeest the gnus (fig. 6)

FIG. 5.—Cape Hartebeest (*Bubalis cama*).

differ by their smooth and outwardly or downwardly directed horns, broad bristly muzzles, heavy manes and long horse-like tails. There are two chief types, the white-tailed gnu or black wildebeest (*Connochaetes gnu*) of South Africa, now nearly extinct (fig. 6), and the brindled gnu, or blue wildebeest (*C. taurinus*), which, with some local variation, has a large range in South and East Africa.

FIG. 6.—White-tailed Gnu, or Black Wildebeest (*Connochaetes gnu*).

In concluding this survey of living antelopes, reference may be made to the subfamily *Rupicaprinae* (typified by the European chamois), the members of which, as already stated, are in some respects intermediate between antelopes and goats. They are all small or medium-sized mountain ruminants, for the most part European and Asiatic, but with one North American representative. They are heavily built ruminants, with horns of nearly equal size in both sexes, short tapering tails, large hoofs, narrow goat-like upper molars, and usually small face-glands. The horns are generally rather small, upright, ringed at the base, and more or less curved backwards, but in the takin they are gnu-like. The group is represented by the European chamois or gemse (*Rupicapra tragus* or *R. rupicapra*), broadly distinguished by its well-known hook-like horns, and the Asiatic gorals (*Urotragus*) and serows (*Nemorhaedus*), which are represented by numerous species ranging from Tibet, the Himalaya, and China, to the Malay Peninsula and islands, being in the two latter areas the sole representatives of both antelopes and goats. In the structure of its horns the North American white Rocky Mountain goat (*Oreamnus*) is very like a serow, from which it differs by its extremely short cannon-bones. In the latter respect this ruminant resembles the takin (*Budorcas*) of Tibet, which, as already mentioned, has horns recalling those of the white-tailed gnu. Possibly the Arctic musk-ox (*Ovibos*) may be connected with the takin by means of certain extinct ruminants, such as the North American Pleistocene *Euceratherium* and the European Pliocene *Criotherium* (see CHAMOIS, GORAL, SEROW, ROCKY MOUNTAIN GOAT and TAKIN).

Extinct Antelopes.—Only a few lines can be devoted to extinct antelopes, the earliest of which apparently date from the European Miocene. An antelope from the Lower Pliocene of Northern India known as *Bubalis*, or *Damaliscus*, *palaeindicus* indicates the occurrence of the hartebeest group in that country. *Cobus* also occurs in the same formation, as does likewise *Hippotragus*. *Palaeoryx* from the corresponding horizon in Greece and Samos is to some extent intermediate between *Hippotragus* and *Oryx*. Gazelles are common in the Miocene and Pliocene of both Europe and Asia. Elands and kudus appear to have been represented in India during the Pliocene; the European *Palaeoreas* of the same age seems to be intermediate between the two, while *Protragelaphus* is evidently another European representative of the group. *Helicophora* is another spiral-horned European Pliocene antelope, but of somewhat doubtful affinity; the same being the case with the large *Criotherium* of the Samos Pliocene, in which the short horns are curiously twisted. As already stated, there is a possibility of this latter ruminant being allied both to the takin and the musk-ox. *Palaeotragus* and *Tragoceros*, of the Lower Pliocene of Greece, at one time regarded as antelopes, are now known to be ancestors of the okapi.

For antelopes in general, see P. L. Sclater and O. Thomas, *The Book of Antelopes* (4 vols., London, 1894–1900). (R. L.*)

ANTEMNAE (Lat. *ante amnem*, sc. *Anienem*; Varro, *Ling. Lat.* v. 28), an ancient village of Latium, situated on the W. of the Via Salaria, 2 m. N. of Rome, where the Anio falls into the Tiber. It is said to have been conquered by Romulus after the rape of the Sabine women, and to have assisted the Tarquins. Certainly it soon lost its independence, and in Strabo's time was a mere village. The site is one of great strength, and is now occupied by a fort, in the construction of which traces of the outer walls and of huts, and several wells and a cistern, all belonging to the primitive village, were discovered, and also the remains of a villa of the end of the Republic.

See T. Ashby in *Papers of the British School at Rome*, iii. 14.

ANTENOR, an Athenian sculptor, of the latter part of the 6th century B.C. He was the author of the group of the tyrannicides Harmodius and Aristogeiton, set up by the Athenians on the expulsion of the Peisistratidae, and carried away to Persia by Xerxes. A basis with the signature of Antenor, son of Eumares, has been shown to belong to one of the dedicated female figures of archaic style which have been found on the Acropolis of Athens.

See GREEK ART; and E. A. Gardner's *Handbook of Greek Sculpture*, i. p. 182.

ANTENOR, in Greek legend, one of the wisest of the Trojan elders and counsellors. He advised his fellow-townsmen to send Helen back to her husband, and showed himself not unfriendly to the Greeks and an advocate of peace. In the later story, according to Dares and Dictys, he was said to have treacherously opened the gates of Troy to the enemy; in return for which, at the general sack of the city, his house, distinguished by a panther's skin at the door, was spared by the victors. Afterwards,

according to various versions of the legend, he either rebuilt a city on the site of Troy, or settled at Cyrene, or became the founder of Patavium.

Homer, *Iliad*, iii. 148, vii. 347; Horace, *Epp.* i. 2. 9; Livy i. 1; Pindar, *Pythia*, v. 83; Virgil, *Aen.* i. 242.

ANTEQUERA (the ancient *Anticaria*), a town of southern Spain, in the province of Málaga; on the Bobadilla-Granada railway. Pop. (1900) 31,609. Antequera overlooks the fertile valley bounded on the S. by the Sierra de los Torcales, and on the N. by the river Guadalhorce. It occupies a commanding position, while the remains of its walls, and of a fine Moorish castle on a rock that overhangs the town, show how admirably its natural defences were supplemented by art. Besides several interesting churches and palaces, it contains a fine arch, erected in 1595 in honour of Philip II., and partly constructed of inscribed Roman masonry. In the eastern suburbs there is one of the largest grave-mounds in Spain, said to be of prehistoric date, and with subterranean chambers excavated to a depth of 65 ft. The Peña de los Enamorados, or "Lovers' Peak," is a conspicuous crag which owes its name to the romantic legend adapted by Robert Southey (1774–1843) in his *Laila and Manuel*. Woollen fabrics are manufactured, and the sugar industry established in 1890 employs several thousand hands; but the majority of the inhabitants are occupied by the trade in grain, fruit, wine and oil. Marble is quarried; and at El Torcal, 6 m. south, there is a very curious labyrinth of red marble rocks. Antequera was captured from the Moors in 1410, and became until 1492 one of the most important outposts of the Christian power in Spain.

See C. Fernandez, *Historia de Antequera, desde su fondacion* (Malaga, 1842).

ANTEROS, pope for some weeks at the end of the year 235. He died on the 3rd of January 236. His original epitaph was discovered in the Catacombs.

ANTHELION (late Gr. *ἀνθήλιος*, opposite the sun), the luminous ring or halo sometimes seen in Alpine or polar regions surrounding the shadow of the head of an observer cast upon a bank of cloud or mist. The halo diminishes in brightness from the centre outwards, and is probably due to the diffraction of light. Under favourable conditions four concentric rings may be seen round the shadow of the observer's head, the outermost, which seldom appears, having an angular radius of 40°.

ANTHEM, derived from the Gr. *ἀντίφωνα*, through the Saxon *antefn*, a word which originally had the same meaning as antiphony (*q.v.*). It is now, however, generally restricted to a form of church music, particularly in the service of the Church of England, in which it is appointed by the rubrics to follow the third collect at both morning and evening prayer, "in choirs and places where they sing." It is just as usual in this place to have an ordinary hymn as an anthem, which is a more elaborate composition than the congregational hymns. Several anthems are included in the English coronation service. The words are selected from Holy Scripture or in some cases from the Liturgy, and the music is generally more elaborate and varied than that of psalm or hymn tunes. Anthems may be written for solo voices only, for the full choir, or for both, and according to this distinction are called respectively *Verse*, *Full*, and *Full with Verse*. Though the anthem of the Church of England is analogous to the *motet* of the Roman Catholic and Lutheran Churches, both being written for a trained choir and not for the congregation, it is as a musical form essentially English in its origin and development. The English school of musicians has from the first devoted its chief attention to this form, and scarcely a composer of any note can be named who has not written several good anthems. Tallis, Tye, Byrd, and Farrant in the 16th century; Orlando Gibbons, Blow, and Purcell in the 17th, and Croft, Boyce, James Kent, James Nares, Benjamin Cooke, and Samuel Arnold in the 18th were famous composers of anthems, and in more recent times the names are too numerous to mention.

ANTHEMION (from the Gr. *ἀνθέμιον*, a flower), the conventional design of flower or leaf forms which was largely employed by the Greeks to decorate (1) the fronts of ante-fixae, (2) the upper portion of the stele or vertical tombstones, (3) the necking of the Ionic columns of the Erechtheum and its continuation as a decorative frieze on the walls of the same, and (4) the cymatium of a cornice. Though generally known as the honeysuckle ornament, from its resemblance to that flower, its origin will be found in the flower of the acanthus plant.

ANTHEMIUS, Greek mathematician and architect, who produced, under the patronage of Justinian (A.D. 532), the original and daring plans for the church of St Sophia in Constantinople, which strikingly displayed at once his knowledge and his ignorance. He was one of five brothers—the sons of Stephanus, a physician of Tralles—who were all more or less eminent in their respective departments. Dioscorus followed his father's profession in his native place; Alexander became at Rome one of the most celebrated medical men of his time; Olympius was deeply versed in Roman jurisprudence; and Metrodorus was one of the distinguished grammarians of the great Eastern capital. It is related of Anthemius that, having a quarrel with his next-door neighbour Zeno, he annoyed him in two ways. First, he made a number of leathern tubes the ends of which he contrived to fix among the joists and flooring of a fine upper-room in which Zeno entertained his friends, and then subjected it to a miniature earthquake by sending steam through the tubes. Secondly, he simulated thunder and lightning, the latter by flashing in Zeno's eyes an intolerable light from a slightly hollowed mirror. Certain it is that he wrote a treatise on burning-glasses. A fragment of this was published under the title *Περὶ παραδόξων μηχαημάτων* by L. Dupuy in 1777, and also appeared in 1786 in the forty-second volume of the *Hist. de l'Acad. des Inscr.*; A. Westermann gave a revised edition of it in his *Παραδοξογράφοι* (*Scriptores rerum mirabilium Graeci*), 1839. In the course of constructions for surfaces to reflect to one and the same point (1) all rays in whatever direction passing through another point, (2) a set of parallel rays, Anthemius assumes a property of an ellipse not found in Apollonius (the equality of the angles subtended at a focus by two tangents drawn from a point), and (having given the focus and a double ordinate) he uses the focus and directrix to obtain any number of points on a parabola—the first instance on record of the practical use of the directrix.

On Anthemius generally, see Procopius, *De Aedific.* i. 1; Agathias, *Hist.* v. 6-9; Gibbon's *Decline and Fall*, cap. xl. (T. L. H.)

ANTHESTERIA, one of the four Athenian festivals in honour of Dionysus, held annually for three days (11th–13th) in the month of Anthesterion (February–March). The object of the festival was to celebrate the maturing of the wine stored at the previous vintage, and the beginning of spring. On the first day, called *Pithoigia* (opening of the casks), libations were offered from the newly opened casks to the god of wine, all the household, including servants and slaves, joining in the festivities. The rooms and the drinking vessels in them were adorned with spring flowers, as were also the children over three years of age. The second day, named *Choës* (feast of beakers), was a time of merrymaking. The people dressed themselves gaily, some in the disguise of the mythical personages in the suite of Dionysus, and paid a round of visits to their acquaintances. Drinking clubs met to drink off matches, the winner being he who drained his cup most rapidly. Others poured libations on the tombs of deceased relatives. On the part of the state this day was the occasion of a peculiarly solemn and secret ceremony in one of the sanctuaries of Dionysus in the Lenaeum, which for the rest of the year was closed. The basilissa (or basilinna), wife of the archon basileus for the time, went through a ceremony of marriage to the wine god, in which she was assisted by fourteen Athenian matrons, called *geraerae*, chosen by the basileus and sworn to secrecy. The days on which the Pithoigia and Choës were celebrated were both regarded as *ἀποφράδες* (*nefasti*) and *μιαραί* ("defiled"), necessitating expiatory libations; on them the souls of the dead came up from the underworld and walked abroad; people chewed leaves of whitethorn and besmeared their doors with tar to protect themselves from evil. But at least in private circles the festive character of the ceremonies predominated. The third day was named *Chytri* (feast of pots, from *χύτρος*, a pot), a festival of the dead. Cooked pulse was offered to Hermes, in his capacity of a

god of the lower world, and to the souls of the dead. Although no performances were allowed at the theatre, a sort of rehearsal took place, at which the players for the ensuing dramatic festival were selected.

The name Anthesteria, according to the account of it given above, is usually connected with ἄνθος ("flower," or the "bloom" of the grape), but A. W. Verrall (*Journal of Hellenic Studies*, xx., 1900, p. 115) explains it as a feast of "revocation" (from ἀναθέσσασθαι, to "pray back" or "up"), at which the ghosts of the dead were recalled to the land of the living (*cp.* the Roman *mundus patet*). J. E. Harrison (*ibid.* 100,109, and *Prolegomena*), regarding the Anthesteria as primarily a festival of all souls, the object of which was the expulsion of ancestral ghosts by means of placation, explains πιθοιγία as the feast of the opening of the graves (πίθος meaning a large urn used for burial purposes), χόες as the day of libations, and χύτροι as the day of the grave-holes (not "pots," which is χύτραι), in point of time really anterior to the πιθοιγία. E. Rohde and M. P. Nilsson, however, take the χύτροι to mean "water vessels," and connect the ceremony with the Hydrophoria, a libation festival to propitiate the dead who had perished in the flood of Deucalion.

See F. Hiller von Gärtringen in Pauly-Wissowa's *Realencyclopädie* (*s.v.*); J. Girard in Daremberg and Saglio, *Dictionnaire des antiquités* (*s.v.* "Dionysia"); and F. A. Voigt in Roscher's *Lexikon der Mythologie* (*s.v.* "Dionysos"); J. E. Harrison, *Prolegomena to the Study of Greek Religion* (1903); M. P. Nilsson, *Studia de Dionysiis Atticis* (1900) and *Griechische Feste* (1906); G. F. Schömann, *Griechische Alterthümer*, ii. (ed. J. H. Lipsius, 1902), p. 516; A. Mommsen, *Feste der Stadt Athen* (1898); E. Rohde, *Psyche* (4th ed., 1907), p. 237.

ANTHIM THE IBERIAN, a notable figure in the ecclesiastical history of Rumania. A Georgian by birth, he came to Rumania early in the second half of the 17th century, as a simple monk. He became bishop of Râmnicu in 1705, and in 1708 archbishop of Walachia. Taking a leading part in the political movements of the time, he came into conflict with the newly appointed Greek hospodars, and was exiled to Rumelia. But on his crossing the Danube in 1716 he was thrown into the water and drowned, as it is alleged, at the instigation of the prince of Walachia. He was a man of great talents and spoke and wrote many Oriental and European languages. Though a foreigner, he soon acquired a thorough knowledge of Rumanian, and was instrumental in helping to introduce that language into the church as its official language. He was a master printer and an artist of the first order. He cut the wood blocks for the books which he printed in Tîrgovishtea, Râmnicu, Snagov and Bucharest. He was also the first to introduce Oriental founts of type into Rumania, and he printed there the first Arabic missal for the Christians of the East (Râmnicu, 1702). He also trained Georgians in the art of printing, and cut the type with which under his pupil Mihail Ishtvanovitch they printed the first Georgian Gospels (Tiflis, 1709). A man of great oratorical power, Anthim delivered a series of sermons (*Didahii*), and some of his pastoral letters are models of style and of language as well as of exact and beautiful printing. He also completed a whole *corpus* of lectionaries, missals, gospels, &c.

See M. Gaster, *Chrestomathie roumaine* (1881), and "Gesch. d. rumänischen Litteratur," in Gröber, *Grundriss d. rom. Philologie*, vol. ii. (1899); and E. Picot, *Notice sur Anthim d'Ivir* (Paris, 1886). (M. G.)

ANTHOLOGY. The term "anthology," literally denoting a garland or collection of flowers, is figuratively applied to any selection of literary beauties, and especially to that great body of fugitive poetry, comprehending about 4500 pieces, by upwards of 300 writers, which is commonly known as the *Greek Anthology*.

Literary History of the Greek Anthology.—The art of occasional poetry had been cultivated in Greece from an early period,—less, however, as the vehicle of personal feeling, than as the recognized commemoration of remarkable individuals or events, on sepulchral monuments and votive offerings. Such compositions were termed epigrams, *i.e.* inscriptions. The modern use of the word is a departure from the original sense, which simply indicated that the composition was intended to be engraved or inscribed. Such a composition must necessarily be brief, and the restraints attendant upon its publication concurred with the simplicity of Greek taste in prescribing conciseness of expression, pregnancy of meaning, purity of diction and singleness of thought, as the indispensable conditions of excellence in the epigrammatic style. The term was soon extended to any piece by which these conditions were fulfilled. The transition from the monumental to the purely literary character of the epigram was favoured by the exhaustion of more lofty forms of poetry, the general increase, from the general diffusion of culture, of accomplished writers and tasteful readers, but, above all, by the changed political circumstances of the times, which induced many who would otherwise have engaged in public affairs to addict themselves to literary pursuits. These causes came into full operation during the Alexandrian era, in which we find every description of epigrammatic composition perfectly developed. About 60 B.C., the sophist and poet, Meleager of Gadara, undertook to combine the choicest effusions of his predecessors into a single body of fugitive poetry. Collections of monumental inscriptions, or of poems on particular subjects, had previously been formed by Polemon Periegetes and others; but Meleager first gave the principle a comprehensive application. His selection, compiled from forty-six of his predecessors, and including numerous contributions of his own, was entitled *The Garland* (Στέφανος); and in an introductory poem each poet is compared to some flower, fancifully deemed appropriate to his genius. The arrangement of his collection was alphabetical, according to the initial letter of each epigram.

In the age of the emperor Tiberius (or Trajan, according to others) the work of Meleager was continued by another epigrammatist, Philippus of Thessalonica, who first employed the term anthology. His collection, which included the compositions of thirteen writers subsequent to Melcager, was also arranged alphabetically, and contained an introductory poem. It was of inferior quality to Meleager's. Somewhat later, under Hadrian, another supplement was formed by the sophist Diogenianus of Heracleia (2nd century A.D.), and Strato of Sardis compiled his elegant but tainted Μοῦσα Παιδική (Musa Puerilis) from his productions and those of earlier writers. No further collection from various sources is recorded until the time of Justinian, when epigrammatic writing, especially of an amatory character, experienced a great revival at the hands of Agathias of Myrina, the historian, Paulus Silentiarius, and their circle. Their ingenious but mannered productions were collected by Agathias into a new anthology, entitled *The Circle* (Κύκλος); it was the first to be divided into books, and arranged with reference to the subjects of the pieces.

These and other collections made during the middle ages are now lost. The partial incorporation of them into a single body, classified according to the contents in 15 books, was the work of a certain Constantinus Cephalas, whose name alone is preserved in the single MS. of his compilation extant, but who probably lived during the temporary revival of letters under Constantine Porphyrogenitus, at the beginning of the 10th century. He appears to have merely made excerpts from the existing anthologies, with the addition of selections from Lucillius, Palladas, and other epigrammatists, whose compositions had been published separately. His arrangement, to which we shall have to recur, is founded on a principle of classification, and nearly corresponds to that adopted by Agathias. His principle of selection is unknown; it is only certain that while he omitted much that he should have retained, he has preserved much that would otherwise have perished. The extent of our obligations may be ascertained by a comparison between his anthology and that of the next editor, the monk Maximus Planudes (A.D. 1320), who has not merely grievously mutilated the anthology of Cephalas by omissions, but has disfigured it by interpolating verses of his own. We are, however, indebted to him for the preservation of the epigrams on works of art, which seem to have been accidentally omitted from our only transcript of Cephalas.

The Planudean (in seven books) was the only recension of the anthology known at the revival of classical literature, and was first published at Florence, by Janus Lascaris, in 1494. It long continued

to be the only accessible collection, for although the Palatine MS., the sole extant copy of the anthology of Cephalas, was discovered in the Palatine library at Heidelberg, and copied by Saumaise (Salmasius) in 1606, it was not published until 1776, when it was included in Brunck's *Analecta Veterum Poetarum Graecorum*. The MS. itself had frequently changed its quarters. In 1623, having been taken in the sack of Heidelberg in the Thirty Years' War, it was sent with the rest of the Palatine Library to Rome as a present from Maximilian I. of Bavaria to Gregory XV., who had it divided into two parts, the first of which was by far the larger; thence it was taken to Paris in 1797. In 1816 it went back to Heidelberg, but in an incomplete state, the second part remaining at Paris. It is now represented at Heidelberg by a photographic facsimile. Brunck's edition was superseded by the standard one of Friedrich Jacobs (1794–1814, 13 vols.), the text of which was reprinted in a more convenient form in 1813–1817, and occupies three pocket volumes in the Tauchnitz series of the classics. The best edition for general purposes is perhaps that of Dübner in Didot's *Bibliotheca* (1864–1872), which contains the Palatine Anthology, the epigrams of the Planudean Anthology not comprised in the former, an appendix of pieces derived from other sources, copious notes selected from all quarters, a literal Latin prose translation by Boissonade, Bothe, and Lapaume and the metrical Latin versions of Hugo Grotius. A third volume, edited by E. Cougny, was published in 1890. The best edition of the Planudean Anthology is the splendid one by van Bosch and van Lennep (1795–1822). There is also a complete edition of the text by Stadtmüller in the Teubner series.

Arrangement.—The Palatine MS., the archetype of the present text, was transcribed by different persons at different times, and the actual arrangement of the collection does not correspond with that signalized in the index. It is as follows: Book 1. Christian epigrams; 2. Christodorus's description of certain statues; 3. Inscriptions in the temple at Cyzicus; 4. The prefaces of Meleager, Philippus, and Agathias to their respective collections; 5. Amatory epigrams; 6. Votive inscriptions; 7. Epitaphs; 8. The epigrams of Gregory of Nazianzus; 9. Rhetorical and illustrative epigrams; 10. Ethical pieces; 11. Humorous and convivial; 12. Strato's Musa Puerilis; 13. Metrical curiosities; 14. Puzzles, enigmas, oracles; 15. Miscellanies. The epigrams on works of art, as already stated, are missing from the *Codex Palatinus*, and must be sought in an appendix of epigrams only occurring in the Planudean Anthology. The epigrams hitherto recovered from ancient monuments and similar sources form appendices in the second and third volumes of Dübner's edition.

Style and Value.—One of the principal claims of the Anthology to attention is derived from its continuity, its existence as a living and growing body of poetry throughout all the vicissitudes of Greek civilization. More ambitious descriptions of composition speedily ran their course, and having attained their complete development became extinct or at best lingered only in feeble or conventional imitations. The humbler strains of the epigrammatic muse, on the other hand, remained ever fresh and animated, ever in intimate union with the spirit of the generation that gave them birth. To peruse the entire collection, accordingly, is as it were to assist at the disinterment of an ancient city, where generation has succeeded generation on the same site, and each stratum of soil enshrines the vestiges of a distinct epoch, but where all epochs, nevertheless, combine to constitute an organic whole, and the transition from one to the other is hardly perceptible. Four stages may be indicated:—1. The Hellenic proper, of which Simonides of Ceos (*c.* 556–469 B.C.), the author of most of the sepulchral inscriptions on those who fell in the Persian wars, is the characteristic representative. This is characterized by a simple dignity of phrase, which to a modern taste almost verges upon baldness, by a crystalline transparency of diction, and by an absolute fidelity to the original conception of the epigram. Nearly all the pieces of this era are actual *bona fide* inscriptions or addresses to real personages, whether living or deceased; narratives, literary exercises, and sports of fancy are exceedingly rare. 2. The epigram received a great development in its second or Alexandrian era, when its range was so extended as to include anecdote, satire, and amorous longing; when epitaphs and votive inscriptions were composed on imaginary persons and things, and men of taste successfully attempted the same subjects in mutual emulation, or sat down to compose verses as displays of their ingenuity. The result was a great gain in richness of style and general interest, counterbalanced by a falling off in purity of diction and sincerity of treatment. The modification—a perfectly legitimate one, the resources of the old style being exhausted—had its real source in the transformation of political life, but may be said to commence with and to find its best representative in the playful and elegant Leonidas of Tarentum, a contemporary of Pyrrhus, and to close with Antipater of Sidon, about 140 B.C. (or later). It should be noticed, however, that Callimachus, one of the most distinguished of the Alexandrian poets, affects the sternest simplicity in his epigrams, and copies the austerity of Simonides with as much success as an imitator can expect. 3. By a slight additional modification in the same direction, the Alexandrian passes into what, for the sake of preserving the parallelism with eras of Greek prose literature, we may call the Roman style, although the peculiarities of its principal representative are decidedly Oriental. Meleager of Gadara was a Syrian; his taste was less severe, and his temperament more fervent than those of his Greek predecessors; his pieces are usually erotic, and their glowing imagery sometimes reminds us of the Song of Solomon. The luxuriance of his fancy occasionally betrays him into far-fetched conceits, and the lavishness of his epithets is only redeemed by their exquisite felicity. Yet his effusions are manifestly the offspring of genuine feeling, and his epitaph on himself indicates a great advance on the exclusiveness of antique Greek patriotism, and is perhaps the first clear enunciation of the spirit of universal humanity characteristic of the later Stoic philosophy. His gaiety and licentiousness are imitated and exaggerated by his somewhat later contemporary, the Epicurean Philodemus, perhaps the liveliest of all the epigrammatists; his fancy reappears with diminished brilliancy in Philodemus's contemporary, Zonas, in Crinagoras, who wrote under Augustus, and in Marcus Argentarius, of uncertain date; his peculiar gorgeousness of colouring remains entirely his own. At a later period of the empire another *genre*, hitherto comparatively in abeyance, was developed, the satirical. Lucillius, who flourished under Nero, and Lucian, more renowned in other fields of literature, display a remarkable talent for shrewd, caustic epigram, frequently embodying moral reflexions of great cogency, often lashing vice and folly with signal effect, but not seldom indulging in mere trivialities, or deformed by scoffs at personal blemishes. This style of composition is not properly Greek, but Roman; it answers to the modern definition of epigram, and has hence attained a celebrity in excess of its deserts. It is remarkable, however, as an almost solitary example of direct Latin influence on Greek literature. The same style obtains with Palladas, an Alexandrian grammarian of the 4th century, the last of the strictly classical epigrammatists, and the first to be guilty of downright bad taste. His better pieces, however, are characterized by an austere ethical impressiveness, and his literary position is very interesting as that of an indignant but despairing opponent of Christianity. 4. The fourth or Byzantine style of epigrammatic composition was cultivated by the *beaux-esprits* of the court of Justinian. To a great extent this is merely imitative, but the circumstances of the period operated so as to produce a species of originality. The peculiarly ornate and *recherché* diction of Agathias and his compeers is not a merit in itself, but, applied for the first time, it has the effect of revivifying an old form, and many of their new locutions are actual enrichments of the language. The writers, moreover, were men of genuine poetical feeling, ingenious in invention, and capable of expressing emotion with energy and liveliness; the colouring of their pieces is sometimes highly dramatic.

It would be hard to exaggerate the substantial value of the Anthology, whether as a storehouse of facts bearing on antique manners, customs and ideas, or as one among the influences which have contributed to mould the literature of the modern world. The multitudinous votive inscriptions, serious and sportive, connote the phases of Greek religious sentiment, from pious awe to irreverent familiarity and sarcastic scepticism; the moral tone of the nation at various periods is mirrored with corresponding fidelity; the sepulchral inscriptions admit us into

the inmost sanctuary of family affection, and reveal a depth and tenderness of feeling beyond the province of the historian to depict, which we should not have surmised even from the dramatists; the general tendency of the collection is to display antiquity on its most human side, and to mitigate those contrasts with the modern world which more ambitious modes of composition force into relief. The constant reference to the details of private life renders the Anthology an inexhaustible treasury for the student of archaeology; art, industry and costume receive their fullest illustration from its pages. Its influence on European literatures will be appreciated in proportion to the inquirer's knowledge of each. The further his researches extend, the greater will be his astonishment at the extent to which the Anthology has been laid under contribution for thoughts which have become household words in all cultivated languages, and at the beneficial effect of the imitation of its brevity, simplicity, and absolute verbal accuracy upon the undisciplined luxuriance of modern genius.

Translations, Imitations, &c.—The best versions of the Anthology ever made are the Latin renderings of select epigrams by Hugo Grotius. They have not been printed separately, but will be found in Bosch and Lennep's edition of the Planudean *Anthology*, in the Didot edition, and in Dr Wellesley's *Anthologia Polyglotta*. The number of more or less professed imitations in modern languages is infinite, that of actual translations less considerable. French and Italian, indeed, are ill adapted to this purpose, from their incapacity of approximating to the form of the original, and their poets have usually contented themselves with paraphrases or imitations, often exceedingly felicitous. F. D. Dehèque's French prose translation, however (1863), is most excellent and valuable. The German language alone admits of the preservation of the original metre—a circumstance advantageous to the German translators, Herder and Jacobs, who have not, however, compensated the loss inevitably consequent upon a change of idiom by any added beauties of their own. Though unfitted to reproduce the precise form, the English language, from its superior terseness, is better adapted to preserve the spirit of the original than the German; and the comparative ill success of many English translators must be chiefly attributed to the extremely low standard of fidelity and brevity observed by them. Bland, Merivale, and their associates (1806–1813), are often intolerably diffuse and feeble, from want, not of ability, but of taking pains. Archdeacon Wrangham's too rare versions are much more spirited; and John Sterling's translations of the inscriptions of Simonides deserve high praise. Professor Wilson (*Blackwood's Magazine*, 1833–1835) collected and commented upon the labours of these and other translators, with his accustomed critical insight and exuberant geniality, but damaged his essay by burdening it with the indifferent attempts of William Hay. In 1849 Dr Wellesley, principal of New Inn Hall, Oxford, published his *Anthologia Polyglotta*, a most valuable collection of the best translations and imitations in all languages, with the original text. In this appeared some admirable versions by Goldwin Smith and Dean Merivale, which, with the other English renderings extant at the time, will be found accompanying the literal prose translation of the *Public School Selections*, executed by the Rev. George Burges for Bohn's Classical Library (1854). This is a useful volume, but the editor's notes are worthless. In 1864 Major R. G. Macgregor published an almost complete translation of the Anthology, a work whose stupendous industry and fidelity almost redeem the general mediocrity of the execution. *Idylls and Epigrams*, by R. Garnett (1869, reprinted 1892 in the Cameo series), includes about 140 translations or imitations, with some original compositions in the same style. Recent translations (selections) are: J. W. Mackail, *Select Epigrams from the Greek Anthology* (with text, introduction, notes, and prose translation), 1890, revised 1906, a most charming volume; Graham R. Tomson (Mrs Marriott Watson), *Selections from the Greek Anthology* (1889); W. H. D. Rouse, *Echo of Greek Song* (1899); L. C. Perry, *From the Garden of Hellas* (New York, 1891); W. R. Paton, *Love Epigrams* (1898). An agreeable little volume on the Anthology, by Lord Neaves, is one of Collins's series of *Ancient Classics for Modern Readers*. The earl of Cromer, with all the cares of Egyptian administration upon him, found time to translate and publish an elegant volume of selections (1903). Two critical contributions to the subject should be noticed, the Rev. James Davies's essay on Epigrams in the *Quarterly Review* (vol. cxvii.), especially valuable for its lucid illustration of the distinction between Greek and Latin epigram; and the brilliant disquisition in J. A. Symonds's *Studies of the Greek Poets* (1873; 3rd ed., 1893).

Latin Anthology.—The *Latin Anthology* is the appellation bestowed upon a collection of fugitive Latin verse, from the age of Ennius to about A.D. 1000, formed by Peter Burmann the Younger. Nothing corresponding to the Greek anthology is known to have existed among the Romans, though professional epigrammatists like Martial published their volumes on their own account, and detached sayings were excerpted from authors like Ennius and Publius Syrus, while the *Priapeïa* were probably but one among many collections on special subjects. The first general collection of scattered pieces made by a modern scholar was Scaliger's *Catalecta veterum Poetarum* (1573), succeeded by the more ample one of Pithoeus, *Epigrammata et Poemata e Codicibus et Lapidibus collecta* (1590). Numerous additions, principally from inscriptions, continued to be made, and in 1759–1773 Burmann digested the whole into his *Anthologia veterum Latinorum Epigrammatum et Poematum*. This, occasionally reprinted, was the standard edition until 1869, when Alexander Riese commenced a new and more critical recension, from which many pieces improperly inserted by Burmann are rejected, and his classified arrangement is discarded for one according to the sources whence the poems have been derived. The first volume contains those found in MSS., in the order of the importance of these documents; those furnished by inscriptions following. The first volume (in two parts) appeared in 1869–1870, a second edition of the first part in 1894, and the second volume, *Carmina Epigraphica* (in two parts), in 1895–1897, edited by F. Bücheler. An *Anthologiae Latinae Supplementa*, in the same series, followed. Having been formed by scholars actuated by no aesthetic principles of selection, but solely intent on preserving everything they could find, the Latin anthology is much more heterogeneous than the Greek, and unspeakably inferior. The really beautiful poems of Petronius and Apuleius are more properly inserted in the collected editions of their writings, and more than half the remainder consists of the frigid conceits of pedantic professional exercises of grammarians of a very late period of the empire, relieved by an occasional gem, such as the apostrophe of the dying Hadrian to his spirit, or the epithalamium of Gallienus. The collection is also, for the most part, too recent in date, and too exclusively literary in character, to add much to our knowledge of classical antiquity. The epitaphs are interesting, but the genuineness of many of them is very questionable. (R. G.)

ANTHON, CHARLES (1797–1867), American classical scholar, was born in New York city on the 19th of November 1797. After graduating with honours at Columbia College in 1815, he began the study of law, and in 1819 was admitted to the bar, but never practised. In 1820 he was appointed assistant professor of Greek and Latin in his old college, full professor ten years later, and at the same time headmaster of the grammar school attached to the college, which post he held until 1864. He died at New York on the 29th of July 1867. He produced for use in colleges and schools a large number of classical works, which enjoyed great popularity, although his editions of classical authors were by no means in favour with schoolmasters, owing to the large amount of assistance, especially translations, contained in the notes.

ANTHONY, SAINT, the first Christian monk, was born in Egypt about 250. At the age of twenty he began to practise an ascetical life in the neighbourhood of his native place, and after fifteen years of this life he withdrew into solitude to a mountain by the Nile, called Pispir, now Der el Memun, opposite Arsinoë in the Fayum. Here he lived strictly enclosed in an old fort for twenty years. At last in the early years of the 4th century he emerged from his retreat and set himself to organize the monastic life of the crowds of monks who had followed him and taken up their abode in the caves around him. After a time, again in pursuit of more complete solitude, he withdrew to the mountain by the Red Sea, where now stands the monastery that bears his name (Der Mar Antonios). Here he died about the middle of the 4th century. His *Life* states that on two occasions he went to Alexandria, to strengthen the Christians in the Diocletian persecution and to preach against Arianism. Anthony is recognized as the first Christian monk and the first organizer and father of Christian monachism (see MONASTICISM). Certain letters and sermons are attributed to him, but their authenticity is more than doubtful. The monastic rule which bears his name was not written by him, but was compiled out of these writings

and out of discourses and utterances put into his mouth in the *Life* and the *Apophthegmata Patrum*. According to this rule live a number of Coptic Syrian and Armenian monks to this day. The chief source of information about St Anthony is the *Life*, attributed to St Athanasius. This attribution, as also the historical character of the book, and even the very existence of St Anthony, were questioned and denied by the sceptical criticism of thirty years ago; but such doubts are no longer entertained by critical scholars.

The Greek *Vita* is among the works of St Athanasius; the almost contemporary Latin translation is among Rosweyd's *Vitae Patrum* (Migne, *Patrol. Lat.* lxxiii.); an English translation is in the Athanasius volume of the "Nicene and Post-Nicene Library." Accounts of St Anthony are given by Card. Newman, *Church of the Fathers* (Historical Sketches) and Alban Butler, *Lives of the Saints* (Jan. 17). Discussions of the historical and critical questions raised will be found in E. C. Butler's *Lausiac History of Palladius* (1898, 1904), Part I. pp. 197, 215-228; Part II. pp. ix.-xii. (E. C. B.)

ANTHONY OF PADUA, SAINT (1195–1231), the most celebrated of the followers of Saint Francis of Assisi, was born at Lisbon on the 15th of August 1195. In his fifteenth year he entered the Augustinian order, and subsequently joined the Franciscans in 1220. He wished to devote himself to missionary labours in North Africa, but the ship in which he sailed was cast by a storm on the coast of Sicily, whence he made his way to Italy. He taught theology at Bologna, Toulouse, Montpellier and Padua, and won a great reputation as a preacher throughout Italy. He was the leader of the rigorous party in the Franciscan order against the mitigations introduced by the general Elias. His death took place at the convent of Ara Coeli, near Padua, on the 13th of June 1231. He was canonized by Gregory IX. in the following year, and his festival is kept on the 13th of June. He is regarded as the patron saint of Padua and of Portugal, and is appealed to by devout clients for finding lost objects. The meagre accounts of his life which we possess have been supplemented by numerous popular legends, which represent him as a continuous worker of miracles, and describe his marvellous eloquence by pictures of fishes leaping out of the water to hear him. There are many confraternities established in his honour throughout Christendom, and the number of "pious" biographies devoted to him would fill many volumes.

The most trustworthy modern works are by A. Lepître, *St Antoine de Padoue* (Paris, 1902, in *Les Saints* series: good bibliography; Eng. trans. by Edith Guest, London, 1902), and by Léopold de Chérancé, *St Antoine de Padoue* (Paris, 1895; Eng. trans., London, 1896). His works, consisting of sermons and a mystical commentary on the Bible, were published in an appendix to those of St Francis, in the *Annales Minorum* of Luke Wadding (Antwerp, 1623), and are also reproduced by Horoy, *Medii aevi bibliotheca patristica* (1880, vi. pp. 555 et sqq.); see art. "Antonius von Padua" in Herzog-Hauck, *Realencyklopädie*.

ANTHONY, SUSAN BROWNELL (1820–1906), American reformer, was born at Adams, Massachusetts, on the 15th of February 1820, the daughter of Quakers. Soon after her birth, her family moved to the state of New York, and after 1845 she lived in Rochester. She received her early education in a school maintained by her father for his own and neighbours' children, and from the time she was seventeen until she was thirty-two she taught in various schools. In the decade preceding the outbreak of the Civil War she took a prominent part in the anti-slavery and temperance movements in New York, organizing in 1852 the first woman's state temperance society in America, and in 1856 becoming the agent for New York state of the American Anti-slavery Society. After 1854 she devoted herself almost exclusively to the agitation for woman's rights, and became recognized as one of the ablest and most zealous advocates, both as a public speaker and as a writer, of the complete legal equality of the two sexes. From 1868 to 1870 she was the proprietor of a weekly paper, *The Revolution*, published in New York, edited by Mrs Elizabeth Cady Stanton, and having for its motto, "The true republic—men, their rights and nothing more; women, their rights and nothing less." She was vice-president-at-large of the National Woman's Suffrage Association from the date of its organization in 1869 until 1892, when she became president. For casting a vote in the presidential election of 1872, as, she asserted, the Fourteenth Amendment to the Federal Constitution entitled her to do, she was arrested and fined $100, but she never paid the fine. In collaboration with Mrs Elizabeth Cady Stanton, Mrs Matilda Joslyn Gage, and Mrs Ida Husted Harper, she published *The History of Woman Suffrage* (4 vols., New York, 1884–1887). She died at Rochester, New York, on the 13th of March 1906.

See Mrs Ida Husted Harper's *Life and Work of Susan B. Anthony* (3 vols., Indianapolis, 1898–1908).

ANTHOZOA (*i.e.* "flower-animals"), the zoological name for a class of marine polyps forming "coral" (*q.v.*). Although corals have been familiar objects since the days of antiquity, and the variety known as the precious red coral has been for a long time an article of commerce in the Mediterranean, it was only in the 18th century that their true nature and structure came to be understood. By the ancients and the earlier naturalists of the Christian era they were regarded either as petrifactions or as plants, and many supposed that they occupied a position midway between minerals and plants. The discovery of the animal nature of red coral is due to J. A. de Peyssonel, a native of Marseilles, who obtained living specimens from the coral fishers on the coast of Barbary and kept them alive in aquaria. He was thus able to see that the so-called "flowers of coral" were in fact nothing else than minute polyps resembling sea-anemones. His discovery, made in 1727, was rejected by the Academy of Sciences of France, but eventually found acceptance at the hands of the Royal Society of London, and was published by that body in 1751. The structure and classification of polyps, however, were at that time very imperfectly understood, and it was fully a century before the true anatomical characters and systematic position of corals were placed on a secure basis.

The hard calcareous substance to which the name coral is applied is the supporting skeleton of certain members of the *Anthozoa*, one of the classes of the phylum Coelentera. The most familiar Anthozoan is the common sea-anemone, *Actinia equina*, L., and it will serve, although it does not form a skeleton or *corallum*, as a good example of the structure of a typical Anthozoan polyp or zooid. The individual animal or zooid of *Actinia equina* has the form of a column fixed by one extremity, called the *base*, to a rock or other object, and bearing at the opposite extremity a crown of *tentacles*. The tentacles surround an area known as the *peristome*, in the middle of which there is an elongated mouth-opening surrounded by tumid lips. The mouth does not open directly into the general cavity of the body, as is the case in a hydrozoan polyp, but into a short tube called the *stomodaeum*, which in its turn opens below into the general body-cavity or *coelenteron*. In Actinia and its allies, and most generally, though not invariably, in Anthozoa, the stomodaeum is not circular, but is compressed from side to side so as to be oval or slit-like in transverse section. At each end of the oval there is a groove lined by specially long vibratile cilia. These grooves are known as the *sulcus* and *sulculus*, and will be more particularly described hereafter. The elongation of the mouth and stomodaeum confer a bilateral symmetry on the body of the zooid, which is extended to other organs of the body. In Actinia, as in all Anthozoan zooids, the coelenteron is not a simple cavity, as in a Hydroid, but is divided by a number of radial folds or curtains of soft tissue into a corresponding number of radial chambers. These radial folds are known as *mesenteries*, and their position and relations may be understood by reference to figs. 1 and 2. Each mesentery is attached by its upper margin to the peristome, by its outer margin to the body-wall, and by its lower margin to the basal disk. A certain number of mesenteries, known as complete mesenteries, are attached by the upper parts of their internal margins to the stomodaeum, but below this level their edges hang in the coelenteron. Other mesenteries, called incomplete, are not attached to the stomodaeum, and their internal margins are free from the peristome to the basal disk. The lower part of the free edge of every mesentery, whether complete or incomplete, is thrown into numerous puckers or folds, and is furnished with a glandular thickening known as a *mesenterial filament*. The reproductive

organs or gonads are borne on the mesenteries, the germinal cells being derived from the inner layer or endoderm.

In common with all Coelenterate animals, the walls of the columnar body and also the tentacles and peristome of Actinia are composed of three layers of tissue. The external layer, or *ectoderm*, is made up of cells, and contains also muscular and nervous elements. The preponderating elements of the ectodermic layer are elongated columnar cells, each containing a nucleus, and bearing cilia at their free extremities. Packed in among these are *gland cells*, *sense cells*, and *cnidoblasts*. The last-named are specially numerous on the tentacles and on some other regions of the body, and produce the well-known "thread cells," or *nematocysts*, so characteristic of the Coelentera. The inner layer or endoderm is also a cellular layer, and is chiefly made up of columnar cells, each bearing a cilium at its free extremity and terminating internally in a long muscular fibre. Such cells, made up of epithelial and muscular components, are known as epithelio-muscular or myo-epithelial cells. In Actinians the epithelio-muscular cells of the endoderm are crowded with yellow spherical bodies, which are unicellular plants or Algae, living symbiotically in the tissues of the zooid. The endoderm contains in addition gland cells and nervous elements. The middle layer or mesogloea is not originally a cellular layer, but a gelatinoid structureless substance, secreted by the two cellular layers. In the course of development, however, cells from the ectoderm and endoderm may migrate into it. In *Actinia equina* the mesogloea consists of fine fibres imbedded in a homogeneous matrix, and between the fibres are minute branched or spindle-shaped cells. For further details of the structure of Actinians, the reader should consult the work of O. and R. Hertwig.

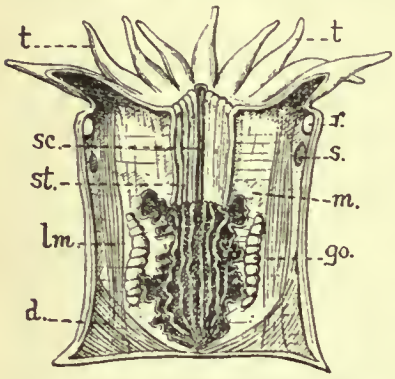


FIG. 1.—Diagrammatic longitudinal section of an Anthozoan zooid.

m, Mesentery. *lm*, Longitudinal muscle.
t, Tentacles. *d*, Diagonal muscle.
st, Stomodaeum. *go*, Gonads.
sc, Sulcus.
r, Rotteken's muscle.
s, Stoma.

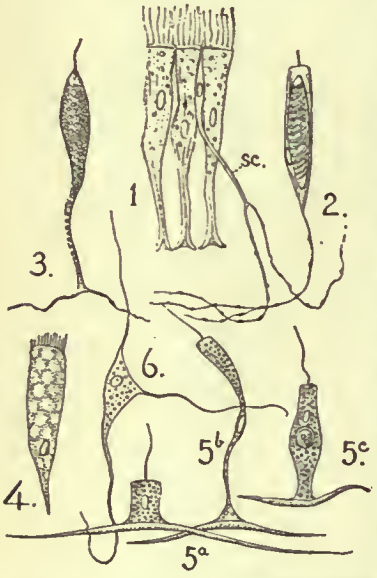


FIG. 2.—1, Portion of epithelium from the tentacle of an Actinian, showing three supporting cells and one sense cell (*sc*); 2, a cnidoblast with enclosed nematocyst from the same specimen; 3 and 4, two forms of gland cell from the stomodaeum; 5*a*, 5*b*, epithelio-muscular cells from the tentacle in different states of contraction; 5*c*, an epithelio-muscular cell from the endoderm, containing a symbiotic zooxanthella; 6, a ganglion cell from the ectoderm of the peristome. (After O. and R. Hertwig.)

The Anthozoa are divisible into two sub-classes, sharply marked off from one another by definite anatomical characters. These are the ALCYONARIA and the ZOANTHARIA. To the first-named belong the precious red coral and its allies, the sea-fans or Gorgoniae; to the second belong the white or Madreporarian corals.

Alcyonaria.—In this sub-class the zooid (fig. 3) has very constant anatomical characters, differing in some important respects from the Actinian zooid, which has been taken as a type. There is only one ciliated groove, the sulcus, in the stomodaeum. There are always eight tentacles, which are hollow and fringed on their sides, with hollow projections or pinnae; and always eight mesenteries, all of which are complete, *i.e.* inserted on the stomodaeum. The mesenteries are provided with well-developed longitudinal retractor muscles, supported on longitudinal folds or plaits of the mesogloea, so that in cross-section they have a branched appearance. These *muscle-banners*, as they are called, have a highly characteristic arrangement; they are all situated on those faces of the mesenteries which look towards the sulcus (fig. 4). Each mesentery has a filament; but two of them, namely, the pair farthest from the sulcus, are longer than the rest, and have a different form of filament. It has been shown that these asulcar filaments are derived from the ectoderm, the remainder from the endoderm. The only exceptions to this structure are found in the arrested or modified zooids, which occur in many of the colonial Alcyonaria. In these the tentacles are stunted or suppressed and the mesenteries are ill-developed, but the sulcus is unusually large and has long cilia. Such modified zooids are called siphonozooids, their function being to drive currents of fluid through the canal-systems of the colonies to which they belong. With very few exceptions a calcareous skeleton is present in all Alcyonaria; it usually consists of spicules of carbonate of lime, each spicule being formed within an ectodermic cell (fig. 3, B). Most commonly the spicule-forming cells pass out of the ectoderm and are imbedded in the mesogloea, where they may remain separate from one another or may be fused together to form a strong mass. In addition to the spicular skeleton an organic horny skeleton is frequently present, either in the form of a horny external investment (*Cornularia*), or an internal axis (*Gorgonia*), or it may form a matrix in which spicules are imbedded (*Keroeides*, *Melitodes*).

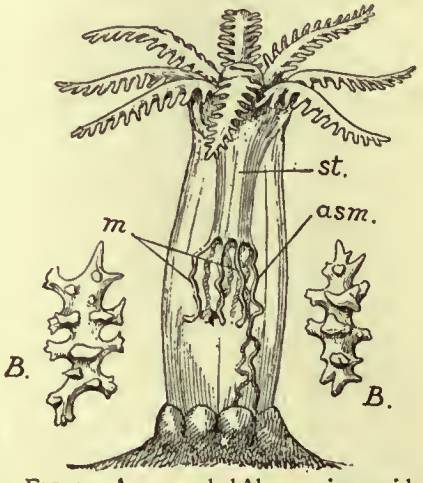


FIG. 3.—An expanded Alcyonarian zooid, showing the mouth surrounded by eight pinnate tentacles. *st*, Stomodaeum in the centre of the transparent body; *m*, mesenteries; *asm*, asulcar mesenteries; B, spicules, enlarged.

Nearly all the Alcyonaria are colonial. Four solitary species have been described, viz. *Haimea funebris* and *H. hyalina*, *Hartea elegans*, and *Monoxenia Darwinii*; but it is doubtful whether these are not the young forms of colonies. For the present the solitary forms may be placed in a grade, *Protalcyonacea*; and the colonial forms may be grouped in another grade, *Synalcyonacea*. Every Alcyonarian colony is developed by budding from a single parent zooid. The buds are not direct outgrowths of the body-wall, but are formed on the courses of hollow outgrowths of the base or body-wall, called *solenia*. These form a more or less complicated canal system, lined by endoderm, and communicating with the cavities of the zooids. The most simple form of budding is found in the genus *Cornularia*, in which the mother zooid gives off from its base one or more simple radiciform outgrowths. Each outgrowth contains a single tube or solenium, and at a longer or shorter distance from the mother zooid a daughter zooid is formed as a bud. This gives off new outgrowths, and these, branching and anastomosing with one another, may form a network, adhering to stones, corals, or other objects, from which

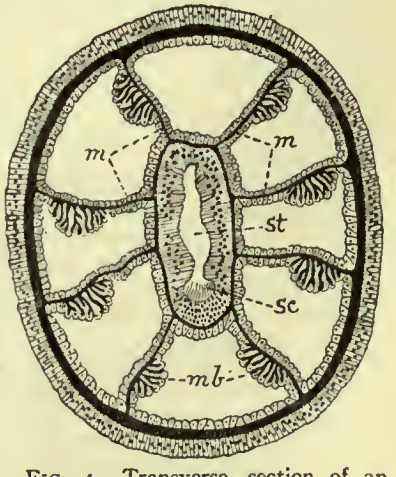


FIG. 4.—Transverse section of an Alcyonarian zooid. *mm*, Mesenteries; *mb*, muscle banners; *sc*, sulcus; *st*, stomodaeum.

zooids arise at intervals. In *Clavularia* and its allies each outgrowth contains several solenia, and the outgrowths may take the form of flat expansions, composed of a number of solenial tubes felted together to form a lamellar surface of attachment. Such outgrowths are called *stolons*, and a stolon may be simple, *i.e.* contain only one solenium, as in *Cornularia*, or may be complex and built up of many solenia, as in *Clavularia*. Further complications arise when the lower walls of the mother zooid become thickened and interpenetrated with solenia, from which buds are developed, so that lobose, tufted, or branched colonies are formed. The chief orders of the Synalcyonacea are founded upon the different architectural features of colonies produced by different modes of budding. We recognize six orders — the STOLONIFERA, ALCYONACEA, PSEUDAXONIA, AXIFERA, STELECHOTOKEA, and COENOTHECALIA.

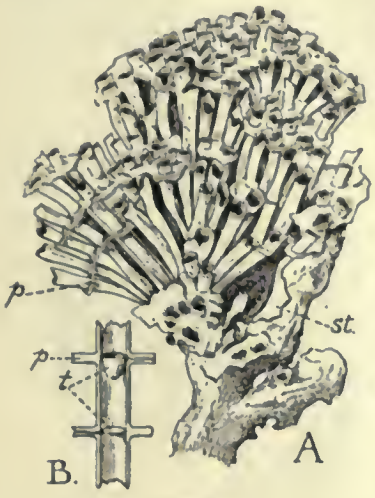


FIG. 5.

A, Skeleton of a young colony of *Tubipora purpurea*. *st*, Stolon; *p*, platform.

B, Diagrammatic longitudinal section of a corallite, showing two platforms, *p*, and simple and cup-shaped tabulae, *t*. (After S. J. Hickson.)

In the order STOLONIFERA the zooids spring at intervals from branching or lamellar stolons, and are usually free from one another, except at their bases, but in some cases horizontal solenia arising at various heights from the body-wall may place the more distal portions of the zooids in communication with one another. In the genus *Tubipora* these horizontal solenia unite to form a series of horizontal platforms (fig. 5). The order comprises the families *Cornulariidae*, *Syringoporidae*, *Tubiporidae*, and *Favositidae*. In the first-named the zooids are united only by their bases and the skeleton consists of loose spicules. In the *Tubiporidae* the spicules of the proximal part of the body-wall are fused together to form a firm tube, the corallite, into which the distal part of the zooid can be retracted. The corallites are connected at intervals by horizontal platforms containing solenia, and at the level of each platform the cavity of the corallite is divided by a transverse calcareous partition, either flat or cup-shaped, called a *tabula*. Formerly all corals in which tabulae are present were classed together as Tabulata, but Tubipora is an undoubted Alcyonarian with a lamellar stolon, and the structure of the fossil genus Syringopora, which has vertical corallites united by horizontal solenia, clearly shows its affinity to Tubipora. The Favositidae, a fossil family from the Silurian and Devonian, have a massive corallum composed of numerous polygonal corallites closely packed together. The cavities of adjacent corallites communicate by means of numerous perforations, which appear to represent solenia, and numerous transverse tabulae are also present. In *Favosites hemisphaerica* a number of radial spines, projecting into the cavity of the corallite, give it the appearance of a madreporarian coral.

FIG. 6.—Portion of a colony of *Corallium rubrum*, showing expanded and contracted zooids. In the lower part of the figure the cortex has been cut away to show the *axis*, *ax*, and the longitudinal canals, *lc*, surrounding it.

In the order ALCYONACEA the colony consists of bunches of elongate cylindrical zooids, whose proximal portions are united by solenia and compacted, by fusion of their own walls and those of the solenia, into a fleshy mass called the coenenchyma. Thus the coenenchyma forms a stem, sometimes branched, from the surface of which the free portions of the zooids project. The skeleton of the Alcyonacea consists of separate calcareous spicules, which are often, especially in the Nephthyidae, so abundant and so closely interlocked as to form a tolerably firm and hard armour. The order comprises the families *Xeniidae*, *Alcyonidae* and *Nephthyidae*. *Alcyonium digitatum*, a pink digitate form popularly known as "dead men's fingers," is common in 10-20 fathoms of water off the English coasts.

In the order PSEUDAXONIA the colonies are upright and branched, consisting of a number of short zooids whose proximal ends are imbedded in a coenenchyma containing numerous ramifying solenia and spicules. The coenenchyma is further differentiated into a medullary portion and a cortex. The latter contains the proximal moieties of the zooids and numerous but separate spicules. The medullary portion is densely crowded with spicules of different shape from those in the cortex, and in some forms the spicules are cemented together to form a hard supporting axis. There are four families of Pseudaxonia — the *Briareidae*, *Sclerogorgidae*, *Melitodidae*, and *Corallidae*. In the first-named the medulla is penetrated by solenia and forms an indistinct axis; in the remainder the medulla is devoid of solenia, and in the *Melitodidae* and *Corallidae* it forms a dense axis, which in the *Melitodidae* consists of alternate calcareous and horny joints. The precious red coral of commerce, *Corallium rubrum* (fig. 6), a member of the family *Corallidae*, is found at depths varying from 15 to 120 fathoms in the Mediterranean Sea, chiefly on the African coast. It owes its commercial value to the beauty of its hard red calcareous axis which in life is covered by a cortex in which the proximal moieties of the zooids are imbedded. *Corallium rubrum* has been the subject of a beautifully-illustrated memoir by de Lacaze-Duthiers, which should be consulted for details of anatomy.

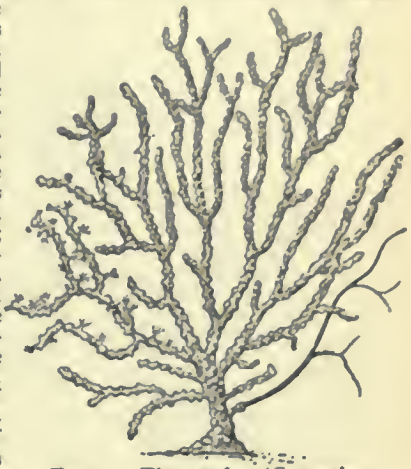


FIG. 7.—The sea-fan (*Gorgonia cavolinii*).

The AXIFERA comprise those corals that have a horny or calcified axis, which in position corresponds to the axis of the Pseudaxonia, but, unlike it, is never formed of fused spicules; the most familiar example is the pink sea-fan, *Gorgonia cavolinii*, which is found in abundance in 10-25 fathoms of water off the English coasts (fig. 7). In this order the axis is formed as an ingrowth of the ectoderm of the base of the mother zooid of the colony, the cavity of the ingrowth being filled by a horny substance secreted by the ectoderm. In *Gorgonia* the axis remains horny throughout life, but in many forms it is further strengthened by a deposit of calcareous matter. In the family *Isidinae* the axis consists of alternate segments of horny and calcareous substance, the latter being amorphous. The order contains six families — the *Dasygorgidae*, *Isidae*, *Primnoidae*, *Muriceidae*, *Plexauridae*, and *Gorgonidae*.

In the order STELECHOTOKEA the colony consists of a stem formed by a greatly-elongated mother zooid, and the daughter zooids are borne as lateral buds on the stem. In the section *Asiphonacea* the colonies are upright and branched, springing from membranous or ramifying stolons. They resemble and are closely allied to certain families of the Cornulariidae, differing from them only in mode of budding and in the disposition of the daughter zooids round a central, much-elongated mother zooid. The section contains two families, the *Telestidae* and the *Coelogorgidae*. The second section comprises the *Pennatulacea* or sea-pens, which are remarkable from the fact that the colony is not fixed by the base to a rock or other

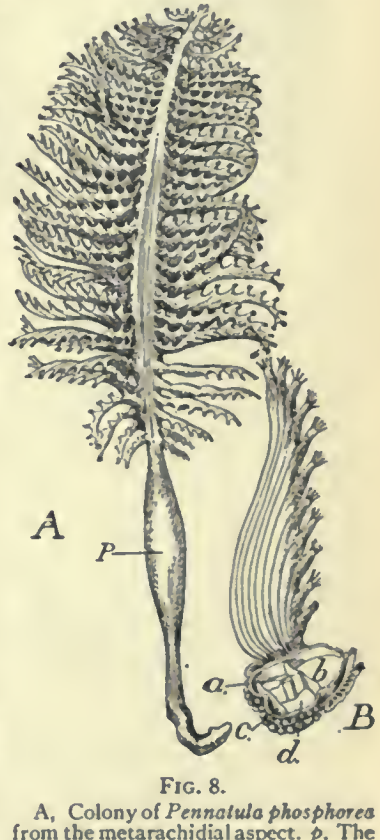


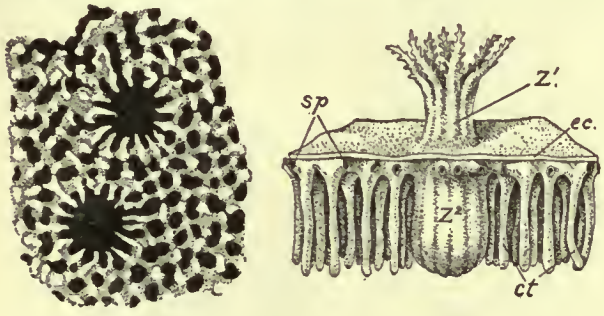
FIG. 8.

A, Colony of *Pennatula phosphorea* from the metarachidial aspect. *p*, The peduncle.

B, Section of the rachis bearing a single pinna. *a*, Axis; *b*, metarachidial; *c*, prorachidial; *d*, pararachidial stem canals.

object, but is imbedded in sand or mud by the proximal portion of the stem known as the peduncle. In the typical genus, Pennatula (fig. 8), the colony looks like a feather having a stem divisible into an upper moiety or rachis, bearing lateral central leaflets (pinnae), and a lower peduncle, which is sterile and imbedded in sand or mud. The stem represents a greatly enlarged and elongated mother zooid. It is divided longitudinally by a partition separating a so-called "ventral" or prorachidial canal from a so-called "dorsal" or metarachidial canal. A rod-like supporting axis of peculiar texture is developed in the longitudinal partition, and a longitudinal canal is hollowed out on either side of the axis in the substance of the longitudinal partition, so that there are four stem-canals in all. The prorachidial and metarachidial aspects of the rachis are sterile, but the sides or pararachides bear numerous daughter zooids of two kinds—(1) fully-formed autozooids, (2) small stunted siphonozooids. The pinnae are formed by the elongated autozooids, whose proximal portions are fused together to form a leaf-like expansion, from the upper edge of which the distal extremities of the zooids project. The siphonozooids are very numerous and lie between the bases of the pinnae on the pararachides; they extend also on the prorachidial and metarachidial surfaces. The calcareous skeleton of the Pennatulacea consists of scattered spicules, but in one species, *Protocaulon molle*, spicules are absent. Although of great interest the Pennatulacea do not form an enduring skeleton or "coral," and need not be considered in detail in this place.

The order COENOTHECALIA is represented by a single living species, *Heliopora coerulea*, which differs from all recent Alcyonaria in the fact that its skeleton is not composed of spicules, but is formed as a secretion from a layer of cells called calicoblasts, which originate from the ectoderm. The corallum of Heliopora is of a blue colour, and has the form of broad, upright, lobed, or digitate masses flattened from side to side. The surfaces are pitted all over with perforations of two kinds, viz. larger star-shaped cavities, called *calices*, in which the zooids are lodged, and very numerous smaller round or polygonal apertures, which in life contain as many short unbranched



A FIG. 9. B

A, Portion of the surface of a colony of *Heliopora coerulea* magnified, showing two calices and the surrounding coenenchymal tubes.

B, Single zooid with the adjacent soft tissues as seen after removal of the skeleton by decalcification. Z^1, the distal, and Z^2, the proximal or intracalicular portion of the zooid; *ec*, ectoderm; *ct*, coenenchymal tubes; *sp*, superficial network of solenia.

tubes, known as the *coenenchymal tubes* (fig. 9, A). The walls of the calices and coenenchymal tubes are formed of flat plates of calcite, which are so disposed that the walls of one tube enter into the composition of the walls of adjacent tubes, and the walls of the calices are formed by the walls of adjacent coenenchymal tubes. Thus the architecture of the Helioporid colony differs entirely from such forms as Tubipora or Favosites, in which each corallite has its own distinct and proper wall. The cavities both of the calices and coenenchymal tubes of Heliopora are closed below by horizontal partitions or *tabulae*, hence the genus was formerly included in the group Tabulata, and was supposed to belong to the madreporarian corals, both because of its lamellar skeleton, which resembles that of a Madrepore, and because each calicle has from twelve to fifteen radial partitions or septa projecting into its cavity. The structure of the zooid of Heliopora, however, is that of a typical Alcyonarian, and the septa have only a resemblance to, but no real homology with, the similarly named structures in madreporarian corals. *Heliopora coerulea* is found between tide-marks on the shore platforms of coral islands. The order was more abundantly represented in Palaeozoic times by the *Heliolitidae* from the Upper and Lower Silurian and the Devonian, and by the *Thecidae* from the Wenlock limestone. In *Heliolites porosus* the colonies had the form of spheroidal masses; the calices were furnished with twelve pseudosepta, and the coenenchymal tubes were more or less regularly hexagonal.

Zoantharia.—In this sub-class the arrangement of the mesenteries is subject to a great deal of variation, but all the types hitherto observed may be referred to a common plan, illustrated by the living genus *Edwardsia* (fig. 10, A, B). This is a small solitary Zoantharian which lives embedded in sand. Its body is divisible into three portions, an upper *capitulum* bearing the mouth and tentacles, a median *scapus* covered by a friable cuticle, and a terminal *physa* which is rounded. Both capitulum and physa can be retracted within the scapus. There are from sixteen to thirty-two simple tentacles, but only eight mesenteries, all of which are complete. The stomodaeum is compressed laterally, and is furnished with two longitudinal grooves, a sulcus and a sulculus. The arrangement of the muscle-banners on the mesenteries is characteristic. On six of the mesenteries the muscle-banners have the same position as in the Alcyonaria, namely, on the sulcar faces; but in the two remaining mesenteries, namely, those which are attached on either side of the sulcus, the muscle-banners are on the opposite or sulcular faces. It is not known whether all the eight mesenteries of *Edwardsia* are developed simultaneously or not, but in the youngest

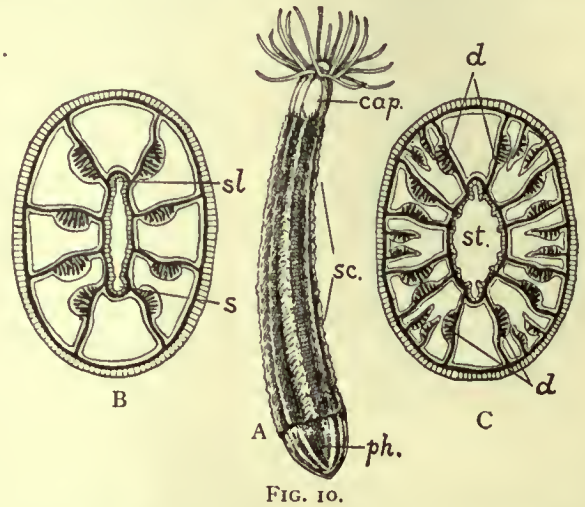


FIG. 10.

A, *Edwardsia claparedii* (after A. Andres). *Cap*, capitulum; *sc*, scapus; *ph*, physa.

B, Transverse section of the same, showing the arrangement of the mesenteries. *s*, Sulcus; *sl*, sulculus.

C, Transverse section of *Halcampa*. *d*, *d*, Directive mesenteries; *st*, stomodaeum.

form which has been studied all the eight mesenteries were present, but only two of them, namely the sulco-laterals, bore mesenterial filaments, and so it is presumed that they are the first pair to be developed. In the common sea-anemone, *Actinia equina* (which has already been quoted as a type of Anthozoan structure), the mesenteries are numerous and are arranged in cycles. The mesenteries of the first cycle are complete (*i.e.* are attached to the stomodaeum), are twelve in number, and arranged in couples, distinguishable by the position of the muscle-banners. In the four couples of mesenteries which are attached to the sides of the elongated stomodaeum the muscle-banners of each couple are turned towards one another, but in the sulcar and sulcular couples, known as the directive

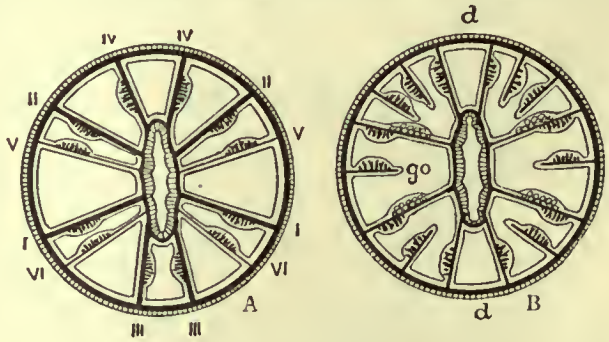


FIG. 11.—A, Diagram showing the sequence of mesenterial development in an Actinian. B, Diagrammatic transverse section of *Gonactinia prolifera*.

mesenteries, the muscle-banners are on the outer faces of the mesenteries, and so are turned away from one another (see fig. 10, C). The space enclosed between two mesenteries of the same couple is called an *entocoele*; the space enclosed between two mesenteries of adjacent couples is called an *exocoele*. The second cycle of mesenteries consists of six couples, each formed in an exocoele of the primary cycle, and in each couple the muscle-banners are *vis-à-vis*. The third cycle comprises twelve couples, each formed in an exocoele between the primary and secondary couples, and so on, it being a general rule (subject, however, to exceptions) that new mesenterial couples are always formed in the exocoeles, and not in the entocoeles.

While the mesenterial couples belonging to the second and each successive cycle are formed simultaneously, those of the first cycle

are formed in successive pairs, each member of a pair being placed on opposite sides of the stomodaeum. Hence the arrangement in six couples is a secondary and not a primary feature. In most Actinians the mesenteries appear in the following order:—At the time when the stomodaeum is formed, a single pair of mesenteries, marked I, I in the diagram (fig. 11, A), makes its appearance, dividing the coelenteric cavity into a smaller sulcar and a large sulcular chamber. The muscle-banners of this pair are placed on the sulcar faces of the mesenteries. Next, a pair of mesenteries, marked II, II in the diagram, is developed in the sulcular chamber, its muscle-banners facing the same way as those of I, I. The third pair is formed in the sulcar chamber, in close connexion with the sulcus, and in this case the muscle-banners are on the *sulcular* faces. The fourth pair, having its muscle-banners on the sulcar faces, is developed at the opposite extremity of the stomodaeum in close connexion with the sulculus. There are now eight mesenteries present, having exactly the same arrangement as in Edwardsia. A pause in the development follows, during which no new mesenteries are formed, and then the six-rayed symmetry characteristic of a normal Actinian zooid is completed by the formation of the mesenteries V, V in the lateral chambers, and VI, VI in the sulcolateral chambers, their muscle-banners being so disposed that they form couples respectively with II, II and I, I. In *Actinia equina* the Edwardsia stage is arrived at somewhat differently. The mesenteries second in order of formation form the sulcular directives, those fourth in order of formation form with the fifth the sulculo-lateral couples of the adult.

As far as the anatomy of the zooid is concerned, the majority of the stony or madreporarian corals agree exactly with the soft-bodied Actinians, such as *Actinia equina*, both in the number and arrangement of the adult mesenteries and in the order of development of the first cycle. The few exceptions will be dealt with later, but it may be stated here that even in these the first cycle of six couples of mesenteries is always formed, and in all the cases which have been examined the course of development described above is followed. There are, however, several groups of Zoantharia in which the mesenterial arrangement of the adult differs widely from that just described. But it is possible to refer all these cases with more or less certainty to the Edwardsian type.

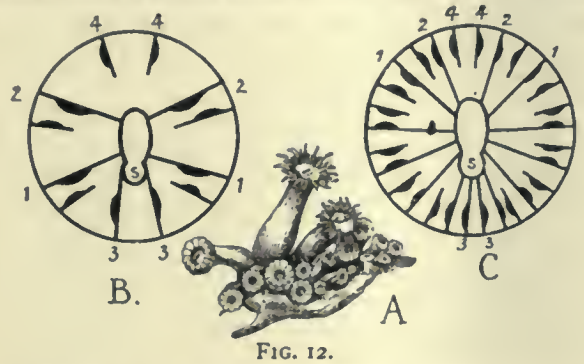


FIG. 12.

A, Zoanthid colony, showing the expanded zooids.
B, Diagram showing the arrangement of mesenteries in a young Zoanthid.
C, Diagram showing the arrangement of mesenteries in an adult Zoanthid. 1, 2, 3, 4, Edwardsian mesenteries.

The order ZOANTHIDEA comprises a number of soft-bodied Zoantharians generally encrusted with sand. Externally they resemble ordinary sea-anemones, but there is only one ciliated groove, the sulcus, in the stomodaeum, and the mesenteries are arranged on a peculiar pattern. The first twelve mesenteries are disposed in couples, and do not differ from those of Actinia except in size. The mesenterial pairs I, II and III are attached to the stomodaeum, and are called macromesenteries (fig. 12, B), but IV, V and VI are much shorter, and are called micromesenteries. The subsequent development is peculiar to the group. New mesenteries are formed only in the sulco-lateral exocoeles. They are formed in couples, each couple consisting of a macromesentery and a micromesentery, disposed so that the former is nearest to the sulcar directives. The derivation of the Zoanthidea from an Edwardsia form is sufficiently obvious.

The order CERIANTHIDEA comprises a few soft-bodied Zoantharians with rounded aboral extremities pierced by pores. They have two circlets of tentacles, a labial and a marginal, and there is only one ciliated groove in the stomodaeum, which appears to be the sulculus. The mesenteries are numerous, and the longitudinal muscles, though distinguishable, are so feebly developed that there are no muscle-banners. The larval forms of the type genus *Cerianthus* float freely in the sea, and were once considered to belong to a separate genus, *Arachnactis*. In this larva four pairs of mesenteries having the typical Edwardsian arrangement are developed, but the fifth and sixth pairs, instead of forming couples with the first and second, arise in the sulcar chamber, the fifth pair inside the fourth, and the sixth pair inside the fifth. New mesenteries are continually added in the sulcar chamber, the seventh pair within the sixth, the eighth pair within the seventh, and so on (fig. 13). In the Cerianthidea, as in the Zoanthidea, much as the adult arrangement of mesenteries differs from that of Actinia, the derivation from an Edwardsia stock is obvious.

The order ANTIPATHIDEA is a well-defined group whose affinities are more obscure. The type form, *Antipathes dichotoma* (fig. 14), forms arborescent colonies consisting of numerous zooids arranged in a single series along one surface of a branched horny axis. Each zooid has six tentacles; the stomodaeum is elongate, but the sulcus and sulculus are very feebly represented. There are ten mesenteries in which the musculature is so little developed as to be almost indistinguishable. The sulcar and sulcular pairs of mesenteries are short, the sulco-lateral and sulculo-lateral pairs are a little longer, but the two transverse are very large and are the only mesenteries which bear gonads. As the development of the Antipathidea is unknown, it is impossible to say what is the sequence of the mesenterial development, but in *Leiopathes glaberrima*, a genus with twelve mesenteries, there are distinct indications of an Edwardsia stage.

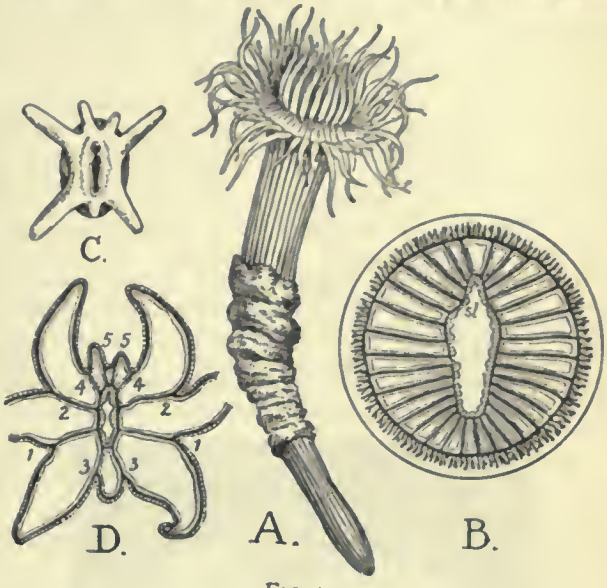


FIG. 13.

A, *Cerianthus solitarius* (after A. Andres).
B, Transverse section of the stomodaeum, showing the sulculus, *sl*, and the arrangement of the mesenteries.
C, Oral aspect of *Arachnactis brachiolata*, the larva of *Cerianthus*, with seven tentacles.
D, Transverse section of an older larva. The numerals indicate the order of development of the mesenteries.

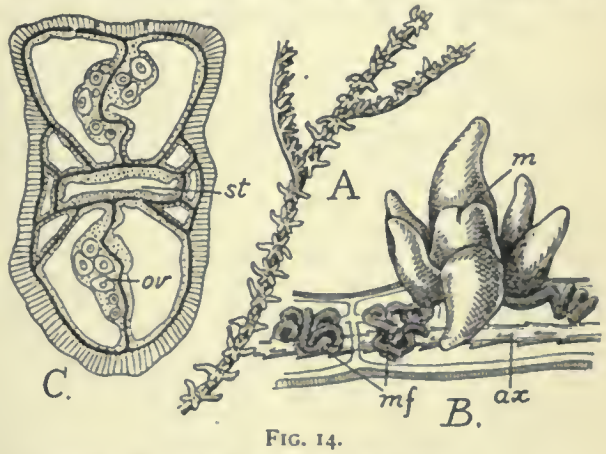


FIG. 14.

A, Portion of a colony of *Antipathes dichotoma*.
B, Single zooid and axis of the same magnified. *m*, Mouth; *mf*, mesenterial filament; *ax*, axis.
C, Transverse section through the oral cone of *Antipathella minor*. *st*, Stomodaeum; *ov*, ovary.

There are, in addition to these groups, several genera of Actinians whose mesenterial arrangement differs from the normal type. Of

these perhaps the most interesting is *Gonactinia prolifera* (fig. 11, B), with eight macromesenteries arranged on the Edwardsian plan. Two pairs of micromesenteries form couples with the first and second Edwardsian pairs, and in addition there is a couple of micromesenteries in each of the sulculo-lateral exocoeles. Only the first and second pairs of Edwardsian macromesenteries are fertile, *i.e.* bear gonads.

The remaining forms, the ACTINIIDEA, are divisible into the Malacactiniae, or soft-bodied sea-anemones, which have already been described sufficiently in the course of this article, and the Scleractiniae (=Madreporaria) or true corals.

All recent corals, as has already been said, conform so closely to the anatomy of normal Actinians that they cannot be classified apart from them, except that they are distinguished by the possession of a calcareous skeleton. This skeleton is largely composed of a number of radiating plates or *septa*, and it differs both in origin and structure from the calcareous skeleton of all Alcyonaria except Heliopora. It is formed, not from fused spicules, but as a secretion of a special layer of cells derived from the basal ectoderm, and known as *calicoblasts*. The skeleton or corallum of a typical solitary coral—the common Devonshire cup-coral *Caryophyllia smithii* (fig. 15) is a good example—exhibits the followings parts:—(1) The *basal plate*, between the zooid and the surface of attachment. (2) The *septa*, radial plates of

FIG. 15.—Corallum of *Caryophyllia*; semi-diagrammatic. *th*, Theca; *c*, costae; *sp*, septa; *p*, palus; *col*, columella.

calcite reaching from the periphery nearly or quite to the centre of the coral-cup or calicle. (3) The *theca* or wall, which in many corals is not an independent structure, but is formed by the conjoined thickened peripheral ends of the septa. (4) The *columella*, a structure which occupies the centre of the calicle, and may arise from the basal plate, when it is called essential, or may be formed by union of trabecular offsets of the septa, when it is called unessential. (5) The *costae*, longitudinal ribs or rows of spines on the outer surface of the theca. True costae always correspond to the septa, and are in fact the peripheral edges of the latter. (6) *Epitheca*, an offset of the basal plate which surrounds the base of the theca in a ring-like manner, and in some corals may take the place of a true theca. (7) *Pali*, spinous or blade-like upgrowths from the bottom of the calicle, which project between the inner edges of certain septa and the columella. In addition to these parts the following structures may exist in corals:—*Dissepiments* are oblique calcareous partitions, stretching from septum to septum, and closing the interseptal chambers below. The whole system of dissepiments in any given calicle is often called *endotheca*. *Synapticulae* are calcareous bars uniting adjacent septa. *Tabulae* are stout horizontal partitions traversing the centre of the calicle and dividing it into as many superimposed chambers. The septa in recent corals always bear a definite relation to the mesenteries, being found either in every entocoele or in every entocoele and exocoele. Hence in corals in which there is only a single cycle of mesenteries the septa are correspondingly few in number; where several cycles of mesenteries are present the septa are correspondingly numerous. In some cases—*e.g.* in some species of *Madrepora*—only two septa are fully developed, the remainder being very feebly represented.

Though the corallum appears to live within the zooid, it is morphologically external to it, as is best shown by its developmental history. The larvae of corals are free swimming ciliated forms known as planulae, and they do not acquire a corallum until they fix themselves. A ring-shaped plate of calcite, secreted by the ectoderm, is then formed, lying between the embryo and the surface of attachment. As the mesenteries are

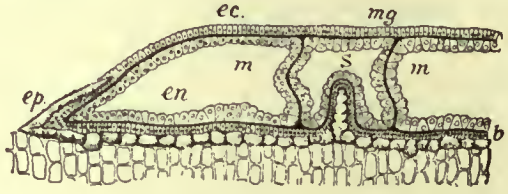


FIG. 16.—Tangential section of a larva of *Astroides calicularis* which has fixed itself on a piece of cork. *ec*, Ectoderm; *en*, endoderm; *mg*, mesogloea; *m*, *m*, mesenteries; *s*, septum; *b*, basal plate formed of ellipsoids of carbonate of lime secreted by the basal ectoderm; *ep*, epitheca. (After von Koch.)

formed, the endoderm of the basal disk lying above the basal plate is raised up in the form of radiating folds. There may be six of these folds, one in each entocoele of the primary cycle of mesenteries; or there may be twelve, one in each exocoele and entocoele. The ectoderm beneath each fold becomes detached from the surface of the basal plate, and both it and the mesogloea are folded conformably with the endoderm. The cells forming the limbs of the ectodermic folds secrete nodules of calcite, and these, fusing together, give rise to six (or twelve) vertical radial plates or septa. As growth proceeds new septa are formed simultaneously with the new couples of secondary mesenteries. In some corals, in which all the septa are entocoelic, each new system is embraced by a mesenteric couple; in others, in which the septa are both entocoelic and exocoelic, three septa are formed in

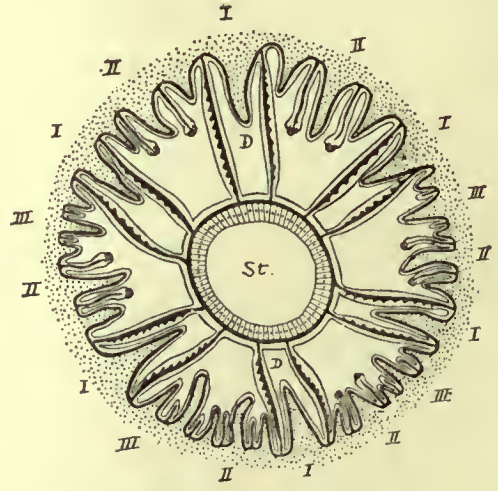


FIG. 17.—Transverse section through a zooid of *Cladocora*. The corallum shaded with dots, the mesogloea represented by a thick line. Thirty-two septa are present, six in the entocoeles of the primary cycle of mesenterics, I; six in the entocoeles of the secondary cycle of mesenteries, II; four in the entocoeles of the tertiary cycle of mesenteries, III, only four pairs of the latter being developed; and sixteen in the entocoeles between the mesenterial pairs. *D*, *D*, Directive mesenteries; *st*, stomodaeum. (After Duerden.)

every chamber between two primary mesenterial couples, one in the entocoele of the newly formed mesenterial couple of the secondary cycle, and one in each exocoele between a primary and a secondary couple. These latter are in turn embraced by the couples of the tertiary cycle of mesenteries, and new septa are formed in the exocoeles on either side of them, and so forth.

It is evident from an inspection of figs. 16 and 17 that every

septum is covered by a fold of endoderm, mesogloea, and ectoderm, and is in fact pushed into the cavity of the zooid from without. The zooid then is, as it were, moulded upon the corallum. When fully extended, the upper part of the zooid projects for some distance out of the calicle, and its wall is reflected for some distance over the lip of the latter, forming a fold of soft tissue extending to a greater or less distance over the theca, and containing in most cases a cavity continuous over the lip of the calicle with the coelenteron. This fold of tissue is known as the *edge-zone*. In some corals the septa are solid imperforate plates of calcite, and their peripheral ends are either firmly welded together, or are united by interstitial pieces so as to form imperforate theca. In others the peripheral ends of the septa are united only by bars or trabeculae, so that the theca is perforate, and in many such perforate corals the septa themselves are pierced by numerous perforations. In the former, which have been called

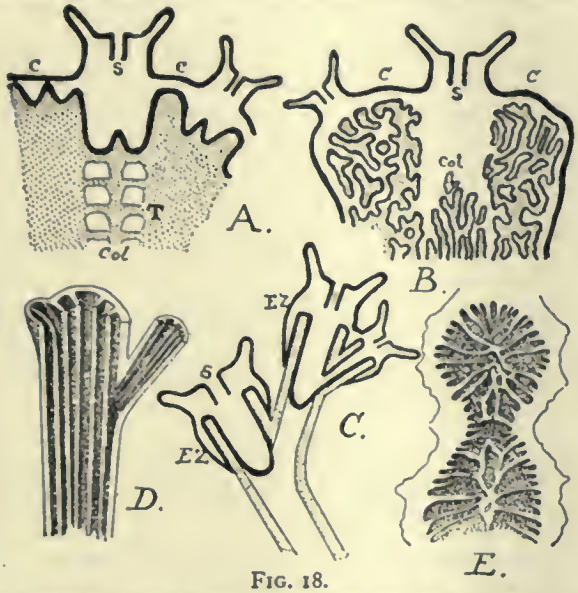


FIG. 18.

A, Schematic longitudinal section through a zooid and bud of *Stylophora digitata*. In A, B, and C the thick black lines represent the soft tissues; the corallum is dotted. *s*, Stomodaeum; *c*, *c*, coenosarc; *col*, columella; *T*, tabulae.

B, Similar section through a single zooid and bud of *Astroides calicularis*.

C, Similar section through three corallites of *Lophohelia prolifera*. *ez*, Edge-zone.

D, Diagram illustrating the process of budding by unequal division.

E, Section through a dividing calicle of *Mussa*, showing the union of two septa in the plane of division, and the origin of new septa at right angles to them.

(C original; the rest after von Koch.)

aporose corals, the only communication between the cavity of the edge-zone and the general cavity of the zooid is by way of the lip of the calicle; in the latter, or perforate corals, the theca is permeated by numerous branching and anastomosing canals lined by endoderm, which place the cavity of the edge-zone in communication with the general cavity of the zooid.

A large number of corals, both aporose and perforate, are colonial. The colonies are produced by either budding or division. In the former case the young daughter zooid, with its corallum, arises wholly outside the cavity of the parent zooid, and the component parts of the young corallum, septa, theca, columella, &c., are formed anew in every individual produced. In division a vertical constriction divides a zooid into two equal or unequal parts, and the several parts of the two corals thus produced are severally derived from the corresponding parts of the dividing corallum. In colonial corals a bud is always formed from the edge-zone, and this bud develops into a new zooid with its corallum. The cavity of the bud in an aporose coral (fig. 18, A, C) does not communicate directly with that of the parent form, but through the medium of the edge-zone. As growth proceeds, and parent and bud become separated farther from one another, the edge-zone forms a sheet of soft tissue, bridging over the space between the two, and resting upon projecting spines of the corallum. This sheet of tissue is called the *coenosarc*. Its lower surface is clothed with a layer of calicoblasts which continue to secrete carbonate of lime, giving rise to a secondary deposit which more or less fills up the spaces between the individual coralla, and is distinguished as *coenenchyme*. This coenenchyme may be scanty, or may be so abundant that the individual corallites produced by budding seem to be immersed in it. Budding takes place in an analogous manner in perforate corals (fig. 18, B), but the presence of the canal system in the perforate theca leads to a modification of the process. Buds arise from the edge-zone which already communicate with the cavity of the zooid by the canals. As the buds develop the canal system becomes much extended, and calcareous tissue is deposited between the network of canals, the confluent edge-zones of mother zooid and bud forming a coenosarc. As the process continues a number of calicles are formed, imbedded in a spongy tissue in which the canals ramify, and it is impossible to say where the theca of one corallite ends and that of another begins. In the formation of colonies by division a constriction at right angles to the long axis of the mouth involves first the mouth, then the peristome, and finally the calyx itself, so that the previously single corallite becomes divided into two (fig. 18, E). After division the corallites continue to grow upwards, and their zooids may remain united by a bridge of soft tissue or coenosarc. But in some cases, as they grow farther apart, this continuity is broken, each corallite has its own edge-zone, and internal continuity is also broken by the formation of dissepiments within each calicle, all organic connexion between the two zooids being eventually lost. Massive meandrine corals are produced by continual repetition of a process of incomplete division, involving the mouth and to some extent the peristome: the calyx, however, does not divide, but elongates to form a characteristic meandrine channel containing several zooid mouths.

Corals have been divided into *Aporosa* and *Perforata*, according as the theca and septa are compact and solid, or are perforated by pores containing canals lined by endoderm. The division is in many respects convenient for descriptive purposes, but recent researches show that it does not accurately represent the relationships of the different families. Various attempts have been made to classify corals according to the arrangement of the septa, the characters of the theca, the microscopic structure of the corallum, and the anatomy of the soft parts. The last-named method has proved little more than that there is a remarkable similarity between the zooids of all recent corals, the differences which have been brought to light being for the most part secondary and valueless for classificatory purposes. On the other hand, the study of the anatomy and development of the zooids has thrown much light upon the manner in which the corallum is formed, and it is now possible to infer the structure of the soft parts from a microscopical examination of the septa, theca, &c., with the result that unexpected relationships have been shown to exist between corals previously supposed to stand far apart. This has been particularly the case with the group of Palaeozoic corals formerly classed together as *Rugosa*. In many of these so-called rugose forms the septa have a characteristic arrangement, differing from that of recent corals chiefly in the fact that they show a tetrameral instead of a hexameral symmetry. Thus in the family *Stauridae* there are four chief septa whose inner ends unite in the middle of the calicle to form a false columella, and in the *Zaphrentidae* there are many instances of an arrangement, such as that depicted in fig. 19, which represents the septal arrangement of *Streptelasma corniculum* from the lower Silurian. In this coral the calicle is divided into quadrants by four principal septa, the *main septum*, *counter septum*, and two *alar septa*. The remaining septa are so disposed that in the quadrants abutting on the chief septum they converge towards that septum, whilst in the other quadrants they converge towards the alar septa. The secondary septa show a regular gradation in size, and, assuming that the smallest were the most recently formed, it will be noticed that in the chief quadrants the youngest septa lie nearest to the main septum;

in the other quadrants the youngest septa lie nearest to the alar septa. This arrangement, however, is by no means characteristic even of the Zaphrentidae, and in the family *Cyathophyllidae* most of the genera exhibit a radial symmetry in which no trace of the bilateral arrangement described above is recognizable, and indeed in the genus *Cyathophyllum* itself a radial arrangement is the rule. The connexion between the Cyathophyllidae and modern Astraeidae is shown by *Moseleya latistellata*, a living reef-building coral from Torres Strait. The general structure of this coral leaves no doubt that it is closely allied to the Astraeidae, but in the young calicles a tetrameral symmetry is indicated by the presence of four large septa placed at right angles to one another. Again, in the family *Amphiastraeidae* there is commonly a single septum much larger than the rest, and it has been shown that in the young calicles, *e.g.* of *Thecidiosmilia*, two septa, corresponding to the main- and counter-septa of Streptelasma, are first formed, then two alar septa, and afterwards the remaining septa, the latter taking on a generally radial arrangement, though the original bilaterality is marked by the preponderance of the main septum. As the microscopic character of the corallum of these extinct forms agrees with that of recent corals, it may be assumed that the anatomy of the soft parts also was similar, and the tetrameral arrangement, when present, may obviously be referred to a stage when only the first two pairs of Edwardsian mesenteries were present and septa were formed in the intervals between them.

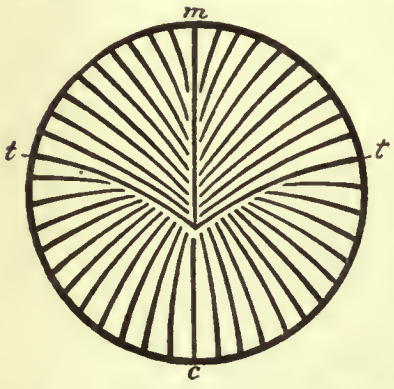


FIG. 19.—Diagram of the arrangement of the septa in a Zaphrentid coral. *m*, Main septum; *c*, counter septum; *t*, *t*, alar septa.

Space forbids a discussion of the proposals to classify corals after the minute structure of their coralla, but it will suffice to say that it has been shown that the septa of all corals are built up of a number of curved bars called trabeculae, each of which is composed of a number of nodes. In many secondary corals (*Cyclolites*, *Thamnastraea*) the trabeculae are so far separate that the individual bars are easily recognizable, and each looks something like a bamboo owing to the thickening of the two ends of each node. The trabeculae are united together by these thickened internodes, and the result is a fenestrated septum, which in older septa may become solid and aporose by continual deposit of calcite in the fenestrae. Each node of a trabecula may be simple, *i.e.* have only one centre of calcification, or may be compound. The septa of modern perforate corals are shown to have a structure nearly identical with that of the secondary forms, but the trabeculae and their nodes are only apparent on microscopical examination. The aporose corals, too, have a practically identical structure, their compactness being due to the union of the trabeculae throughout their entire lengths instead of at intervals, as in the Perforata. Further, the trabeculae may be evenly spaced throughout the septum, or may be grouped together, and this feature is probably of value in estimating the affinities of corals. (For an account of coral formations see CORAL-REEFS.)

In the present state of our knowledge the Zoantharia in which a primary cycle of six couples of mesenteries is (or may be inferred to be) completed by the addition of two pairs to the eight Edwardsian mesenteries, and succeeding cycles are formed in the exocoeles of the pre-existing mesenterial cycles, may be classed in an order ACTINIIDEA, and this may be divided into the sub-orders *Malacactiniae*, comprising the soft-bodied Actinians, such as *Actinia*, *Sagartia*, *Bunodes*, &c., and the *Scleractiniae*, comprising the corals. The Scleractiniae may best be divided into groups of families which appear to be most closely related to one another, but it should not be forgotten that there is great reason to believe that many if not most of the extinct corals must have differed from modern Actiniidea in mesenterial characters, and may have only possessed Edwardsian mesenteries, or even have possessed only four mesenteries, in this respect showing close affinities to the Stauromedusae. Moreover, there are some modern corals in which the secondary cycle of mesenteries departs from the Actinian plan. For example, J. E. Duerden has shown that in *Porites* the ordinary zooids possess only six couples of mesenteries arranged on the Actinian plan. But some zooids grow to a larger size and develop a number of additional mesenteries, which arise either in the sulcar or the sulcular entocoele, much in the same manner as in Cerianthus. Bearing this in mind, the following arrangement may be taken to represent the most recent knowledge of coral structure:—

Group A.

Family 1. ZAPHRENTIDAE.—Solitary Palaeozoic corals with an epithecal wall. Septa numerous, arranged pinnately with regard to four principal septa. Tabulae present. One or more pits or fossulae present in the calicle. Typical genera—*Zaphrentis*, Raf. *Amplexus*, M. Edw. and H. *Streptelasma*, Hall. *Omphyma*, Raf.

Family 2. TURBINOLIDAE.—Solitary, rarely colonial corals, with radially arranged septa and without tabulae. Typical genera—*Flabellum*, Lesson. *Turbinolia*, M. Edw. and H. *Caryophyllia*, Lamarck. *Sphenotrochus*, Moseley, &c.

Family 3. AMPHIASTRAEIDAE.—Mainly colonial, rarely solitary corals, with radial septa, but bilateral arrangement indicated by persistence of a main septum. Typical genera—*Amphiastraea*, Étallon. *Thecidiosmilia*.

Family 4. STYLINIDAE.—Colonial corals allied to the Amphiastraeidae, but with radially symmetrical septa arranged in cycles. Typical genera—*Stylina*, Lamarck (Jurassic). *Convexastraea*, D'Orb. (Jurassic). *Isastraea*, M. Edw. and H. (Jurassic). Ogilvie refers the modern genus *Galaxea* to this family.

Group B.

Family 5. OCULINIDAE.—Branching or massive aporose corals, the calices projecting above the level of a compact coenenchyme formed from the coenosarc which covers the exterior of the corallum. Typical genera—*Lophohelia*, M. Edw. and H. *Oculina*, M. Edw. and H.

Family 6. POCILLOPORIDAE.—Colonial branching aporose corals, with small calices sunk in the coenenchyme. Tabulae present, and two larger septa, an axial and abaxial, are always present, with traces of ten smaller septa. Typical genera—*Pocillopora*, Lamarck. *Seriatopora*, Lamarck.

Family 7. MADREPORIDAE.—Colonial branching or palmate perforate corals, with abundant trabecular coenenchyme. Theca porous; septa compact and reduced in number. Typical genera—*Madrepora*, Linn. *Turbinaria*, Oken. *Montipora*, Quoy and G.

Family 8. PORITIDAE.—Incrusting or massive colonial perforate corals; calices usually in contact by their edges, sometimes disjunct and immersed in coenenchyme. Theca and septa perforate. Typical genera—*Porites*, M. Edw. and H. *Goniopora*, Quoy and G. *Rhodaraea*, M. Edw. and H.

Group C.

Family 9. CYATHOPHYLLIDAE.—Solitary and colonial aporose corals. Tabulae and vesicular endotheca present. Septa numerous, generally radial, seldom pinnate. Typical genera—*Cyathophyllum*, Goldfuss (Devonian and Carboniferous). *Moseleya*, Quelch (recent).

Family 10. ASTRAEIDAE.—Aporose, mainly colonial corals, massive, branching, or maeandroid. Septa radial; dissepiments present; an epitheca surrounds the base of massive or maeandroid forms, but only surrounds individual corallites in simple or branching forms. Typical genera—*Goniastraea*, M. Edw. and H. *Heliastraea*, M. Edw. and H. *Maeandrina*, Lam. *Coeloria*, M. Edw. and H. *Favia*, Oken.

Family 11. FUNGIDAE.—Solitary and colonial corals, with numerous radial septa united by synapticulae. Typical genera—*Lophoseris*, M. Edw. and H. *Thamnastraea*, Le Sauvage. *Leptophyllia*, Reuss (Jurassic and Cretaceous). *Fungia*, Dana. *Siderastraea*, Blainv.

Group D.

Family 12. EUPSAMMIDAE.—Solitary or colonial perforate corals, branching, massive, or encrusting. Septa radial; the primary septa usually compact, the remainder perforate. Theca perforate. Synapticula present in some genera. Typical genera—*Stephanophyllia*, Michelin. *Eupsammia*, M. Edw. and H. *Astroides*, Blainv. *Rhodopsammia*, M. Edw. and H. *Dendrophyllia*, M. Edw. and H.

Group E.

Family 13. CYSTIPHYLLIDAE.—Solitary corals with rudimentary septa, and the calicle filled with vesicular endotheca. Genera—

Cystiphyllum, Lonsdale (Silurian and Devonian), *Goniophyllum*, M. Edw. and H. (In this Silurian genus the calyx is provided with a movable operculum, consisting of four paired triangular pieces, the bases of each being attached to the sides of the calyx, and their apices meeting in the middle when the operculum is closed). *Calceola*, Lam. (In this Devonian genus there is a single semicircular operculum furnished with a stout median septum and numerous feebly developed secondary septa. The calyx is triangular in section, pointed below, and the operculum is attached to it by hinge-like teeth.)

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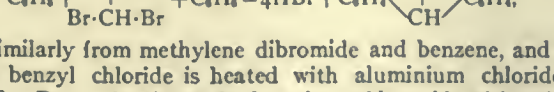
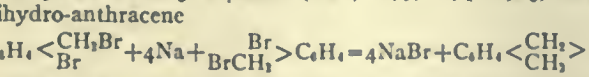
ANTHRACENE (from the Greek ἄνθραξ, coal), $C_{14}H_{10}$, a hydrocarbon obtained from the fraction of the coal-tar distillate boiling between 270° and 400° C. This high boiling fraction is allowed to stand for some days, when it partially solidifies. It is then separated in a centrifugal machine, the low melting-point impurities are removed by means of hot water, and the residue is finally hot-pressed. The crude anthracene cake is purified by treatment with the higher pyridine bases, the operation being carried out in large steam-jacketed boilers. The whole mass dissolves on heating, and the anthracene crystallizes out on cooling. The crystallized anthracene is then removed by a centrifugal separator and the process of solution in the pyridine bases is repeated. Finally the anthracene is purified by sublimation.

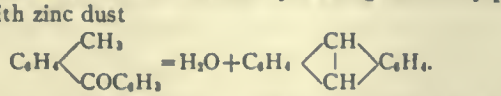
Many synthetical processes for the preparation of anthracene and its derivatives are known. It is formed by the condensation of acetylene tetrabromide with benzene in the presence of aluminium chloride:—



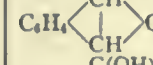
and similarly from methylene dibromide and benzene, and also when benzyl chloride is heated with aluminium chloride to 200° C. By condensing ortho-brombenzyl bromide with sodium, C. L. Jackson and J. F. White (*Ber.*, 1879, 12, p. 1965) obtained dihydro-anthracene



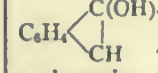
Anthracene has also been obtained by heating ortho-tolylphenyl ketone with zinc dust



Anthracene crystallizes in colourless monoclinic tables which show a fine blue fluorescence. It melts at 213° C. and boils at 351° C. It is insoluble in water, sparingly soluble in alcohol and ether, but readily soluble in hot benzene. It unites with picric acid to form a picrate, $C_{14}H_{10}\cdot C_6H_2(NO_2)_3\cdot OH$, which crystallizes in needles, melting at 138° C. On exposure to sunlight a solution of anthracene in benzene or xylene deposits para-anthracene $(C_{14}H_{10})_2$, which melts at 244° C. and passes back into the ordinary form. Chlorine and bromine form both addition and substitution products with anthracene; the addition product, anthracene dichloride, $C_{14}H_{10}Cl_2$, being formed when chlorine is passed into a cold solution of anthracene in carbon bisulphide. On treatment with potash, it forms the substitution product, monochloranthracene, $C_{14}H_9Cl$. Nitro-anthracenes are not as yet known. The mono-oxyanthracenes (anthrols), $C_{14}H_9OH$ or



(α) and (β), resemble the phenols, whilst



(γ) (anthranol) is a reduction product of anthraquinone. β-anthrol and anthranol give the corresponding amino compounds (anthramines) when heated with ammonia.

Numerous sulphonic acids of anthracene are known, a monosulphonic acid being obtained with dilute sulphuric acid, whilst concentrated sulphuric acid produces mixtures of the anthracene disulphonic acids. By the action of sodium amalgam on an alcoholic solution of anthracene, an anthracene dihydride, $C_{14}H_{12}$, is obtained, whilst by the use of stronger reducing agents, such as hydriodic acid and amorphous phosphorus, hydrides of composition $C_{14}H_{16}$ and $C_{14}H_{24}$ are produced.

Methyl and phenyl anthracenes are known; phenyl anthranol (phthalidin) being somewhat closely related to the phenolphthaleins (*q.v.*). Oxidizing agents convert anthracene into anthraquinone (*q.v.*); the production of this substance by oxidizing anthracene in glacial acetic acid solution, with chromic acid, is the usual method employed for the estimation of anthracene.

ANTHRACITE (Gr. ἄνθραξ, coal), a term applied to those varieties of coal which do not give off tarry or other hydrocarbon vapours when heated below their point of ignition; or, in other words, which burn with a smokeless and nearly non-luminous flame. Other terms having the same meaning are, "stone coal" (not to be confounded with the German *Steinkohle*) or "blind coal" in Scotland, and "Kilkenny coal" in Ireland. The imperfect anthracite of north Devon, which however is only used as a pigment, is known as *culm*, the same term being used in geological classification to distinguish the strata in which it is found, and similar strata in the Rhenish hill countries which are known as the Culm Measures. In America, culm is used as an equivalent for waste or slack in anthracite mining.

Physically, anthracite differs from ordinary bituminous coal by its greater hardness, higher density, 1·3–1·4, and lustre, the latter being often semi-metallic with a somewhat brownish reflection. It is also free from included soft or fibrous notches and does not soil the fingers when rubbed. Structurally it shows some alteration by the development of secondary divisional planes and fissures so that the original stratification lines are not always easily seen. The thermal conductivity is also higher, a lump of anthracite feeling perceptibly colder when held in the warm hand than a similar lump of bituminous coal at the same temperature. The chemical composition of some typical anthracites is given in the article COAL.

Anthracite may be considered to be a transition stage between ordinary bituminous coal and graphite, produced by the more or less complete elimination of the volatile constituents of the former; and it is found most abundantly in areas that have been subjected to considerable earth-movements, such as the flanks of great mountain ranges. The largest and most important anthracite region, that of the north-eastern portion of the Pennsylvania coal-field, is a good example of this; the highly contorted strata of the Appalachian region produce anthracite exclusively, while in the western portion of the same basin on the Ohio and its tributaries, where the strata are undisturbed, free-burning and coking coals, rich in volatile matter, prevail. In the same way the anthracite region of South Wales is confined to the contorted portion west of Swansea and Llanelly, the

central and eastern portions producing steam, coking and house coals.

Anthracites of newer, tertiary or cretaceous age, are found in the Crow's Nest part of the Rocky Mountains in Canada, and at various points in the Andes in Peru.

The principal use of anthracite is as a smokeless fuel. In the eastern United States, it is largely employed as domestic fuel, usually in close stoves or furnaces, as well as for steam purposes, since, unlike that from South Wales, it does not decrepitate when heated, or at least not to the same extent. For proper use, however, it is necessary that the fuel should be supplied in pieces as nearly uniform in size as possible, a condition that has led to the development of the *breaker* which is so characteristic a feature in American anthracite mining (see COAL). The large coal as raised from the mine is passed through breakers with toothed rolls to reduce the lumps to smaller pieces, which are separated into different sizes by a system of graduated sieves, placed in descending order. Each size can be perfectly well burnt alone on an appropriate grate, if kept free from larger or smaller admixtures. The common American classification is as follows:—

Lump, steamboat, egg and stove coals, the latter in two or three sizes, all three being above 1½ in. size on round-hole screens.

Chestnut	below 1½ inch	above ⅞ inch.
Pea	" ⅞ "	" 9/16 "
Buckwheat	" 9/16 "	" ⅜ "
Rice	" ⅜ "	" 5/16 "
Barley	" 5/16 "	" 5/32 "

From the pea size downwards the principal use is for steam purposes. In South Wales a less elaborate classification is adopted; but great care is exercised in hand-picking and cleaning the coal from included particles of pyrites in the higher qualities known as best malting coals, which are used for kiln-drying malt and hops.

Formerly, anthracite was largely used, both in America and South Wales, as blast-furnace fuel for iron smelting, but for this purpose it has been largely superseded by coke in the former country and entirely in the latter. An important application has, however, been developed in the extended use of internal combustion motors driven by the so-called "mixed," "poor," "semi-water" or "Dowson gas" produced by the gasification of anthracite with air and a small proportion of steam. This is probably the most economical method of obtaining power known; with an engine as small as 15 horse-power the expenditure of fuel is at the rate of only 1 lb per horse-power hour, and with larger engines it is proportionately less. Large quantities of anthracite for power purposes are now exported from South Wales to France, Switzerland and parts of Germany. (H. B.)

ANTHRACOTHERIUM ("coal-animal," so called from the fact of the remains first described having been obtained from the Tertiary lignite-beds of Europe), a genus of extinct artiodactyle ungulate mammals, characterized by having 44 teeth, with five semi-crescentic cusps on the crowns of the upper molars. In many respects, especially the form of the lower jaw, *Anthracotherium*, which is of Oligocene and Miocene age in Europe, and typifies the family *Anthracotheriidae*, is allied to the hippopotamus, of which it is probably an ancestral form. The European *A. magnum* was as large as the last-mentioned animal, but there were several smaller species and the genus also occurs in Egypt, India and North America. (See ARTIODACTYLA.)

ANTHRAQUINONE, $C_{14}H_8O_2$, an important derivative of anthracene, first prepared in 1834 by A. Laurent. It is prepared commercially from anthracene by stirring a sludge of anthracene and water in horizontal cylinders with a mixture of sodium bichromate and caustic soda. This suspension is then run through a conical mill in order to remove all grit, the cones of the mill fitting so tightly that water cannot pass through unless the mill is running; the speed of the mill when working is about 3000 revolutions per minute. After this treatment, the mixture is run into lead-lined vats and treated with sulphuric acid, steam is blown through the mixture in order to bring it to the boil, and the anthracene is rapidly oxidized to anthraquinone. When the oxidation is complete, the anthraquinone is separated in a filter press, washed and heated to 120° C. with commercial oil of vitriol, using about 2½ parts of vitriol to 1 of anthraquinone. It is then removed to lead-lined tanks and again washed with water and dried; the product obtained contains about 95 % of anthraquinone. It may be purified by sublimation. Various synthetic processes have been used for the preparation of anthraquinone. A. Behr and W. A. v. Dorp (*Ber.*, 1874, 7, p. 578) obtained orthobenzoyl benzoic acid by heating phthalic anhydride with benzene in the presence of aluminium chloride. This compound on heating with phosphoric anhydride loses water and yields anthraquinone,

$$C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle O \xrightarrow{C_6H_6} C_6H_4\langle\begin{matrix}CO\cdot C_6H_5\\COOH\end{matrix} \rightarrow C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle C_6H_4.$$

It may be prepared in a similar manner by heating phthalyl chloride with benzene in the presence of aluminium chloride. Dioxy- and tetraoxy-anthraquinones are obtained when meta-oxy- and dimeta-dioxy-benzoic acids are heated with concentrated sulphuric acid.

Anthraquinone crystallizes in yellow needles or prisms, which melt at 277° C. It is soluble in hot benzene, sublimes easily, and is very stable towards oxidizing agents. On the other hand, it is readily attacked by reducing agents. With zinc dust in presence of caustic soda it yields the secondary alcohol oxanthranol, C_6H_4: CO·CHOH : C_6H_4, with tin and hydrochloric acid, the phenolic compound anthranol, C_6H_4: CO·C(OH): C_6H_4; and with hydriodic acid at 150° C. or on distillation with zinc dust, the hydrocarbon anthracene, $C_{14}H_{10}$. When fused with caustic potash, it gives benzoic acid. It behaves more as a ketone than as a quinone, since with hydroxylamine it yields an oxime, and on reduction with zinc dust and caustic soda it yields a secondary alcohol, whilst it cannot be reduced by means of sulphurous acid. Various sulphonic acids of anthraquinone are known, as well as oxy-derivatives, for the preparation and properties of which see ALIZARIN.

ANTHRAX (the Greek for "coal," or "carbuncle," so called by the ancients because they regarded it as burning like coal; cf. the French equivalent *charbon*; also known as *fièvre charbonneuse*, *Milzbrand*, splenic fever, and malignant pustule), an acute, specific, infectious, virulent disease, caused by the *Bacillus anthracis*, in animals, chiefly cattle, sheep and horses, and frequently occurring in workers in the wool or hair, as well as in those handling the hides or carcases, of beasts which have been affected.

Animals.—As affecting wild as well as domesticated animals and man, anthrax has been widely diffused in one or more of its forms, over the surface of the globe. It at times decimates the reindeer herds in Lapland and the Polar regions, and is only too well known in the tropics and in temperate latitudes. It has been observed and described in Russia, Siberia, Central Asia, China, Cochin-China, Egypt, West Indies, Peru, Paraguay, Brazil, Mexico, and other parts of North and South America, in Australia, and on different parts of the African continent, while for other European countries the writings which have been published with regard to its nature, its peculiar characteristics, and the injury it inflicts are innumerable. Countries in which are extensive marshes, or the subsoil of which is tenacious or impermeable, are usually those most frequently and seriously visited. Thus there have been regions notorious for its prevalence, such as the marshes of Sologne, Dombes and Bresse in France; certain parts of Germany, Hungary and Poland; in Spain the half-submerged valleys and the maritime coasts of Catalonia, as well as the Romagna and other marshy districts of Italy; while it is epizootic, and even panzootic, in the swampy regions of Esthonia, Livonia, Courland, and especially of Siberia, where it is known as the *Sibirskaja jaswa* (Siberian boil-plague). The records of anthrax go back to a very ancient date. It is supposed to be the murrain of Exodus. Classical writers allude to anthrax as if it were the only cattle disease worthy of mention (see Virgil, *Georg.* iii.). It figures largely in the history of the early and middle ages as a devastating pestilence attacking animals, and through them mankind; the oldest Anglo-Saxon manuscripts contain many fantastic recipes, leechdoms,

charms and incantations for the prevention or cure of the "blacan blezene" (black blain) and the relief of the "elfshot" creatures. In the 18th and 19th centuries it sometimes spread like an epizootic over the whole of Europe, from Siberia to France. It was in this malady that disease-producing germs (*bacteria*) were first discovered, in 1849, by Pollender of Wipperfürth, and, independently, by veterinary surgeon Brauell of Dorpat, and their real character afterwards verified by C. J. Davaine (1812–1882) of Alfort in 1863; and it was in their experiments with this disease that Toussaint, Pasteur and J. B. Chauveau first showed how to make the morbific poison its own antidote. (See VIVISECTION.)

The symptoms vary with the species of animal, the mode of infection, and the seat of the primary lesion, internal or external. In all its forms anthrax is an inoculable disease, transmission being surely and promptly effected by this means, and it may be conveyed to nearly all animals by inoculation of a wound of the skin or through the digestive organs. Cattle, sheep and horses nearly always owe their infection to spores or bacilli ingested with their food or water, and pigs usually contract the disease by eating the flesh of animals dead of anthrax.

Internal anthrax, of cattle and sheep, exhibits no premonitory symptoms that can be relied on. Generally the first indication of an outbreak is the sudden death of one or more of the herd or flock. Animals which do not die at once may be noticed to stagger and tremble; the breathing becomes hurried and the pulse very rapid, while the heart beats violently; the internal temperature of the body is high, 104° to 106° F.; blood oozes from the nose, mouth and anus, the visible mucous membranes are dusky or almost black. The animal becomes weak and listless, the temperature falls and death supervenes in a few hours, being immediately preceded by delirium, convulsions or coma. While death is usually rapid or sudden when the malady is general, constituting what is designated splenic apoplexy, internal anthrax in cattle is not invariably fatal. In some cases the animal rallies from a first attack and gradually recovers.

In the external or localized form, marked by the formation of carbuncles before general infection takes place, death may not occur for several days. The carbuncles may appear in any part of the body, being preceded or accompanied by fever. They are developed in the subcutaneous connective tissue where this is loose and plentiful, in the interstices of the muscles, lymphatic glands, in the mucous membranes of the mouth and tongue (glossanthrax of cattle), pharynx and larynx (*anthrax angina* of horses and pigs), and the rectum. They begin as small circumscribed swellings which are warm, slightly painful and oedematous. In from two to eight hours they attain a considerable size, are cold, painless and gangrenous, and when they are incised a quantity of a blood-stained gelatinous exudate escapes. When the swellings have attained certain proportions symptoms of general infection appear, and, running their course with great rapidity, cause death in a few hours. Anthrax of the horse usually begins as an affection of the throat or bowel. In the former there is rapid obstructive oedema of the mucous membrane of the pharynx and larynx with swelling of the throat and neck, fever, salivation, difficulty in swallowing, noisy breathing, frothy discharge from the nose and threatening suffocation. General invasion soon ensues, and the horse may die in from four to sixteen hours. The intestinal form is marked by high temperature, great prostration, small thready pulse, tumultuous action of the heart, laboured breathing and symptoms of abdominal pain with straining and diarrhoea. When moved the horse staggers and trembles. Profuse sweating, a falling temperature and cyanotic mucous membranes indicate the approach of a fatal termination.

In splenic fever or splenic apoplexy, the most marked alterations observed after death are—the effects of rapid decomposition, evidenced by the foul odour, disengagement of gas beneath the skin and in the tissues and cavities of the body, yellow or yellowish-red gelatinous exudation into and between the muscles, effusion of citron or rust-coloured fluid in various cavities, extravasations of blood and local congestions throughout the body, the blood in the vessels generally being very dark and tar-like. The most notable feature, however, in the majority of cases is the enormous enlargement of the spleen, which is engorged with blood to such an extent that it often ruptures, while its tissue is changed into a violet or black fluid mass.

The bacillus of anthrax, under certain conditions, retains its vitality for a long time, and rapidly grows when it finds a suitable field in which to develop, its mode of multiplication being by scission and the formation of spores, and depending, to a great extent at least, on the presence of oxygen. The morbid action of the bacillus is indeed said to be due to its affinity for oxygen; by depriving the red corpuscles of the blood of that most essential gas, it renders the vital fluid unfit to sustain life. Albert Hoffa and others assert that the fatal lesions are produced by the poisonous action of the toxins formed by the bacilli and not by the blocking up of the minute blood-vessels, or the abstraction of oxygen from the blood by the bacilli.

It was by the cultivation of this micro-organism, or attenuation of the virus, that Pasteur was enabled to produce a prophylactic remedy for anthrax. His discovery was first made with regard to the cholera of fowls, a most destructive disorder which annually carries off great numbers of poultry. Pasteur produced his inoculation material by the cultivation of the bacilli at a temperature of 42° C. in oxygen. Two vaccines are required. The first or weak vaccine is obtained by incubating a bouillon culture for twenty-four days at 42° C., and the second or less attenuated vaccine by incubating a bouillon culture, at the same temperature, for twelve days. Pasteur's method of protective inoculation comprises two inoculations with an interval of twelve days between them. Immunity, established in about fifteen days after the injection of the second vaccine, lasts from nine months to a year.

Toussaint had, previous to Pasteur, attenuated the virus of anthrax by the action of heat; and Chauveau subsequently corroborated by numerous experiments the value of Toussaint's method, demonstrating that, according to the degree of heat to which the virus is subjected, so is its inocuousness when transferred to a healthy creature. In outbreaks of anthrax on farms where many animals are exposed to infection immediate temporary protection can be conferred by the injection of anthrax serum.

Human Beings.—For many years cases of sudden death had been observed to occur from time to time among healthy men engaged in woollen manufactories, particularly in the work of sorting or combing wool. In some instances death appeared to be due to the direct inoculation of some poisonous material into the body, for a form of malignant pustule was observed upon the skin; but, on the other hand, in not a few cases without any external manifestation, symptoms of blood-poisoning, often proving rapidly fatal, suggested the probability of other channels for the introduction of the disease. In 1880 the occurrence of several such cases among woolsorters at Bradford, reported by Dr J. H. Bell of that town, led to an official inquiry in England by the Local Government Board, and an elaborate investigation into the pathology of what was then called "woolsorters' disease" was at the same time conducted at the Brown Institution, London, by Professor W. S. Greenfield. Among the results of this inquiry it was ascertained: (1) that the disease appeared to be identical with that occurring among sheep and cattle; (2) that in the blood and tissues of the body was found in abundance, as in the disease in animals, the *Bacillus anthracis*, and (3) that the skins, hair, wool, &c., of animals dying of anthrax retain this infecting organism, which, under certain conditions, finds ready access to the bodies of the workers.

Two well-marked forms of this disease in man are recognized, "external anthrax" and "internal anthrax." In external anthrax the infecting agent is accidentally inoculated into some portion of skin, the seat of a slight abrasion, often the hand, arm or face. A minute swelling soon appears at the part, and develops into a vesicle containing serum or bloody matter, and varying in size, but seldom larger than a shilling. This vesicle speedily bursts and leaves an ulcerated or sloughing

surface, round about which are numerous smaller vesicles which undergo similar changes, and the whole affected part becomes hard and tender, while the surrounding surface participates in the inflammatory action, and the neighbouring lymphatic glands are also inflamed. This condition, termed "malignant pustule," is frequently accompanied with severe constitutional disturbance, in the form of fever, delirium, perspirations, together with great prostration and a tendency to death from septicaemia, although on the other hand recovery is not uncommon. It was repeatedly found that the matter taken from the vesicle during the progress of the disease, as well as the blood in the body after death, contained the *Bacillus anthracis*, and when inoculated into small animals produced rapid death, with all the symptoms and post-mortem appearances characteristic of the disease as known to affect them.

In internal anthrax there is no visible local manifestation of the disease, and the spores or bacilli appear to gain access to the system from the air charged with them, as in rooms where the contaminated wool or hair is unpacked, or again during the process of sorting. The symptoms usually observed are those of rapid physical prostration, with a small pulse, somewhat lowered temperature (rarely fever), and quickened breathing. Examination of the chest reveals inflammation of the lungs and pleura. In some cases death takes place by collapse in less than one day, while in others the fatal issue is postponed for three or four days, and is preceded by symptoms of blood-poisoning, including rigors, perspirations, extreme exhaustion, &c. In some cases of internal anthrax the symptoms are more intestinal than pulmonary, and consist in severe exhausting diarrhoea, with vomiting and rapid sinking. Recovery from the internal variety, although not unknown, is more rare than from the external, and its most striking phenomena are its sudden onset in the midst of apparent health, the rapid development of physical prostration, and its tendency to a fatal termination despite treatment. The post-mortem appearances in internal anthrax are such as are usually observed in septicaemia, but in addition evidence of extensive inflammation of the lungs, pleura and bronchial glands has in most cases been met with. The blood and other fluids and the diseased tissues are found loaded with the *Bacillus anthracis*.

Treatment in this disease appears to be of but little avail, except as regards the external form, where the malignant pustule may be excised or dealt with early by strong caustics to destroy the affected textures. For the relief of the general constitutional symptoms, quinine, stimulants and strong nourishment appear to be the only available means. An anti-anthrax serum has also been tried. As preventive measures in woollen manufactories, the disinfection of suspicious material, or the wetting of it before handling, is recommended as lessening the risk to the workers. (J. Mac.)

ANTHROPOID APES, or Manlike Apes, the name given to the family of the Simiidae, because, of all the ape-world, they most closely resemble man. This family includes four kinds, the gibbons of S. E. Asia, the orangs of Borneo and Sumatra, the gorillas of W. Equatorial Africa, and the chimpanzees of W. and Central Equatorial Africa. Each of these apes resembles man most in some one physical characteristic: the gibbons in the formation of the teeth, the orangs in the brain-structure, the gorillas in size, and the chimpanzees in the sigmoid flexure of the spine. In general structure they all closely resemble human beings, as in the absence of tails; in their semi-erect position (resting on finger-tips or knuckles); in the shape of vertebral column, sternum and pelvis; in the adaptation of the arms for turning the palm uppermost at will; in the possession of a long vermiform appendix to the short caecum of the intestine; in the size of the cerebral hemispheres and the complexity of their convolutions. They differ in certain respects, as in the proportion of the limbs, in the bony development of the eyebrow ridges, and in the opposable great toe, which fits the foot to be a climbing and grasping organ.

Man differs from them in the absence of a hairy coat; in the development of a large lobule to the external ear; in his fully erect attitude; in his flattened foot with the non-opposable great toe; in the straight limb-bones; in the wider pelvis; in the marked sigmoid flexure of his spine; in the perfection of the muscular movements of the arm; in the delicacy of hand; in the smallness of the canine teeth and other dental peculiarities; in the development of a chin; and in the small size of his jaws compared to the relatively great size of the cranium. Together with man and the baboons, the anthropoid apes form the group known to science as Catarhini, those, that is, possessing a narrow nasal septum, and are thus easily distinguishable from the flat-nosed monkeys or Platyrhini. The anthropoid apes are arboreal and confined to the Old World. They are of special interest from the important place assigned to them in the arguments of Darwin and the Evolutionists. It is generally admitted now that no fundamental anatomical difference can be proved to exist between these higher apes and man, but it is equally agreed that none probably of the Simiidae is in the direct line of human ancestry. There is a great gap to be bridged between the highest anthropoid and the lowest man, and much importance has been attached to the discovery of an extinct primate, Pithecanthropus (*q.v.*), which has been regarded as the "missing link."

See Huxley's *Man's Place in Nature* (1863); Robt. Hartmann's *Anthropoid Apes* (1883; London, 1885); A. H. Keane's *Ethnology* (1896); Darwin's *Descent of Man* (1871; pop. ed., 1901); Haeckel's *Anthropogeny* (Leipzig, 1874, 1903; Paris, 1877; Eng. ed., 1883); W. H. Flower and Rich. Lydekker, *Mammals Living and Extinct* (London, 1891).

ANTHROPOLOGY (Gr. ἄνθρωπος man, and λόγος, theory or science), the science which, in its strictest sense, has as its object the study of man as a unit in the animal kingdom. It is distinguished from ethnology, which is devoted to the study of man as a *racial* unit, and from ethnography, which deals with the *distribution* of the races formed by the aggregation of such units. To anthropology, however, in its more general sense as the natural history of man, ethnology and ethnography may both be considered to belong, being related as parts to a whole.

Various other sciences, in conformity with the above definition, must be regarded as subsidiary to anthropology, which yet hold their own independent places in the field of knowledge. Thus anatomy and physiology display the structure and functions of the human body, while psychology investigates the operations of the human mind. Philology deals with the general principles of language, as well as with the relations between the languages of particular races and nations. Ethics or moral science treats of man's duty or rules of conduct toward his fellow-men. Sociology and the science of culture are concerned with the origin and development of arts and sciences, opinions, beliefs, customs, laws and institutions generally among mankind within historic time; while beyond the historical limit the study is continued by inferences from relics of early ages and remote districts, to interpret which is the task of pre-historic archaeology and geology.

I. *Man's Place in Nature.*—In 1843 Dr J. C. Prichard, who perhaps of all others merits the title of founder of modern anthropology, wrote in his *Natural History of Man*:—

"The organized world presents no contrasts and resemblances more remarkable than those which we discover on comparing mankind with the inferior tribes. That creatures should exist so nearly approaching to each other in all the particulars of their physical structure, and yet differing so immeasurably in their endowments and capabilities, would be a fact hard to believe, if it were not manifest to our observation. The differences are everywhere striking: the resemblances are less obvious in the fulness of their extent, and they are never contemplated without wonder by those who, in the study of anatomy and physiology, are first made aware how near is man in his physical constitution to the brutes. In all the principles of his internal structure, in the composition and functions of his parts, man is but an animal. The lord of the earth, who contemplates the eternal order of the universe, and aspires to communion with its invisible Maker, is a being composed of the same materials, and framed on the same principles, as the creatures which he has tamed to be the servile instruments of his will, or slays for his daily food. The points of resemblance are innumerable; they extend to the most recondite arrangements of that mechanism which maintains instrumentally the physical life of the body, which

brings forward its early development and admits, after a given period, its decay, and by means of which is prepared a succession of similar beings destined to perpetuate the race."

The acknowledgment of man's structural similarity with the anthropomorphous species nearest approaching him, viz.: the higher or anthropoid apes, had long before Prichard's day been made by Linnaeus, who in his *Systema Naturae* (1735) grouped them together as the highest order of Mammalia, to which he gave the name of Primates. The *Amoenitates Academicae* (vol. vi., Leiden, 1764), published under the auspices of Linnaeus, contains a remarkable picture which illustrates a discourse by his disciple Hoppius, and is here reproduced (see Plate, fig. 1). In this picture, which shows the crudeness of the zoological notions current in the 18th century as to both men and apes, there are set in a row four figures: (*a*) a recognizable orang-utan, sitting and holding a staff; (*b*) a chimpanzee, absurdly humanized as to head, hands, and feet; (*c*) a hairy woman, with a tail a foot long; (*d*) another woman, more completely coated with hair. The great Swedish naturalist was possibly justified in treating the two latter creatures as quasi-human, for they seem to be grotesque exaggerations of such tailed and hairy human beings as really, though rarely, occur, and are apt to be exhibited as monstrosities (see Bastian and Hartmann, *Zeitschrift für Ethnologie*, Index, "Geschwänzte Menschen"; Gould and Pile, *Anomalies and Curiosities of Medicine*, 1897). To Linnaeus, however, they represented normal anthropomorpha or man-like creatures, vouched for by visitors to remote parts of the world. This opinion of the Swedish naturalist seems to have been little noticed in Great Britain till it was taken up by the learned but credulous Scottish judge, Lord Monboddo (see his *Origin and Progress of Language*, 1774, &c.; *Antient Metaphysics*, 1778). He had not heard of the tailed men till he met with them in the work of Linnaeus, with whom he entered into correspondence, with the result that he enlarged his range of mankind with races of sub-human type. One was founded on the description by the Swedish sailor Niklas Köping of the ferocious men with long tails inhabiting the Nicobar Islands. Another comprised the orang-utans of Sumatra, who were said to take men captive and set them to work as slaves. One of these apes, it was related, served as a sailor on board a Jamaica ship, and used to wait on the captain. These are stories which seem to carry their own explanation. When the Nicobar Islands were taken over by the British government two centuries later, the native warriors were still wearing their peculiar loin-cloth hanging behind in a most tail-like manner (E. H. Man, *Journal Anthropological Institute*, vol. xv. p. 442). As for the story of the orang-utan cabin boy, this may even be verbally true, it being borne in mind that in the Malay languages the term *orang-utan*, "man of the forest," was originally used for inland forest natives and other rude men, rather than for the *miyas* apes to which it has come to be generally applied by Europeans. The speculations as to primitive man connected with these stories diverted the British public, headed by Dr Johnson, who said that Monboddo was "as jealous of his tail as a squirrel." Linnaeus's primarily zoological classification of man did not, however, suit the philosophical opinion of the time, which responded more readily to the systems represented by Buffon, and later by Cuvier, in which the human mind and soul formed an impassable wall of partition between him and other mammalia, so that the definition of man's position in the animal world was treated as not belonging to zoology, but to metaphysics and theology. It has to be borne in mind that Linnaeus, plainly as he recognized the likeness of the higher simian and the human types, does not seem to have entertained the thought of accounting for this similarity by common descent. It satisfied his mind to consider it as belonging to the system of nature, as indeed remained the case with a greater anatomist of the following century, Richard Owen. The present drawing, which under the authority of Linnaeus shows an anthropomorphic series from which the normal type of man, the *Homo sapiens*, is conspicuously absent, brings zoological similarity into view without suggesting kinship to account for it. There are few ideas more ingrained in ancient and low civilization than that of relationship by descent between the lower animals and man. Savage and barbaric religions recognize it, and the mythology of the world has hardly a more universal theme. But in educated Europe such ideas had long been superseded by the influence of theology and philosophy, with which they seemed too incompatible. In the 19th century, however, Lamarck's theory of the development of new species by habit and circumstance led through Wallace and Darwin to the doctrines of the hereditary transmission of acquired characters, the survival of the fittest, and natural selection. Thenceforward it was impossible to exclude a theory of descent of man from ancestral beings whom zoological similarity connects also, though by lines of descent not at all clearly defined, with ancestors of the anthropomorphic apes. In one form or another such a theory of human descent has in our time become part of an accepted framework of zoology, if not as a demonstrable truth, at any rate as a working hypothesis which has no effective rival.

The new development from Linnaeus's zoological scheme which has thus ensued appears in Huxley's diagram of simian and human skeletons (fig. 2, (*a*) gibbon; (*b*) orang; (*c*) chimpanzee; (*d*) gorilla; (*e*) man). Evidently suggested by the Linnean picture, this is brought up to the modern level of zoology, and continued on to man, forming an introduction to his zoological history hardly to be surpassed. Some of the main points it illustrates may be briefly stated here, the reader being referred for further information to Huxley's *Essays*. In tracing the osteological characters of apes and man through this series, the general system of the skeletons, and the close correspondence in number and arrangement of vertebrae and ribs, as well as in the teeth, go far towards justifying the opinion of hereditary connexion. At the same time, the comparison brings into view differences in human structure adapted to man's pre-eminent mode of life, though hardly to be accounted its chief causes. It may be seen how the arrangement of limbs suited for going on all-fours belongs rather to the apes than to man, and walking on the soles of the feet rather to man than the apes. The two modes of progression overlap in human life, but the child's tendency when learning is to rest on the soles of the feet and the palms of the hands, unlike the apes, which support themselves on the sides of the feet and the bent knuckles of the hands. With regard to climbing, the long stretch of arm and the grasp with both hands and feet contribute to the arboreal life of the apes, contrasting with what seem the mere remains of the climbing habit to be found even among forest savages. On the whole, man's locomotive limbs are not so much specialized to particular purposes, as generalized into adaptation to many ends. As to the mechanical conditions of the human body, the upright posture has always been recognized as the chief. To it contributes the balance of the skull on the cervical vertebrae, while the human form of the pelvis provides the necessary support to the intestines in the standing attitude. The marked curvature of the vertebral column, by breaking the shock to the neck and head in running and leaping, likewise favours the erect position. The lowest coccygeal vertebrae of man remain as a rudimentary tail. While it is evident that high importance must be attached to the adaptation of the human body to the life of diversified intelligence and occupation he has to lead, this must not be treated as though it were the principal element of the superiority of man, whose comparison with all lower genera of mammals must be mainly directed to the intellectual organ, the brain. Comparison of the brains of vertebrate animals (see BRAIN) brings into view the immense difference between the small, smooth brain of a fish or bird and the large and convoluted organ in man. In man, both size and complexity contribute to the increased area of the cortex or outer layer of the brain, which has been fully ascertained to be the seat of the mysterious processes by which sensation furnishes the groundwork of thought. Schäfer (*Textbook of Physiology*, vol. ii. p. 697) thus defines it: "The cerebral cortex is the seat of the intellectual functions, of intelligent sensation or consciousness, of ideation, of volition, and of memory."

The relations between man and ape are most readily stated in

comparison with the gorilla, as on the whole the most anthropomorphous ape. In the general proportions of the body and limbs there is a marked difference between the gorilla and man. The gorilla's brain-case is smaller, its trunk larger, its lower limbs shorter, its upper limbs longer in proportion than those of man. The differences between a gorilla's skull and a man's are truly immense. In the gorilla, the face, formed largely by the massive jaw-bones, predominates over the brain-case or cranium; in the man these proportions are reversed. In man the occipital foramen, through which passes the spinal cord, is placed just behind the centre of the base of the skull, which is thus evenly balanced in the erect posture, whereas the gorilla, which goes habitually on all fours, and whose skull is inclined forward, in accordance with this posture has the foramen farther back. In man the surface of the skull is comparatively smooth, and the brow-ridges project but little, while in the gorilla these ridges overhang the cavernous orbits like penthouse roofs. The absolute capacity of the cranium of the gorilla is far less than that of man; the smallest adult human cranium hardly measuring less than 63 cub. in., while the largest gorilla cranium measured had a content of only 34½ cub. in. The largest proportional size of the facial bones, and the great projection of the jaws, confer on the gorilla's skull its small facial angle and brutal character, while its teeth differ from man's in relative size and number of fangs. Comparing the lengths of the extremities, it is seen that the gorilla's arm is of enormous length, in fact about one-sixth longer than the spine, whereas a man's arm is one-fifth shorter than the spine; both hand and foot are proportionally much longer in the gorilla than in man; the leg does not so much differ. The vertebral column of the gorilla differs from that of man in its curvature and other characters, as also does the conformation of its narrow pelvis. The hand of the gorilla corresponds essentially as to bones and muscles with that of man, but is clumsier and heavier; its thumb is "opposable" like a human thumb, that is, it can easily meet with its extremity the extremities of the other fingers, thus possessing a character which does much to make the human hand so admirable an instrument; but the gorilla's thumb is proportionately shorter than man's. The foot of the higher apes, though often spoken of as a hand, is anatomically not such, but a prehensile foot. It has been argued by Sir Richard Owen and others that the position of the great toe converts the foot of the higher apes into a hand, an extremely important distinction from man; but against this Professor T. H. Huxley maintained that it has the characteristic structure of a foot with a very movable great toe. The external unlikeness of the apes to man depends much on their hairiness, but this and some other characteristics have no great zoological value. No doubt the difference between man and the apes depends, of all things, on the relative size and organization of the brain. While similar as to their general arrangement to the human brain, those of the higher apes, such as the chimpanzee, are much less complex in their convolutions, as well as much less in both absolute and relative weight—the weight of a gorilla's brain hardly exceeding 20 oz., and a man's brain hardly weighing less than 32 oz., although the gorilla is considerably the larger animal of the two.

These anatomical distinctions are undoubtedly of great moment, and it is an interesting question whether they suffice to place man in a zoological order by himself. It is plain that some eminent zoologists, regarding man as absolutely differing as to mind and spirit from any other animal, have had their discrimination of mere bodily differences unconsciously sharpened, and have been led to give differences, such as in the brain or even the foot of the apes and man, somewhat more importance than if they had merely distinguished two species of apes. Many naturalists hold the opinion that the anatomical differences which separate the gorilla or chimpanzee from man are in some respects less than those which separate these man-like apes from apes lower in the scale. Yet all authorities class both the higher and lower apes in the same order. This is Huxley's argument, some prominent points of which are the following: As regards the proportion of limbs, the hylobates or gibbon is as much longer in the arms than the gorilla as the gorilla is than the man, while on the other hand, it is as much longer in the legs than the man as the man is than the gorilla. As to the vertebral column and pelvis, the lower apes differ from the gorilla as much as, or more than, it differs from man. As to the capacity of the cranium, men differ from one another so extremely that the largest known human skull holds nearly twice the measure of the smallest, a larger proportion than that in which man surpasses the gorilla; while, with proper allowance for difference of size of the various species, it appears that some of the lower apes fall nearly as much below the higher apes. The projection of the muzzle, which gives the character of brutality to the gorilla as distinguished from the man, is yet further exaggerated in the lemurs, as is also the backward position of the occipital foramen. In characters of such importance as the structure of the hand and foot, the lower apes diverge extremely from the gorilla; thus the thumb ceases to be opposable in the American monkeys, and in the marmosets is directed forwards, and armed with a curved claw like the other digits, the great toe in these latter being insignificant in proportion. The same argument can be extended to other points of anatomical structure, and, what is of more consequence, it appears true of the brain. A series of the apes, arranged from lower to higher orders, shows gradations from a brain little higher that that of a rat, to a brain like a small and imperfect imitation of a man's; and the greatest structural break in the series lies not between man and the man-like apes, but between the apes and monkeys on one side, and the lemurs on the other. On these grounds Huxley, restoring in principle the Linnean classification, desired to include man in the order of *Primates*. This order he divided into seven families: first, the *Anthropini*, consisting of man only; second, the *Catarhini* or Old World apes; third, the *Platyrhini*, all New World apes, except the marmosets; fourth, the *Arctopithecini*, or marmosets; fifth, the *Lemurini*, or lemurs; sixth and seventh, the *Cheiromyini* and *Galeopithecini*.

It is in assigning to man his place in nature on psychological grounds that the greater difficulty arises. Huxley acknowledged an immeasurable and practically infinite divergence, ending in the present enormous psychological gulf between ape and man. It is difficult to account for this intellectual chasm as due to some minor structural difference. The opinion is deeply rooted in modern as in ancient thought, that only a distinctively human element of the highest import can account for the severance between man and the highest animal below him. Differences in the mechanical organs, such as the perfection of the human hand as an instrument, or the adaptability of the human voice to the expression of human thought, are indeed of great value. But they have not of themselves such value, that to endow an ape with the hand and vocal organs of a man would be likely to raise it through any large part of the interval that now separates it from humanity. Much more is to be said for the view that man's larger and more highly organized brain accounts for those mental powers in which he so absolutely surpasses the brutes.

The distinction does not seem to lie principally in the range and delicacy of direct sensation, as may be judged from such well-known facts as man's inferiority to the eagle in sight, or to the dog in scent. At the same time, it seems that the human sensory organs may have in various respects acuteness beyond those of other creatures. But, beyond a doubt, man possesses, and in some way possesses by virtue of his superior brain, a power of co-ordinating the impressions of his senses, which enables him to understand the world he lives in, and by understanding to use, resist, and even in a measure rule it. No human art shows the nature of this human attribute more clearly than does language. Man shares with the mammalia and birds the direct expression of the feelings by emotional tones and interjectional cries; the parrot's power of articulate utterance almost equals his own; and, by association of ideas in some measure, some of the lower animals have even learnt to recognize words he utters. But, to use words in themselves unmeaning, as symbols by which to conduct and convey the complex intellectual processes in which mental conceptions are suggested, compared, combined, and even analysed, and new ones created—this is a faculty which is scarcely to be traced in any lower animal.

The view that this, with other mental processes, is a function of the brain, is remarkably corroborated by modern investigation of the disease of aphasia, where the power of thinking remains, but the power is lost of recalling the word corresponding to the thought, and this mental defect is found to accompany a diseased state of a particular locality of the brain (see Aphasia). This may stand among the most perfect of the many evidences that, in Professor Bain's words, "the brain is the principal, though not the sole organ of mind." As the brains of the vertebrate animals form an ascending scale, more and more approaching man's in their arrangement, the fact here finds its explanation, that lower animals perform mental processes corresponding in their nature to our own, though of generally less power and complexity. The full evidence of this correspondence will be found in such works as Brehm's *Thierleben*; and some of the salient points are set forth by Charles Darwin, in the chapter on "Mental Powers," in his *Descent of Man*. Such are the similar effects of terror on man and the lower animals, causing the muscles to tremble, the heart to palpitate, the sphincters to be relaxed, and the hair to stand on end. The phenomena of memory, as to both persons and places, is strong in animals, as is manifest by their recognition of their masters, and their returning at once to habits of which, though disused for many years, their brain has not lost the stored-up impressions. Such facts as that dogs "hunt in dreams," make it likely that their minds are not only sensible to actual events, present and past, but can, like our minds, combine revived sensations into ideal scenes in which they are actors,—that is to say, they have the faculty of imagination. As for the reasoning powers in animals, the accounts of monkeys learning by experience to break eggs carefully, and pick off bits of shell, so as not to lose the contents, or of the way in which rats or martens after a while can no longer be caught by the same kind of trap, with innumerable similar facts, show in the plainest way that the reason of animals goes so far as to form by new experience a new hypothesis of cause and effect which will henceforth guide their actions. The employment of mechanical instruments, of which instances of monkeys using sticks and stones furnish the only rudimentary traces among the lower animals, is one of the often-quoted distinctive powers of man. With this comes the whole vast and ever-widening range of inventive and adaptive art, where the uniform hereditary instinct of the cell-forming bee and the nest-building bird is supplanted by multiform processes and constructions, often at first rude and clumsy in comparison to those of the lower instinct, but carried on by the faculty of improvement and new invention into ever higher stages. "From the moment," writes A. R. Wallace (*Natural Selection*), "when the first skin was used as a covering, when the first rude spear was formed to assist in the chase, when fire was first used to cook his food, when the first seed was sown or shoot planted, a grand revolution was effected in nature, a revolution which in all the previous ages of the earth's history had had no parallel; for a being had arisen who was no longer necessarily subject to change with the changing universe,—a being who was in some degree superior to nature, inasmuch as he knew how to control and regulate her action, and could keep himself in harmony with her, not by a change in body, but by an advance of mind."

As to the lower instincts tending directly to self-preservation, it is acknowledged on all hands that man has them in a less developed state than other animals; in fact, the natural defencelessness of the human being, and the long-continued care and teaching of the young by the elders, are among the commonest themes of moral discourse. Parental tenderness and care for the young are strongly marked among the lower animals, though so inferior in scope and duration to the human qualities; and the same may be said of the mutual forbearance and defence which bind together in a rudimentary social bond the families and herds of animals. Philosophy seeking knowledge for its own sake; morality, manifested in the sense of truth, right, and virtue; and religion, the belief in and communion with superhuman powers ruling and pervading the universe, are human characters, of which it is instructive to trace, if possible, the earliest symptoms in the lower animals, but which can there show at most only faint and rudimentary signs of their wondrous development in mankind. That the tracing of physical and even intellectual continuity between the lower animals and our own race, does not necessarily lead the anthropologist to lower the rank of man in the scale of nature, may be shown by citing A. R. Wallace. Man, he considers, is to be placed "apart, as not only the head and culminating point of the grand series of organic nature, but as in some degree a new and distinct order of being."

To regard the intellectual functions of the brain and nervous system as alone to be considered in the psychological comparison of man with the lower animals, is a view satisfactory to those thinkers who hold materialistic views. According to this school, man is a machine, no doubt the most complex and wonderfully adapted of all known machines, but still neither more nor less than an instrument whose energy is provided by force from without, and which, when set in action, performs the various operations for which its structure fits it, namely, to live, move, feel, and think. This view, however, always has been strongly opposed by those who accept on theological grounds a spiritualistic doctrine, or what is, perhaps, more usual, a theory which combines spiritualism and materialism in the doctrine of a composite nature in man, animal as to the body and in some measure as to the mind, spiritual as to the soul. It may be useful, as an illustration of one opinion on this subject, to continue here the citation of Dr Prichard's comparison between man and the lower animals:—

"If it be inquired in what the still more remarkable difference consists, it is by no means easy to reply. By some it will be said that man, while similar in the organization of his body to the lower tribes, is distinguished from them by the possession of an immaterial soul, a principle capable of conscious feeling, of intellect and thought. To many persons it will appear paradoxical to ascribe the endowment of a soul to the inferior tribes in the creation, yet it is difficult to discover a valid argument that limits the possession of an immaterial principle to man. The phenomena of feeling, of desire and aversion, of love and hatred, of fear and revenge, and the perception of external relations manifested in the life of brutes, imply, not only through the analogy which they display to the human faculties, but likewise from all that we can learn or conjecture of their particular nature, the superadded existence of a principle distinct from the mere mechanism of material bodies. That such a principle must exist in all beings capable of sensation, or of anything analogous to human passions and feelings, will hardly be denied by those who perceive the force of arguments which metaphysically demonstrate the immaterial nature of the mind. There may be no rational grounds for the ancient dogma that the souls of the lower animals were imperishable, like the soul of man: this is, however, a problem which we are not called upon to discuss; and we may venture to conjecture that there may be immaterial essences of divers kinds, and endowed with various attributes and capabilities. But the real nature of these unseen principles eludes our research: they are only known to us by their external manifestations. These manifestations are the various powers and capabilities, or rather the habitudes of action, which characterize the different orders of being, diversified according to their several destinations."

Dr Prichard here puts forward distinctly the time-honoured doctrine which refers the mental faculties to the operation of the soul. The view maintained by a distinguished comparative anatomist, Professor St George Mivart, in his *Genesis of Species*, ch. xii., may fairly follow. "Man, according to the old scholastic definition, is 'a rational animal' (*animal rationale*), and his animality is distinct in nature from his rationality, though inseparably joined, during life, in one common personality. Man's animal body must have had a different source from that of the spiritual soul which informs it, owing to the distinctness of the two orders to which those two existences severally belong." The two extracts just given, however, significant in themselves, fail to render an account of the view of the human constitution which would probably, among the theological and scholastic leaders of public opinion, count the largest weight of adherence. According to this view, not only life but thought are functions of the animal system, in which man excels all other animals as to height of organization: but beyond this, man embodies an immaterial and immortal spiritual principle which no lower creature possesses, and which makes the resemblance of the apes

to him but a mocking simulance. To pronounce any absolute decision on these conflicting doctrines is foreign to our present purpose, which is to show that all of them count among their adherents men of high rank in science.

II. *Origin of Man.*—Opinion as to the genesis of man is divided between the theories of creation and evolution. In both schools, the ancient doctrine of the contemporaneous appearance on earth of all species of animals having been abandoned under the positive evidence of geology, it is admitted that the animal kingdom, past and present, includes a vast series of successive forms, whose appearances and disappearances have taken place at intervals during an immense lapse of ages. The line of inquiry has thus been directed to ascertaining what formative relation subsists among these species and genera, the last link of the argument reaching to the relation between man and the lower creatures preceding him in time. On both the theories here concerned it would be admitted, in the words of Agassiz (*Principles of Zoology*, pp. 205-206), that "there is a manifest progress in the succession of beings on the surface of the earth. This progress consists in an increasing similarity of the living fauna, and, among the vertebrates especially, in their increasing resemblance to man." Agassiz continues, however, in terms characteristic of the creationist school: "But this connexion is not the consequence of a direct lineage between the faunas of different ages. There is nothing like parental descent connecting them. The fishes of the Palaeozoic age are in no respect the ancestors of the reptiles of the Secondary age, nor does man descend from the mammals which preceded him in the Tertiary age. The link by which they are connected is of a higher and immaterial nature; and their connexion is to be sought in the view of the Creator himself, whose aim in forming the earth, in allowing it to undergo the successive changes which geology has pointed out, and in creating successively all the different types of animals which have passed away, was to introduce man upon the surface of our globe. Man is the end towards which all the animal creation has tended from the first appearance of the first Palaeozoic fishes." The evolutionist, on the contrary (see EVOLUTION), maintains that different successive species of animals are in fact connected by parental descent, having become modified in the course of successive generations. The result of Charles Darwin's application of this theory to man may be given in his own words (*Descent of Man*, part i. ch. 6):—

"The Catarhine and Platyrhine monkeys agree in a multitude of characters, as is shown by their unquestionably belonging to one and the same order. The many characters which they possess in common can hardly have been independently acquired by so many distinct species; so that these characters must have been inherited. But an ancient form which possessed many characters common to the Catarhine and Platyrhine monkeys, and others in an intermediate condition, and some few perhaps distinct from those now present in either group, would undoubtedly have been ranked, if seen by a naturalist, as an ape or a monkey. And as man under a genealogical point of view belongs to the Catarhine or Old World stock, we must conclude, however much the conclusion may revolt our pride, that our early progenitors would have been properly thus designated. But we must not fall into the error of supposing that the early progenitor of the whole Simian stock, including man, was identical with, or even closely resembled, any existing ape or monkey."

The problem of the origin of man cannot be properly discussed apart from the full problem of the origin of species. The homologies between man and other animals which both schools try to account for; the explanation of the intervals, with apparent want of intermediate forms, which seem to the creationists so absolute a separation between species; the evidence of useless "rudimentary organs," such as in man the external shell of the ear, and the muscle which enables some individuals to twitch their ears, which rudimentary parts the evolutionists claim to be only explicable as relics of an earlier specific condition,—these, which are the main points of the argument on the origin of man, belong to general biology. The philosophical principles which underlie the two theories stand for the most part in strong contrast, the theory of evolution tending toward the supposition of ordinary causes, such as "natural selection," producing modifications in species, whether by gradual accumulation or more sudden leaps, while the theory of creation has recourse to acts of supernatural intervention (see the duke of Argyll, *Reign of Law*, ch. v.). St George Mivart (*Genesis of Species*) propounded a theory of a natural evolution of man as to his body, combined with a supernatural creation as to his soul; but this attempt to meet the difficulties on both sides seems to have satisfied neither.

The wide acceptance of the Darwinian theory, as applied to the descent of man, has naturally roused anticipation that geological research, which provides evidence of the animal life of incalculably greater antiquity, would furnish fossil remains of some comparatively recent being intermediate between the anthropomorphic and the anthropic types. This expectation has hardly been fulfilled, but of late years the notion of a variety of the human race, geologically ancient, differing from any known in historic times, and with characters approaching the simian, has been supported by further discoveries. To bring this to the reader's notice, top and side views of three skulls, as placed together in the human development series in the Oxford University Museum, are represented in the plate, for the purpose of showing the great size of the orbital ridges, which the reader may contrast with his own by a touch with his fingers on his forehead. The first (fig.3) is the famous Neanderthal skull from near Düsseldorf, described by Schaafhausen in Müller's *Archiv*, 1858; Huxley in Lyell, *Antiquity of Man*, p. 86, and in *Man's Place in Nature*. The second (fig. 4) is the skull from the cavern of Spy in Belgium (de Puydt and Lohest, *Compte rendu du Congrès de Namur*, 1886). The foreheads of these two skulls have an ape-like form, obvious on comparison with the simian skulls of the gorilla and other apes, and visible even in the small-scale figures in the Plate, fig. 2. Among modern tribes of mankind the forehead of the Australian aborigines makes the nearest approach to this type, as was pointed out by Huxley. This brief description will serve to show the importance of a later discovery. At Trinil, in Java, in an equatorial region where, if anywhere, a being intermediate between the higher apes and man would seem likely to be found, Dr Eugene Dubois in 1891–1892 excavated from a bed, considered by him to be of Sivalik formation (Pliocene), a thighbone which competent anatomists decide to be human, and a remarkably depressed calvaria or skull-cap (fig. 5), bearing a certain resemblance in its proportions to the corresponding part of the simian skull. These remains were referred by their discoverer to an animal intermediate between man and ape, to which he gave the name of *Pithecanthropus erectus* (*q.v.*), but the interesting discussions on the subject have shown divergence of opinion among anatomists. At any rate, classing the Trinil skull as human, it may be described as tending towards the simian type more than any other known.

III. *Races of Mankind.*—The classification of mankind into a number of permanent varieties or races, rests on grounds which are within limits not only obvious but definite. Whether from a popular or a scientific point of view, it would be admitted that a Negro, a Chinese, and an Australian belong to three such permanent varieties of men, all plainly distinguishable from one another and from any European. Moreover, such a division takes for granted the idea which is involved in the word race, that each of these varieties is due to special ancestry, each race thus representing an ancient breed or stock, however these breeds or stocks may have had their origin. The anthropological classification of mankind is thus zoological in its nature, like that of the varieties or species of any other animal group, and the characters on which it is based are in great measure physical, though intellectual and traditional peculiarities, such as moral habit and language, furnish important aid. Among the best-marked race-characters are the colour of the skin, eyes and hair; and the structure and arrangement of the latter. Stature is by no means a general criterion of race, and it would not, for instance, be difficult to choose groups of Englishmen, Kaffirs, and North American Indians, whose mean height should hardly differ. Yet in many cases it is a valuable means of distinction, as between the tall Patagonians and the stunted Fuegians, and even as a help in minuter problems, such as separating the

Teutonic and Celtic ancestry in the population of England (see Beddoe, "Stature and Bulk of Man in the British Isles," in *Mem. Anthrop. Soc. London*, vol. iii.). Proportions of the limbs, compared in length with the trunk, have been claimed as constituting peculiarities of African and American races; and other anatomical points, such as the conformation of the pelvis, have speciality. But inferences of this class have hardly attained to sufficient certainty and generality to be set down in the form of rules. The conformation of the skull is second only to the colour of the skin as a criterion for the distinction of race; and the position of the jaws is recognized as important, races being described as prognathous when the jaws project far, as in the Australian or Negro, in contradistinction to the orthognathous type, which is that of the ordinary well-shaped European skull. On this distinction in great measure depends the celebrated "facial angle," measured by Camper as a test of low and high races; but this angle is objectionable as resulting partly from the development of the forehead and partly from the position of the jaws. The capacity of the cranium is estimated in cubic measure by filling it with sand, &c., with the general result that the civilized white man is found to have a larger brain than the barbarian or savage. Classification of races on cranial measurements has long been attempted by eminent anatomists, and in certain cases great reliance may be placed on such measurements. Thus the skulls of an Australian and a Negro would be generally distinguished by their narrowness and the projection of the jaw from that of any Englishman; but the Australian skull would usually differ perceptibly from the Negroid in its upright sides and strong orbital ridges. The relation of height to breadth may also furnish a valuable test; but it is acknowledged by all experienced craniologists, that the shape of the skull may vary so much within the same tribe, and even the same family, that it must be used with extreme caution, and if possible only in conjunction with other criteria of race. The general contour of the face, in part dependent on the form of the skull, varies much in different races, among whom it is loosely defined as oval, lozenge-shaped, pentagonal, &c. Of particular features, some of the most marked contrasts to European types are seen in the oblique Chinese eyes, the broad-set Kamchadale cheeks, the pointed Arab chin, the snub Kirghiz nose, the fleshy protuberant Negro lips, and the broad Kalmuck ear. Taken altogether, the features have a typical character which popular observation seizes with some degree of correctness, as in the recognition of the Jewish countenance in a European city.

Were the race-characters constant in degree or even in kind, the classification of races would be easy; but this is not so. Every division of mankind presents in every character wide deviations from a standard. Thus the Negro race, well marked as it may seem at the first glance, proves on closer examination to include several shades of complexion and features, in some districts varying far from the accepted Negro type; while the examination of a series of native American tribes shows that, notwithstanding their asserted uniformity of type, they differ in stature, colour, features and proportions of skull. (See Prichard, *Nat. Hist. of Man*; Waitz, *Anthropology*, part i. sec. 5.) Detailed anthropological research, indeed, more and more justifies Blumenbach's words, that "innumerable varieties of mankind run into one another by insensible degrees." This state of things, due partly to mixture and crossing of races, and partly to independent variation of types, makes the attempt to arrange the whole human species within exactly bounded divisions an apparently hopeless task. It does not follow, however, that the attempt to distinguish special races should be given up, for there at least exist several definable types, each of which so far prevails in a certain population as to be taken as its standard. L. A. J. Quetelet's plan of defining such types will probably meet with general acceptance as the scientific method proper to this branch of anthropology. It consists in the determination of the standard or typical "mean man" (*homme moyen*) of a population, with reference to any particular quality, such as stature, weight, complexion, &c. In the case of stature, this would be done by measuring a sufficient number of men, and counting how many of them belong to each height on the scale. If it be thus ascertained, as it might be in an English district, that the 5 ft. 7 in. men form the most numerous group, while the 5 ft. 6 in. and 5 ft. 8 in. men are less in number, and the 5 ft. 5 in. and 5 ft. 9 in. still fewer, and so on until the extremely small number of extremely short or tall individuals of 5 ft. or 7 ft. is reached, it will thus be ascertained that the stature of the mean or typical man is to be taken as 5 ft. 7 in. The method is thus that of selecting as the standard the most numerous group, on both sides of which the groups decrease in number as they vary in type. Such classification may show the existence of two or more types, in a community, as, for instance, the population of a Californian settlement made up of Whites and Chinese might show two predominant groups (one of 5 ft. 8 in., the other of 5 ft. 4 in.) corresponding to these two racial types. It need hardly be said that this method of determining the mean type of a race, as being that of its really existing and most numerous class, is altogether superior to the mere calculation of an average, which may actually be represented by comparatively few individuals, and those the exceptional ones. For instance, the average stature of the mixed European and Chinese population just referred to might be 5 ft. 6 in.—a worthless and indeed misleading result. (For particulars of Quetelet's method, see his *Physique sociale* (1869), and *Anthropométrie* (1871).)

Classifications of man have been numerous, and though, regarded as systems, most of them are unsatisfactory, yet they have been of great value in systematizing knowledge, and are all more or less based on indisputable distinctions. J. F. Blumenbach's division, though published as long ago as 1781, has had the greatest influence. He reckons five races, viz. Caucasian, Mongolian, Ethiopian, American, Malay. The ill-chosen name of Caucasian, invented by Blumenbach in allusion to a South Caucasian skull of specially typical proportions, and applied by him to the so-called white races, is still current; it brings into one race peoples such as the Arabs and Swedes, although these are scarcely less different than the Americans and Malays, who are set down as two distinct races. Again, two of the best-marked varieties of mankind are the Australians and the Bushmen, neither of whom, however, seems to have a natural place in Blumenbach's series. The yet simpler classification by Cuvier into Caucasian, Mongol and Negro corresponds in some measure with a division by mere complexion into white, yellow and black races; but neither this threefold division, nor the ancient classification into Semitic, Hamitic and Japhetic nations can be regarded as separating the human types either justly or sufficiently (see Prichard, *Natural History of Man*, sec. 15; Waitz, *Anthropology*, vol. i. part i. sec. 5). Schemes which set up a larger number of distinct races, such as the eleven of Pickering, the fifteen of Bory de St Vincent and the sixteen of Desmoulins, have the advantage of finding niches for most well-defined human varieties; but no modern naturalist would be likely to adopt any one of these as it stands. In criticism of Pickering's system, it is sufficient to point out that he divides the white nations into two races, entitled the Arab and the Abyssinian (Pickering, *Races of Man*, ch. i.). Agassiz, Nott, Crawfurd and others who have assumed a much larger number of races or species of man, are not considered to have satisfactorily defined a corresponding number of distinguishable types. On the whole, Huxley's division probably approaches more nearly than any other to such a tentative classification as may be accepted in definition of the principal varieties of mankind, regarded from a zoological point of view, though anthropologists may be disposed to erect into separate races several of his widely-differing sub-races. He distinguishes four principal types of mankind, the Australioid, Negroid, Mongoloid and Xanthochroic ("fair whites"), adding a fifth variety, the Melanochroic ("dark whites").

In determining whether the races of mankind are to be classed as varieties of one species, it is important to decide whether every two races can unite to produce fertile offspring. It is settled by experience that the most numerous and well-known crossed races, such as the Mulattos, descended from Europeans

and Negroes—the Mestizos, from Europeans and American indigenes—the Zambos, from these American indigenes and Negroes, &c., are permanently fertile. They practically constitute sub-races, with a general blending of the characters of the two parents, and only differing from fully-established races in more or less tendency to revert to one or other of the original types. It has been argued, on the other hand, that not all such mixed breeds are permanent, and especially that the cross between Europeans and Australian indigenes is almost sterile; but this assertion, when examined with the care demanded by its bearing on the general question of hybridity, has distinctly broken down. On the whole, the general evidence favours the opinion that any two races may combine to produce a new sub-race, which again may combine with any other variety. Thus, if the existence of a small number of distinct races of mankind be taken as a starting-point, it is obvious that their crossing would produce an indefinite number of secondary varieties, such as the population of the world actually presents. The working out in detail of the problem, how far the differences among complex nations, such as those of Europe, may have been brought about by hybridity, is still, however, a task of almost hopeless intricacy. Among the boldest attempts to account for distinctly-marked populations as resulting from the intermixture of two races, are Huxley's view that the Hottentots are hybrid between the Bushmen and the Negroes, and his more important suggestion, that the Melanochroic peoples of southern Europe are of mixed Xanthochroic and Australioid stock.

The problem of ascertaining how the small number of races, distinct enough to be called primary, can have assumed their different types, has been for years the most disputed field of anthropology, the battle-ground of the rival schools of monogenists and polygenists. The one has claimed all mankind to be descended from one original stock, and generally from a single pair; the other has contended for the several primary races being separate species of independent origin. The great problem of the monogenist theory is to explain by what course of variation the so different races of man have arisen from a single stock. In ancient times little difficulty was felt in this, authorities such as Aristotle and Vitruvius seeing in climate and circumstance the natural cause of racial differences, the Ethiopian having been blackened by the tropical sun, &c. Later and closer observations, however, have shown such influences to be, at any rate, far slighter in amount and slower in operation than was once supposed. A. de Quatrefages brings forward (*Unité de l'espèce humaine*) his strongest arguments for the variability of races under change of climate, &c. (*action du milieu*), instancing the asserted alteration in complexion, constitution and character of Negroes in America, and Englishmen in America and Australia. But although the reality of some such modification is not disputed, especially as to stature and constitution, its amount is not enough to upset the counter-proposition of the remarkable permanence of type displayed by races ages after they have been transported to climates extremely different from that of their former home. Moreover, physically different peoples, such as the Bushmen and Negroes in Africa, show no signs of approximation under the influence of the same climate; while, on the other hand, the coast tribes of Tierra del Fuego and forest tribes of tropical Brazil continue to resemble one another, in spite of extreme differences of climate and food. Darwin is moderate in his estimation of the changes produced on races of man by climate and mode of life within the range of history (*Descent of Man*, part i. ch. 4 and 7). The slightness and slowness of variation in human races having become known, a great difficulty of the monogenist theory was seen to lie in the apparent shortness of the Biblical chronology. Inasmuch as several well-marked races of mankind, such as the Egyptian, Phoenician, Ethiopian, &c., were much the same three or four thousand years ago as now, their variation from a single stock in the course of any like period could hardly be accounted for without a miracle. This difficulty the polygenist theory escaped, and in consequence it gained ground. Modern views have however tended to restore, though under a new aspect, the doctrine of a single human stock. The fact that man has existed during a vast period of time makes it more easy to assume the continuance of very slow natural variation as having differentiated even the white man and the Negro among the descendants of a common progenitor. On the other hand it does not follow necessarily from a theory of evolution of species that mankind must have descended from a single stock, for the hypothesis of development admits of the argument, that several simian species may have culminated in several races of man. The general tendency of the development theory, however, is against constituting separate species where the differences are moderate enough to be accounted for as due to variation from a single type. Darwin's summing-up of the evidence as to unity of type throughout the races of mankind is as distinctly a monogenist argument as those of Blumenbach, Prichard or Quatrefages—

"Although the existing races of man differ in many respects, as in colour, hair, shape of skull, proportions of the body, &c., yet, if their whole organization be taken into consideration, they are found to resemble each other closely in a multitude of points. Many of these points are of so unimportant, or of so singular a nature, that it is extremely improbable that they should have been independently acquired by aboriginally distinct species or races. The same remark holds good with equal or greater force with respect to the numerous points of mental similarity between the most distinct races of man. . . . Now, when naturalists observe a close agreement in numerous small details of habits, tastes and dispositions between two or more domestic races, or between nearly allied natural forms, they use this fact as an argument that all are descended from a common progenitor who was thus endowed; and, consequently, that all should be classed under the same species. The same argument may be applied with much force to the races of man."—(Darwin, *Descent of Man*, part i. ch. 7.)

The main difficulty of the monogenist school has ever been to explain how races which have remained comparatively fixed in type during the long period of history, such as the white man and the Negro, should, in even a far longer period, have passed by variation from a common original. To meet this A. R. Wallace suggests that the remotely ancient representatives of the human species, being as yet animals too low in mind to have developed those arts of maintenance and social ordinances by which man holds his own against influences from climate and circumstance, were in their then wild state much more plastic than now to external nature; so that "natural selection" and other causes met with but feeble resistance in forming the permanent varieties or races of man, whose complexion and structure still remained fixed in their descendants (see Wallace, *Contributions to the Theory of Natural Selection*, p. 319). On the whole, it may be asserted that the doctrine of the unity of mankind stands on a firmer basis than in previous ages. It would be premature to judge how far the problem of the origin of races may be capable of exact solution; but the experience gained since 1871 countenances Darwin's prophecy that before long the dispute between the monogenists and the polygenists would die a silent and unobserved death.

IV. *Antiquity of Man.*—Until the 19th century man's first appearance on earth was treated on a historical basis as matter of record. It is true that the schemes drawn up by chronologists differed widely, as was natural, considering the variety and inconsistency of their documentary data. On the whole, the scheme of Archbishop Usher, who computed that the earth and man were created in 4004 B.C., was the most popular (see CHRONOLOGY). It is no longer necessary, however, to discuss these chronologies. Geology has made it manifest that our earth must have been the seat of vegetable and animal life for an immense period of time; while the first appearance of man, though comparatively recent, is positively so remote, that an estimate between twenty and a hundred thousand years may fairly be taken as a minimum. This geological claim for a vast antiquity of the human race is supported by the similar claims of prehistoric archaeology and the science of culture, the evidence of all three departments of inquiry being intimately connected, and in perfect harmony.

Human bones and objects of human manufacture have been found in such geological relation to the remains of fossil species of elephant, rhinoceros, hyena, bear, &c., as to lead to the distinct inference that man already existed at a remote period in localities

where these mammalia are now and have long been extinct. The not quite conclusive researches of Tournal and Christol in limestone caverns of the south of France date back to 1828. About the same time P. C. Schmerling of Liége was exploring the ossiferous caverns of the valley of the Meuse, and satisfied himself that the men whose bones he found beneath the stalagmite floors, together with bones cut and flints shaped by human workmanship, had inhabited this Belgian district at the same time with the cave-bear and several other extinct animals whose bones were imbedded with them (*Recherches sur les ossements fossiles découverts dans les cavernes de la province de Liége* (Liége, 1833–1834)). This evidence, however, met with little acceptance among scientific men. Nor, at first, was more credit given to the discovery by M. Boucher de Perthes, about 1841, of rude flint hatchets in a sand-bed containing remains of mammoth and rhinoceros at Menchecourt near Abbeville, which first find was followed by others in the same district (see Boucher de Perthes, *De l'Industrie primitive, ou les arts à leur origine* (1846); *Antiquités celtiques et antédiluviennes* (Paris, 1847), &c.). Between 1850 and 1860 French and English geologists were induced to examine into the facts, and found irresistible the evidence that man existed and used rude implements of chipped flint during the Quaternary or Drift period. Further investigations were then made, and overlooked results of older ones reviewed. In describing Kent's Cavern (*q.v.*) near Torquay, R. A. C. Godwin-Austen had maintained, as early as 1840 (*Proc. Geo. Soc. London*, vol. iii. p. 286), that the human bones and worked flints had been deposited indiscriminately together with the remains of fossil elephant, rhinoceros, &c. Certain caves and rock-shelters in the province of Dordogne, in central France, were examined by a French and an English archaeologist, Edouard Lartet and Henry Christy, the remains discovered showing the former prevalence of the reindeer in this region, at that time inhabited by savages, whose bone and stone implements indicate a habit of life similar to that of the Eskimos. Moreover, the co-existence of man with a fauna now extinct or confined to other districts was brought to yet clearer demonstration by the discovery in these caves of certain drawings and carvings of the animals done by the ancient inhabitants themselves, such as a group of reindeer on a piece of reindeer horn, and a sketch of a mammoth, showing the elephant's long hair, on a piece of a mammoth's tusk from La Madeleine (Lartet and Christy, *Reliquiae Aquitanicae*, ed. by T. R. Jones (London, 1865), &c.).

This and other evidence (which is considered in more detail in the article ARCHAEOLOGY) is now generally accepted by geologists as carrying back the existence of man into the period of the post-glacial drift, in what is now called the Quaternary period, an antiquity at least of tens of thousands of years. Again, certain inferences have been tentatively made from the depth of mud, earth, peat, &c., which has accumulated above relics of human art imbedded in ancient times. Among these is the argument from the numerous borings made in the alluvium of the Nile valley to a depth of 60 ft., where down to the lowest level fragments of burnt brick and pottery were always found, showing that people advanced enough in the arts to bake brick and pottery have inhabited the valley during the long period required for the Nile inundations to deposit 60 ft. of mud, at a rate probably not averaging more than a few inches in a century. Another argument is that of Professor von Morlot, based on a railway section through a conical accumulation of gravel and alluvium, which the torrent of the Tinière has gradually built up where it enters the Lake of Geneva near Villeneuve. Here three layers of vegetable soil appear, proved by the objects imbedded in them to have been the successive surface soils in two prehistoric periods and in the Roman period, but now lying 4, 10 and 19 ft. underground. On this it is computed that if 4 ft. of soil were formed in the 1500 years since the Roman period, we must go 5000 years farther back for the date of the earliest human inhabitants. Calculations of this kind, loose as they are, deserve attention.

The interval between the Quaternary or Drift period and the period of historical antiquity is to some extent bridged over by relics of various intermediate civilizations, *e.g.* the Lake-dwellings (*q.v.*) of Switzerland, mostly of the lower grades, and in some cases reaching back to remote dates. And further evidence of man's antiquity is afforded by the kitchen-middens or shell-heaps (*q.v.*), especially those in Denmark. Danish peat-mosses again show the existence of man at a time when the Scotch fir was abundant; at a later period the firs were succeeded by oaks, which have again been almost superseded by beeches, a succession of changes which indicate a considerable lapse of time.

Lastly, chronicles and documentary records, taken in connexion with archaeological relics of the historical period, carry back into distant ages the starting-point of actual history, behind which lies the evidently vast period only known by inferences from the relations of languages and the stages of development of civilization. The most recent work of Egyptologists proves a systematic civilization to have existed in the valley of the Nile at least 6000 to 7000 years ago (see CHRONOLOGY).

It was formerly held that the early state of society was one of comparatively high culture, and thus there was no hesitation in assigning the origin of man to a time but little beyond the range of historical records and monuments. But the researches of anthropologists in recent years have proved that the civilization of man has been gradually developed from an original stone-age culture, such as characterizes modern savage life. To the 6000 years to which ancient civilization dates back must be added a vast period during which the knowledge, arts and institutions of such a civilization as that of ancient Egypt attained the high level evidenced by the earliest records. The evidence of comparative philology supports the necessity for an enormous time allowance. Thus, Hebrew and Arabic are closely related languages, neither of them the original of the other, but both sprung from some parent language more ancient than either. When, therefore, the Hebrew records have carried back to the most ancient admissible date the existence of the Hebrew language, this date must have been long preceded by that of the extinct parent language of the whole Semitic family; while this again was no doubt the descendant of languages slowly shaping themselves through ages into this peculiar type. Yet more striking is the evidence of the Indo-European (formerly called Aryan) family of languages. The Hindus, Medes, Persians, Greeks, Romans, Germans, Celts and Slavs make their appearance at more or less remote dates as nations separate in language as in history. Nevertheless, it is now acknowledged that at some far remoter time, before these nations were divided from the parent stock, and distributed over Asia and Europe, a single barbaric people stood as physical and political representative of the nascent Aryan race, speaking a now extinct Aryan language, from which, by a series of modifications not to be estimated as possible within many thousands of years, there arose languages which have been mutually unintelligible since the dawn of history, and between which it was only possible for an age of advanced philology to trace the fundamental relationship.

From the combination of these considerations, it will be seen that the farthest date to which documentary or other records extend is now generally regarded by anthropologists as but the earliest distinctly visible point of the historic period, beyond which stretches back a vast indefinite series of prehistoric ages.

V. *Language.*—In examining how the science of language bears on the general problems of anthropology, it is not necessary to discuss at length the critical questions which arise, the principal of which are considered elsewhere (see LANGUAGE). Philology is especially appealed to by anthropologists as contributing to the following lines of argument. A primary mental similarity of all branches of the human race is evidenced by their common faculty of speech, while at the same time secondary diversities of race-character and history are marked by difference of grammatical structure and of vocabularies. The existence of groups or families of allied languages, each group being evidently descended from a single language, affords one of the principal aids in classifying nations and races. The adoption by one language of words originally belonging to another, proving as it does the fact of intercourse between two races, and even to some extent indicating the results of such intercourse, affords a

valuable clue through obscure regions of the history of civilization.

Communication by gesture-signs, between persons unable to converse in vocal language, is an effective system of expression common to all mankind. Thus, the signs used to ask a deaf and dumb child about his meals and lessons, or to communicate with a savage met in the desert about game or enemies, belong to codes of gesture-signals identical in principle, and to a great extent independent both of nationality and education; there is even a natural syntax, or order of succession, in such gesture-signs. To these gestures let there be added the use of the interjectional cries, such as *oh! ugh! hey!* and imitative sounds to represent the cat's *mew*, the *click* of a trigger, the *clap* or *thud* of a blow, &c. The total result of this combination of gesture and significant sound will be a general system of expression, imperfect but serviceable, and naturally intelligible to all mankind without distinction of race. Nor is such a system of communication only theoretically conceivable; it is, and always has been, in practical operation between people ignorant of one another's language, and as such is largely used in the intercourse of savage tribes. It is true that to some extent these means of utterance are common to the lower animals, the power of expressing emotion by cries and tones extending far down in the scale of animal life, while rudimentary gesture-signs are made by various mammals and birds. Still, the lower animals make no approach to the human system of natural utterance by gesture-signs and emotional-imitative sounds, while the practical identity of this human system among races physically so unlike as the Englishman and the native of the Australian bush indicates extreme closeness of mental similarity throughout the human species.

When, however, the Englishman and the Australian speak each in his native tongue, only such words as belong to the interjectional and imitative classes will be naturally intelligible, and as it were instinctive to both. Thus the savage, uttering the sound *waow!* as an explanation of surprise and warning, might be answered by the white man with the not less evidently significant *sh!* of silence, and the two speakers would be on common ground when the native indicated by the name *bwirri* his cudgel, flung *whirring* through the air at a flock of birds, or when the native described as a *jakkal-yakkal* the bird called by the foreigner a *cockatoo*. With these, and other very limited classes of natural words, however, resemblance in vocabulary practically ceases. The Australian and English languages each consist mainly of a series of words having no apparent connexion with the ideas they signify, and differing utterly; of course, accidental coincidences and borrowed words must be excluded from such comparisons. It would be easy to enumerate other languages of the world, such as Basque, Turkish, Hebrew, Malay, Mexican, all devoid of traceable resemblance to Australian and English, and to one another. There is, moreover, extreme difference in the grammatical structure both of words and sentences in various languages. The question then arises, how far the employment of different vocabularies, and that to a great extent on different grammatical principles, is compatible with similarity of the speakers' minds, or how far does diversity of speech indicate diversity of mental nature? The obvious answer is, that the power of using words as signs to express thoughts with which their sound does not directly connect them, in fact as arbitrary symbols, is the highest grade of the special human faculty in language, the presence of which binds together all races of mankind in substantial mental unity. The measure of this unity is, that any child of any race can be brought up to speak the language of any other race.

Under the present standard of evidence in comparing languages and tracing allied groups to a common origin, the crude speculations as to a single primeval language of mankind, which formerly occupied so much attention, are acknowledged to be worthless. Increased knowledge and accuracy of method have as yet only left the way open to the most widely divergent suppositions. For all that known dialects prove to the contrary, on the one hand, there may have been one primitive language, from which the descendant languages have varied so widely, that neither their words nor their formation now indicate their unity in long past ages, while, on the other hand, the primitive tongues of mankind may have been numerous, and the extreme unlikeness of such languages as Basque, Chinese, Peruvian, Hottentot and Sanskrit may arise from absolute independence of origin.

The language spoken by any tribe or nation is not of itself absolute evidence as to its race-affinities. This is clearly shown in extreme cases. Thus the Jews in Europe have almost lost the use of Hebrew, but speak as their vernacular the language of their adopted nation, whatever it may be; even the Jewish-German dialect, though consisting so largely of Hebrew words, is philologically German, as any sentence shows: "*Ich hab noch hoiom lo geachelt,*" "I have not yet eaten to-day." The mixture of the Israelites in Europe by marriage with other nations is probably much greater than is acknowledged by them; yet, on the whole, the race has been preserved with extraordinary strictness, as its physical characteristics sufficiently show. Language thus here fails conspicuously as a test of race and even of national history. Not much less conclusive is the case of the predominantly Negro populations of the West India Islands, who, nevertheless, speak as their native tongues dialects of English or French, in which the number of intermingled native African words is very scanty: "*Dem hitti netti na ini watra bikasi dem de fisiman,*" "They cast a net into the water, because they were fishermen." (Surinam Negro-Eng.) "*Bef pas ca jamain lasse poter cônes li,*" "Le bœuf n'est jamais las de porter ses cornes." (Haitian Negro-Fr.) If it be objected that the linguistic conditions of these two races are more artificial than has been usual in the history of the world, less extreme cases may be seen in countries where the ordinary results of conquest-colonization have taken place. The Mestizos, who form so large a fraction of the population of modern Mexico, numbering several millions, afford a convenient test in this respect, inasmuch as their intermediate complexion separates them from both their ancestral races, the Spaniard, and the chocolate-brown indigenous Aztec or other Mexican. The mother-tongue of this mixed race is Spanish, with an infusion of Mexican words; and a large proportion cannot speak any native dialect. In most or all nations of mankind, crossing or intermarriage of races has thus taken place between the conquering invader and the conquered native, so that the language spoken by the nation may represent the results of conquest as much or more than of ancestry. The supersession of the Celtic Cornish by English, and of the Slavonic Old-Prussian by German, are but examples of a process which has for untold ages been supplanting native dialects, whose very names have mostly disappeared. On the other hand, the language of the warlike invader or peaceful immigrant may yield, in a few generations, to the tongue of the mass of the population, as the Northman's was replaced by French, and modern German gives way to English in the United States. Judging, then, by the extirpation and adoption of languages within the range of history, it is obvious that to classify mankind into races, Aryan, Semitic, Turanian, Polynesian, Kaffir, &c., on the mere evidence of language, is intrinsically unsound.

VI. *Development of Civilization.*—The conditions of man at the lowest and highest known levels of culture are separated by a vast interval; but this interval is so nearly filled by known intermediate stages, that the line of continuity between the lowest savagery and the highest civilization is unbroken at any critical point.

An examination of the details of savage life shows not only that there is an immeasurable difference between the rudest man and the highest lower animal, but also that the least cultured savages have themselves advanced far beyond the lowest intellectual and moral state at which human tribes can be conceived as capable of existing, when placed under favourable circumstances of warm climate, abundant food, and security from too severe destructive influences. The Australian black-fellow or the forest Indian of Brazil, who may be taken as examples of the lowest modern savage, had, before contact with whites, attained to rudimentary stages in many of the characteristic

functions of civilized life. His language, expressing thoughts by conventional articulate sounds, is the same in essential principle as the most cultivated philosophic dialect, only less exact and copious. His weapons, tools and other appliances such as the hammer, hatchet, spear, knife, awl, thread, net, canoe, &c., are the evident rudimentary analogues of what still remains in use among Europeans. His structures, such as the hut, fence, stockade, earthwork, &c., may be poor and clumsy, but they are of the same nature as our own. In the simple arts of broiling and roasting meat, the use of hides and furs for covering, the plaiting of mats and baskets, the devices of hunting, trapping and fishing, the pleasure taken in personal ornament, the touches of artistic decoration on objects of daily use, the savage differs in degree but not in kind from the civilized man. The domestic and social affections, the kindly care of the young and the old, some acknowledgment of marital and parental obligation, the duty of mutual defence in the tribe, the authority of the elders, and general respect to traditional custom as the regulator of life and duty, are more or less well marked in every savage tribe which is not disorganized and falling to pieces. Lastly, there is usually to be discerned amongst such lower races a belief in unseen powers pervading the universe, this belief shaping itself into an animistic or spiritualistic theology, mostly resulting in some kind of worship. If, again, high savage or low barbaric types be selected, as among the North American Indians, Polynesians, and Kaffirs of South Africa, the same elements of culture appear, but at a more advanced stage, namely, a more full and accurate language, more knowledge of the laws of nature, more serviceable implements, more perfect industrial processes, more definite and fixed social order and frame of government, more systematic and philosophic schemes of religion and a more elaborate and ceremonial worship. At intervals new arts and ideas appear, such as agriculture and pasturage, the manufacture of pottery, the use of metal implements and the device of record and communication by picture writing. Along such stages of improvement and invention the bridge is fairly made between savage and barbaric culture; and this once attained to, the remainder of the series of stages of civilization lies within the range of common knowledge.

The teaching of history, during the three to four thousand years of which contemporary chronicles have been preserved, is that civilization is gradually developed in the course of ages by enlargement and increased precision of knowledge, invention and improvement of arts, and the progression of social and political habits and institutions towards general well-being. That processes of development similar to these were in prehistoric times effective to raise culture from the savage to the barbaric level, two considerations especially tend to prove. First, there are numerous points in the culture even of rude races which are not explicable otherwise than on the theory of development. Thus, though difficult or superfluous arts may easily be lost, it is hard to imagine the abandonment of contrivances of practical daily utility, where little skill is required and materials are easily accessible. Had the Australians or New Zealanders, for instance, ever possessed the potter's art, they could hardly have forgotten it. The inference that these tribes represent the stage of culture before the invention of pottery is confirmed by the absence of buried fragments of pottery in the districts they inhabit. The same races who were found making thread by the laborious process of twisting with the hand, would hardly have disused, if they had ever possessed, so simple a labour-saving device as the spindle, which consists merely of a small stick weighted at one end; the spindle may, accordingly, be regarded as an instrument invented somewhere between the lowest and highest savage levels (Tylor, *Early Hist. of Mankind*, p. 193). Again, many devices of civilization bear unmistakable marks of derivation from a lower source; thus the ancient Egyptian and Assyrian harps, which differ from ours in having no front pillar, appear certainly to owe this remarkable defect to having grown up through intermediate forms from the simple strung bow, the still used type of the most primitive stringed instrument. In this way the history of numeral words furnishes actual proof of that independent intellectural progress among savage tribes which some writers have rashly denied. Such words as *hand*, *hands*, *foot*, *man*, &c., are used as numerals signifying 5, 10, 15, 20, &c., among many savage and barbaric peoples; thus Polynesian *lima*, *i.e.* "hand," means 5; Zulu *tatisitupa*, *i.e.* "taking the thumb," means 6; Greenlandish *arfersanek-pingasut*, *i.e.* "on the other foot three," means 18; Tamanac *tevin itoto*, *i.e.* "one man," means 20, &c., &c. The existence of such expressions demonstrates that the people who use them had originally no spoken names for these numbers, but once merely counted them by gesture on their fingers and toes in low savage fashion, till they obtained higher numerals by the inventive process of describing in words these counting-gestures. Second, the process of "survival in culture" has caused the preservation in each stage of society of phenomena belonging to an earlier period, but kept up by force of custom into the later, thus supplying evidence of the modern condition being derived from the ancient. Thus the mitre over an English bishop's coat-of-arms is a survival which indicates him as the successor of bishops who actually wore mitres, while armorial bearings themselves, and the whole craft of heraldry, are survivals bearing record of a state of warfare and social order whence our present state was by vast modification evolved. Evidence of this class, proving the derivation of modern civilization, not only from ancient barbarism, but beyond this, from primeval savagery, is immensely plentiful, especially in rites and ceremonies, where the survival of ancient habits is peculiarly favoured. Thus the modern Hindu, though using civilized means for lighting his household fires, retains the savage "fire-drill" for obtaining fire by friction of wood when what he considers pure or sacred fire has to be produced for sacrificial purposes; while in Europe into modern times the same primitive process has been kept up in producing the sacred and magical "need-fire," which was lighted to deliver cattle from a murrain. Again, the funeral offerings of food, clothing, weapons, &c., to the dead are absolutely intelligible and purposeful among savage races, who believe that the souls of the departed are ethereal beings capable of consuming food, and of receiving and using the souls or phantoms of any objects sacrificed for their use. The primitive philosophy to which these conceptions belong has to a great degree been discredited by modern science; yet the clear survivals of such ancient and savage rites may still be seen in Europe, where the Bretons leave the remains of the All Souls' supper on the table for the ghosts of the dead kinsfolk to partake of, and Russian peasants set out cakes for the ancestral manes on the ledge which supports the holy pictures, and make dough ladders to assist the ghosts of the dead to ascend out of their graves and start on their journey for the future world; while other provision for the same spiritual journey is made when the coin is still put in the hand of the corpse at an Irish wake. In like manner magic still exists in the civilized world as a survival from the savage and barbaric times to which it originally belongs, and in which is found the natural source and proper home of utterly savage practices still carried on by ignorant peasants in Great Britain, such as taking omens from the cries of animals, or bewitching an enemy by sticking full of pins and hanging up to shrivel in the smoke an image or other object, that similar destruction may fall on the hated person represented by the symbol (Tylor, *Primitive Culture*, ch. i., iii., iv., xi., xii.; *Early Hist. of Man*, ch. vi.).

The comparative science of civilization thus not only generalizes the data of history, but supplements its information by laying down the lines of development along which the lowest prehistoric culture has gradually risen to the highest modern level. Among the most clearly marked of these lines is that which follows the succession of the Stone, Bronze, and Iron Ages (see ARCHAEOLOGY). The Stone Age represents the early condition of mankind in general, and has remained in savage districts up to modern times, while the introduction of metals need not at once supersede the use of the old stone hatchets and arrows, which have often long continued in dwindling survival by the side of the new bronze and even iron ones. The Bronze Age had its most important place among ancient nations of Asia and Europe, and

among them was only succeeded after many centuries by the Iron Age; while in other districts, such as Polynesia and Central and South Africa, and America (except Mexico and Peru), the native tribes were moved directly from the Stone to the Iron Age without passing through the Bronze Age at all. Although the three divisions of savage, barbaric, and civilized man do not correspond at all perfectly with the Stone, Bronze, and Iron Ages, this classification of civilization has proved of extraordinary value in arranging in their proper order of culture the nations of the Old World.

Another great line of progress has been followed by tribes passing from the primitive state of the wild hunter, fisher and fruit-gatherer to that of the settled tiller of the soil, for to this change of habit may be plainly in great part traced the expansion of industrial arts and the creation of higher social and political institutions. These, again, have followed their proper lines along the course of time. Among such is the immense legal development by which the primitive law of personal vengeance passed gradually away, leaving but a few surviving relics in the modern civilized world, and being replaced by the higher doctrine that crime is an offence against society, to be repressed for the public good. Another vast social change has been that from the patriarchal condition, in which the unit is the family under the despotic rule of its head, to the systems in which individuals make up a society whose government is centralized in a chief or king. In the growth of systematic civilization, the art of writing has had an influence so intense, that of all tests to distinguish the barbaric from the civilized state, none is so generally effective as this, whether they have but the failing link with the past which mere memory furnishes, or can have recourse to written records of past history and written constitutions of present order. Lastly, still following the main lines of human culture, the primitive germs of religious institutions have to be traced in the childish faith and rude rites of savage life, and thence followed in their expansion into the vast systems administered by patriarchs and priests, henceforth taking under their charge the precepts of morality, and enforcing them under divine sanction, while also exercising in political life an authority beside or above the civil law.

The state of culture reached by Quaternary man is evidenced by the stone implements in the drift-gravels, and other relics of human art in the cave deposits. His drawings on bone or tusk found in the caves show no mean artistic power, as appears by the three specimens copied in the Plate. That representing two deer (fig. 6) was found so early as 1852 in the breccia of a limestone cave on the Charente, and its importance recognized in a remarkable letter by Prosper Merimée, as at once historically ancient and geologically modern (*Congrès d'anthropologie et d'archéologie préhistoriques*, Copenhagen (1869), p. 128). The other two are the famous mammoth from the cave of La Madeleine, on which the woolly mane and huge tusks of *Elephas primigenius* are boldly drawn (fig. 7); and the group of man and horses (fig. 8). There has been found one other contemporary portrait of man, where a hunter is shown stalking an aurochs.

That the men of the Quaternary period knew the savage art of producing fire by friction, and roasted the flesh on which they mainly subsisted, is proved by the fragments of charcoal found in the cave deposits, where also occur bone awls and needles, which indicate the wearing of skin clothing, like that of the modern Australians and Fuegians. Their bone lance-heads and dart-points were comparable to those of northern and southern savages. Particular attention has to be given to the stone implements used by these earliest known of mankind. The division of tribes in the stone implement stage into two classes, the Palaeolithic or Old Stone Age, and the Neolithic or New Stone Age, according to their proficiency in this most important art furnishes in some respects the best means of determining their rank in general culture.

In order to put this argument clearly before the reader, a few selected implements are figured in the Plate. The group in fig. 9 contains tools and weapons of the Neolithic period such as are dug up on European soil; they are evident relics of ancient populations who used them till replaced by metal. The stone hatchets are symmetrically shaped and edged by grinding, while the cutting flakes, scrapers, spear and arrow heads are of high finish. Direct knowledge of the tribes who made them is scanty, but implements so similar in make and design having been in use in North and South America until modern times, it may be assumed for purposes of classification that the Neolithic peoples of the New World were at a similar barbarous level in industrial arts, social organization, moral and religious ideas. Such comparison, though needing caution and reserve, at once proved of great value to anthropology. When, however, there came to light from the drift-gravels and limestone caves of Europe the Palaeolithic implements, of which some types are shown in the group (fig. 10), the difficult problem presented itself, what degree of general culture these rude implements belonged to. On mere inspection, their rudeness, their unsuitability for being hafted, and the absence of shaping and edging by the grindstone, mark their inferiority to the Neolithic implements. Their immensely greater antiquity was proved by their geological position and their association with a long extinct fauna, and they were not, like the Neoliths, recognizable as corresponding closely to the implements used by modern tribes. There was at first a tendency to consider the Palaeoliths as the work of men ruder than savages, if, indeed, their makers were to be accounted human at all. Since then, however, the problem has passed into a more manageable state. Stone implements, more or less approaching the European Palaeolithic type, were found in Africa from Egypt southwards, where in such parts as Somaliland and Cape Colony they lie about on the ground, as though they had been the rough tools and weapons of the rude inhabitants of the land at no very distant period. The group in fig. 11 in the Plate shows the usual Somaliland types. These facts tended to remove the mystery from Palaeolithic man, though too little is known of the ruder ancient tribes of Africa to furnish a definition of the state of culture which might have co-existed with the use of Palaeolithic implements. Information to this purpose, however, can now be furnished from a more outlying region. This is Tasmania, where as in the adjacent continent of Australia, the survival of marsupial animals indicates long isolation from the rest of the world. Here, till far on into the 19th century, the Englishmen could watch the natives striking off flakes of stone, trimming them to convenient shape for grasping them in the hand, and edging them by taking off successive chips on one face only. The group in fig. 12 shows ordinary Tasmanian forms, two of them being finer tools for scraping and grooving. (For further details reference may be made to H. Ling Roth, *The Tasmanians*, (2nd ed., 1899); R. Brough Smyth, *Aborigines of Victoria* (1878), vol. ii.; *Papers and Proceedings of Royal Society of Tasmania*; and papers by the present writer in *Journal of the Anthropological Institute*.) The Tasmanians, when they came in contact with the European explorers and settlers, were not the broken outcasts they afterwards became. They were a savage people, perhaps the lowest in culture of any known, but leading a normal, self-supporting, and not unhappy life, which had probably changed little during untold ages. The accounts, imperfect as they are, which have been preserved of their arts, beliefs and habits, thus present a picture of the arts, beliefs and habits of tribes whose place in the Stone Age was a grade lower than that of Palaeolithic man of the Quaternary period.

The Tasmanian stone implements, figured in the Plate, show their own use when it is noticed that the rude chipping forms a good hand-grip above, and an effective edge for chopping, sawing, and cutting below. But the absence of the long-shaped implements, so characteristic of the Neolithic and Palaeolithic series, and serviceable as picks, hatchets, and chisels, shows remarkable limitation in the mind of these savages, who made a broad, hand-grasped knife their tool of all work to cut, saw, and chop with. Their weapons were the wooden club or waddy notched to the grasp, and spears of sticks, often crooked but well balanced, with points sharpened by tool or fire, and sometimes jagged. No spear thrower or bow and arrow was known. The

FIG. 1.

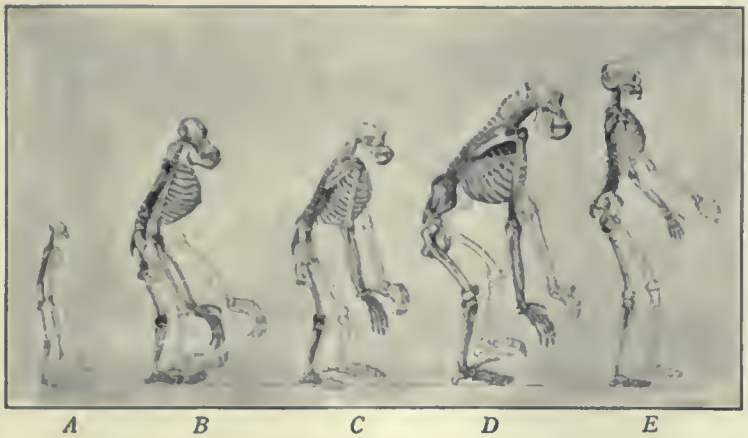


FIG. 2.

FIG. 3.

FIG. 4.

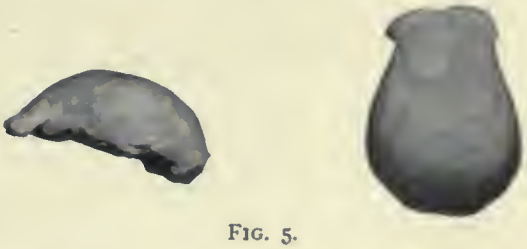


FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

Tasmanian savages were crafty warriors and kangaroo-hunters, and the women climbed the highest trees by notching, in quest of opossums. Shell-fish and crabs were taken, and seals knocked on the head with clubs, but neither fish-hook nor fishing-net was known, and indeed swimming fish were taboo as food. Meat and vegetable food, such as fern-root, was broiled over the fire, but boiling in a vessel was unknown. The fire was produced by the ordinary savage fire-drill. Ignorant of agriculture, with no dwellings but rough huts or breakwinds of sticks and bark, without dogs or other domestic animals, these savages, until the coming of civilized man, roamed after food within their tribal bounds. Logs and clumsy floats of bark and grass enabled them to cross water under favourable circumstances. They had clothing of skins rudely stitched together with bark thread, and they were decorated with simple necklaces of kangaroo teeth, shells and berries. Among their simple arts, plaiting and basket-work was one in which they approached the civilized level. The pictorial art of the Tasmanians was poor and childish, quite below that of the Palaeolithic men of Europe. The Tasmanians spoke a fairly copious agglutinating language, well marked as to parts of speech, syntax and inflexion. Numeration was at a low level, based on counting fingers on one hand only, so that the word for man (*puggana*) stood also for the number 5. The religion of the Tasmanians, when cleared from ideas apparently learnt from the whites, was a simple form of animism based on the shadow (*warrawa*) being the soul or spirit. The strongest belief of the natives was in the power of the ghosts of the dead, so that they carried the bones of relatives to secure themselves from harm, and they fancied the forest swarming with malignant demons. They placed weapons near the grave for the dead friend's soul to use, and drove out disease from the sick by exorcising the ghost which was supposed to have caused it. Of greater special spirits of Nature we find something vaguely mentioned. The earliest recorders of the native social life set down such features as their previous experience of rude civilized life had made them judges of. They notice the self-denying affection of the mothers, and the hard treatment of the wives by the husbands, polygamy and the shifting marriage unions. But when we meet with a casual remark as to the tendency of the Tasmanians to take wives from other tribes than their own, it seems likely that they had some custom of exogamy which the foreigners did not understand. Meagre as is the information preserved of the arts, thoughts, and customs of these survivors from the lower Stone Age, it is of value as furnishing even a temporary and tentative means of working out the development of culture on a basis not of conjecture but of fact.

Conclusion.—To-day anthropology is grappling with the heavy task of systematizing the vast stores of knowledge to which the key was found by Boucher de Perthes, by Lartet, Christy and their successors. There have been recently no discoveries to rival in novelty those which followed the exploration of the bone-caves and drift-gravels, and which effected an instant revolution in all accepted theories of man's antiquity, substituting for a chronology of centuries a vague computation of hundreds of thousands of years. The existence of man in remote geological time cannot now be questioned, but, despite much effort made in likely localities, no bones, with the exception of those of the much-discussed *Pithecanthropus*, have been found which can be regarded as definitely bridging the gulf between man and the lower creation. It seems as if anthropology had in this direction reached the limits of its discoveries. Far different are the prospects in other directions where the work of co-ordinating the material and facts collected promises to throw much light on the history of civilization. Anthropological researches undertaken all over the globe have shown the necessity of abandoning the old theory that a similarity of customs and superstitions, of arts and crafts, justifies the assumption of a remote relationship, if not an identity of origin, between races. It is now certain that there has ever been an inherent tendency in man, allowing for difference of climate and material surroundings, to develop culture by the same stages and in the same way. American man, for example, need not necessarily owe the minutest portion of his mental, religious, social or industrial development to remote contact with Asia or Europe, though he were proved to possess identical usages. An example in point is that of pyramid-building. No ethnical relationship can ever have existed between the Aztecs and the Egyptians; yet each race developed the idea of the pyramid tomb through that psychological similarity which is as much a characteristic of the species man as is his physique.

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ANTHROPOMETRY (Gr. ἄνθρωπος, man, and μέτρον, measure), the name given by the French savant, Alphonse Bertillon (b. 1853), to a system of identification (*q.v.*) depending on the unchanging character of certain measurements of parts of the human frame. He found by patient inquiry that several physical features and the dimensions of certain bones or bony structures in the body remain practically constant during adult life. He concluded from this that when these measurements were made and recorded systematically every single individual would be found to be perfectly distinguishable from others. The system was soon adapted to police methods, as the immense value of being able to fix a person's identity was fully realized, both in preventing false personation and in bringing home to any one charged with an offence his responsibility for previous wrong-doing. "Bertillonage," as it was called, became widely popular, and after its introduction into France in 1883, where it was soon credited with highly gratifying results, was applied to the administration of justice in most civilized countries. England followed tardily, and it was not until 1894 that an investigation of the methods used and results obtained was made by a special committee sent to Paris for the purpose. It reported favourably, especially on the use of the measurements for primary classification, but recommended also the adoption in part of a system of "finger prints" as suggested by Francis Galton, and already practised in Bengal.

M. Bertillon selected the following five measurements as the basis of his system: (1) head length; (2) head breadth; (3) length of middle finger; (4) of left foot, and (5) of cubit or forearm from the elbow to the extremity of the middle finger. Each principal heading was further subdivided into three classes of "small," "medium" and "large," and as an increased guarantee height, length of little finger, and the colour of the eye were also recorded. From this great mass of details, soon represented in Paris by the collection of some 100,000 cards, it was possible, proceeding by exhaustion, to sift and sort down the cards till a small bundle of half a dozen produced the combined facts of the measurements of the individual last sought. The whole of the information is easily contained in one cabinet of very ordinary dimensions, and most ingeniously contrived so as to make the most of the space and facilitate the search. The whole of the record is independent of names, and the final identification is by means of the photograph which lies with the individual's card of measurements.

Anthropometry, however, gradually fell into disfavour, and it has been generally supplanted by the superior system of finger

prints (*q.v.*). Bertillonage exhibited certain defects which were first brought to light in Bengal. The objections raised were (1) the costliness of the instruments employed and their liability to get out of order; (2) the need for specially instructed measurers, men of superior education; (3) the errors that frequently crept in when carrying out the processes and were all but irremediable. Measures inaccurately taken, or wrongly read off, could seldom, if ever, be corrected, and these persistent errors defeated all chance of successful search. The process was slow, as it was necessary to repeat it three times so as to arrive at a mean result. In Bengal measurements were already abandoned by 1897, when the finger print system was adopted throughout British India. Three years later England followed suit; and as the result of a fresh inquiry ordered by the Home Office, finger prints were alone relied upon for identification.

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ANTHROPOMORPHISM (Gr. ἄνθρωπος, man, μορφή, form), the attribution (*a*) of a human body, or (*b*) of human qualities generally, to God or the gods. The word anthropomorphism is a modern coinage (possibly from 18th century French). The *New English Dictionary* is misled by the 1866 reprint of Paul Bayne on Ephesians when it quotes "anthropomorphist" as 17th century English. Seventeenth century editions print "anthropomorphits," *i.e.* anthropomorphites, in sense (*a*). The older abstract term is "anthropopathy," literally "attributing human feelings," in sense (*b*).

Early religion, among its many objects of worship, includes beasts (see ANIMAL-WORSHIP), considered, in the more refined theology of the later Greeks and Romans, as metamorphoses of the great gods. Similarly we find "therianthropic" forms—half animal, half human—in Egypt or Assyria-Babylonia. In contrast with these, it is considered one of the glories of the Olympian mythology of Greece that it believed in happy manlike beings (though exempt from death, and using special rarefied foods, &c.), and celebrated them in statues of the most exquisite art. Israel shows us animal images, doubtless of a ruder sort, when Yahweh is worshipped in the northern kingdom under the image of a steer. (Some scholars think the title "mighty one of Jacob," Psalm cxxxii., 2, 5, *et al.*, אַבִּיר as if from אָבַר, is really "steer" "of Jacob.") But the higher religion of Israel inclined to morality more than to art, and forbade image worship altogether. This prepared the way for the conception of God as an immaterial Spirit. True mythical anthropomorphisms occur in early parts of the Old Testament (*e.g.* Genesis iii. 8, cf. vi. 2), though in the majority of Old Testament passages such expressions are merely verbal (*e.g.* Isaiah lix. 1). In the Christian Church (and again in early Mahommedanism) simple minds believed in the corporeal nature of God. Gibbon and other writers quote from John Cassian the tale of the poor monk, who, being convinced of his error, burst into tears, exclaiming, "You have taken away my God! I have none now whom I can worship!" According to a fragment of Origen (on Genesis i. 26), Melito of Sardis shared this belief. Many have thought Melito's work, περὶ ἐνσωμάτου θεοῦ, must have been a treatise on the Incarnation; but it is hard to think that Origen could blunder so. Epiphanius tells of Audaeus of Mesopotamia and his followers, Puritan sectaries in the 4th century, who were orthodox except for this belief and for Quartodecimanism (see EASTER). Tertullian, who is sometimes called an anthropomorphist, stood for the Stoical doctrine, that all reality, even the divine, is in a sense material.

The reaction against anthropomorphism begins in Greek philosophy with the satirical spirit of Xenophanes (540 B.C.), who puts the case as broadly as any. The "greatest God" resembles man "neither in form nor in mind." In Judaism—unless we should refer to the prophets' polemic against images—a reaction is due to the introduction of the codified law. God seemed to grow more remote. The old sacred name Yahweh is never pronounced; even "God" is avoided for allusive titles like "heaven" or "place." Still, amid all this, the God of Judaism remains a personal, almost a limited, being. In Philo we see Jewish scruples uniting with others drawn from Greek philosophy. For, though the quarrel with popular anthropomorphism was patched up, and the gods of the Pantheon were described by Stoics and Epicureans as manlike in form, philosophy nevertheless tended to highly abstract conceptions of supreme, or real, deity. Philo followed out the line of this tradition in teaching that God cannot be named. How much exactly he meant is disputed. The same inheritance of Greek philosophy appears in the Christian fathers, especially Origen. He names and condemns the "anthropomorphites," who ascribe a human body to God (on Romans i., *sub fin.*; Rufinus' Latin version). In Arabian philosophy the reaction sought to deny that God had any attributes. And, under the influence of Mahommedan Aristotelianism, the same paralysing speculation found entrance among the learned Jews of Spain (see MAIMONIDES).

Till modern times the philosophical reaction was not carried out with full vigour. Spinoza (*Ethics*, i. 15 and 17), representing here as elsewhere both a Jewish inheritance and a philosophical, but advancing further, sweeps away all community between God and man. So later J. G. Fichte and Matthew Arnold ("a magnified and non-natural man"),—strangely, in view of their strong belief in an objective moral order. For the use of the *word* "anthropomorphic," or kindred forms, in this new spirit of condemnation for all conceptions of God as manlike—sense (*b*) noted above—see J. J. Rousseau in *Émile* iv. (cited by Littré),—*Nous sommes pour la plupart de vrais anthropomorphites.* Rousseau is here speaking of the language of Christian theology,—a divine Spirit: divine Persons. At the present day this usage is universal. What it means on the lips of pantheists is plain. But when theists charge one another with "anthropomorphism," in order to rebuke what they deem unduly manlike conceptions of God, they stand on slippery ground. All theism implies the assertion of kinship between man, especially in his moral being, and God. As a brilliant theologian, B. Duhm, has said, physiomorphism is the enemy of Christian faith, not anthropomorphism.

The latest extension of the word, proposed in the interests of philosophy or psychology, uses it of the principle according to which man is said to interpret all things (not God merely) through himself. Common-sense intuitionalism would deny that man does this, attributing to him immediate knowledge of reality. And idealism in all its forms would say that man, interpreting through his reason, does rightly, and reaches truth. Even here then the use of the word is not colourless. It implies blame. It is the symptom of a philosophy which confines knowledge within narrow limits, and which, when held by Christians (*e.g.* Peter Browne, or H. L. Mansel), believes only in an "analogical" knowledge of God. (R. MA.)

ANTI, or CAMPA, a tribe of South American Indians of Arawakan stock, inhabiting the forests of the upper Ucayali basin, east of Cuzco, on the eastern side of the Andes, south Peru. The Antis, who gave their name to the eastern province of Antisuyu, have always been notorious for ferocity and cannibalism. They are of fine physique and generally good-looking. Their dress is a robe with holes for the head and arms. Their long hair hangs down over the shoulders, and round their necks a toucan beak or a bunch of feathers is worn as an ornament.

ANTIBES, a seaport town in the French department of the Alpes-Maritimes (formerly in that of the Var, but transferred after the Alpes-Maritimes department was formed in 1860 out of the county of Nice). Pop. (1906) of the town, 5730; of the commune, 11,753. It is 12½ m. by rail S.W. of Nice, and is situated on the E. side of the Garoupe peninsula. It was formerly fortified, but all the ramparts (save the Fort Carré, built by Vauban) have now been demolished, and a new town is rising on their site. There is a tolerable harbour, with a considerable fishing industry. The principal exports are dried fruits, salt fish and oil. Much perfume distilling is done here, as the surrounding

country produces an abundance of flowers. Antibes is the ancient Antipolis. It is said to have been founded before the Christian era (perhaps about 340 B.C.) by colonists from Marseilles, and is mentioned by Strabo. It was the seat of a bishopric from the 5th century to 1244, when the see was transferred to Grasse.

(W. A. B. C.)

ANTICHRIST (ἀντίχριστος). The earliest mention of the name Antichrist, which was probably first coined in Christian eschatological literature, is in the Epistles of St John (I. ii. 18, 22, iv. 3; II. 7), and it has since come into universal use. The conception, paraphrased in this word, of a mighty ruler who will appear at the end of time, and whose essence will be enmity to God (Dan. xi. 36; cf. 2 Thess. ii. 4; ὁ ἀντικείμενος), is older, and traceable to Jewish eschatology. Its origin is to be sought in the first place in the prophecy of Daniel, written at the beginning of the Maccabean period. The historical figure who served as a model for the "Antichrist" was Antiochus IV. Epiphanes, the persecutor of the Jews, and he has impressed indelible traits upon the conception. Since then ever-recurring characteristics of this figure (cf. especially Dan xi. 40, &c.) are, that he would appear as a mighty ruler at the head of gigantic armies, that he would destroy three rulers (the three horns, Dan. vii. 8, 24), persecute the saints (vii. 25), rule for three and a half years (vii. 25, &c.), and subject the temple of God to a horrible devastation (βδέλυγμα τῆς ἐρημώσεως). When the end of the world foretold by Daniel did not take place, but the book of Daniel retained its validity as a sacred scripture which foretold future things, the personality of the tyrant who was God's enemy disengaged itself from that of Antiochus IV., and became merely a figure of prophecy, which was applied now to one and now to another historical phenomenon. Thus for the author of the *Psalms of Solomon* (*c.* 60 B.C.), Pompey, who destroyed the independent rule of the Maccabees and stormed Jerusalem, was the Adversary of God (cf. ii. 26, &c.); so too the tyrant whom the *Ascension of Moses* (*c.* A.D. 30) expects at the end of all things, possesses, besides the traits of Antiochus IV., those of Herod the Great. A further influence on the development of the eschatological imagination of the Jews was exercised by such a figure as that of the emperor Caligula (A.D. 37–41), who is known to have given the order, never carried out, to erect his statue in the temple of Jerusalem. In the little Jewish Apocalypse, the existence of which is assumed by many scholars, which in Mark xiii. and Matt. xxiv. is combined with the words of Christ to form the great eschatological discourse, the prophecy of the "abomination of desolation" (Mark xiii. 14 et seq.) may have originated in this episode of Jewish history. Later Jewish and Christian writers of Apocalypses saw in Nero the tyrant of the end of time. The author of the Syriac *Apocalypse of Baruch* (or his source), cap. 36-40, speaks in quite general terms of the last ruler of the end of time. In 4 Ezra v. 6 also is found the allusion: *regnabit quem non sperant.*

The roots of this eschatological fancy are to be sought perhaps still deeper in a purely mythological and speculative expectation of a battle at the end of days between God and the devil, which has no reference whatever to historical occurrences. This idea has its original source in the apocalypses of Iran, for these are based upon the conflict between Ahura-Mazda (Auramazda, Ormazd) and Añgrô-Mainyush (Ahriman) and its consummation at the end of the world. This Iranian dualism is proved to have penetrated into the late Jewish eschatology from the beginning of the 1st century before Christ, and did so probably still earlier. Thus the opposition between God and the devil already plays a part in the Jewish groundwork of the *Testaments of the Patriarchs*, which was perhaps composed at the end of the period of the Maccabees. In this the name of the devil appears, besides the usual form (σατανᾶς, διάβολος), especially as Belial (Beliar, probably, from Ps. xviii. 4, where the rivers of Belial are spoken of, originally a god of the underworld), a name which also plays a part in the Antichrist tradition. In the *Ascension of Moses* we already hear, at the beginning of the description of the latter time (x. 1): "And then will God's rule be made manifest over all his creatures, then will the devil have an end" (cf. Matt. xii. 28; Luke xi. 20; John xii. 31, xiv. 30, xvi. 11).[1] This conception of the strife of God with the devil was further interwoven, before its introduction into the Antichrist myth, with another idea of different origin, namely, the myth derived from the Babylonian religion, of the battle of the supreme God (Marduk) with the dragon of chaos (Tiamât), originally a myth of the origin of things which, later perhaps, was changed into an eschatological one, again under Iranian influence.[2] Thus it comes that the devil, the opponent of God, appears in the end often also in the form of a terrible dragon-monster; this appears most clearly in Rev. xii. Now it is possible that the whole conception of Antichrist has its final roots in this already complicated myth, that the form of the mighty adversary of God is but the equivalent in human form of the devil or of the dragon of chaos. In any case, however, this myth has exercised a formative influence on the conception of Antichrist. For only thus can we explain how his figure acquires numerous superhuman and ghostly traits, which cannot be explained by any particular historical phenomenon on which it may have been based. Thus the figure of Antiochus IV. has already become superhuman, when in Dan. viii. 10, it is said that the little horn "waxed great, even to the host of heaven; and cast down some of the host and of the stars to the ground." Similarly Pompey, in the second psalm of Solomon, is obviously represented as the dragon of chaos, and his figure exalted into myth. Without this assumption of a continual infusion of mythological conceptions, we cannot understand the figure of Antichrist. Finally, it must be mentioned that Antichrist receives, at least in the later sources, the name originally proper to the devil himself.[3]

From the Jews, Christianity took over the idea. It is present quite unaltered in certain passages, specifically traceable to Judaism, *e.g.* (Rev. xi.). "The Beast that ascendeth out of the bottomless pit" and, surrounded by a mighty host of nations, slays the "two witnesses" in Jerusalem, is the entirely superhuman Jewish conception of Antichrist. Even if the beast (ch. xiii.), which rises from the sea at the summons of the devil, be interpreted as the Roman empire, and, specially, as any particular Roman ruler, yet the original form of the malevolent tyrant of the latter time is completely preserved.

A fundamental change of the whole idea from the specifically Christian point of view, then, is signified by the conclusion of ch. ii. of the Second Epistle to the Thessalonians.[4] There can, of course, be no doubt as to the identity of the "man of sin, the son of perdition" here described with the dominating figure of Jewish eschatology (cf. ii. 3 &c., ὁ ἄνθρωπος τῆς ἀνομίας, *i.e.* Beliar (?), ὁ ἀντικείμενος—the allusion that follows to Dan xi. 36). But Antichrist here appears as a tempter, who works by signs and wonders (ii. 9) and seeks to obtain divine honours; it is further signified that this "man of sin" will obtain credence, more especially among the Jews, because they have not accepted the truth. The conception, moreover, has become almost more superhuman than ever (cf. ii. 4, "showing himself that he is God"). The destruction of the Adversary is drawn from Isaiah xi. 4, where it is said of the Messiah: "with the breath of his lips shall he slay the wicked."[5] The idea that Antichrist was to establish himself in the temple of Jerusalem (ii. 4) is very enigmatical, and has not yet been explained. The "abomination of desolation" has naturally had its influence upon it; possibly also the experience of the time of Caligula (see above). Remarkable also is the allusion to a power which

[1] See further, Bousset, *Religion des Judentums*, ed. ii. pp. 289 &c., 381 &c., 585 &c.

[2] See Gunkel, *Schöpfung und Chaos* (1893).

[3] It is, of course, uncertain whether this phenomenon already occurs in 2 Cor. vi. 15, since here Belial might still be Satan; cf. however, *Ascensio Jesaiae* iv. 2 &c.; *Sibyll.* iii. 63 &c., ii. 167 &c.

[4] It is not necessary to decide whether the epistle is by St Paul or by a pupil of Paul, although the former seems to the present writer to be by far the more probable, in spite of the brilliant attack on the genuineness of the epistle by Wrede in *Texte und Übersetzungen*, N.F. ix. 2.

[5] Cf. 2 Thess. ii. 8; the Targum also, in its comment on the passage of Isaiah, applies "the wicked" to Antichrist.

still retards the revelation of Antichrist (2 Thess. ii. 6 &c., *τὸ κατέχον*; *ὁ κατέχων*), an allusion which, in the tradition of the Fathers of the church, came to be universally, and probably correctly, referred to the Roman empire. In this then consists the significant turn given by St Paul in the Second Epistle to the Thessalonians to the whole conception, namely, in the substitution for the tyrant of the latter time who should persecute the Jewish people, of a pseudo-Messianic figure, who, establishing himself in the temple of God, should find credence and a following precisely among the Jews. And while the originally Jewish idea led straight to the conception, set forth in Revelation, of the Roman empire or its ruler as Antichrist, here, on the contrary, it is probably the Roman empire that is the power which still retards the reign of Antichrist. With this, the expectation of such an event at last separates itself from any connexion with historical fact, and becomes purely ideal. In this process of transformation of the idea, which has become of importance for the history of the world, is revealed probably the genius of Paul, or at any rate, that of the young Christianity which was breaking its ties with Judaism and establishing itself in the world of the Roman empire.

This version of the figure of Antichrist, who may now really for the first time be described by this name, appears to have been at once widely accepted in Christendom. The idea that the Jews would believe in Antichrist, as punishment for not having believed in the true Christ, seems to be expressed by the author of the fourth gospel (v. 43). The conception of Antichrist as a perverter of men, leads naturally to his connexion with false doctrine (1 John ii. 18, 22; iv. 3; 2 John 7). The *Teaching of the Apostles* (xvi. 4) describes his form in the same way as 2 Thessalonians (*καὶ τότε φανήσεται ὁ κοσμοπλάνος ὡς υἱὸς θεοῦ καὶ ποιεῖ σημεῖα καὶ τέρατα*). In the late Christian Sibylline fragment (iii. 63 &c.) also, " Beliar " appears above all as a worker of wonders, this figure having possibly been influenced by that of Simon Magus. Finally the author of the Apocalypse of St John also has made use of the new conception of Antichrist as a wonder-worker and seducer, and has set his figure beside that of the " first " Beast which was for him the actual embodiment of Antichrist (xiii. 11 &c.). Since this second Beast could not appear along with the first as a power demanding worship and directly playing the part of Antichrist, he made out of him the false prophet (xvi. 13, xix. 20, xx. 10) who seduces the inhabitants of the earth to worship the first Beast, and probably interpreted this figure as applying to the Roman provincial priesthood.[1]

But this version of the idea of Antichrist, hostile to the Jews and better expressing the relation of Christianity to the Roman empire, was prevented from obtaining an absolute ascendancy in Christian tradition by the rise of the belief in the ultimate return of Nero, and by the absorption of this outcome of pagan superstition into the Jewish-Christian apocalyptic conceptions. It is known that soon after the death of Nero rumours were current that he was not dead. This report soon took the more concrete form that he had fled to the Parthians and would return thence to take vengeance on Rome. This expectation led to the appearance of several pretenders who posed as Nero; and as late as A.D. 100 many still held the belief that Nero yet lived.[2] This idea of Nero's return was in the first instance taken up by the Jewish apocalyptic writers. While the Jewish author of the fourth Sibylline book (*c.* A.D. 80) still only refers simply to the heathen belief, the author of the (Jewish?) original of the 17th chapter of the Apocalypse of St John expects the return of Nero with the Parthians to take vengeance on Rome, because she had shed the blood of the Saints (destruction of Jerusalem!). In the fifth Sibylline book, which, with the exception of verses 1-51, was mainly composed by a Jewish writer at the close of the first century, the return of Nero plays a great part. Three times the author recurs to this theme, 137-154; 214-227; 361-385. He sees in the coming again of Nero, whose figure he endows with supernatural and daemonic characteristics, a judgment of God, in whose hand the revivified Nero becomes a rod of chastisement. Later, the figure of Nero *redivivus* became, more especially in Christian thought, entirely confused with that of Antichrist. The less it became possible, as time went on, to believe that Nero yet lived and would return as a living ruler, the greater was the tendency for his figure to develop into one wholly infernal and daemonic. The relation to the Parthians is also gradually lost sight of; and from being the adversary of Rome, Nero becomes the adversary of God and of Christ. This is the version of the expectation of Nero's second coming preserved in the form given to the prophecy, under Domitian, by the collaborator in the Apocalypse of John (xiii., xvii.). Nero is here the beast that returns from the bottomless pit, "that was, and is not, and yet is"; the head "as it were wounded to death" that lives again; the gruesome similitude of the Lamb that was slain, and his adversary in the final struggle. The number of the Beast, 666, points certainly to Nero (קסר נרון=666, or נרו קסר=616). In the little apocalypse of the *Ascensio Jesaiae* (iii. 13b–iv. 18), which dates perhaps from the second, perhaps only from the first, decade of the third century,[3] it is said that Beliar, the king of this world, would descend from the firmament in the human form of Nero. In the same way, in *Sibyll.* v. 28-34, Nero and Antichrist are absolutely identical (mostly obscure reminiscences, *Sib.* viii. 68 &c., 140 &c., 151 &c.). Then the Nero-legend gradually fades away. But Victorinus of Pettau, who wrote during the persecution under Diocletian, still knows the relation of the Apocalypse to the legend of Nero; and Commodian, whose *Carmen Apologeticum* was perhaps not written until the beginning of the 4th century, knows two Antichrist-figures, of which he still identifies the first with Nero *redivivus*.

In proportion as the figure of Nero again ceased to dominate the imagination of the faithful, the wholly unhistorical, unpolitical and anti-Jewish conception of Antichrist, which based itself more especially on 2 Thess. ii., gained the upper hand, having usually become associated with the description of the universal conflagration of the world which had also originated in the Iranian eschatology. On the strength of exegetical combinations, and with the assistance of various traditions, it was developed even in its details, which it thenceforth maintained practically unchanged. In this form it is in great part present in the eschatological portions of the *Adv. Haereses* of Irenaeus, and in the *de Antichristo* and commentary on Daniel of Hippolytus. In times of political excitement, during the following centuries, men appealed again and again to the prophecy of Antichrist. Then the foreground scenery of the prophecies was shifted; special prophecies, having reference to contemporary events, are pushed to the front, but in the background remains standing, with scarcely a change, the prophecy of Antichrist that is bound up with no particular time. Thus at the beginning of the *Testamentum Domini*, edited by Rahmani, there is an apocalypse, possibly of the time of Decius, though it has been worked over (Harnack, *Chronol. der altchrist. Litt.* ii. 514 &c.). In the third century, the period of Aurelianus and Gallienus, with its wild warfare of Romans and Persians, and of Roman pretenders one with another, seems especially to have aroused the spirit of prophecy. To this period belongs the Jewish apocalypse of Elijah (ed. Buttenwieser), of which the Antichrist is possibly Odaenathus of Palmyra, while *Sibyll.* xiii., a Christian writing of this period, glorifies this very prince. It is possible that at this time also the Sibylline fragment (iii. 63 &c.) and the Christian recension of the two first Sibylline books were written.[4] To this time possibly belongs also a recension of the Coptic apocalypse of Elijah, edited by Steindorff (*Texte und Untersuchungen*, N. F. ii. 3). To the 4th century belongs, according to Kamper (*Die deutsche Kaiseridee*, 1896, p. 18) and Sackur (*Texte und Forschungen*, 1898, p. 114 &c.), the first nucleus of the " Tiburtine " Sibyl, very celebrated in the middle ages, with its prophecy of the return of

[1] See Bousset, *Kommentar zur Offenbarung Johannis*, on these passages.

[2] *Ibid.* ch. xvii.; and Charles, *Ascension of Isaiah*, lvii. sq.

[3] Harnack, *Chronologie der altchristlichen Literatur*, i. 573.

[4] See Bousset, in Herzog-Hauck, *Realencyklop. für Theologie und Kirche* (ed. 3), xviii. 273 &c.

Constans, and its dream, which later on exercised so much influence, that after ruling over the whole world he would go to Jerusalem and lay down his crown upon Golgotha. To the 4th century also perhaps belongs a series of apocalyptic pieces and homilies which have been handed down under the name of Ephraem. At the beginning of the Mahommedan period, then, we meet with the most influential and the most curious of these prophetic books, the *Pseudo-Methodius*,[1] which prophesied of the emperor who would awake from his sleep and conquer Islam. From the *Pseudo-Methodius* are derived innumerable Byzantine prophecies (cf. especially Vassiliev, *Anecdota Graeco-Byzantina*) which follow the fortunes of the Byzantine emperors and their governments. A prophecy in verse, adorned with pictures, which is ascribed to Leo VI. the Philosopher (Migne, *Patr. Graeca*, cvii. p. 1121 &c.), tells of the downfall of the house of the Comneni and sings of the emperor of the future who would one day awake from death and go forth from the cave in which he had lain. Thus the prophecy of the sleeping emperor of the future is very closely connected with the Antichrist tradition. There is extant a Daniel prophecy which, in the time of the Latin empire, foretells the restoration of the Greek rule.[2] In the East, too, Antichrist prophecies were extraordinarily flourishing during the period of the rise of Islam and of the Crusades. To these belong the apocalypses in Arabic, Ethiopian and perhaps also in Syrian, preserved in the so-called *Liber Clementis discipuli S. Petri* (*Petri apostoli apocalypsis per Clementem*), the late Syrian apocalypse of Ezra (Bousset, *Antichrist*, 45 &c.), the Coptic (14th) vision of Daniel (in the appendix to Woide's edition of the *Codex Alexandrinus*; Oxford, 1799), the Ethiopian *Wisdom of the Sibyl*, which is closely related to the Tiburtine Sibyl (see Basset, *Apocryphes éthiopiennes*, x.); in the last mentioned of these sources long series of Islamic rulers are foretold before the final time of Antichrist. Jewish apocalypse also awakes to fresh developments in the Mahommedan period, and shows a close relationship with the Christian Antichrist literature. One of the most interesting apocalypses is the Jewish *History of Daniel*, handed down in Persian.[3]

This whole type of prophecy reached the West above all through the *Pseudo-Methodius*, which was soon translated into Latin. Especially influential, too, in this respect was the letter which the monk Adso in 954 wrote to Queen Gerberga, *De ortu et tempore Antichristi*. The old Tiburtine Sibylla went through edition after edition, in each case being altered so as to apply to the government of the monarch who happened to be ruling at the time. Then in the West the period arrived in which eschatology, and above all the expectation of the coming of Antichrist, exercised a great influence on the world's history. This period, as is well known, was inaugurated, at the end of the 12th century, by the apocalyptic writings of the abbot Joachim of Floris. Soon the word Antichrist re-echoed from all sides in the embittered controversies of the West. The pope bestowed this title upon the emperor, the emperor upon the pope, the Guelphs on the Ghibellines and the Ghibellines on the Guelphs. In the contests between the rival powers and courts of the period, the prophecy of Antichrist played a political part. It gave motives to art, to lyrical, epic and dramatic poetry.[4] Among the visionary Franciscans, enthusiastic adherents of Joachim's prophecies, arose above all the conviction that the pope was Antichrist, or at least his precursor. From the Franciscans, influenced by Abbot Joachim, the lines of connexion are clearly traceable with Milič of Kremsier (*Libellus de Antichristo*) and Matthias of Janow. For Wycliffe and his adherent John Purvey (probably the author of the *Commentarius in Apocalypsin ante centum annos editus*, edited in 1528 by Luther), as on the other hand for Hus, the conviction that the papacy is essentially Antichrist is absolute. Finally, if Luther advanced in his contest with the papacy with greater and greater energy, he did so because he was borne on by the conviction that the pope in Rome was Antichrist. And if in the *Augustana* the expression of this conviction was suppressed for political reasons, in the Articles of Schmalkalden, drawn up by him, Luther propounded it in the most uncompromising fashion. This sentence was for him an *articulus stantis et cadentis ecclesiae*. To write the history of the idea of Antichrist in the last centuries of the middle ages, would be almost to write that of the middle ages themselves.

[1] Latin text by Sackur, cf. *op. cit.* 1 &c.; Greek text by V. Istrin.
[2] See Bousset, *Zeitschrift für Kirchengeschichte*, xx. p. 289 &c.
[3] Published in Merx, *Archiv zur Erforschung des Alten Testament*.
[4] See especially the *Ludus de Antichristo*, ed. W. Meyer.

Authorities.—See, for the progress of the idea in Jewish and New Testament times, the modern commentaries on Revelation and the 2nd Epistle to the Thessalonians; Bousset, *Antichrist* (1895), and the article "Antichrist" in the *Encyclop. Biblica*; R. H. Charles, *Ascension of Isaiah*, Introduction, li.-lxxiii. For the history of the legend of Nero, see J. Geffcken, *Nachrichten der Göttinger Gesellschaft der Wissenschaft* (1899), p. 446 &c.; Th. Zahn, *Zeitschrift für kirchliche Wissenschaft und kirchliches Leben* (1886), p. 337 &c.; Bousset, *Kritisch-exegetisches Kommentar zur Offenbarung Johannis*, cap. 17, and the article "Sibyllen" in Herzog-Hauck, *Realencyklopädie für Theologie und Kirche* (3rd ed.), xviii. 265 &c.; Nordmeyer, *Der Tod Neros in der Legende*, a *Festschrift* of the Gymnasium of Moos. For the later history of the legend, see Bousset, *Antichrist*, where will be found a more detailed discussion of nearly all the sources named; Bousset, "Beiträge zur Geschichte der Eschatologie," in *Zeitschrift für Kirchengeschichte*, xx. 2, and especially xx. 3, on the later Byzantine prophecies; Vassiliev, *Anecdota Graeco-Byzantina*, i. (Moscow, 1893), which gives the texts of a series of Byzantine prophecies; E. Sackur, *Sibyllinische Texte und Forschungen* (1898), containing (1) *Pseudo-Methodius*, Latin text, (2) *Epistola Adsonis*, (3) the *Tiburtine Sibylla*; V. Istrin, *The Apocalypse of Methodius of Patara and the Apocryphal Visions of Daniel in Byzantine and Slavo-Russian Literature*, Russian (Moscow, 1897); J. Kampers, *Die deutsche Kaiseridee in Prophetie und Sage* (Munich, 1896), and "Alexander der Grosse und die Idee des Weltimperiums," in H. Grauert's *Studien und Darstellungen aus dem Gebiet der Geschichte*, vol. i. 2-3 (Freiburg, 1901); E. Wadstein, *Die eschatologische Ideengruppe, Antichrist, Weltsabbat, Weltende und Weltgericht* (Leipzig, 1896), which contains excellent material for the history of the idea in the West during the middle ages; W Meyer, "Ludus de Antichristo," in *Sitzbericht der Münchener Akad.* (Phil. hist. Klasse 1882, H. i.); Kropatschek, *Das Schriftprincip der lutherischen Kirche*, i. 247 &c. (Leipzig, 1904); H. Preuss, *Die Vorstellungen vom Antichrist im späteren Mittelalter, bei Luther u. i. d. Konfessionellen Polemik* (Leipzig, 1906). (W. Bo.)

ANTICLIMAX (*i.e.* the opposite to "climax"), in rhetoric, an abrupt declension (either deliberate or unintended) on the part of a speaker or writer from the dignity of idea which he appeared to be aiming at; as in the following well-known distich:—

"The great Dalhousie, he, the god of war,
Lieutenant-colonel to the earl of Mar."

An anticlimax can be intentionally employed only for a jocular or satiric purpose. It frequently partakes of the nature of antithesis, as—

"Die and endow a *college* or a *cat*."

It is often difficult to distinguish between "anticlimax" and "bathos"; but the former is more decidedly a relative term. A whole speech may never rise above the level of bathos; but a climax of greater or less elevation is the necessary antecedent of an anticlimax.

ANTICOSTI, an island of the province of Quebec, Canada, situated in the Gulf of St Lawrence, between 49° and 50° N., and between 61° 40′ and 64° 30′ W., with a length of 135 m. and a breadth of 30 m. Population 250, consisting chiefly of the keepers of the numerous lighthouses erected by the Canadian government. The coast is dangerous, and the only two harbours, Ellis Bay and Fox Bay, are very indifferent. Anticosti was sighted by Jacques Cartier in 1534, and named Assomption. In 1763 it was ceded by France to Britain, and in 1774 became part of Canada. Wild animals, especially bears, are numerous, but prior to 1896 the fish and game had been almost exterminated by indiscriminate slaughter. In that year Anticosti and the shore fisheries were leased to M. Menier, the French chocolate manufacturer, who converted the island into a game preserve, and attempted to develop its resources of lumber, peat and minerals.

See Logan, *Geological Survey of Canada, Report of Progress from its Commencement to 1863* (Montreal, 1863–1865); E. Billings, *Geological Survey of Canada: Catalogue of the Silurian Fossils of Anticosti* (Montreal, 1866); J. Schmitt, *Anticosti* (Paris, 1904).

ANTICYCLONE (*i.e.* opposite to a cyclone), an atmospheric system in which there is a descending movement of the air and a relative increase in barometric pressure over the part of the earth's surface affected by it. At the surface the air tends to flow outwards in all directions from the central area of high pressure, and is deflected on account of the earth's rotation (see FERREL'S LAW) so as to give a spiral movement in the direction of the hands of a watch face upwards in the northern hemisphere, against that direction in the southern hemisphere. Since the air in an anticyclone is descending, it becomes warmed and dried, and therefore transmits radiation freely whether from the sun to the earth or from the earth into space. Hence in winter anticyclonic weather is characterized by clear air with periods of frost, causing fogs in towns and low-lying damp areas, and in summer by still cloudless days with gentle variable airs and fine weather.

ANTICYRA, the ancient name of three cities of Greece. (1) (Mod. *Asprospitia*), in Phocis, on the bay of Anticyra, in the Corinthian gulf; some remains are still visible. It was a town of considerable importance in ancient times; was destroyed by Philip of Macedon; recovered its prosperity; and was captured by T. Quinctius Flamininus in 198 B.C. The city was famous for its black hellebore, a herb which was regarded as a cure for insanity. This circumstance gave rise to a number of proverbial expressions, like Ἀντικύρας σε δεῖ or "naviget Anticyram," and to frequent allusions in the Greek and Latin writers. Hellebore was likewise considered beneficial in cases of gout and epilepsy. (2) In Thessaly, on the right bank of the river Spercheus, near its mouth. (3) In Locris, on the north side of the entrance to the Corinthian gulf, near Naupactus.

ANTIETAM, the name of a Maryland creek, near which, on the 16th–17th of September 1862, was fought the battle of Antietam or Sharpsburg (see AMERICAN CIVIL WAR), between the Federals under McClellan and the Confederates commanded by Lee. General McClellan had captured the passes of South Mountain farther east on the 14th, and his Army of the Potomac marched to meet Lee's forces which, hitherto divided, had, by the 16th, successfully concentrated between the Antietam and the Potomac. The Confederate Army of Northern Virginia occupied a position which, in relation to the surrounding country, may be compared to the string of a bow in the act of being drawn, Lee's left wing forming the upper half of the string, his right the lower, and the Potomac in his rear the bow itself. The town of Sharpsburg represents the fingers of the archer drawing the bow. The right wing of the position was covered by the Antietam as it approaches the Potomac, the upper course of that stream formed no part of the battlefield. Generals Longstreet and Jackson commanded the right and left wings. The division of A. P. Hill was at Harper's Ferry, but had received orders to rejoin Lee. McClellan's troops appeared late on the 16th, and Hooker was immediately sent across the upper Antietam. He had a sharp fight with Jackson's men, but night soon put an end to the contest. Early on the 19th the corps of Sumner and Mansfield followed Hooker across the upper stream whilst McClellan's left wing (Burnside's corps) drew up opposite Lee's extreme right. The Federal leader intended to hold back his centre whilst these two forces were rolling up Lee's wings. The battle began with a furious assault on the extreme right by Hooker's corps. After a very severe struggle he was repulsed with the loss of a quarter of his men, Jackson's divisions suffering even more severely and losing nearly all their generals and colonels. It was only the arrival of Hood and D. H. Hill which enabled Stonewall Jackson's corps to hold its ground, and had the other Federal corps been at hand to support Hooker the result might have been very different. Mansfield next attacked farther to the left and with better fortune. Mansfield was killed, but his successor led the corps well, and after heavy fighting Hood and D. H. Hill were driven back. Again want of support checked the Federals and the fight became stationary, both sides losing many men. Sumner now came into action, and overhaste involved him in a catastrophe, his troops being attacked in front and flank and driven back in great confusion with nearly half their number killed and wounded; and their retreat involved the gallant remnants of Mansfield's corps. Soon afterwards the Federal divisions of French and Richardson attacked D. H. Hill, whose men were now exhausted by continuous fighting. Here occurred the fighting in the "Bloody Lane," north of Sharpsburg which French and Richardson eventually carried. Opposed as they were by D. H. Hill, whose men had fought the battle of South Mountain and had already been three times engaged *à fond* on this day, proper support must have enabled the Federals to crush Lee's centre, but Franklin and Porter in reserve were not allowed by McClellan to move forward and the opportunity passed. Burnside, on the southern wing, had received his orders late, and acted on them still later. The battle was over on the right before he fired a shot, and Lee had been able to use nearly all his right wing troops to support Jackson. At last Burnside moved forward, and, after a brilliant defence by the handful of men left to oppose him, forced the Antietam and began to roll up Lee's right, only to be attacked in rear himself by A. P. Hill's troops newly arrived from Harper's Ferry. The repulse of Burnside ended the battle. Pressure was brought to bear on McClellan to renew the fight, but he refused and Lee retired across the Potomac unmolested. The Army of the Potomac had lost 11,832 men out of 46,000 engaged; the cavalry and two corps in reserve had only lost 578. Lee's 31,200 men lost over 8000 of their number.

See the bibliography appended to AMERICAN CIVIL WAR, and also General Palfrey's *Antietam and Fredericksburg*.

ANTI-FEDERALISTS, the name given in the political history of the United States to those who, after the formation of the federal Constitution of 1787, opposed its ratification by the people of the several states. The "party" (though it was never regularly organized as such) was composed of statesrights, particularistic, individualistic and radical democratic elements; that is, of those persons who thought that a stronger government threatened the sovereignty and prestige of the states, or the special interests, individual or commercial, of localities, or the liberties of individuals, or who fancied they saw in the government proposed a new centralized, disguised "monarchic" power that would only replace the cast-off despotism of Great Britain. In every state the opposition to the Constitution was strong, and in two—North Carolina and Rhode Island—it prevented ratification until the definite establishment of the new government practically forced their adhesion. The individualistic was the strongest element of opposition; the necessity, or at least the desirability, of a bill of rights was almost universally felt. Instead of accepting the Constitution upon the condition of amendments,—in which way they might very likely have secured large concessions,—the Anti-Federalists stood for unconditional rejection, and public opinion, which went against them, proved that for all its shortcomings the Constitution was regarded as preferable to the Articles of Confederation. After the inauguration of the new government, the composition of the Anti-Federalist party changed. The Federalist (*q.v.*) party gradually showed broad-construction, nationalistic tendencies; the Anti-Federalist party became a strict-construction party and advocated popular rights against the asserted aristocratic, centralizing tendencies of its opponent, and gradually was transformed into the Democratic-Republican party, mustered and led by Thomas Jefferson, who, however, had approved the ratification of the Constitution and was not, therefore, an Anti-Federalist in the original sense of that term.

See O. G. Libby, *Geographical Distribution of the Vote . . . on the Federal Constitution, 1787–1788* (University of Wisconsin, Bulletin, 1894); S. B. Harding, *Contest over the Ratification of the Federol Constitution in . . . Massachusetts* (Harvard University Studies, New York, 1896); and authorities on political and constitutional history in the article UNITED STATES.

ANTIGO, a city and the county-seat of Langlade county, Wisconsin, U.S.A., about 160 m. N.W. of Milwaukee. Pop. (1890) 4424; (1900) 5145, of whom 965 were foreign-born; (1905) 6663; (1910) 7196. It is served by the Chicago & North Western railway. Antigo is the centre of a good farming and lumbering district, and its manufactures consist principally of

lumber, chairs, furniture, sashes, doors and blinds, hubs and spokes, and other wood products. The city has a Carnegie library. Antigo was first settled in 1880, and was chartered as a city in 1885. Its name is said to be part of an Indian word, *neequee-antigo-sebi*, meaning "evergreen."

ANTIGONE, (1) in Greek legend, daughter of Oedipus and Iocaste (Jocasta), or, according to the older story, of Euryganeia. When her father, on discovering that Iocaste, the mother of his children, was also his own mother, put his eyes out and resigned the throne of Thebes, she accompanied him into exile at Colonus. After his death she returned to Thebes, where Haemon, the son of Creon, king of Thebes, became enamoured of her. When her brothers Eteocles and Polyneices had slain each other in single combat, she buried Polyneices, although Creon had forbidden it. As a punishment she was sentenced to be buried alive in a vault, where she hanged herself, and Haemon killed himself in despair. Her character and these incidents of her life presented an attractive subject to the Greek tragic poets, especially Sophocles in the *Antigone* and *Oedipus at Colonus*, and Euripides, whose *Antigone*, though now lost, is partly known from extracts incidentally preserved in later writers, and from passages in his *Phoenissae*. In the order of the events, at least, Sophocles departed from the original legend, according to which the burial of Polyneices took place while Oedipus was yet in Thebes, not after he had died at Colonus. Again, in regard to Antigone's tragic end Sophocles differs from Euripides, according to whom the calamity was averted by the intercession of Dionysus and was followed by the marriage of Antigone and Haemon. In Hyginus's version of the legend, founded apparently on a tragedy by some follower of Euripides, Antigone, on being handed over by Creon to her lover Haemon to be slain, was secretly carried off by him, and concealed in a shepherd's hut, where she bore him a son Maeon. When the boy grew up, he went to some funeral games at Thebes, and was recognized by the mark of a dragon on his body. This led to the discovery that Antigone was still alive. Heracles pleaded in vain with Creon for Haemon, who slew both Antigone and himself, to escape his father's vengeance. On a painted vase the scene of the intercession of Heracles is represented (Heydermann, *Über eine nacheuripideische Antigone*, 1868). Antigone placing the body of Polyneices on the funeral pile occurs on a sarcophagus in the villa Pamfili in Rome, and is mentioned in the description of an ancient painting by Philostratus (*Imag.* ii. 29), who states that the flames consuming the two brothers burnt apart, indicating their unalterable hatred, even in death.

(2) A second Antigone was the daughter of Eurytion, king of Phthia, and wife of Peleus. Her husband, having accidentally killed Eurytion in the Calydonian boar hunt, fled and obtained expiation from Acastus, whose wife made advances to Peleus. Finding that her affection was not returned, she falsely accused Peleus of infidelity to his wife, who thereupon hanged herself (Apollodorus, iii. 13).

ANTIGONUS CYCLOPS (or MONOPTHALMOS; so called from his having lost an eye) (382–301 B.C.), Macedonian king, son of Philip, was one of the generals of Alexander the Great. He was made governor of Greater Phrygia in 333, and in the division of the provinces after Alexander's death (323) Pamphylia and Lycia were added to his command. He incurred the enmity of Perdiccas, the regent, by refusing to assist Eumenes (*q.v.*) to obtain possession of the provinces allotted to him. In danger of his life he escaped with his son Demetrius into Greece, where he obtained the favour of Antipater, regent of Macedonia (321); and when, soon after, on the death of Perdiccas, a new division took place, he was entrusted with the command of the war against Eumenes, who had joined Perdiccas against the coalition of Antipater, Antigonus, and the other generals. Eumenes was completely defeated, and obliged to retire to Nora in Cappadocia, and a new army that was marching to his relief was routed by Antigonus. Polyperchon succeeding Antipater (d. 319) in the regency, to the exclusion of Cassander, his son, Antigonus resolved to set himself up as lord of all Asia, and in conjunction with Cassander and Ptolemy of Egypt, refused to recognize Polyperchon. He entered into negotiations with Eumenes; but Eumenes remained faithful to the royal house. Effecting his escape from Nora, he raised an army, and formed a coalition with the satraps of the eastern provinces. He was at last delivered up to Antigonus through treachery in Persia and put to death (316). Antigonus again claimed authority over the whole of Asia, seized the treasures at Susa, and entered Babylonia, of which Seleucus was governor. Seleucus fled to Ptolemy, and entered into a league with him (315), together with Lysimachus and Cassander. After the war had been carried on with varying success from 315 to 311, peace was concluded, by which the government of Asia Minor and Syria was provisionally secured to Antigonus. This agreement was soon violated on the pretext that garrisons had been placed in some of the free Greek cities by Antigonus, and Ptolemy and Cassander renewed hostilities against him. Demetrius Poliorcetes, the son of Antigonus, wrested part of Greece from Cassander. At first Ptolemy had made a successful descent upon Asia Minor and on several of the islands of the Archipelago; but he was at length totally defeated by Demetrius in a naval engagement off Salamis, in Cyprus (306). On this victory Antigonus assumed the title of king, and bestowed the same upon his son, a declaration that he claimed to be the heir of Alexander. Antigonus now prepared a large army, and a formidable fleet, the command of which he gave to Demetrius, and hastened to attack Ptolemy in his own dominions. His invasion of Egypt, however, proved a failure; he was unable to penetrate the defences of Ptolemy, and was obliged to retire. Demetrius now attempted the reduction of Rhodes, which had refused to assist Antigonus against Egypt; but, meeting with obstinate resistance, he was obliged to make a treaty upon the best terms that he could (304). In 302, although Demetrius was again winning success after success in Greece, Antigonus was obliged to recall him to meet the confederacy that had been formed between Cassander, Seleucus and Lysimachus. A decisive battle was fought at Ipsus, in which Antigonus fell, in the eighty-first year of his age.

Diodorus Siculus xviii., xx. 46-86; Plutarch, *Demetrius*, *Eumenes*; Nepos, *Eumenes*; Justin xv. 1-4. See MACEDONIAN EMPIRE; and Köhler, "Das Reich des Antigonos," in the *Sitzungsberichte d. Berl. Akad.*, 1898, p. 835 f.

ANTIGONUS GONATAS (*c.* 319–239 B.C.), Macedonian king, was the son of Demetrius Poliorcetes, and grandson of Antigonus Cyclops. On the death of his father (283), he assumed the title of king of Macedonia, but did not obtain possession of the throne till 276, after it had been successively in the hands of Pyrrhus, Lysimachus, Seleucus, and Ptolemy Ceraunus. Antigonus repelled the invasion of the Gauls, and continued in undisputed possession of Macedonia till 274, when Pyrrhus returned from Italy, and (in 273) made himself master of nearly all the country. On the advance of Pyrrhus into Peloponnesus, he recovered his dominions. He was again (between 263 and 255) driven out of his kingdom by Alexander, the son of Pyrrhus, and again recovered it. The latter part of his reign was comparatively peaceful, and he gained the affection of his subjects by his honesty and his cultivation of the arts. He gathered round him distinguished literary men—philosophers, poets, and historians. He died in the eightieth year of his age, and the forty-fourth of his reign. His surname was usually derived by later Greek writers from the name of his supposed birthplace, Gonni (Gonnus) in Thessaly; some take it to be a Macedonian word signifying an iron plate for protecting the knee; neither conjecture is a happy one, and in our ignorance of the Macedonian language it must remain unexplained.

Plutarch, *Demetrius*, *Pyrrhus*, *Aratus*; Justin xxiv. 1; xxv. 1-3; Polybius ii. 43-45, ix. 29, 34. See Thirlwall, *History of Greece*, vol. viii. (1847); Holm, *Griech. Gesch.* vol. iv. (1894); Niese, *Gesch. d. griech. u. maked. Staaten*, vols. i. and ii. (1893, 1899); Beloch, *Griech. Gesch.* vol. iii. (1904); also Wilamowitz-Moellendorff, *Antigonos von Karystos* (1881).

ANTIGONUS OF CARYSTUS (in Euboea), Greek writer on various subjects, flourished in the 3rd century B.C. After some time spent at Athens and in travelling, he was summoned to the court of Attalus I. (241–197) of Pergamum. His chief work was the *Lives of Philosophers* drawn from personal knowledge, of which considerable fragments are preserved in Athenaeus

and Diogenes Laertius. We still possess his *Collection of Wonderful Tales*, chiefly extracted from the Θαυμάσια Ἀκούσματα attributed to Aristotle and the Θαυμάσια of Callimachus. It is doubtful whether he is identical with the sculptor who, according to Pliny (*Nat. Hist.* xxxiv. 19), wrote books on his art.

Text in Keller, *Rerum Naturalium Scriptores Graeci Minores*, i. (1877); see Köpke, *De Antigono Carystio* (1862); Wilamowitz-Möllendorff, "A. von Karystos," in *Philologische Untersuchungen*, iv. (1881).

ANTIGUA, an island in the British West Indies, forming, with Barbuda and Redonda, one of the five presidencies in the colony of the Leeward Islands. It lies 50 m. E. of St Kitts, in 17° 6′ N. and 61° 45′ W., and is 54 m. in circumference, with an area of 108 sq. m. The surface is comparatively flat, and there is no central range of mountains as in most other West Indian islands, but among the hills in the south-west an elevation of 1328 ft. is attained. Owing to the absence of rivers, the paucity of springs, and the almost complete deforestation, Antigua is subject to frequent droughts, and although the average rainfall is 45·6 in., the variations from year to year are great. The dryness of the air proves very beneficial to persons suffering from pulmonary complaints. The high rocky coast is much indented by bays and arms of the sea, several of which form excellent harbours, that of St John being safe and commodious, but inferior to English Harbour, which, although little frequented, is capable of receiving vessels of the largest size. The soil, especially in the interior, is very fertile. Sugar and pineapples are the chief products for export, but sweet potatoes, yams, maize and guinea corn are grown for local consumption. Antigua is the residence of the governor of the Leeward Islands, and the meeting place of the general legislative council, but there is also a local legislative council of 16 members, half official and half unofficial. Until 1898, when the Crown Colony system was adopted, the legislative council was partly elected, partly nominated. Elementary education is compulsory. Agricultural training is given under government control, and the Cambridge local examinations and those of the University of London are held annually. Antigua is the see of a bishop of the Church of England, the members of which predominate here, but Moravians and Wesleyans are numerous. There is a small volunteer defence force. The island has direct steam communication with Great Britain, the United States and Canada, and is also served by the submarine cable. The three chief towns are St John, Falmouth and Parham. St John (pop. about 10,000), the capital, situated on the north-west, is an exceedingly picturesque town, built on an eminence overlooking one of the most beautiful harbours in the West Indies. Although both Falmouth and Parham have good harbours, most of the produce of the island finds its way to St John for shipment. The trade is chiefly with the United States, and the main exports are sugar, molasses, logwood, tamarinds, turtles, and pineapples. The cultivation of cotton has been introduced with success, and this also is exported. The dependent islands of Barbuda and Redonda have an area of 62 sq. m. Pop. of Antigua (1901), 34,178; of the presidency, 35,073.

Antigua was discovered in 1493 by Columbus, who is said to have named it after a church in Seville, called Santa Maria la Antigua. It remained, however, uninhabited until 1632, when a body of English settlers took possession of it, and in 1663 another settlement of the same nation was effected under the direction of Lord Willoughby, to whom the entire island was granted by Charles II. It was ravaged by the French in 1666, but was soon after reconquered by the British and formally restored to them by the treaty of Breda. Since then it has been a British possession.

ANTILEGOMENA (ἀντιλεγόμενα, contradicted or disputed), an epithet used by the early Christian writers to denote those books of the New Testament which, although sometimes publicly read in the churches, were not for a considerable time admitted to be genuine, or received into the canon of Scripture. They were thus contrasted with the *Homologoumena*, or universally acknowledged writings. Eusebius (*Hist. Eccl.* iii. 25) applies the term *Antilegomena* to the Epistle of James, the Epistle of Jude, 2 Peter, 2 and 3 John, the Acts of Paul, the Shepherd of Hermas, the Teaching of the Apostles, the Apocalypse of John, and the Gospel according to the Hebrews. In later usage it describes those of the New Testament books which have obtained a doubtful place in the Canon. These are the Epistles of James and Jude, 2 Peter, 2 and 3 John, the Apocalypse of John, and the Epistle to the Hebrews.

ANTILIA or ANTILLIA, sometimes called the Island of the Seven Cities (Portuguese *Isla das Sete Cidades*), a legendary island in the Atlantic ocean. The origin of the name is quite uncertain. The oldest suggested etymology (1455) fancifully connects it with the name of the Platonic Atlantis, while later writers have endeavoured to derive it from the Latin *anterior* (*i.e.* the island that is reached "before" Cipango), or from the *Jezirat al Tennyn*, "Dragon's Isle," of the Arabian geographers. Antilia is marked in an anonymous map which is dated 1424 and preserved in the grand-ducal library at Weimar. It reappears in the maps of the Genoese B. Beccario or Beccaria (1435), and of the Venetian Andrea Bianco (1436), and again in 1455 and 1476. In most of these it is accompanied by the smaller and equally legendary islands of Royllo, St Atanagio, and Tanmar, the whole group being classified as *insulae de novo repertae*, "newly discovered islands." The Florentine Paul Toscanelli, in his letters to Columbus and the Portuguese court (1474), takes Antilia as the principal landmark for measuring the distance between Lisbon and the island of Cipango or Zipangu (Japan). One of the chief early descriptions of Antilia is that inscribed on the globe which the geographer Martin Behaim made at Nuremberg in 1492 (see MAP: *History*). Behaim relates that in 734—a date which is probably a misprint for 714—and after the Moors had conquered Spain and Portugal, the island of Antilia or "Septe Cidade" was colonized by Christian refugees under the archbishop of Oporto and six bishops. The inscription adds that a Spanish vessel sighted the island in 1414. According to an old Portuguese tradition each of the seven leaders founded and ruled a city, and the whole island became a Utopian commonwealth, free from the disorders of less favoured states. Later Portuguese tradition localized Antilia in the island of St Michael's, the largest of the Azores. It is impossible to estimate how far this legend commemorates some actual but imperfectly recorded discovery, and how far it is a reminiscence of the ancient idea of an elysium in the western seas which is embodied in the legends of the Isles of the Blest or Fortunate Islands.

ANTILLES, a term of somewhat doubtful origin, now generally used, especially by foreign writers, as synonymous with the expression "West India Islands." Like "Brazil," it dates from a period anterior to the discovery of the New World, "Antilia," as stated above, being one of those mysterious lands, which figured on the medieval charts sometimes as an archipelago, sometimes as continuous land of greater or lesser extent, constantly fluctuating in mid-ocean between the Canaries and East India. But it came at last to be identified with the land discovered by Columbus. Later, when this was found to consist of a vast archipelago enclosing the Caribbean Sea and Gulf of Mexico, *Antilia* assumed its present plural form, *Antilles*, which was collectively applied to the whole of this archipelago.

A distinction is made between the Greater Antilles, including Cuba, Jamaica, Haiti, and Porto Rico; and the Lesser Antilles, covering the remainder of the islands.

ANTILOCHUS, in Greek legend, son of Nestor, king of Pylos. One of the suitors of Helen, he accompanied his father to the Trojan War. He was distinguished for his beauty, swiftness of foot, and skill as a charioteer; though the youngest among the Greek princes, he commanded the Pylians in the war, and performed many deeds of valour. He was a favourite of the gods, and an intimate friend of Achilles, to whom he was commissioned to announce the death of Patroclus. When his father was attacked by Memnon, he saved his life at the sacrifice of his own (Pindar, *Pyth.* vi. 28), thus fulfilling an oracle which had bidden him "beware of an Ethiopian." His death was avenged by Achilles. According to other accounts, he was slain by

Hector (Hyginus, *Fab.* 113), or by Paris in the temple of the Thymbraean Apollo together with Achilles (Dares Phrygius 34). His ashes, with those of Achilles and Patroclus, were deposited in a mound on the promontory of Sigeum, where the inhabitants of Ilium offered sacrifice to the dead heroes (*Odyssey*, xxiv. 72; Strabo xiii. p. 596). In the *Odyssey* (xi. 468) the three friends are represented as united in the underworld and walking together in the fields of asphodel; according to Pausanias (iii. 19) they dwell together in the island of Leukē.

ANTIMACASSAR, a separate covering for the back of a chair, or the head or cushions of a sofa, to prevent soiling of the permanent fabric. The name is attributable to the unguent for the hair commonly used in the early 19th century,—Byron calls it "thine incomparable oil, Macassar." The original antimacassar was almost invariably made of white crochet-work, very stiff, hard, and uncomfortable, but in the third quarter of the 19th century it became simpler and less inartistic, and was made of soft coloured stuffs, usually worked with a simple pattern in tinted wools or silk.

ANTIMACHUS, of Colophon or Claros, Greek poet and grammarian, flourished about 400 B.C. Scarcely anything is known of his life. His poetical efforts were not generally appreciated, although he received encouragement from his younger contemporary Plato (Plutarch, *Lysander*, 18). His chief works were: a long-winded epic *Thebais*, an account of the expedition of the Seven against Thebes and the war of the Epigoni; and an elegiac poem *Lydē*, so called from the poet's mistress, for whose death he endeavoured to find consolation by ransacking mythology for stories of unhappy love affairs (Plutarch, *Consol. ad Apoll.* 9; Athenaeus xiii. 597). Antimachus was the founder of "learned" epic poetry, and the forerunner of the Alexandrian school, whose critics allotted him the next place to Homer. He also prepared a critical recension of the Homeric poems.

Fragments, ed. Stoll (1845); Bergk, *Poetae Lyrici Graeci* (1882); Kinkel, *Fragmenta epicorum Graecorum* (1877).

ANTI-MASONIC PARTY, an American political organization which had its rise after the mysterious disappearance, in 1826, of William Morgan (*c.* 1776–*c.* 1826), a Freemason of Batavia, New York, who had become dissatisfied with his Order and had planned to publish its secrets. When his purpose became known to the Masons, Morgan was subjected to frequent annoyances, and finally in September 1826 he was seized and surreptitiously conveyed to Fort Niagara, whence he disappeared. Though his ultimate fate was never known, it was generally believed at the time that he had been foully dealt with. The event created great excitement, and led many to believe that Masonry and good citizenship were incompatible. Opposition to Masonry was taken up by the churches as a sort of religious crusade, and it also became a local political issue in western New York, where early in 1827 the citizens in many mass meetings resolved to support no Mason for public office. In New York at this time the National Republicans, or "Adams men," were a very feeble organization, and shrewd political leaders at once determined to utilize the strong anti-Masonic feeling in creating a new and vigorous party to oppose the rising Jacksonian Democracy. In this effort they were aided by the fact that Jackson was a high Mason and frequently spoke in praise of the Order. In the elections of 1828 the new party proved unexpectedly strong, and after this year it practically superseded the National Republican party in New York. In 1829 the hand of its leaders was shown, when, in addition to its antagonism to the Masons, it became a champion of internal improvements and of the protective tariff. From New York the movement spread into other middle states and into New England, and became especially strong in Pennsylvania and Vermont. A national organization was planned as early as 1827, when the New York leaders attempted, unsuccessfully, to persuade Henry Clay, though a Mason, to renounce the Order and head the movement. In September 1831 the party at a national convention in Baltimore nominated as its candidates for the presidency and vice-presidency William Wirt of Maryland and Amos Ellmaker (1787–1851) of Pennsylvania; and in the election of the following year it secured the seven electoral votes of the state of Vermont. This was the high tide of its prosperity; in New York in 1833 the organization was moribund, and its members gradually united with other opponents of Jacksonian Democracy in forming the Whig party. In other states, however, the party survived somewhat longer, but by 1836 most of its members had united with the Whigs. Its last act in national politics was to nominate William Henry Harrison for president and John Tyler for vice-president at a convention in Philadelphia in November 1838.

The growth of the anti-Masonic movement was due to the political and social conditions of the time rather than to the Morgan episode, which was merely the torch that ignited the train. Under the name of "Anti-Masons" able leaders united those who were discontented with existing political conditions, and the fact that William Wirt, their choice for the presidency in 1832, was not only a Mason but even defended the Order in a speech before the convention that nominated him, indicates that simple opposition to Masonry soon became a minor factor in holding together the various elements of which the party was composed.

See Charles McCarthy, *The Antimasonic Party: A Study of Political Anti-Masonry in the United States, 1827–1840*, in the Report of the American Historical Association for 1902 (Washington, 1903); the *Autobiography of Thurlow Weed* (2 vols., Boston, 1884); A. G. Mackey and W. R. Singleton, *The History of Freemasonry*, vol. vi. (New York, 1898); and J. D. Hammond, *History of Political Parties in the State of New York* (2 vols., Albany, 1842).

ANTIMONY (symbol Sb, atomic weight 120·2), one of the metallic chemical elements, included in the same natural family of the elements as nitrogen, phosphorus, arsenic, and bismuth. Antimony, in the form of its sulphide, has been known from very early times, more especially in Eastern countries, reference to it being made in the Old Testament. The Arabic name for the naturally occurring stibnite is "kohl"; Dioscorides mentions it under the term *στίμμι*, Pliny as *stibium*; and Geber as *antimonium*. By the German writers it is called *Speissglanz*. Basil Valentine alludes to it in his *Triumphal Car of Antimony* (circa 1600), and at a later date describes the preparation of the metal.

Native mineral antimony is occasionally found, and as such was first recognized in 1748. It usually occurs as lamellar or granular masses, with a tin-white colour and metallic lustre, in limestone or in mineral veins often in association with ores of silver. Distinct crystals are rarely met with; these are rhombohedral and isomorphous with arsenic and bismuth; they have a perfect cleavage parallel to the basal plane, *c* (111), and are sometimes twinned on a rhombohedral plane, *e* (110). Hardness 3–3½, specific gravity 6·65–6·72. Sala in Sweden, Allemont in Dauphiné, and Sarawak in Borneo may be mentioned as some of the localities for this mineral.

Antimony, however, occurs chiefly as the sulphide, stibnite; to a much smaller extent it occurs in combination with other metallic sulphides in the minerals wolfsbergite, boulangerite, bournonite, pyrargyrite, &c. For the preparation of metallic antimony the crude stibnite is first liquated, to free it from earthy and siliceous matter, and is then roasted in order to convert it into oxide. After oxidation, the product is reduced by heating with carbon, care being taken to prevent any loss through volatilization, by covering the mass with a layer of some protective substance such as potash, soda or glauber salt, which also aids the refining. For rich ores the method of roasting the sulphide with metallic iron is sometimes employed; carbon and salt or sodium sulphate being used to slag the iron. Electrolytic methods, in which a solution of antimony sulphide in sodium sulphide is used as the electrolyte, have been proposed (see German Patent 67973, and also Borcher's *Electro-Metallurgie*), but do not yet appear to have been used on the large scale.

Antimony combines readily with many other metals to form alloys, some of which find extensive application in the arts. Type-metal is an alloy of lead with antimony and tin, to which occasionally a small quantity of copper or zinc is added. The presence of the antimony in this alloy gives to it hardness, and the property of expanding on solidification, thus allowing a sharp cast of the letter to be taken. An alloy of tin and antimony forms

the basis of Britannia-metal, small quantities of copper, lead, zinc or bismuth being added. It is a white metal of bluish tint and is malleable and ductile. For the linings of brasses, various white metals are used, these being alloys of copper, antimony and tin, and occasionally lead.

Antimony is a silvery white, crystalline, brittle metal, and has a high lustre. Its specific gravity varies from 6·7 to 6·86; it melts at 432° C. (Dalton), and boils between 1090-1600° C. (T. Carnelley), or above 1300° (V. Meyer). Its specific heat is 0·0523 (H. Kopp). The vapour density of antimony at 1572° C. is 10·74, and at 1640° C. 9·78 (V. Meyer, *Berichte*, 1889, 22, p. 725), so that the antimony molecule is less complex than the molecules of the elements phosphorus and arsenic. An amorphous modification of antimony can be prepared by heating the metal in a stream of nitrogen, when it condenses in the cool part of the apparatus as a grey powder of specific gravity 6·22, melting at 614° C. and containing 98-99% of antimony (F. Hérard, *Comptes Rendus*, 1888, cvii. 420).

Another form of the metal, known as explosive antimony, was discovered by G. Gore (*Phil. Trans.*, 1858, p. 185; 1859, p. 797; 1862, p. 623), on electrolysing a solution of antimony trichloride in hydrochloric acid, using a positive pole of antimony and a negative pole of copper or platinum wire. It has a specific gravity of 5·78 and always contains some unaltered antimony trichloride (from 6 to 20%, G. Gore). It is very unstable, a scratch causing it instantaneously to pass into the stable form with explosive violence and the development of much heat. Similar phenomena are exhibited in the electrolysis of solutions of antimony tribromide and tri-iodide, the product obtained from the tribromide having a specific gravity of 5·4, and containing 18-20% of antimony tribromide, whilst that from the tri-iodide has a specific gravity of 5·2-5·8 and contains about 22% of hydriodic acid and antimony tri-iodide.

The atomic weight of antimony has been determined by the analysis of the chloride, bromide and iodide. J. P. Cooke (*Proc. Amer. Acad.*, 1878, xiii. 1) and J. Bongartz (*Berichte*, 1883, 16, p. 1942) obtained the value 120, whilst F. Pfeiffer (*Ann. Chim. et Phys.* ccix. 173) obtained the value 121 from the electrolysis of the chloride.

Pure antimony is quite permanent in air at ordinary temperatures, but when heated in air or oxygen it burns, forming the trioxide. It decomposes steam at a red heat, and burns (especially when finely powdered) in chlorine. Dilute hydrochloric acid is without action on it, but on warming with the concentrated acid, antimony trichloride is formed; it dissolves in warm concentrated sulphuric acid, the sulphate $Sb_2(SO_4)_3$ being formed. Nitric acid oxidizes antimony either to the trioxide Sb_4O_6 or the pentoxide Sb_2O_5, the product obtained depending on the temperature and concentration of the acid. It combines directly with sulphur and phosphorus, and is readily oxidized when heated with metallic oxides (such as litharge, mercuric oxide, manganese dioxide, &c.). Antimony and its salts may be readily detected by the orange precipitate of antimony sulphide which is produced when sulphuretted hydrogen is passed through their acid solutions, and also by the Marsh test (see ARSENIC); in this latter case the black stain produced is not soluble in bleaching powder solution. Antimony compounds when heated on charcoal with sodium carbonate in the reducing flame give brittle beads of metallic antimony, and a white incrustation of the oxide. The antimonious compounds are decomposed on addition of water, with formation of basic salts.

Antimony may be estimated quantitatively by conversion into the sulphide; the precipitate obtained is dried at 100° C. and heated in a current of carbon dioxide, or it may be converted into the tetroxide by nitric acid.

Antimony, like phosphorus and arsenic, combines directly with hydrogen. The compound formed, antimoniuretted hydrogen or stibine, SbH_3, may also be prepared by the action of hydrochloric acid on an alloy of antimony and zinc, or by the action of nascent hydrogen on antimony compounds. As prepared by these methods it contains a relatively large amount of hydrogen, from which it can be freed by passing through a tube immersed in liquid air, when it condenses to a white solid. It is a poisonous colourless gas, with a characteristic offensive smell. In its general behaviour it resembles arsine, burning with a violet flame and being decomposed by heat into its constituent elements. When passed into silver nitrate solution it gives a black precipitate of silver antimonide, $SbAg_3$. It is decomposed by the halogen elements and also by sulphuretted hydrogen. All three hydrogen atoms are replaceable by organic radicals and the resulting compounds combine with compounds of the type RCl, RBr and RI to form stibonium compounds.

There are three known oxides of antimony, the trioxide Sb_4O_6 which is capable of combining with both acids and bases to form salts, the tetroxide Sb_2O_4 and the pentoxide Sb_2O_5. Antimony trioxide occurs as the minerals valentinite and senarmontite, and can be artificially prepared by burning antimony in air; by heating the metal in steam to a bright red heat; by oxidizing melted antimony with litharge; by decomposing antimony trichloride with an aqueous solution of sodium carbonate, or by the action of dilute nitric acid on the metal. It is a white powder, almost insoluble in water, and when volatilized, condenses in two crystalline forms, either octahedral or prismatic. It is insoluble in sulphuric and nitric acids, but is readily soluble in hydrochloric and tartaric acids and in solutions of the caustic alkalies. On strongly heating in air it is converted into the tetroxide. The corresponding hydroxide, orthoantimonious acid, $Sb(OH)_3$, can be obtained in a somewhat impure form by precipitating tartar emetic with dilute sulphuric acid; or better by decomposing antimonyl tartaric acid with sulphuric acid and drying the precipitated white powder at 100° C. Antimony tetroxide is formed by strongly heating either the trioxide or pentoxide. It is a non-volatile white powder, and has a specific gravity of 6·6952; it is insoluble in water and almost so in acids—concentrated hydrochloric acid dissolving a small quantity. It is decomposed by a hot solution of potassium bitartrate. Antimony pentoxide is obtained by repeatedly evaporating antimony with nitric acid and heating the resulting antimonic acid to a temperature not above 275° C.; by heating antimony with red mercuric oxide until the mass becomes yellow (J. Berzelius); or by evaporating antimony trichloride to dryness with nitric acid. It is a pale yellow powder (of specific gravity 6·5), which on being heated strongly gives up oxygen and forms the tetroxide. It is insoluble in water, but dissolves slowly in hydrochloric acid. It possesses a feeble acid character, giving metantimoniates when heated with alkaline carbonates.

Orthoantimonic acid, H_3SbO_4, is obtained by the decomposition of its potassium salt with nitric acid (A. Geuther); or by the addition of water to the pentachloride, the precipitate formed being dried over sulphuric acid (P. Conrad, *Chem. News*, 1879, xl. 198). It is a white powder almost insoluble in water and nitric acid, and when heated, is first converted into metantimonic acid, $HSbO_3$, and then into the pentoxide Sb_2O_5. Pyroantimonic acid, $H_4Sb_2O_7$ (the metantimonic acid of E. Frémy), is obtained by decomposing antimony pentachloride with hot water, and drying the precipitate so obtained at 100° C. It is a white powder which is more soluble in water and acids than orthoantimonic acid. It forms two series of salts, of the types $M_2H_2Sb_2O_7$ and $M_4Sb_2O_7$. Metantimonic acid, $HSbO_3$, can be obtained by heating orthoantimonic acid to 175° C., or by long fusion of antimony with antimony sulphide and nitre. The fused mass is extracted with water, nitric acid is added to the solution, and the precipitate obtained washed with water (J. Berzelius). It is a white powder almost insoluble in water. On standing with water for some time it is slowly converted into the ortho-acid.

Compounds of antimony with all the halogen elements are known, one atom of the metal combining with three or five atoms of the halogen, except in the case of bromine, where only the tribromide is known. The majority of these halide compounds are decomposed by water, with the formation of basic salts. Antimony trichloride (" Butter of Antimony "), $SbCl_3$, is obtained by burning the metal in chlorine; by distilling antimony with excess of mercuric chloride; and by fractional distillation of antimony tetroxide or trisulphide in hydrochloric acid solution. It is a colourless deliquescent solid of specific gravity 3·06; it melts at 73·2° C. (H. Kopp) to a colourless oil; and boils at 223° (H. Capitaine). It is soluble in alcohol and in carbon bisulphide, and also in a small quantity of water; but with an excess of water it gives a precipitate of various oxychlorides, known as powder of algaroth (*q.v.*). These precipitated oxychlorides on continued boiling with water lose all their chlorine and ultimately give a residue of antimony trioxide. It combines with chlorides of the alkali metals to form double salts, and also with barium, calcium, strontium, and magnesium chlorides. Antimony pentachloride, $SbCl_5$, is prepared by heating the trichloride in a current of chlorine. It is a nearly colourless fuming liquid of unpleasant smell, which can be solidified to a mass of crystals melting at −6° C. It dissociates into the trichloride and chlorine when heated. It combines with water, forming the hydrates $SbCl_5 \cdot H_2O$ and $SbCl_5 \cdot 4H_2O$; it also combines with phosphorus oxychloride, hydrocyanic acid, and cyanogen chloride. In chloroform solution it combines with anhydrous oxalic

acid to form a compound, $Sb_2Cl_4(C_2O_4)$, which is to be considered as $\begin{matrix}COOSbCl_4\\|\\COOSbCl_4\end{matrix}$ tetra-chlorstibonium oxalate (R. Anschütz and Evans, *Annalen*, 1887, ccxxxix. 235). Antimonyl chloride, SbOCl, is produced by the decomposition of one part of the trichloride with four parts of water. Prepared in this way it contains a small quantity of the unaltered chloride, which can be removed by ether or carbon bisulphide. It is a white powder insoluble in water, alcohol and ether. On heating, it is converted into the oxychloride $Sb_4O_5Cl_2$ ($Sb_2O_3{\cdot}2SbOCl$). Antimony oxychloride, $SbOCl_3$, is formed by addition of the calculated quantity of water to ice-cooled antimony pentachloride, $SbCl_5+H_2O=SbOCl_3+2HCl$. It forms a yellowish crystalline precipitate which in moist air goes to a thick liquid. Compounds of composition, $SbOCl_3{\cdot}2SbCl_3$ and $SbO_2Cl{\cdot}2SbOCl_3$, have also been described (W. C. Williams, *Chem. News*. 1871, xxiv. 234).

Antimony tribromide, $SbBr_3$, and tri-iodide, SbI_3, may be prepared by the action of antimony on solutions of bromine or iodine in carbon bisulphide. The tribromide is a colourless crystalline mass of specific gravity 4·148 (23°), melting at 90° to 94° C. and boiling at 275·4° C. (H. Kopp). The tri-iodide forms red-coloured crystals of specific gravity 4·848 (26°), melting at 165° to 167° C. and boiling at 401° C. By the action of water they give oxybromides and oxyiodides SbOBr, $Sb_4O_5Br_2$, SbOI. Antimony penta-iodide, SbI_5, is formed by heating antimony with excess of iodine, in a sealed tube, to a temperature not above 130° C. It forms a dark brown crystalline mass, melting at 78° to 79° C., and is easily dissociated on heating. Antimony trifluoride, SbF_3, is obtained by dissolving the trioxide in aqueous hydrofluoric acid or by distilling antimony with mercuric fluoride. By rapid evaporation of its solution it may be obtained in small prisms. The pentafluoride SbF_5 results when metantimonic acid is dissolved in hydrofluoric acid, and the solution is evaporated. It forms an amorphous gummy mass, which is decomposed by heat. Oxyfluorides of composition SbOF and $SbOF_3$ are known.

Two sulphides of antimony are definitely known, the trisulphide Sb_2S_3 and the pentasulphide Sb_2S_5; a third, the tetrasulphide Sb_2S_4, has also been described, but its existence is doubtful. Antimony trisulphide, Sb_2S_3, occurs as the mineral antimonite or stibnite, from which the commercial product is obtained by a process of liquation. The amorphous variety may be obtained from the crystalline form by dissolving it in caustic potash or soda or in solutions of alkaline sulphides, and precipitating the hot solution by dilute sulphuric acid. The precipitate is then washed with water and dried at 100° C., by which treatment it is obtained in the anhydrous form. On precipitating antimony trichloride or tartar emetic in acid solution with sulphuretted hydrogen, an orange-red precipitate of the hydrated sulphide is obtained, which turns black on being heated to 200° C. The trisulphide heated in a current of hydrogen is reduced to the metallic state; it burns in air forming the tetroxide, and is soluble in concentrated hydrochloric acid, in solutions of the caustic alkalis, and in alkaline sulphides. By the union of antimony trisulphide with basic sulphides, livers of antimony are obtained. These substances are usually prepared by fusing their components together, and are dark powders which are less soluble in water the more antimony they contain. These thioantimonites are used in the vulcanizing of rubber and in the preparation of matches. Antimony pentasulphide, Sb_2S_5, is prepared by precipitating a solution of the pentachloride with sulphuretted hydrogen, by decomposing "Schlippe's salt" (*q.v.*) with an acid, or by passing sulphuretted hydrogen into water containing antimonic acid. It forms a fine dark orange powder, insoluble in water, but readily soluble in aqueous solutions of the caustic alkalis and alkaline carbonates. On heating in absence of air, it decomposes into the trisulphide and sulphur.

An antimony phosphide and arsenide are known, as is also a thiophosphate, $SbPS_4$, which is prepared by heating together antimony trichloride and phosphorus pentasulphide.

Many organic compounds containing antimony are known. By distilling an alloy of antimony and sodium with mythyl iodide, mixed with sand, trimethyl stibine, $Sb(CH_3)_3$, is obtained; this combines with excess of methyl iodide to form tetramethyl stibonium iodide, $Sb(CH_3)_4I$. From this iodide the trimethyl stibine may be obtained by distillation with an alloy of potassium and antimony in a current of carbon dioxide. It is a colourless liquid, slightly soluble in water, and is spontaneously inflammable. The stibonium iodide on treatment with moist silver oxide gives the corresponding tetramethyl stibonium hydroxide, $Sb(CH_3)_4OH$, which forms deliquescent crystals, of alkaline reaction, and absorbs carbon dioxide readily. On distilling trimethyl stibine with zinc methyl, antimony tetra-methyl and penta-methyl are formed. Corresponding antimony compounds containing the ethyl group are known, as is also a tri-phenyl stibine, $Sb(C_6H_5)_3$, which is prepared from antimony trichloride, sodium and monochlorbenzene. See Chung Yu Wang, *Antimony* (1909).

Antimony in Medicine.—So far back as Basil Valentine and Paracelsus, antimonial preparations were in great vogue as medicinal agents, and came to be so much abused that a prohibition was placed upon their employment by the Paris parlement in 1566. Metallic antimony was utilized to make goblets in which wine was allowed to stand so as to acquire emetic properties, and "everlasting" pills of the metal, supposed to act by contact merely, were administered and recovered for future use after they had fulfilled their purpose. Antimony compounds act as irritants both externally and internally. Tartar emetic (antimony tartrate) when swallowed, acts directly on the wall of the stomach, producing vomiting, and after absorption continues this effect by its action on the medulla. It is a powerful cardiac depressant, diminishing both the force and frequency of the heart's beat. It depresses respiration, and in large doses lowers temperature. It depresses the nervous system, especially the spinal cord. It is excreted by all the secretions and excretions of the body. Thus as it passes out by the bronchial mucous membrane it increases the amount of secretion and so acts as an expectorant. On the skin its action is that of a diaphoretic, and being also excreted by the bile it acts slightly as a cholagogue. Summed up, its action is that of an irritant, and a cardiac and nervous depressant. But on account of this depressant action it is to be avoided for women and children and rarely used for men.

Toxicology.—Antimony is one of the "protoplasmic" poisons, directly lethal to all living matter. In acute poisoning by it the symptoms are almost identical with those of arsenical poisoning, which is much commoner (See ARSENIC). The post-mortem appearances are also very similar, but the gastro-intestinal irritation is much less marked and inflammation of the lungs is more commonly seen. If the patient is not already vomiting freely the treatment is to use the stomach-pump, or give sulphate of zinc (gr. 10–30) by the mouth or apomorphine (gr. $\frac{1}{10}$–$\frac{1}{6}$) subcutaneously. Frequent doses of a teaspoonful of tannin dissolved in water should be administered, together with strong tea and coffee and mucilaginous fluids. Stimulants may be given subcutaneously, and the patient should be placed in bed between warm blankets with hot-water bottles. Chronic poisoning by antimony is very rare, but resembles in essentials chronic poisoning by arsenic. In its medico-legal aspects antimonial poisoning is of little and lessening importance.

ANTINOMIANS (Gr. *ἀντί*, against, *νόμος*, law), a term apparently coined by Luther to stigmatize Johannes Agricola (*q.v.*) and his following, indicating an interpretation of the antithesis between law and gospel, recurrent from the earliest times. Christians being released, in important particulars, from conformity to the Old Testament polity as a whole, a real difficulty attended the settlement of the limits and the immediate authority of the remainder, known vaguely as the moral law. Indications are not wanting that St Paul's doctrine of justification by faith was, in his own day, mistaken or perverted in the interests of immoral licence. Gnostic sects approached the question in two ways. Marcionites, named by Clement of Alexandria *Antitactae* (revolters against the Demiurge) held the Old Testament economy to be throughout tainted by its source; but they are not accused of licentiousness. Manichaeans, again, holding their spiritual being to be unaffected by the action of matter, regarded carnal sins as being, at worst, forms of bodily disease. Kindred to this latter view was the position of sundry sects of English fanatics during the Commonwealth, who denied that an elect person sinned, even when committing acts in themselves gross and evil. Different from either of these was the Antinomianism charged by Luther against Agricola. Its starting-point was a dispute with Melanchthon in 1527 as to the relation between repentance and faith. Melanchthon urged that repentance must precede faith, and that knowledge of the moral law is needed to produce repentance. Agricola gave the initial place to faith, maintaining that repentance is the work, not of law, but of the gospel-given knowledge of the love of God. The resulting Antinomian controversy (the only one within the Lutheran body in Luther's lifetime) is not remarkable for the precision or the moderation of the combatants on either side. Agricola was apparently satisfied in conference with Luther and Melanchthon at Torgau, December 1527. His eighteen *Positiones* of 1537 revived the

controversy and made it acute. Random as are some of his statements, he was consistent in two objects: (1) in the interest of solifidian doctrine, to place the rejection of the Catholic doctrine of good works on a sure ground; (2) in the interest of the New Testament, to find all needful guidance for Christian duty in its principles, if not in its precepts. From the latter part of the 17th century charges of Antinomianism have frequently been directed against Calvinists, on the ground of their disparagement of "deadly doing" and of "legal preaching." The virulent controversy between Arminian and Calvinistic Methodists produced as its ablest outcome Fletcher's *Checks to Antinomianism* (1771–1775).

See G. Kawerau, in A. Hauck's *Realencyklopädie* (1896); Riess, in I. Goschler's *Dict. Encyclop. de la théol. cath.* (1858); J. H. Blunt, *Dict. of Doct. and Hist. Theol.* (1872); J. C. L. Gieseler, *Ch. Hist.* (New York ed. 1868, vol. iv.).

ANTINOMY (Gr. *ἀντί*, against, *νόμος*, law), literally, the mutual incompatibility, real or apparent, of two laws. The term acquired a special significance in the philosophy of Kant, who used it to describe the contradictory results of applying to the universe of pure thought the categories or criteria proper to the universe of sensible perception (phenomena). These antinomies are four—two mathematical, two dynamical—connected with (1) the limitation of the universe in respect of space and time, (2) the theory that the whole consists of indivisible atoms (whereas, in fact, none such exist), (3) the problem of freedom in relation to universal causality, (4) the existence of a universal being—about each of which pure reason contradicts the empirical, as thesis and antithesis. Kant claimed to solve these contradictions by saying, that in no case is the contradiction real, however really it has been intended by the opposing partisans, or must appear to the mind without critical enlightenment. It is wrong, therefore, to impute to Kant, as is often done, the view that human reason is, on ultimate subjects, at war with itself, in the sense of being impelled by equally strong arguments towards alternatives contradictory of each other. The difficulty arises from a confusion between the spheres of phenomena and noumena. In fact no rational cosmology is possible.

See John Watson, *Selections from Kant* (trans. Glasgow, 1897), pp. 155 foll.; W. Windelband, *History of Philosophy* (Eng. trans. 1893); H. Sidgwick, *Philos. of Kant*, lectures x. and xi. (Lond., 1905); F. Paulsen, *I. Kant* (Eng. trans. 1902), pp. 216 foll.

ANTINOÜS, a beautiful youth of Claudiopolis in Bithynia, was the favourite of the emperor Hadrian, whom he accompanied on his journeys. He committed suicide by drowning himself in the Nile (A.D. 130), either in a fit of melancholy or in order to prolong his patron's life by his voluntary sacrifice. After his death, Hadrian caused the most extravagant respect to be paid to his memory. Not only were cities called after him, medals struck with his effigy, and statues erected to him in all parts of the empire, but he was raised to the rank of the gods, temples were built for his worship in Bithynia, Mantineia in Arcadia, and Athens, festivals celebrated in his honour and oracles delivered in his name. The city of Antinoöpolis was founded on the ruins of Besa where he died (Dio Cassius lix. 11; Spartianus, *Hadrian*). A number of statues, busts, gems and coins represented Antinoüs as the ideal type of youthful beauty, often with the attributes of some special god. We still possess a colossal bust in the Vatican, a bust in the Louvre, a bas-relief from the Villa Albani, a statue in the Capitoline museum, another in Berlin, another in the Lateran, and many more.

See Levezow, *Über den Antinous* (1808); Dietrich, *Antinoos* (1884); Laban, *Der Gemütsausdruck des Antinoos* (1891); *Antinoüs, A Romance of Ancient Rome*, from the German of A. Hausrath, by M. Safford (New York, 1882); Ebers, *Der Kaiser* (1881).

ANTIOCH. There were sixteen cities known to have been founded under this name by Hellenistic monarchs; and at least twelve others were renamed Antioch. But by far the most famous and important in the list was Ἀντιόχεια ἡ ἐπὶ Δάφνῃ (mod. *Antakia*), situated on the left bank of the Orontes, about 20 m. from the sea and its port, Seleucia of Pieria (*Suedia*). Founded as a Greek city in 300 B.C. by Seleucus Nicator, as soon as he had assured his grip upon western Asia by the victory of Ipsus (301), it was destined to rival Alexandria in Egypt as the chief city of the nearer East, and to be the cradle of gentile Christianity. The geographical character of the district north and north-east of the elbow of Orontes makes it the natural centre of Syria, so long as that country is held by a western power; and only Asiatic, and especially Arab, dynasties have neglected it for the oasis of Damascus. The two easiest routes from the Mediterranean, lying through the Orontes gorge and the Beilan Pass, converge in the plain of the Antioch Lake (*Balük Geul* or *El Bahr*) and are met there by (1) the road from the Amanic Gates (Baghche Pass) and western Commagene, which descends the valley of the Kara Su, (2) the roads from eastern Commagene and the Euphratean crossings at Samosata (Samsat) and Apamea Zeugma (Birejik), which descend the valleys of the Afrin and the Kuwaik, and (3) the road from the Euphratean ford at Thapsacus, which skirts the fringe of the Syrian steppe. Travellers by all these roads must proceed south by the single route of the Orontes valley. Alexander is said to have camped on the site of Antioch, and dedicated an altar to Zeus Bottiaeus, which lay in the north-west of the future city. But the first western sovereign practically to recognize the importance of the district was Antigonus, who began to build a city, Antigonia, on the Kara Su a few miles north of the situation of Antioch; but, on his defeat, he left it to serve as a quarry for his rival Seleucus. The latter is said to have appealed to augury to determine the exact site of his projected foundation; but less fantastic considerations went far to settle it. To build south of the river, and on and under the last east spur of Casius, was to have security against invasion from the north, and command of the abundant waters of the mountain. One torrent, the Onopniktes ("donkey-drowner"), flowed through the new city, and many other streams came down a few miles west into the beautiful suburb of Daphne. The site appears not to have been found wholly uninhabited. A settlement, *Meroe*, boasting a shrine of Anait, called by the Greeks the "Persian Artemis," had long been located there, and was ultimately included in the eastern suburbs of the new city; and there seems to have been a village on the spur (Mt. Silpius), of which we hear in late authors under the name *Io*, or *Iopolis*. This name was always adduced as evidence by Antiochenes (*e.g.* Libanius) anxious to affiliate themselves to the Attic Ionians—an anxiety which is illustrated by the Athenian types used on the city's coins. At any rate, Io may have been a small early colony of trading Greeks (*Javan*). John Malalas mentions also a village, Bottia, in the plain by the river.

The original city of Seleucus was laid out in imitation of the "gridiron" plan of Alexandria by the architect, Xenarius. Libanius describes the first building and arrangement of this city (i. p. 300. 17). The citadel was on Mt. Silpius and the city lay mainly on the low ground to the north, fringing the river. Two great colonnaded streets intersected in the centre. Shortly afterwards a second quarter was laid out, probably on the east and by Antiochus I., which, from an expression of Strabo, appears to have been the native, as contrasted with the Greek, town. It was enclosed by a wall of its own. In the Orontes, north of the city, lay a large island, and on this Seleucus II. Callinicus began a third walled "city," which was finished by Antiochus III. A fourth and last quarter was added by Antiochus IV. Epiphanes (175–164 B.C.); and thenceforth Antioch was known as *Tetrapolis*. From west to east the whole was about 4 m. in diameter and little less from north to south, this area including many large gardens. Of its population in the Greek period we know nothing. In the 4th century A.D. it was about 200,000 according to Chrysostom, who probably did not reckon slaves. About 4 m. west and beyond the suburb, Heraclea, lay the paradise of Daphne, a park of woods and waters, in the midst of which rose a great temple to the Pythian Apollo, founded by Seleucus I. and enriched with a cult-statue of the god, as Musagetes, by Bryaxis. A companion sanctuary of Hecate was constructed underground by Diocletian. The beauty and the lax morals of Daphne were celebrated all over

the western world; and indeed Antioch as a whole shared in both these titles to fame. Its amenities awoke both the enthusiasm and the scorn of many writers of antiquity.

Antioch became the capital and court-city of the western Seleucid empire under Antiochus I., its counterpart in the east being Seleucia-on-Tigris; but its paramount importance dates from the battle of Ancyra (240 B.C.), which shifted the Seleucid centre of gravity from Asia Minor, and led indirectly to the rise of Pergamum. Thenceforward the Seleucids resided at Antioch and treated it as their capital *par excellence*. We know little of it in the Greek period, apart from Syria (*q.v.*), all our information coming from authors of the late Roman time. Among its great Greek buildings we hear only of the theatre, of which substructures still remain on the flank of Silpius, and of the royal palace, probably situated on the island. It enjoyed a great reputation for letters and the arts (Cicero *pro Archia*, 3); but the only names of distinction in these pursuits during the Seleucid period, that have come down to us, are Apollophanes, the Stoic, and one Phoebus, a writer on dreams. The mass of the population seems to have been only superficially Hellenic, and to have spoken Aramaic in non-official life. The nicknames which they gave to their later kings were Aramaic; and, except Apollo and Daphne, the great divinities of north Syria seem to have remained essentially native, such as the "Persian Artemis" of Meroe and Atargatis of Hierapolis Bambyce. We may infer, from its epithet, "Golden," that the external appearance of Antioch was magnificent; but the city needed constant restoration owing to the seismic disturbances to which the district has always been peculiarly liable. The first great earthquake is said by the native chronicler John Malalas, who tells us most that we know of the city, to have occurred in 148 B.C., and to have done immense damage. The inhabitants were turbulent, fickle and notoriously dissolute. In the many dissensions of the Seleucid house they took violent part, and frequently rose in rebellion, for example against Alexander Balas in 147 B.C., and Demetrius II. in 129. The latter, enlisting a body of Jews, punished his capital with fire and sword. In the last struggles of the Seleucid house, Antioch turned definitely against its feeble rulers, invited Tigranes of Armenia to occupy the city in 83, tried to unseat Antiochus XIII. in 65, and petitioned Rome against his restoration in the following year. Its wish prevailed, and it passed with Syria to the Roman Republic in 64 B.C., but remained a *civitas libera*.

The Romans both felt and expressed boundless contempt for the hybrid Antiochenes; but their emperors favoured the city from the first, seeing in it a more suitable capital for the eastern part of the empire than Alexandria could ever be, thanks to the isolated position of Egypt. To a certain extent they tried to make it an eastern Rome. Caesar visited it in 47 B.C., and confirmed its freedom. A great temple to Jupiter Capitolinus rose on Silpius, probably at the instance of Octavian, whose cause the city had espoused. A forum of Roman type was laid out. Tiberius built two long colonnades on the south towards Silpius. Agrippa and Tiberius enlarged the theatre, and Trajan finished their work. Antoninus Pius paved the great east to west artery with granite. A circus, other colonnades and great numbers of baths were built, and new aqueducts to supply them bore the names of Caesars, the finest being the work of Hadrian. The Roman client, King Herod, erected a long *stoa* on the east, and Agrippa encouraged the growth of a new suburb south of this. Under the empire we chiefly hear of the earthquakes which shook Antioch. One, in A.D. 37, caused the emperor Caligula to send two senators to report on the condition of the city. Another followed in the next reign; and in 115, during Trajan's sojourn in the place with his army of Parthia, the whole site was convulsed, the landscape altered, and the emperor himself forced to take shelter in the circus for several days. He and his successor restored the city; but in 526, after minor shocks, the calamity returned in a terrible form, and thousands of lives were lost, largely those of Christians gathered to a great church assembly. We hear also of especially terrific earthquakes on the 29th of November 528 and the 31st of October 588.

At Antioch Germanicus died in A.D. 19, and his body was burnt in the forum. Titus set up the Cherubim, captured from the Jewish temple, over one of the gates. Commodus had Olympic games celebrated at Antioch, and in A.D. 266 the town was suddenly raided by the Persians, who slew many in the theatre. In 387 there was a great sedition caused by a new tax levied by order of Theodosius, and the city was punished by the loss of its metropolitan status. Zeno, who renamed it Theopolis, restored many of its public buildings just before the great earthquake of 526, whose destructive work was completed by the Persian Chosroes twelve years later. Justinian made an effort to revive it, and Procopius describes his repairing of the walls; but its glory was past.

The chief interest of Antioch under the empire lies in its relation to Christianity. Evangelized perhaps by Peter, according to the tradition upon which the Antiochene patriarchate still rests its claim for primacy (cf. Acts xi.), and certainly by Barnabas and Saul, its converts were the first to be called "Christians." They multiplied exceedingly, and by the time of Theodosius were reckoned by Chrysostom at about 100,000 souls. Between 252 and 300 A.D. ten assemblies of the church were held at Antioch and it became the residence of the patriarch of Asia. When Julian visited the place in 362 the impudent population railed at him for his favour to Jewish and pagan rites, and to revenge itself for the closing of its great church of Constantine, burned down the temple of Apollo in Daphne. The emperor's rough and severe habits and his rigid administration prompted Antiochene lampoons, to which he replied in the curious satiric *apologia*, still extant, which he called *Misopogon*. His successor, Valens, who endowed Antioch with a new forum having a statue of Valentinian on a central column, reopened the great church, which stood till the sack of Chosroes in 538. Antioch gave its name to a certain school of Christian thought, distinguished by literal interpretation of the Scriptures and insistence on the human limitations of Jesus. Diodorus of Tarsus and Theodore of Mopsuestia were the leaders of this school. The principal local saint was Simeon Stylites, who performed his penance on a hill some 40 m. east. His body was brought to the city and buried in a building erected under the emperor Leo. In A.D. 635, during the reign of Heraclius, Antioch passed into Saracen hands, and decayed apace for more than 300 years; but in 969 it was recovered for Byzantium by Michael Burza and Peter the Eunuch. In 1084 the Seljuk Turks captured it but held it only fourteen years, yielding place to the crusaders, who besieged it for nine months, enduring frightful sufferings. Being at last betrayed, it was given to Bohemund, prince of Tarentum, and it remained the capital of a Latin principality for nearly two centuries. It fell at last to the Egyptian, Bibars, in 1268, after a great destruction and slaughter, from which it never revived. Little remains now of the ancient city, except colossal ruins of aqueducts and part of the Roman walls, which are used as quarries for modern Antakia; but no scientific examination of the site has been made. A statue in the Vatican and a silver statuette in the British Museum perpetuate the type of its great effigy of the civic Fortune of Antioch—a majestic seated figure, with Orontes as a youth issuing from under her feet.

ANTAKIA, the modern town, is still of considerable importance. Pop. about 25,000, including Ansarieh, Jews, and a large body of Christians of several denominations about 8000 strong. Though superseded by Aleppo (*q.v.*) as capital of N. Syria, it is still the centre of a large district, growing in wealth and productiveness with the draining of its central lake, undertaken by a French company. The principal cultures are tobacco, maize and cotton, and the mulberry for silk production. Liquorice also is collected and exported. In 1822 (as in 1872) Antakia suffered by earthquake, and when Ibrahim Pasha made it his headquarters in 1835, it had only some 5000 inhabitants. Its hopes, based on a Euphrates valley railway, which was to have started from its port of Suedia (Seleucia), were doomed to disappointment, and it has suffered repeatedly from visitations of cholera; but it has nevertheless grown rapidly and will resume much of its old importance when a railway is made down the lower Orontes valley. It is a

centre of American mission enterprise, and has a British vice-consul.

See C. O. Müller, *Antiquitates Antiochenae* (1839); A. Freund, *Beiträge zur antiochenischen . . . Stadtchronik* (1882); R. Förster, in *Jahrbuch* of Berlin Arch. Institute, xii. (1897). Also authorities for SYRIA. (D. G. H.)

SYNODS OF ANTIOCH. Beginning with three synods convened between 264 and 269 in the matter of Paul of Samosata, more than thirty councils were held in Antioch in ancient times. Most of these dealt with phases of the Arian and of the Christological controversies. The most celebrated took place in the summer of 341 at the dedication of the golden Basilica, and is therefore called *in encaeniis* (ἐν ἐγκαινίοις), *in dedicatione*. Nearly a hundred bishops were present, all from the Orient, but the bishop of Rome was not represented. The emperor Constantius attended in person. The council approved three creeds (Hahn, §§ 153-155). Whether or no the so-called "fourth formula" (Hahn, § 156) is to be ascribed to a continuation of this synod or to a subsequent but distinct assembly of the same year, its aim is like that of the first three; while repudiating certain Arian formulas it avoids the Athanasian shibboleth "homoousios." The somewhat colourless compromise doubtless proceeded from the party of Eusebius of Nicomedia, and proved not inacceptable to the more nearly orthodox members of the synod. The twenty-five canons adopted regulate the so-called metropolitan constitution of the church. Ecclesiastical power is vested chiefly in the metropolitan (later called archbishop), and the semi-annual provincial synod (cf. Nicaea, canon 5), which he summons and over which he presides. Consequently the powers of country bishops (*chorepiscopi*) are curtailed, and direct recourse to the emperor is forbidden. The sentence of one judicatory is to be respected by other judicatories of equal rank; re-trial may take place only before that authority to whom appeal regularly lies (see canons 3, 4, 6). Without due invitation, a bishop may not ordain, or in any other way interfere with affairs lying outside his proper territory; nor may he appoint his own successor. Penalties are set on the refusal to celebrate Easter in accordance with the Nicene decree, as well as on leaving a church before the service of the Eucharist is completed. The numerous objections made by eminent scholars in past centuries to the ascription of these twenty-five canons to the synod *in encaeniis* have been elaborately stated and probably refuted by Hefele. The canons formed part of the *Codex canonum* used at Chalcedon in 451 and passed over into the later collections of East and West.

The canons are printed in Greek by Mansi ii. 1307 ff., Bruns i. 80 ff., Lauchert 43 ff., and translated by Hefele, *Councils*, ii. 67 ff. and by H. R. Percival in the *Nicene and Post-Nicene Fathers*, 2nd series, xiv. 108 ff. The four dogmatic formulas are given by G. Ludwig Hahn, *Bibliothek der Symbole*, 3rd edition (Breslau, 1897), 183 ff.; for translations compare the *Nicene and Post-Nicene Fathers*, 2nd series, iv. 461 ff., ii. 39 ff., ix. 12, ii. 44, and Hefele, ii. 76 ff. For full titles see COUNCILS. (W. W. R.*)

ANTIOCH IN PISIDIA, an ancient city, the remains of which, including ruins of temples, a theatre and a fine aqueduct, were found by Arundell in 1833 close to the modern Yalovach. It was situated on the lower southern slopes of the Sultan Dagh, in the Konia vilayet of Asia Minor, on the right bank of a stream, the ancient Anthius, which flows into the Hoiran Geul. It was probably founded on the site of a Phrygian sanctuary, by Seleucus Nicator, before 280 B.C. and was made a free city by the Romans in 189 B.C. It was a thoroughly Hellenized, Greek-speaking city, in the midst of a Phrygian people, with a mixed population that included many Jews. Before 6 B.C. Augustus made it a colony, with the title Caesarea, and it became the centre of civil and military administration in south Galatia, the romanization of which was progressing rapidly in the time of Claudius, A.D. 41–54, when Paul visited it (Acts xiii. 14, xiv. 21, xvi. 6, xviii. 23). In 1097 the crusaders found rest and shelter within its walls. The ruins are interesting, and show that Antioch was a strongly fortified city of Hellenic and Roman type.

ANTIOCHUS, the name of thirteen kings of the Seleucid dynasty in Nearer Asia. The most famous are Antiochus III. the Great (223–187 B.C.) who sheltered Hannibal and waged war with Rome, and his son Antiochus IV. Epiphanes (176–164 B.C.) who tried to suppress Judaism by persecution (see SELEUCID DYNASTY).

The name was subsequently borne by the kings of Commagene (69 B.C.–A.D. 72), whose house was affiliated to the Seleucid.

ANTIOCHUS I. of Commagene, who without sufficient reason has been identified with the Seleucid Antiochus XIII. Asiaticus, made peace on advantageous terms with Pompey in 64 B.C. Subsequently he fought on Pompey's side in the Civil War, and later still repelled an attack on Samosata by Marcus Antonius (Mark Antony.) He died before 31 B.C. and was succeeded by one Mithradates I. This Mithradates was succeeded by an ANTIOCHUS II., who was executed by Augustus in 29 B.C. After another Mithradates we know of an ANTIOCHUS III., on whose death in A.D. 17 Commagene became a Roman province. In 38 his son ANTIOCHUS IV. EPIPHANES was made king by Caligula, who deposed him almost immediately. Restored by Claudius in 41, he reigned until 72 as an ally of Rome against Parthia. In that year he was deposed on suspicion of treason and retired to Rome. Several of his coins are extant.

On all the above see "Antiochos" in Pauly-Wissowa's *Realencyclopädie der classischen Alterlumswissenschaft*, i. part ii. (1894).

ANTIOCHUS OF ASCALON (1st century B.C.), Greek philosopher. His philosophy consisted in an attempt to reconcile the doctrines of his teachers Philo of Larissa and Mnesarchus the Stoic. Against the scepticism of the former, he held that the intellect has in itself a sufficient test of truth; against Mnesarchus, that happiness, though its main factor is virtue, depends also on outward circumstances. This electicism is known as the Fifth Academy (see ACADEMY, GREEK). His writings are lost, and we are indebted for information to Cicero (*Acad. Pr.* ii. 43), who studied under him at Athens, and Sextus Empiricus (*Pyrrh. hyp.* i. 235). Antiochus lectured also in Rome and Alexandria.

See R. Hoyer, *De Antiocho Ascalonita* (Bonn, 1883).

ANTIOCHUS OF SYRACUSE, Greek historian, flourished about 420 B.C. Nothing is known of his life, but his works, of which only fragments remain, enjoyed a high reputation. He wrote a *History of Sicily* from the earliest times to 424, which was used by Thucydides, and the *Colonizing of Italy*, frequently referred to by Strabo and Dionysius of Halicarnassus.

Müller, *Fragmenta Historicorum Graecorum*, i.; Wölfflin, *Antiochos von Syrakus*, 1872.

ANTIOPE. (1) In Greek legend, the mother of Amphion and Zethus, and, according to Homer (*Od.* xi. 260), a daughter of the Boeotian river-god Asopus. In later poems she is called the daughter of Nycteus or Lycurgus. Her beauty attracted Zeus, who, assuming the form of a satyr, took her by force (Apollodorus iii. 5). After this she was carried off by Epopeus, king of Sicyon, who would not give her up till compelled by her uncle Lycus. On the way home she gave birth, in the neighbourhood of Eleutherae on Mount Cithaeron, to the twins Amphion and Zethus, of whom Amphion was the son of the god, and Zethus the son of Epopeus. Both were left to be brought up by herdsmen. At Thebes Antiope now suffered from the persecution of Dirce, the wife of Lycus, but at last escaped towards Eleutherae, and there found shelter, unknowingly, in the house where her two sons were living as herdsmen. Here she was discovered by Dirce, who ordered the two young men to tie her to the horns of a wild bull. They were about to obey, when the old herdsman, who had brought them up, revealed his secret, and they carried out the punishment on Dirce instead (Hyginus, *Fab.* 8). For this, it is said, Dionysus, to whose worship Dirce had been devoted, visited Antiope with madness, which caused her to wander restlessly all over Greece till she was cured, and married by Phocus of Tithorea, on Mount Parnassus, where both were buried in one grave (Pausanias ix. 17, x. 32).

(2) A second Antiope, daughter of Ares, and sister of Hippolyte, queen of the Amazons, was the wife of Theseus. There are various accounts of the manner in which Theseus became possessed of her, and of her subsequent fortunes. Either she gave herself up to him out of love, when with Heracles he captured Themiscyra, the seat of the Amazons, or she fell to his lot as a captive (Diodorus iv. 16). Or again, Theseus himself

invaded the dominion of the Amazons and carried her off, the consequence of which was a counter-invasion of Attica by the Amazons. After four months of war peace was made, and Antiope left with Theseus as a peace-offering. According to another account, she had joined the Amazons against him because he had been untrue to her in desiring to marry Phaedra. She is said to have been killed by another Amazon, Molpadia, a rival in her affection for Theseus. Elsewhere it was believed that he had himself killed her, and fulfilled an oracle to that effect (Hyginus, *Fab.* 241). By Theseus she had a son, the well-known Hippolytus (Plutarch, *Theseus*).

ANTIOQUIA, an interior department of the republic of Colombia, lying S. of Bolivar, W. of the Magdalena river, and E. of Cauca. Area, 22,870 sq. m.; pop. (est. 1899) 464,887. The greater part of its territory lies between the Magdalena and Cauca rivers and includes the northern end of the Central Cordillera. The country is covered with valuable forests, and its mineral wealth renders it one of the most important mining regions of the republic. The capital, Medellin (est. pop. 53,000 in 1902), is a thriving mining centre, 4822 ft. above sea-level, and 125 m. from Puerto Berrió on the Magdalena. Other important towns are Manizales (18,000) in the extreme south, the commercial centre of a rich gold and grazing region; Antioquia, the old capital, on the Cauca; and Puerto Berrió on the Magdalena, from which a railway has been started to the capital.

ANTIPAROS (anc. *Oliaros*), an island of the kingdom of Greece, in the modern eparchy of Naxos, separated by a strait (about 1½ m. wide at the narrowest point) from the west coast of Paros. It is 7 m. long by 3 broad, and contains about 700 inhabitants, most of whom live in Kastro, a village on the north coast, and are employed in agriculture and fishing. Formerly piracy was common. The only remarkable feature in the island is a stalactite cavern on the south coast, which is reached by a narrow passage broken by two steep and dangerous descents which are accomplished by the aid of rope-ladders. The grotto itself, which is about 150 ft. by 100, and 50 ft. high (not all can be seen from any part, and probably some portions are still unexplored), shows many remarkable examples of stalactite formations and incrustations of dazzling brilliance. It is not mentioned by ancient writers; the first western traveller to visit it was the marquis de Nointel (ambassador of Louis XIV. to the Porte) who descended it with a numerous suite and held high mass there on Christmas day 1673. There is, however, in the entrance of the cavern an inscription recording the names of visitors in ancient times.

See J. P. de Tournefort, *Relation d'un voyage au Levant* (1717); English edition, 1718, vol. i. p. 146, and guide-books to Greece.

ANTIPATER (398?–319 B.C.), Macedonian general, and regent of Macedonia during Alexander's Eastern expedition (334–323). He had previously (346) been sent as ambassador by Philip to Athens and negotiated peace after the battle of Chaeroneia (338). About 332 he set out against the rebellious tribes of Thrace; but before this insurrection was quelled, the Spartan king Agis had risen against Macedonia. Having settled affairs in Thrace as well as he could, Antipater hastened to the south, and in a battle near Megalopolis (331) gained a complete victory over the insurgents (Diodorus xvii. 62). His regency was greatly troubled by the ambition of Olympias, mother of Alexander, and he was nominally superseded by Craterus. But, on the death of Alexander in 323, he was, by the first partition of the empire, left in command of Macedonia, and in the Lamian War, at the battle of Crannon (322), crushed the Greeks who had attempted to re-assert their independence. Later in the same year he and Craterus were engaged in a war against the Aetolians, when the news arrived from Asia which induced Antipater to conclude peace with them; for Antigonus reported that Perdiccas contemplated making himself sole master of the empire. Antipater and Craterus accordingly prepared for war against Perdiccas, and allied themselves with Ptolemy, the governor of Egypt. Antipater crossed over into Asia in 321; and while still in Syria, he received information that Perdiccas had been murdered by his own soldiers. Craterus fell in battle against Eumenes (Diodorus xviii. 25-39). Antipater, now sole regent, made several new regulations, and having quelled a mutiny of his troops and commissioned Antigonus to continue the war against Eumenes and the other partisans of Perdiccas, returned to Macedonia, where he arrived in 320 (Justin xiii. 6). Soon after he was seized by an illness which terminated his active career, 319. Passing over his son Cassander, he appointed the aged Polyperchon regent, a measure which gave rise to much confusion and ill-feeling (Diodorus xvii., xviii).

ANTIPHANES, the most important writer of the Middle Attic comedy with the exception of Alexis, lived from about 408 to 334 B.C. He was apparently a foreigner who settled in Athens, where he began to write about 387. He was extremely prolific: more than 200 of the 365 (or 260) comedies attributed to him are known to us from the titles and considerable fragments preserved in Athenaeus. They chiefly deal with matters connected with the table, but contain many striking sentiments.

Fragments in Koch, *Comicorum Atticorum Fragmenta*, ii. (1884); see also Clinton, *Philological Museum*, i. (1832); Meineke, *Historia Critica Comicorum Graecorum* (1839).

ANTIPHILUS, a Greek painter, of the age of Alexander. He worked for Philip of Macedon and Ptolemy I. of Egypt. Thus he was a contemporary of Apelles, whose rival he is said to have been, but he seems to have worked in quite another style. Quintilian speaks of his facility: the descriptions of his works which have come down to us show that he excelled in light and shade, in *genre* representations, and in caricature.

See Brunn, *Geschichte der griechischen Künstler*, ii. p. 249.

ANTIPHON, of Rhamnus in Attica, the earliest of the "ten" Attic orators, was born in 480 B.C. He took an active part in political affairs at Athens, and, as a zealous supporter of the oligarchical party, was largely responsible for the establishment of the Four Hundred in 411 (see THERAMENES); on the restoration of the democracy he was accused of treason and condemned to death. Thucydides (viii. 68) expresses a very high opinion of him. Antiphon may be regarded as the founder of political oratory, but he never addressed the people himself except on the occasion of his trial. Fragments of his speech then delivered in defence of his policy (called Περὶ μεταστάσεως) have been edited by J. Nicole (1907) from an Egyptian papyrus. His chief business was that of a professional speech-writer (λογογράφος), for those who felt incompetent to conduct their own cases—as all disputants were obliged to do—without expert assistance. Fifteen of Antiphon's speeches are extant: twelve are mere school exercises on fictitious cases, divided into tetralogies, each consisting of two speeches for prosecution and defence—accusation, defence, reply, counter-reply; three refer to actual legal processes. All deal with cases of homicide (φονικαὶ δίκαι). Antiphon is also said to have composed a Τέχνη or art of Rhetoric.

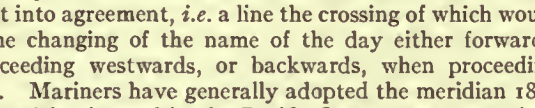
Edition, with commentary, by Maetzner (1838); text by Blass (1881); Jebb, *Attic Orators*; Plutarch, *Vitae X. Oratorum*; Philostratus, *Vit. Sophistarum*, i. 15; van Cleef, *Index Antiphonteus*, Ithaca, N. Y. (1895); see also RHETORIC.

ANTIPHONY (Gr. ἀντί, and φωνή, a voice), a species of psalmody in which the choir or congregation, being divided into two parts, sing alternately. The peculiar structure of the Hebrew psalms renders it probable that the antiphonal method originated in the service of the ancient Jewish Church. According to the historian Socrates, its introduction into Christian worship was due to Ignatius (died 115 A.D.), who in a vision had seen the angels singing in alternate choirs. In the Latin Church it was not practised until more than two centuries later, when it was introduced by Ambrose, bishop of Milan, who compiled an *antiphonary*, or collection of words suitable for antiphonal singing. The antiphonary still in use in the Roman Catholic Church was compiled by Gregory the Great (590 A.D.).

ANTIPODES (Gr. ἀντί, opposed to, and πόδες, feet), a term applied strictly to any two peoples or places on opposite sides of the earth, so situated that a line drawn from the one to the other passes through the centre of the globe and forms a true diameter. Any two places having this relation—as London and, approximately, Antipodes Island, near New Zealand—must be distant from each other by 180° of longitude, and the

one must be as many degrees to the north of the equator as the other is to the south, in other words, the latitudes are numerically equal, but one is *north* and the other *south*. Noon at the one place is midnight at the other, the longest day corresponds to the shortest, and mid-winter is contemporaneous with mid-summer. In the calculation of days and nights, midnight on the one side may be regarded as corresponding to the noon either of the *previous* or of the *following* day. If a voyager sail eastward, and thus anticipate the sun, his dating will be twelve hours in advance, while the reckoning of another who has been sailing westward will be as much in arrear. There will thus be a difference of twenty-four hours between the two when they meet. To avoid the confusion of dates which would thus arise, it is necessary to determine a meridian at which dates should be brought into agreement, *i.e.* a line the crossing of which would involve the changing of the name of the day either forwards, when proceeding westwards, or backwards, when proceeding eastwards. Mariners have generally adopted the meridian 180° from Greenwich, situated in the Pacific Ocean, as a convenient line for co-ordinating dates. The so-called "International Date Line," which is, however, practically only due to American initiative, is designed to remove certain objections to the meridian of 180° W., the most important of which is that groups of islands lying about this meridian differ in date by a day although only a few miles apart. Several forms have been suggested; these generally agree in retaining the meridian of 180° in the mid Pacific, with a bend in the north in order to make the Aleutian Islands and Alaska of the same time as America, and also in the south so as to bring certain of the South Sea islands into line with Australia and New Zealand.

ANTIPYRINE (phenyldimethyl pyrazolone) ($C_{11}H_{12}N_2O$), is prepared by the condensation of phenylhydrazine with aceto-acetic ester, the resulting phenyl methyl pyrazolone being heated with methyl iodide and methyl alcohol to 100–110° C.:—



Phenyl methyl pyrazolone — Antipyrine

On the large scale phenylhydrazine is dissolved in dilute sulphuric acid, the solution warmed to about 40° C. and the aceto-acetic ester added. When the reaction is complete the acid is neutralized with soda, and the phenyl methyl pyrazolone extracted with ether and distilled *in vacuo*. The portion distilling at about 200° C. is then methylated by means of methyl alcohol and methyl iodide at 100–110° C., the excess of methyl alcohol removed and the product obtained decolorized by sulphuric acid. The residue is treated with a warm concentrated solution of soda, and the oil which separates is removed by shaking with benzene. The benzene layer on evaporation deposits the antipyrine as a colourless crystalline solid which melts at 113° C. and is soluble in water. It is basic in character, and gives a red coloration on the addition of ferric chloride. In medicine antipyrine ("phenazonum") has been used as an analgesic and antipyretic. The dose is 5–20 grs., but on account of its depressant action on the heart, and the toxic effects to which it occasionally gives rise, it is now but little used. It is more safely replaced by phenacetine.

ANTIQUARY, a person who devotes himself to the study of ancient learning and "antiques," *i.e.* ancient objects of art or science. The London Society of Antiquaries was formed in the 18th century to promote the study of antiquities. As early as 1572 a society had been founded by Bishop Matthew Parker, Sir Robert Cotton, William Camden and others for the preservation of national antiquities. This body existed till 1604, when it fell under suspicion of being political in its aims, and was abolished by James I. Papers read at their meetings are preserved in the Cottonian library and were printed by Thomas Hearne in 1720 under the title *A Collection of Curious Discourses*, a second edition appearing in 1771. In 1707 a number of English antiquaries began to hold regular meetings for the discussion of their hobby and in 1717 the Society of Antiquaries was formally reconstituted, finally receiving a charter from George II. in 1751. In 1780 George III. granted the society apartments in Somerset House, Strand. The society is governed by a council of twenty and a president who is *ex officio* a trustee of the British Museum. The present headquarters of the society are at Burlington House, Piccadilly.

The Society of Antiquaries of Scotland was founded in 1780, and has the management of a large national antiquarian museum in Edinburgh. In Ireland a society was founded in 1849 called the Kilkenny Archaeological Society, holding its meetings at Kilkenny. In 1869 its name was changed to the Royal Historical and Archaeological Association of Ireland, and in 1890 to the Royal Society of Antiquaries of Ireland, its office being transferred to Dublin. In France *La Société Nationale des Antiquaires de France* was formed in 1814 by the reconstruction of the *Académie Celtique*, which had existed since 1805. The American Antiquarian Society was founded in 1812, with its headquarters at Worcester, Mass. It has a library of upwards of 100,000 volumes and its transactions have been published bi-annually since 1849. In Germany the *Gesamtverein der Deutschen Geschichts-und Altertumsvereine* was founded in 1852. *La Société Royale des Antiquaires du Nord* at Copenhagen is among the best known of European antiquarian societies.

ANTIQUE (Lat. *antiquus*, old), a term conventionally restricted to the remains of ancient art, such as sculptures, gems, medals, seals, &c. In a limited sense it applies only to Greek and Roman art, and includes neither the artistic remains of other ancient nations nor any product of classical art of a later date than the fall of the western empire.

ANTI-SEMITISM. In the political struggles of the concluding quarter of the 19th century an important part was played by a religious, political and social agitation against the Jews, known as "Anti-Semitism." The origins of this remarkable movement already threaten to become obscured by legend. The Jews contend that anti-Semitism is a mere atavistic revival of the Jew-hatred of the middle ages. The extreme section of the anti-Semites, who have given the movement its quasi-scientific name, declare that it is a racial struggle—an incident of the eternal conflict between Europe and Asia—and that the anti-Semites are engaged in an effort to prevent what is called the Aryan race from being subjugated by a Semitic immigration, and to save Aryan ideals from being modified by an alien and demoralizing oriental *Anschauung*. There is no essential foundation for either of these contentions. Religious prejudices reaching back to the dawn of history have been reawakened by the anti-Semitic agitation, but they did not originate it, and they have not entirely controlled it. The alleged racial divergence is, too, only a linguistic hypothesis on the physical evidence of which anthropologists are not agreed (Topinard, *Anthropologie*, p. 444; Taylor, *Origins of Aryans*, cap. i.), and, even if it were proved, it has existed in Europe for so many centuries, and so many ethnic modifications have occurred on both sides, that it cannot be accepted as a practical issue. It is true that the ethnographical histories of the Jews and the nations of Europe have proceeded on widely diverging lines, but these lines have more than once crossed each other and become interlaced. Thus Aryan elements are at the beginning of both; European morals have been ineradicably semitized by Christianity, and the Jews have been Europeans for over a thousand years, during which their character has been modified and in some respects transformed by the ecclesiastical and civil polities of the nations among whom they have made their permanent home. Anti-Semitism is then exclusively a question of European politics, and its origin is to be found, not in the long struggle between Europe and Asia, or between the Church and the Synagogue, which filled so much of ancient and medieval history, but in the social conditions resulting from the emancipation of the Jews in the middle of the 19th century.

If the emancipated Jews were Europeans in virtue of the antiquity of their western settlements, and of the character impressed upon them by the circumstances of their European history, they none the less presented the appearance of a strange people to their Gentile fellow-countrymen. They had been

secluded in their ghettos for centuries, and had consequently acquired a physical and moral physiognomy differentiating them in a measure from their former oppressors. This peculiar physiognomy was, on its moral side, not essentially Jewish or even Semitic. It was an advanced development of the main attributes of civilized life, to which Christendom in its transition from feudalism had as yet only imperfectly adapted itself. The ghetto, which had been designed as a sort of quarantine to safeguard Christendom against the Jewish heresy, had in fact proved a storage chamber for a portion of the political and social forces which were destined to sweep away the last traces of feudalism from central Europe. In the ghetto, the pastoral Semite, who had been made a wanderer by the destruction of his nationality, was steadily trained, through centuries, to become an urban European, with all the parasitic activities of urban economics, and all the democratic tendencies of occidental industrialism. Excluded from the army, the land, the trade corporations and the artisan gilds, this quondam oriental peasant was gradually transformed into a commercial middleman and a practised dealer in money. Oppressed by the Church, and persecuted by the State, his theocratic and monarchical traditions lost their hold on his daily life, and he became saturated with a passionate devotion to the ideals of democratic politics. Finally, this former bucolic victim of Phoenician exploitation had his wits preternaturally sharpened, partly by the stress of his struggle for life, and partly by his being compelled in his urban seclusion to seek for recreation in literary exercises, chiefly the subtle dialectics of the Talmudists (Loeb, *Juif de l'histoire*; Jellinek, *Der Jüdische Stamm*). Thus, the Jew who emerged from the ghetto was no longer a Palestinian Semite, but an essentially modern European, who differed from his Christian fellow-countrymen only in the circumstances that his religion was of the older Semitic form, and that his physical type had become sharply defined through a slightly more rigid exclusiveness in the matter of marriages than that practised by Protestants and Roman Catholics (Andree, *Volkskunde der Juden*, p. 58).

Unfortunately, these distinctive elements, though not very serious in themselves, became strongly accentuated by concentration. Had it been possible to distribute the emancipated Jews uniformly throughout Christian society, as was the case with other emancipated religious denominations, there would have been no revival of the Jewish question. The Jews, however, through no fault of their own, belonged to only one class in European society—the industrial *bourgeoisie*. Into that class all their strength was thrown, and owing to their ghetto preparation, they rapidly took a leading place in it, politically and socially. When the mid-century revolutions made the *bourgeoisie* the ruling power in Europe, the semblance of a Hebrew domination presented itself. It was the exaggeration of this apparent domination, not by the *bourgeoisie* itself, but by its enemies among the vanquished reactionaries on the one hand, and by the extreme Radicals on the other, which created modern anti-Semitism as a political force.

The movement took its rise in Germany and Austria. Here the concentration of the Jews in one class of the population was aggravated by their excessive numbers. While in France the proportion to the total population was, in the early 'seventies, 0·14 %, and in Italy, 0·12 %, it was 1·22 % in Germany, and 3·85 % in Austria-Hungary; Berlin had 4·36 % of Jews, and Vienna 6·62 % (Andree, *Volkskunde*, pp. 287, 291, 294, 295). The activity of the Jews consequently manifested itself in a far more intense form in these countries than elsewhere. This was apparent even before the emancipations of 1848. Towards the middle of the 18th century, a limited number of wealthy Jews had been tolerated as *Schutz-Juden* outside the ghettos, and their sons, educated as Germans under the influence of Moses Mendelssohn and his school (see JEWS), supplied a majority of the leading spirits of the revolutionary agitation. To this period belong the formidable names of Ludwig Börne (1786–1837), Heinrich Heine (1799–1854), Edward Ganz (1798–1839), Gabriel Riesser (1806–1863), Ferdinand Lassalle (1825–1864), Karl Marx (1818–1883), Moses Hess (1812–1875), Ignatz Kuranda (1811–1884), and Johann Jacobi (1805–1877). When the revolution was completed, and the Jews entered in a body the national life of Germany and Austria, they sustained this high average in all the intellectual branches of middle-class activity. Here again, owing to the accidents of their history, a further concentration became apparent. Their activity was almost exclusively intellectual. The bulk of them flocked to the financial and the distributive (as distinct from the productive) fields of industry to which they had been confined in the ghettos. The sharpened faculties of the younger generation at the same time carried everything before them in the schools, with the result that they soon crowded the professions, especially medicine, law and journalism (Nossig, *Statistik des Jüd. Stammes*, pp. 33-37; Jacobs, *Jew. Statistics*, pp. 41-69). Thus the "Semitic domination," as it was afterwards called, became every day more strongly accentuated. If it was a long time in exciting resentment and jealousy, the reason was that it was in no sense alien to the new conditions of the national life. The competition was a fair one. The Jews might be more successful than their Christian fellow-citizens, but it was in virtue of qualities which complied with the national standards of conduct. They were as law-abiding and patriotic as they were intelligent. Crime among them was far below the average (Nossig, p. 31). Their complete assimilation of the national spirit was brilliantly illustrated by the achievements in German literature, art and science of such men as Heinrich Heine and Berthold Auerbach (1812–1882), Felix Mendelssohn (-Bartholdy) (1809–1847), and Jacob Meyerbeer (1794–1864), Karl Gustav Jacobi the mathematician (1804–1851), Gabriel Gustav Valentin the physiologist (1810–1883), and Moritz Lazarus (1824–1903) and Heymann Steinthal (1823–1899) the national psychologists. In politics, too, Edward Lasker (1829–1884) and Ludwig Bamberger (1823–1899) had shown how Jews could put their country before party, when, at the turning-point of German imperial history in 1866, they led the secession from the *Fortschritts-Partei* and founded the National Liberal party, which enabled Prince Bismarck to accomplish German unity. Even their financiers were not behind their Christian fellow-citizens in patriotism. Prince Bismarck himself confessed that the money for carrying on the 1866 campaign was obtained from the Jewish banker Bleichroeder, in face of the refusal of the money-market to support the war. Hence the voice of the old Jew-hatred—for in a weak way it was still occasionally heard in obscurantist corners—was shamed into silence, and it was only in the European twilight—in Russia and Rumania—and in lands where mediævalism still lingered, such as northern Africa and Persia, that oppression and persecution continued to dog the steps of the Jews.

Germany.

The signal for the change came in 1873, and was given unconsciously by one of the most distinguished Jews of his time, Edward Lasker, the gifted lieutenant of Bennigsen in the leadership of the National Liberal party. The unification of Germany in 1870, and the rapid payment of the enormous French war indemnity, had given an unprecedented impulse to industrial and financial activity throughout the empire. Money became cheap and speculation universal. A company mania set in which was favoured by the government, who granted railway and other concessions with a prodigal hand. The inevitable result of this state of things was first indicated by Jewish politicians and economists. On the 14th of January 1873, Edward Lasker called the attention of the Prussian diet to the dangers of the situation, while his colleague, Ludwig Bamberger, in an able article in the *Preussischen Jahrbücher*, condemned the policy which had permitted the milliards to glut the country instead of being paid on a plan which would have facilitated their gradual digestion by the economic machinery of the nation. Deeply impressed by the gravity of the impending crisis, Lasker instituted a searching inquiry, with the result that he discovered a series of grave company scandals in which financial promoters and aristocratic directors were chiefly involved. Undeterred by the fact that the leading spirit in these abuses, Bethel Henry Strousberg (1823–1884), was a Jew, Lasker presented the results of his inquiry to the diet on the 7th of February 1873, in a speech

of great power and full of sensational disclosures. The dramatic results of this speech need not be dwelt upon here (for details see Blum, *Das deutsche Reich zur Zeit Bismarcks*, pp. 153-181). It must suffice to say that in the following May the great Vienna "Krach" occurred, and the colossal bubble of speculation burst, bringing with it all the ruin foretold by Lasker and Bamberger. From the position occupied by the Jews in the commercial class, and especially in the financial section of that class, it was inevitable that a considerable number of them should figure in the scandals which followed. At this moment an obscure Hamburg journalist, Wilhelm Marr, who as far back as 1862 had printed a still-born tract against the Jews (*Judenspiegel*), published a sensational pamphlet entitled *Der Sieg des Judenthums über das Germanthum* ("The Victory of Judaism over Germanism"). The book fell upon fruitful soil. It applied to the nascent controversy a theory of nationality which, under the great sponsorship of Hegel, had seized on the minds of the German youth, and to which the stirring events of 1870 had already given a deep practical significance. The state, according to the Hegelians, should be rational, and the nation should be a unit comprising individuals speaking the same language and of the same racial origin. Heterogeneous elements might be absorbed, but if they could not be reduced to the national type they should be eliminated. This was the pseudo-scientific note of the new anti-Semitism, the theory which differentiated it from the old religious Jew-hatred and sought to give it a rational place in modern thought. Marr's pamphlet, which reviewed the facts of the Jewish social concentration without noticing their essentially transitional character, proved the pioneer of this teaching. It was, however, in the passions of party politics that the new crusade found its chief sources of vitality. The enemies of the *bourgeoisie* at once saw that the movement was calculated to discredit and weaken the school of Manchester Liberalism, then in the ascendant. Agrarian capitalism, which had been dethroned by industrial capitalism in 1848, and had burnt its fingers in 1873, seized the opportunity of paying off old scores. The clericals, smarting under the *Kulturkampf*, which was supported by the whole body of Jewish liberalism, joined eagerly in the new cry. In 1876 another sensational pamphlet was published, Otto Glogau's *Die Börsen und Grundergeschwindel in Berlin* ("The Bourses and the Company Swindles in Berlin"), dealing in detail with the Jewish participation in the scandals first revealed by Lasker. The agitation gradually swelled, its growth being helped by the sensitiveness and *cacoëthes scribendi* of the Jews themselves, who contributed two pamphlets and a much larger proportion of newspaper articles for every one supplied by their opponents (Jacobs, *Bibliog. Jew. Question*, p. xi.). Up to 1879, however, it was more of a literary than a political agitation, and was generally regarded only as an ephemeral craze or a passing spasm of popular passion.

Towards the end of 1879 it spread with sudden fury over the whole of Germany. This outburst, at a moment when no new financial scandals or other illustrations of Semitic demoralization and domination were before the public, has never been fully explained. It is impossible to doubt, however, that the secret springs of the new agitation were more or less directly supplied by Prince Bismarck himself. Since 1877 the relations between the chancellor and the National Liberals had gradually become strained. The deficit in the budget had compelled the government to think of new taxes, and in order to carry them through the Reichstag the support of the National Liberals had been solicited. Until then the National Liberals had faithfully supported the chancellor in nursing the consolidation of the new empire, but the great dream of its leaders, especially of Lasker and Bamberger, who had learnt their politics in England, was to obtain a constitutional and economic *régime* similar to that of the British Isles. The organization of German unity was now completed, and they regarded the new overtures of Prince Bismarck as an opportunity for pressing their constitutional demands. These were refused, the Reichstag was dissolved and Prince Bismarck boldly came forward with a new fiscal policy, a combination of protection and state socialism. Lasker and Bamberger thereupon led a powerful secession of National Liberals into opposition, and the chancellor was compelled to seek a new majority among the ultra-Conservatives and the Roman Catholic Centre. This was the beginning of the famous "journey to Canossa." Bismarck did not hide his mortification. He began to recognize in anti-Semitism a means of "dishing" the Judaized liberals, and to his creatures who assisted him in his press campaigns he dropped significant hints in this sense (Busch, *Bismarck*, ii. 453-454, iii. 16). He even spoke of a new *Kulturkampf* against the Jews (*ibid.* ii. p. 484). How these hints were acted upon has not been revealed, but it is sufficiently instructive to notice that the final breach with the National Liberals took place in July 1879, and that it was immediately followed by a violent revival of the anti-Semitic agitation. Marr's pamphlet was reprinted, and within a few months ran through nine further editions. The historian Treitschke gave the sanction of his great name to the movement. The Conservative and Ultramontane press rang with the sins of the Jews. In October an anti-Semitic league was founded in Berlin and Dresden (for statutes of the league see *Nineteenth Century*, February 1881, p. 344).

The leadership of the agitation was now definitely assumed by a man who combined with social influence, oratorical power and inexhaustible energy, a definite scheme of social regeneration and an organization for carrying it out. This man was Adolf Stöcker (b. 1835), one of the court preachers. He had embraced the doctrines of Christian socialism which the Roman Catholics, under the guidance of Archbishop Ketteler, had adopted from the teachings of the Jew Lassalle (Nitti, *Catholic Socialism*, pp. 94-96, 122, 127), and he had formed a society called "The Christian Social Working-man's Union." He was also a conspicuous member of the Prussian diet, where he sat and voted with the Conservatives. He found himself in strong sympathy with Prince Bismarck's new economic policy, which, although also of Lassallian origin (Kohut, *Ferdinand Lassalle*, pp. 144 et seq.), was claimed by its author as being essentially Christian (Busch, p. 483). Under his auspices the years 1880–1881 became a period of bitter and scandalous conflict with the Jews. The Conservatives supported him, partly to satisfy their old grudges against the Liberal *bourgeoisie* and partly because Christian Socialism, with its anti-Semitic appeal to ignorant prejudice, was likely to weaken the hold of the Social Democrats on the lower classes. The Lutheran clergy followed suit, in order to prevent the Roman Catholics from obtaining a monopoly of Christian Socialism, while the Ultramontanes readily adopted anti-Semitism, partly to maintain their monopoly, and partly to avenge themselves on the Jewish and Liberal supporters of the *Kulturkampf*. In this way a formidable body of public opinion was recruited for the anti-Semites. Violent debates took place in the Prussian diet. A petition to exclude the Jews from the national schools and universities and to disable them from holding public appointments was presented to Prince Bismarck. Jews were boycotted and insulted. Duels between Jews and anti-Semites, many of them fatal, became of daily occurrence. Even unruly demonstrations and street riots were reported. Pamphlets attacking every phase and aspect of Jewish life streamed by the hundred from the printing-press. On their side the Jews did not want for friends, and it was owing to the strong attitude adopted by the Liberals that the agitation failed to secure legislative fruition. The crown prince (afterwards Emperor Frederick) and crown princess boldly set themselves at the head of the party of protest. The crown prince publicly declared that the agitation was "a shame and a disgrace to Germany." A manifesto denouncing the movement as a blot on German culture, a danger to German unity and a flagrant injustice to the Jews themselves, was signed by a long list of illustrious men, including Herr von Forckenbeck, Professors Mommsen, Gneist, Droysen, Virchow, and Dr Werner Siemens (*Times*, November 18, 1880). During the Reichstag elections of 1881 the agitation played an active part, but without much effect, although Stöcker was elected. This was due to the fact that the great Conservative parties, so

far as their political organizations were concerned, still remained chary of publicly identifying themselves with a movement which, in its essence, was of socialistic tendency. Hence the electoral returns of that year supplied no sure guide to the strength of anti-Semitic opinion among the German people.

The first severe blow suffered by the German anti-Semites was in 1881, when, to the indignation of the whole civilized world, the barbarous riots against the Jews in Russia and the revival of the medieval Blood Accusation in Hungary (see *infra*) illustrated the liability of unreasoning mobs to carry into violent practice the incendiary doctrines of the new Jew-haters. From this blow anti-Semitism might have recovered had it not been for the divisions and scandals in its own ranks, and the artificial forms it subsequently assumed through factitious alliances with political parties bent less on persecuting the Jews than on profiting by the anti-Jewish agitation. The divisions showed themselves at the first attempt to form a political party on an anti-Semitic basis. Imperceptibly the agitators had grouped themselves into two classes, economic and ethnological anti-Semites. The impracticable racial views of Marr and Treitschke had not found favour with Stöcker and the Christian Socialists. They were disposed to leave the Jews in peace so long as they behaved themselves properly, and although they carried on their agitation against Jewish malpractices in a comprehensive form which seemed superficially to identify them with the root-and-branch anti-Semites, they were in reality not inclined to accept the racial theory with its scheme of revived Jewish disabilities (Huret, *La Question Sociale*—interview with Stöcker). This feeling was strengthened by a tendency on the part of an extreme wing of the racial anti-Semites to extend their campaign against Judaism to its offspring, Christianity. In 1879 Professor Sepp, arguing that Jesus was of no human race, had proposed that Christianity should reject the Hebrew Scriptures and seek a fresh historical basis in the cuneiform inscriptions. Later Dr Eugen Dühring, in several brochures, notably *Die Judenfrage als Frage des Rassencharakters* (1881, 5th ed. Berlin, 1901), had attacked Christianity as a manifestation of the Semitic spirit which was not compatible with the theological and ethical conceptions of the Scandinavian peoples. The philosopher Friedrich Nietzsche had also adopted the same view, without noticing that it was a *reductio ad absurdum* of the whole agitation, in his *Menschliches, Allzumenschliches* (1878), *Jenseits von Gut und Böse* (1886), *Genealogie der Moral* (1887). With these tendencies the Christian Socialists could have no sympathy, and the consequence was that when in March 1881 a political organization of anti-Semitism was attempted, two rival bodies were created, the "Deutsche Volksverein," under the Conservative auspices of Herr Liebermann von Sonnenberg (b. 1848) and Herr Förster, and the "Sociale Reichsverein," led by the racial and Radical anti-Semites, Ernst Henrici (b. 1854) and Otto Böckel (b. 1859). In 1886, at an anti-Semitic congress held at Cassel a reunion was effected under the name of the "Deutsche antisemitische Verein," but this only lasted three years. In June 1889 the anti-Semitic Christian Socialists under Stöcker again seceded.

Meanwhile racial anti-Semitism with its wholesale radical proposals had been making considerable progress among the ignorant lower classes. It adapted itself better to popular passions and inherited prejudice than the more academic conceptions of the Christian Socialists. The latter, too, were largely Conservatives, and their points of contact with the proletariat were at best artificial. Among the Hessian peasantry the inflammatory appeals of Böckel secured many adherents. This paved the way for a new anti-Semitic leader, Herrmann Ahlwardt (b. 1846), who, towards the end of the 'eighties, eclipsed all the other anti-Semites by the sensationalism and violence with which he prosecuted the campaign. Ahlwardt was a person of evil notoriety. He was loaded with debt. In the Manché decoration scandals it was proved that he had acted first as a corrupt intermediary and afterwards as the betrayer of his confederates. His anti-Semitism was adopted originally as a means of *chantage*, and it was only when it failed to yield profit in this form that he came out boldly as an agitator. The wildness, unscrupulousness, and full-bloodedness of his propaganda enchanted the mob, and he bid fair to become a powerful democratic leader. His pamphlets, full of scandalous revelations of alleged malpractices of eminent Jews, were read with avidity. No fewer than ten of them were written and published during 1892. Over and over again he was prosecuted for libel and convicted, but this seemed only to strengthen his influence with his followers. The Roman Catholic clergy and newspapers helped to inflame the popular passions. The result was that anti-Jewish riots broke out. At Neustettin the Jewish synagogue was burnt, and at Xanten the Blood Accusation was revived, and a Jewish butcher was tried on the ancient charge of murdering a Christian child for ritual purposes. The man was, of course, acquitted, but the symptoms it revealed of reviving medievalism strongly stirred the liberal and cultured mind of Germany. All protest, however, seemed powerless, and the barbarian movement appeared destined to carry everything before it.

German politics at this moment were in a very intricate state. Prince Bismarck had retired, and Count Caprivi, with a programme of general conciliation based on Liberal principles, was in power. Alarmed by the non-renewal of the anti-Socialist law, and by the conclusion of commercial treaties which made great concessions to German industry, the landed gentry and the Conservative party became alienated from the new chancellor. In January 1892 the split was completed by the withdrawal by the government of the Primary Education bill, which had been designed to place primary instruction on a religious basis. The Conservatives saw their opportunity of posing as the party of Christianity against the Liberals and Socialists, who had wrecked the bill, and they began to look towards Ahlwardt as a possible ally. He had the advantages over Stöcker that he was not a Socialist, and that he was prepared to lead his apparently large following to assist the agrarian movement and weaken the Social Democrats. The intrigue gradually came to light. Towards the end of the year Herr Liebknecht, the Social Democratic leader, denounced the Conservatives to the Reichstag as being concerned "in using the anti-Semitic movement as a bastard edition of Socialism for the use of stupid people." (1st December). Two days later the charge was confirmed. At a meeting of the party held on the 3rd of December the following plank was added to the Conservative programme: "We combat the oppressive and disintegrating Jewish influence on our national life; we demand for our Christian people a Christian magistracy and Christian teachers for Christian pupils; we repudiate the excesses of anti-Semitism." In pursuance of the resolution Ahlwardt was returned to the Reichstag at a by-election by the Conservative district of Arnswalde-Friedeberg. The coalition was, however, not yet completed. The intransigeant Conservatives, led by Baron von Hammerstein, the editor of the *Kreuz-Zeitung*, justly felt that the concluding sentence of the resolution of the 3rd of December repudiating "the excesses of anti-Semitism" was calculated to hinder a full and loyal co-operation between the two parties. Accordingly on the 9th of December another meeting of the party was summoned. Twelve hundred members met at the Tivoli Hall in Berlin, and with only seven dissentients solemnly expunged the offending sentence from the resolution. The history of political parties may be searched in vain for a parallel to this discreditable transaction.

The capture of the Conservative party proved the high-water mark of German anti-Semitism. From that moment the tide began to recede. All that was best in German national life was scandalized by the cynical tactics of the Conservatives. The emperor, strong Christian though he was, was shocked at the idea of serving Christianity by a compact with unscrupulous demagogues and ignorant fanatics. Prince Bismarck growled out a stinging sarcasm from his retreat at Friedrichsruh. Even Stöcker raised his voice in protest against the "Ahlwardtismus" and "Böckelianismus," and called upon his Conservative colleagues to distinguish between "respectable and disreputable anti-Semitism." As for the Liberals and Socialists, they filled the air with bitter laughter, and declared from the housetops that the stupid party had at last been overwhelmed by its own

stupidity. The Conservatives began to suspect that they had made a false step, and they were confirmed in this belief by the conduct of their new ally in the Reichstag. His début in parliament was the signal for a succession of disgraceful scenes. His whole campaign of calumny was transferred to the floor of the house, and for some weeks the Reichstag discussed little else than his so-called revelations. The Conservatives listened to his wild charges in uncomfortable silence, and refused to support him. Stöcker opposed him in a violent speech. The Radicals and Socialists, taking an accurate measure of the shallow vanity of the man, adopted the policy of giving him "enough rope." Shortly after his election he was condemned to five months' imprisonment for libel, and he would have been arrested but for the interposition of the Socialist party, including five Jews, who claimed for him the immunities of a member of parliament. When he moved for a commission to inquire into his revelations, it was again the Socialist party which supported him, with the result that all his charges, without exception, were found to be absolutely baseless. Ahlwardt was covered with ridicule, and when in May the Reichstag was dissolved, he was marched off to prison to undergo the sentence for libel from which his parliamentary privilege had up to that moment protected him.

His hold on the anti-Semitic populace was, however, not diminished. On the contrary, the action of the Conservatives at the Tivoli congress could not be at once eradicated from the minds of the Conservative voters, and when the electoral campaign began it was found impossible to explain to them that the party leaders had changed their minds. The result was that Ahlwardt, although in prison, was elected by two constituencies. At Arnswalde-Friedeberg he was returned in the teeth of the opposition of the official Conservatives, and at Neustettin he defeated no less a person than his anti-Semitic opponent Stöcker. Fifteen other anti-Semites, all of the Ahlwardtian school, were elected. This, however, represented little in the way of political influence; for henceforth the party had to stand alone as one of the many minor factions in the Reichstag, avoided by all the great parties, and too weak to exercise any influence on the main course of affairs.

During the subsequent seven years it became more and more discredited. The financial scandals connected with Förster's attempt to found a Christian Socialist colony in Paraguay, the conviction of Baron von Hammerstein, the anti-Semitic Conservative leader, for forgery and swindling (1895–1896), and several minor scandals of the same unsavoury character, covered the party with the very obloquy which it had attempted to attach to the Jews. At the same time the Christian Socialists who had remained with the Conservative party also suffered. After the elections of 1893, Stöcker was dismissed from his post of court preacher, and publicly reprimanded for speaking familiarly of the empress. Two years later the Christian Socialist, Pastor Neumann, observing the tendency of the Conservatives to coalesce with the moderate Liberals in antagonism to Social Democracy, declared against the Conservative party. The following year the emperor publicly condemned Christian Socialism and the "political pastors," and Stöcker was expelled from the Conservative party for refusing to modify the socialistic propanganda of his organ, *Das Volk*. His fall was completed by a quarrel with the Evangelical Social Union. He left the Union and appealed to the Lutheran clergy to found a new church social organization, but met with no response. Another blow to anti-Semitism came from the Roman Catholics. They had become alarmed by the unbridled violence of the Ahlwardtians, and when in 1894 Förster declared in an address to the German anti-Semitic Union that anarchical outrages like the murder of President Carnot were as much due to the "Anarchismus von oben" as the "Anarchismus von unten," the Ultramontane *Germania* publicly washed its hands of the Jew-baiters (1st of July 1894). Thus gradually German anti-Semitism became stripped of every adventitious alliance; and at the general election of 1898 it only managed to return twelve members to the Reichstag, and in 1903 its party strength fell to nine. A remarkable revival in its fortunes, however, took place between 1905 and 1907. Identifying itself with the extreme Chauvinists and Anglophobes it profited by the anti-national errors of the Clericals and Socialists, and won no fewer than twelve by-elections. At the general election of 1907 its jingoism and aggressive Protestantism were rewarded with twenty-five seats. It is clear, however, from the figures of the second ballots that these successes owed far more to the tendencies of the party in the field of general politics than to its anti-Semitism. Indeed the specifically anti-Semitic movement has shown little activity since 1893.

The causes of the decline of German anti-Semitism are not difficult to determine. While it remained a theory of nationality and a fad of the metaphysicians, it made considerable noise in the world, but without exercising much practical influence. When it attempted to play an active part in politics it became submerged by the ignorant and superstitious voters, who could not understand its scientific justification, but who were quite ready to declaim and riot against the Jew bogey. It thus became a sort of Jacquerie which, being exploited by unscrupulous demagogues, soon alienated all its respectable elements. Its moments of real importance have been due not to inherent strength but to the uses made of it by other political parties for their own purposes. These coalitions are no longer of perilous significance so far as the Jews are concerned, chiefly because, in face of the menace of democratic socialism and its unholy alliance with the Roman Catholic Centrum, all supporters of the present organization of society have found it necessary to sink their differences. The new social struggle has eclipsed the racial theory of nationality. The Social Democrat became the enemy, and the new reaction counted on the support of the rich Jews and the strongly individualist Jewish middle class to assist it in preserving the existing social structure. Hence in Prince Bülow's "Bloc" (1908) anti-Semites figured side by side with Judeophil Radicals.

More serious have been the effects of German anti-Semitic teachings on the political and social life of the countries adjacent to the empire—Russia, Austria and France. In Russia these effects were first seriously felt owing to the fury of autocratic reaction to which the tragic death of the tsar Alexander II. gave rise. This, however, like the Strousberg *Krach* in Germany, was only the proximate cause of the outbreak. There were other elements which had created a *milieu* peculiarly favourable to the transplantation of the German craze. In the first place the medieval anti-Semitism was still an integral part of the polity of the empire. The Jews were cooped up in one huge ghetto in the western provinces, "marked out to all their fellow-countrymen as aliens, and a pariah caste set apart for special and degrading treatment" (*Persecution of the Jews in Russia*, 1891, p. 5). In the next place, owing to the emancipation of the serfs which had half ruined the landowners, while creating a free but moneyless peasantry, the Jews, who could be neither nobles nor peasants, had found a vocation as money-lenders and as middlemen between the grain producers, and the grain consumers and exporters. There is no evidence that this function was performed, as a rule, in an exorbitant or oppressive way. On the contrary, the fall in the value of cereals on all the provincial markets, after the riots of 1881, shows that the Jewish competition had previously assured full prices to the farmers (Schwabacher, *Denkschrift*, 1882, p. 27). Nevertheless, the Jewish activity or "exploitation," as it was called, was resented, and the ill-feeling it caused among landowners and farmers was shared by non-Jewish middlemen and merchants who had thereby been compelled to be satisfied with small profits. Still there was but little thought of seeking a remedy in an organized anti-Jewish movement. On the contrary, the abnormal situation aggravated by the disappointments and depression caused by the Turkish war, had stimulated a widespread demand for constitutional changes which would enable the people to adopt a state-machinery more exactly suited to their needs. Among the peasantry this demand was promoted and fomented by the Nihilists, and among the landowners it was largely adopted as a means of checking what threatened to become a new Jacquerie (Walcker, *Gegenwärtige Lage Russlands*, 1873; *Innere Krisis Russlands*, 1876). The tsar, Alexander II., strongly sympathized

Russia.

with this movement, and on the advice of Count Loris-Melikov and the council of ministers a rudimentary scheme of parliamentary government had been drafted and actually signed when the emperor was assassinated. Meanwhile a nationalist and reactionary agitation, originating like its German analogue in the Hegelianism of a section of the lettered public, had manifested itself in Moscow. After some early vicissitudes, it had been organized, under the auspices of Alexis Kireiev, Chomyakov, Aksakov and Kochelev, into the Slavophil party, with a Romanticist programme of reforms based on the old traditions of the pre-Petrine epoch. This party gave a great impetus to Slav nationalism. Its final possibilities were sanguinarily illustrated by Muraviev's campaign in Poland in 1863, and in the war against Turkey in 1877, which was exclusively its handiwork (Statement by General Kireiev: Schütz, *Das heutige Russland*, p. 104). After the assassination of Alexander II. the Slavophil teaching, as expounded by Ignatiev and Pobêdonostsev, became paramount in the government, and the new tsar was persuaded to cancel the constitutional project of his father. The more liberal views of a section of the Slavophils under Aksakov, who had been in favour of representative institutions on traditional lines, were displaced by the reactionary system of Pobêdonostsev, who took his stand on absolutism, orthodoxy and the racial unity of the Russian people. This was the situation on the eve of Easter 1881. The hardening nationalism above, the increasing discontent below, the economic activity of the Hebrew heretics and aliens, and the echoes of anti-Semitism from over the western border were combining for an explosion.

A scuffle in a tavern at Elisabethgrad in Kherson sufficed to ignite this combustible material. The scuffle grew into a riot, the tavern was sacked, and the drunken mob, hounded on by agitators who declared that the Jews were using Christian blood for the manufacture of their Easter bread, attacked and looted the Jewish quarter. The outbreak spread rapidly. On the 7th of May there was a similar riot at Smiela, near Cherkasy, and the following day there was a violent outbreak at Kiev, which left 2000 Jews homeless. Within a few weeks the whole of western Russia, from the Black Sea to the Baltic, was smoking with the ruins of Jewish homes. Scores of Jewish women were dishonoured, hundreds of men, women and children were slaughtered, and tens of thousands were reduced to beggary and left without a shelter. Murderous riots or incendiary outrages took place in no fewer than 167 towns and villages, including Warsaw, Odessa and Kiev. Europe had witnessed no such scenes of mob savagery since the Black Death massacres in the 14th century. As the facts gradually filtered through to the western capitals they caused a thrill of horror everywhere. An indignation meeting held at the Mansion House in London, under the presidency of the lord mayor, was the signal for a long series of popular demonstrations condemning the persecutions, held in most of the chief cities of England and the continent.

Except as stimulated by the Judeophobe revival in Germany the Russian outbreak in its earlier forms does not belong specifically to modern anti-Semitism. It was essentially a medieval uprising animated by the religious fanaticism, gross superstition and predatory instincts of a people still in the medieval stage of their development. This is proved by the fact that, although the Russian peasant was supposed to be a victim of unbearable Jewish "exploitation," he was not moved to riot until he had been brutalized by drink and excited by the old fable of the Blood Accusation. The modern anti-Semitic element came from above and followed closely on the heels of the riots. It has been freely charged against the Russian government that it promoted the riots in 1881 in order to distract popular attention from the Nihilist propaganda and from the political disappointments involved in the cancellation of the previous tsar's constitutional project (Lazare, *L'Antisémitisme*, p. 211). This seems to be true of General Ignatiev, then minister of the interior, and the secret police (Séménoff, *The Russian Government and the Massacres*, pp. 17, 32, 241). It is certain that the local authorities, both civil and military, favoured the outbreak, and took no steps to suppress it, and that the feudal bureaucracy who had just escaped a great danger were not sorry to see the discontented populace venting their passions on the Jews. In the higher circles of the government, however, other views prevailed. The tsar himself was at first persuaded that the riots were the work of Nihilists, and he publicly promised his protection to the Jews. On the other hand, his ministers, ardent Slavophils, thought they recognized in the outbreak an endorsement of the nationalist teaching of which they were the apostles, and, while reprobating the acts of violence, came to the conclusion that the most reasonable solution was to aggravate the legal disabilities of the persecuted aliens and heretics. To this view the tsar was won over, partly by the clamorous indignation of western Europe, which had wounded his national *amour propre* to the quick, and partly by the strongly partisan report of a commission appointed to inquire, not into the administrative complaisance which had allowed riot to run loose over the western and southern provinces, but into the "exploitation" alleged against the Jews, the reasons why "the former laws limiting the rights of the Jews" had been mitigated, and how these laws could be altered so as "to stop the pernicious conduct of the Jews" (Rescript of the 3rd of September 1881). The result of this report was the drafting of a "Temporary Order concerning the Jews" by the minister of the interior, which received the assent of the tsar on the 3rd of May 1882. This order, which was so little temporary that it has not yet been repealed, had the effect of creating a number of fresh ghettos within the pale of Jewish settlement. The Jews were cooped up within the towns, and their rural interests were arbitrarily confiscated. The doubtful incidence of the order gave rise to a number of judgments of the senate, by which all its persecuting possibilities were brought out, with the result that the activities of the Jews were completely paralysed, and they became a prey to unparalleled cruelty. As the gruesome effect of this legislation became known, a fresh outburst of horror and indignation swelled up from western Europe. It proved powerless. Count Ignatiev was dismissed owing to the protests of high-placed Russians, who were disgusted by the new *Kulturkampf*, but his work remained, and, under the influence of Pobêdonostsev, the procurator of the Holy Synod, the policy of the "May Laws," as they were significantly called, was applied to every aspect of Jewish life with pitiless rigour. The temper of the tsar may be judged by the fact that when an appeal for mercy from an illustrious personage in England was conveyed to him at Fredensborg through the gracious medium of the tsaritsa, he angrily exclaimed within the hearing of an Englishman in the ante-room who was the bearer of the message, "Never let me hear you mention the name of that people again!"

The Russian May Laws are the most conspicuous legislative monument achieved by modern anti-Semitism. It is true that they re-enacted regulations which resemble the oppressive statutes introduced into Poland through the influence of the Jesuits in the 16th century (Sternberg, *Gesch. d. Juden in Polen*, pp. 141 et seq.), but their Orthodox authors were as little conscious of this irony of history as they were of the Teutonic origins of the whole Slavophil movement. These laws are an experimental application of the political principles extracted by Marr and his German disciples from the metaphysics of Hegel, and as such they afford a valuable means of testing the practical operation of modern anti-Semitism. Their result was a widespread commercial depression which was felt all over the empire. Even before the May Laws were definitely promulgated the passport registers showed that the anti-Semitic movement had driven 67,900 Jews across the frontier, and it was estimated that they had taken with them 13,000,000 roubles, representing a minimum loss of 60,000,000 roubles to the annual turnover of the country's trade. Towards the end of 1882 it was calculated that the agitation had cost Russia as much as the whole Turkish war of 1877. Trade was everywhere paralysed. The enormous increase of bankruptcies, the transfer of investments to foreign funds, the consequent fall in the value of the rouble and the prices of Russian stocks, the suspension of farming operations owing to advances on growing crops being no longer available, the rise in the prices of the necessaries of life, and lastly, the

appearance of famine, filled half the empire with gloom. Banks closed their doors, and the great provincial fairs proved failures. When it was proposed to expel the Jews from Moscow there was a loud outcry all over the sacred city, and even the Orthodox merchants, realizing that the measure would ruin their flourishing trade with the south and west, petitioned against it. The Moscow Exhibition proved a failure. Nevertheless the government persisted with its harsh policy, and Jewish refugees streamed by tens of thousands across the western frontier to seek an asylum in other lands. In 1891 the alarm caused by this emigration led to further protests from abroad. The citizens of London again assembled at Guildhall, and addressed a petition to the tsar on behalf of his Hebrew subjects. It was handed back to the lord mayor by the Russian ambassador, with a curt intimation that the emperor declined to receive it. At the same time orders were defiantly given that the May Laws should be strictly enforced. Meanwhile the Russian minister of finance was at his wits' ends for money. Negotiations for a large loan had been entered upon with the house of Rothschild, and a preliminary contract had been signed, when, at the instance of the London firm, M. Wyshnigradski, the finance minister, was informed that unless the persecutions of the Jews were stopped the great banking-house would be compelled to withdraw from the operation. Deeply mortified by this attempt to deal with him *de puissance à puissance*, the tsar peremptorily broke off the negotiations, and ordered that overtures should be made to a non-Jewish French syndicate. In this way anti-Semitism, which had already so profoundly influenced the domestic politics of Europe, set its mark on the international relations of the powers, for it was the urgent need of the Russian treasury quite as much as the termination of Prince Bismarck's secret treaty of mutual neutrality which brought about the Franco-Russian alliance (Daudet, *Hist. Dipl. de l'Alliance Franco-Russe*, pp. 259 et. seq.).

For nearly three years more the persecutions continued. Elated by the success of his crusade against the Jews, Pobêdonostsev extended his persecuting policy to other non-Orthodox denominations. The legislation against the Protestant Stundists became almost as unbearable as that imposed on the Jews. In the report of the Holy Synod, presented to the tsar towards the end of 1893, the procurator called for repressive measures against Roman Catholics, Moslems and Buddhists, and denounced the rationalist tendency of the whole system of secular education in the empire (*Neue Freie Presse*, 31st January 1894). A year later, however, the tsar died, and his successor, without repealing any of the persecuting laws, let it gradually be understood that their rigorous application might be mitigated. The country was tired and exhausted by the persecution, and the tolerant hints which came from high quarters were acted upon with significant alacrity.

A new era of conflict dawned with the great constitutional struggle towards the end of the century. The conditions, however, were very different from those which prevailed in the 'eighties. The May Laws had avenged themselves with singular fitness. By confining the Jews to the towns at the very moment that Count Witte's policy of protection was creating an enormous industrial proletariat they placed at the disposal of the disaffected masses an ally powerful in numbers and intelligence, and especially in its bitter sense of wrong, its reckless despair and its cosmopolitan outlook and connexions. As early as 1885 the Jewish workmen assisted by Jewish university students led the way in the formation of trades unions. They also became the *colporteurs* of western European socialism, and they played an important part in the organization of the Russian Social Democratic Federation which their "Arbeiter Bund" joined in 1898 with no fewer than 30,000 members. The Jewish element in the new democratic movement excited the resentment of the government, and under the minister of the interior, M. Sipiaguine, the persecuting laws were once more rigorously enforced. The "Bund" replied in 1901 by proclaiming itself frankly political and revolutionary, and at once took a leading place in the revolutionary movement. The reactionaries were not slow to profit by this circumstance. With the support of M. Plehve, the new minister of the interior, and the whole of the bureaucratic class they denounced the revolution as a Jewish conspiracy, engineered for exclusively Jewish purposes and designed to establish a Jewish domination over the Russian people. The government and even the intimates of the tsar became persuaded that only by the terrorization of the Jews could the revolutionary movement be effectually dealt with. For this purpose a so-called League of True Russians was formed. Under high patronage, and with the assistance of the secret police and a large number of the local authorities, it set itself to stir up the populace, chiefly the fanatics and the hooligans, against the Jews. Incendiary proclamations were prepared and printed in the ministry of the interior itself, and were circulated by the provincial governors and the police (Prince Urussov's speech in the Duma, June 8 (21), 1906). The result was another series of massacres which began at Kishinev in 1903 and culminated in wholesale butchery at Odessa and Bielostok in October 1905. An attempt was made to picture and excuse these outbreaks as a national upheaval against the Jew-made revolution but it failed. They only embittered the revolutionists and "intellectuals" throughout the country, and won for them a great deal of outspoken sympathy abroad. The artificiality of the anti-Jewish outbreak was illustrated by the first Duma elections. Thirteen Jews were elected and every constituency which had been the scene of a *pogrom* returned a liberal member. Unfortunately the Jews benefited little by the new parliamentary constitution. The privileges of voting for members of the Duma and of sitting in the new assembly were granted them, but all their civil and religious disabilities were maintained. Both the first and the second Duma proposed to emancipate them, but they were dissolved before any action could be taken. By the modification of the electoral law under which the third Duma was elected the voting power of the Jews was diminished and further restrictions were imposed upon them through official intimidation during the elections. The result was that only two Jews were elected, while the reactionary tendency of the new electorate virtually removed the question of their emancipation from the field of practical politics.

Rumania.

The only other country in Europe in which a legalized anti-Semitism exists is Rumania. The conditions are very similar to those which obtain in Russia, with the important difference that Rumania is a constitutional country, and that the Jewish persecutions are the work of the elected deputies of the nation. Like the *Bourgeois Gentilhomme* who wrote prose all his life without knowing it, the Rumanians practised the nationalist doctrines of the Hegelian anti-Semites unconsciously long before they were formulated in Germany. In the old days of Turkish domination the lot of the Rumanian Jews was not conspicuously unhappy. It was only when the nation began to be emancipated, and the struggle in the East assumed the form of a crusade against Islam that the Jews were persecuted. Rumanian politicians preached a nationalism limited exclusively to indigenous Christians, and they were strongly supported by all who felt the commercial competition of the Jews. Thus, although the Jews had been settled in the land for many centuries, they were by law declared aliens. This was done in defiance of the treaty of Paris of 1856 and the convention of 1858 which declared all Rumans to be equal before the law. Under the influence of this distinction the Jews became persecuted, and sanguinary riots were of frequent occurrence. The realization of a Jewish question led to legislation imposing disabilities on the Jews. In 1878 the congress of Berlin agreed to recognize the independence of Rumania on condition that all religious disabilities were removed. Rumania agreed to this condition, but ultimately persuaded the powers to allow her to carry out the emancipation of the Jews gradually. Persecutions, however, continued, and in 1902 they led to a great exodus of Jews. The United States addressed a strong remonstrance to the Rumanian government, but the condition of the Jews was in no way improved. Their emancipation was in 1908 as far off as ever, and their disabilities heavier than those of their brethren in Russia. For this state of things the example of the anti-Semites in Germany, Russia, Austria and France was largely to blame, since it had justified the intolerance of the Rumans. Owing, also, to

the fact that of late years Rumania had become a sort of *annexe* of the Triple Alliance, it was found impossible to induce the signatories of the treaty of Berlin to take action to compel the state to fulfil its obligations under that treaty.

Austria-Hungary.

In Austria-Hungary the anti-Semitic impulses came almost simultaneously from the North and East. Already in the 'seventies the doctrinaire anti-Semitism of Berlin had found an echo in Budapest. Two members of the diet, Victor Istoczy and Geza Onody, together with a publicist named Georg Marczianyi, busied themselves in making known the doctrine of Marr in Hungary. Marczianyi, who translated the German Judeophobe pamphlets into Magyar, and the Magyar works of Onody into German, was the chief medium between the northern and southern schools. In 1880 Istoczy tried to establish a "Nichtjuden Bund" in Hungary, with statutes literally translated from those of the German anti-Semitic league. The movement, however, made no progress, owing to the stalwart Liberalism of the predominant political parties, and of the national principles inherited from the revolution of 1848. The large part played by the Jews in that struggle, and the fruitful patriotism with which they had worked for the political and economic progress of the country, had created, too, a strong claim on the gratitude of the best elements in the nation. Nevertheless, among the ultramontane clergy, the higher aristocracy, the ill-paid minor officials, and the ignorant peasantry, the seeds of a tacit anti-Semitism were latent. It was probably the aversion of the nobility from anything in the nature of a demagogic agitation which for a time prevented these seeds from germinating. The news of the uprising in Russia and the appearance of Jewish refugees on the frontier, had the effect of giving a certain prominence to the agitation of Istoczy and Onody and of exciting the rural communities, but it did not succeed in impressing the public with the pseudo-scientific doctrines of the new anti-Semitism. It was not until the agitators resorted to the Blood Accusation—that never-failing decoy of obscurantism and superstition—that Hungary took a definite place in the anti-Semitic movement. The outbreak was short and fortunately bloodless, but while it lasted its scandals shocked the whole of Europe.

Dr August Rohling, professor of Hebrew at the university of Prague, a Roman Catholic theologian of high position but dubious learning, had for some years assisted the Hungarian anti-Semites with *réchauffés* of Eisenmenger's *Entdecktes Judenthum* (Frankfurt a/M. 1700). In 1881 he made a solemn deposition before the Supreme Court accusing the Jews of being bound by their law to work the moral and physical ruin of non-Jews. He followed this up with an offer to depose on oath that the murder of Christians for ritual purposes was a doctrine secretly taught among Jews. Professor Delitzsch and other eminent Hebraists, both Christian and Jewish, exposed and denounced the ignorance and malevolence of Rohling, but were unable to stem the mischief he was causing. In April 1882 a Christian girl named Esther Sobymossi was missed from the Hungarian village of Tisza Eszlar, where a small community of Jews were settled. The rumour got abroad that she had been kidnapped and murdered by the Jews, but it remained the burden of idle gossip, and gave rise to neither judicial complaint nor public disorders. At this moment the question of the Bosnian Pacification credits was before the diet. The unpopularity of the task assumed by Austria-Hungary, under the treaty of Berlin, which was calculated to strengthen the disaffected Croat element in the empire, had reduced the government majority to very small proportions, and all the reactionary factions in the country were accordingly in arms. The government was violently and unscrupulously attacked on all sides. On the 23rd of May there was a debate in the diet when M. Onody, in an incendiary harangue, told the story of the missing girl at Tisza Eszlar, and accused ministers of criminal indulgence to races alien to the national spirit. In the then excited state of the public mind on the Croat question, the manœuvre was adroitly conceived. The government fell into the trap, and treated the story with lofty disdain. Thereupon the anti-Semites set to work on the case, and M. Joseph Bary, the magistrate at Nyiregyhaza, and a noted anti-Semite, was induced to go to Tisza Eszlar and institute an inquiry. All the anti-liberal elements in the country now became banded together in this effort to discredit the liberal government, and for the first time the Hungarian anti-Semites found themselves at the head of a powerful party. Fifteen Jews were arrested and thrown into prison. No pains were spared in preparing the case for trial. Perjury and even forgery were freely resorted to. The son of one of the accused, a boy of fourteen, was taken into custody by the police, and by threats and cajoleries prevailed upon to give evidence for the prosecution. He was elaborately coached for the terrible *rôle* he was to play. The trial opened at Nyiregyhaza on the 19th of June, and lasted till the 3rd of August. It was one of the most dramatic *causes célèbres* of the century. Under the brilliant cross-examination of the advocates for the defence the whole of the shocking conspiracy was gradually exposed. The public prosecutor thereupon withdrew from the case, and the four judges—the chief of whom held strong anti-Semitic opinions—unanimously acquitted all the prisoners. The case proved the death-blow of Hungarian anti-Semitism. Although another phase of the Jewish question, which will be referred to presently, had still to occupy the public mind, the shame brought on the nation by the Tisza Eszlar conspiracy effectually prevented the anti-Semites from raising their voices with any effect again.

Meanwhile a more formidable and complicated outburst was preparing in Austria itself. Here the lines of the German agitation were closely followed, but with far more dramatic results. It was exclusively political—that is to say, it appealed to anti-Jewish prejudices for party purposes while it sought to rehabilitate them on a pseudo-scientific basis, racial and economic. At first it was confined to sporadic pamphleteers. By their side there gradually grew up a school of Christian Socialists, recruited from the ultra-Clericals, for the study and application of the doctrines preached at Mainz by Archbishop Ketteler. This constituted a complete Austrian analogue to the Evangelical-Socialist movement started in Germany by Herr Stöcker. For some years the two movements remained distinct, but signs of approximation were early visible. Thus one of the first complaints of the anti-Semites was that the Jews were becoming masters of the soil. This found an echo in the agrarian principles of the Christian Socialists, as expounded by Rudolph Meyer, in which individualism in landed property was admitted on the condition that the landowners were "the families of the nation" and not "cosmopolitan financiers." A further indication of anti-Semitism is found in a speech delivered in 1878 by Prince Alois von Liechtenstein (b. 1846), the most prominent disciple of Rudolph Meyer, who denounced the national debt as a tribute paid by the state to cosmopolitan *rentiers* (Nitti, *Catholic Socialism*, pp. 200, 201, 211, 216). The growing disorder in parliament, due to the bitter struggle between the German and Czech parties, served to bring anti-Semitism into the field of practical politics. Since 1867 the German Liberals had been in power. They had made enemies of the Clericals by tampering with the concordat, and they had split up their own party by the federalist policy adopted by Count Taaffe. The Radical secessionists in their turn found it difficult to agree, and an ultra-national German wing formed itself into a separate party under the leadership of Ritter von Schönerer (b. 1842), a Radical nationalist of the most violent type. In 1882 two anti-Semitic leagues had been founded in Vienna, and to these the Radical nationalists now appealed for support. The growing importance of the party led the premier, Count Taaffe, to angle for the support of the Clericals by accepting a portion of the Christian Socialist programme. The hostility this excited in the liberal press, largely written by Jews, served to bring the feudal Christian Socialists and Radical anti-Semites together. In 1891 these strangely assorted factions became consolidated, and during the elections of that year Prince Liechtenstein came forward as an anti-Semitic candidate and the acknowledged leader of the party. The elections resulted in the return of fifteen anti-Semites to the Reichsrath, chiefly from Vienna.

Although Prince Liechtenstein and the bulk of the Christian

Socialists had joined the anti-Semites with the support of the Clerical organ, the *Vaterland*, the Clerical party as a whole still held aloof from the Jew-baiters. The events of 1892–1895 put an end to their hesitation. The Hungarian government, in compliance with long-standing pledges to the liberal party, introduced into the diet a series of ecclesiastical reform bills providing for civil marriage, freedom of worship, and the legal recognition of Judasim on an equality with other denominations. These proposals, which synchronized with Ahlwardt's turbulent agitation in Germany, gave a great impulse to anti-Semitism and served to drive into its ranks a large number of Clericals. The agitation was taken in hand by the Roman Catholic clergy, and the pulpits resounded with denunciations of the Jews. One clergyman, Father Deckert, was prosecuted for preaching the Blood Accusation and convicted (1894). Cardinal Schlauch, bishop of Grosswardein, declared in the Hungarian House of Magnates that the Liberals were in league with "cosmopolitans" for the ruin of the country. In October 1894 the magnates adopted two of the ecclesiastical bills with amendments, but threw out the Jewish bill by a majority of six. The crown sided with the magnates, and the ministry resigned, although it had a majority in the Lower House. An effort was made to form a Clerical cabinet, but it failed. Baron Banffy was then entrusted with the construction of a fresh Liberal ministry. The announcement that he would persist with the ecclesiastical bills lashed the Clericals and anti-Semites into a fury, and the agitation broke out afresh. The pope addressed a letter to Count Zichy encouraging the magnates to resist, and once more two of the bills were amended, and the third rejected. The papal nuncio, Mgr. Agliardi, now thought proper to pay a visit to Budapest, where he allowed himself to be interviewed on the crisis. This interference in the domestic concerns of Hungary was deeply resented by the Liberals, and Baron Banffy requested Count Kalnoky, the imperial minister of foreign affairs, to protest against it at the Vatican. Count Kalnoky refused and tendered his resignation to the emperor. Clerical sympathies were predominant in Vienna, and the emperor was induced for a moment to decline the count's resignation. It soon became clear, however, that the Hungarians were resolved to see the crisis out, and that in the end Vienna would be compelled to give way. The emperor accordingly retraced his steps, Count Kalnoky's resignation was accepted, the papal nuncio was recalled, a batch of new magnates were created, and the Hungarian ecclesiastical bills passed.

Simultaneously with this crisis another startling phase of the anti-Semitic drama was being enacted in Vienna itself. Encouraged by the support of the Clericals the anti-Semites resolved to make an effort to carry the Vienna municipal elections. So far the alliance of the Clericals with the anti-Semites had been unofficial, but on the eve of the elections (January 1895) the pope, influenced partly by the Hungarian crisis and partly by an idea of Cardinal Rampolla that the best antidote to democratic socialism would be a clerically controlled fusion of the Christian Socialists and anti-Semites, sent his blessing to Prince Liechtenstein and his followers. This action alarmed the government and a considerable body of the higher episcopate, who felt assured that any permanent encouragement given to the anti-Semites would in the end strengthen the parties of sedition and disorder. Cardinal Schönborn was despatched in haste to Rome to expostulate with the pontiff, and his representations were strongly supported by the French and Belgian bishops. The mischief was however, done, and although the pope sent a verbal message to Prince Liechtenstein excluding the anti-Semites from his blessing, the elections resulted in a great triumph for the Jew-haters. The municipal council was immediately dissolved by the government, and new elections were ordered, but these only strengthened the position of the anti-Semites, who carried 92 seats out of a total of 138. A cabinet crisis followed, and the premiership was entrusted to the Statthalter of Galicia, Count Badeni, who assumed office with a pledge of war to the knife against anti-Semitism. In October the new municipal council elected as burgomaster of Vienna Dr Karl Lueger (b. 1844), a vehement anti-Semite, who had displaced Prince Liechtenstein as leader of the party. The emperor declined to sanction the election, but the council repeated it in face of the imperial displeasure. Once more a dissolution was ordered, and for three months the city was governed by administrative commissioners. In February 1896 elections were again held, and the anti-Semites were returned with an increased majority. The emperor then capitulated, and after a temporary arrangement, by which for one year Dr Lueger acted as vice-burgomaster and handed over the burgomastership to an inoffensive nominee, permitted the municipal council to have its way. The growing anarchy in parliament at this moment served still further to strengthen the anti-Semites, and their conquest of Vienna was speedily followed by a not less striking conquest of the Landtag of Lower Austria (November 1896).

Since then a reaction of sanity has slowly but surely asserted itself. In 1908 the anti-Semites had governed Vienna twelve years, and, although they had accomplished much mischief, the millennium of which they were supposed to be the heralds had not dawned. On the contrary, the commercial interests of the city had suffered and the rates had been enormously increased (*Neue Freie Presse*, 29th March 1901), while the predatory hopes which secured them office had only been realized on a small and select scale. The spectacle of a Clerico-anti-Semitic tammany in Vienna had strengthened the resistance of the better elements in the country. Time had also shown that Christian Socialism is only a disguise for high Toryism, and that the German Radicals who were originally induced to join the anti-Semites had been victimized by the Clericals. The fruits of this disillusion began to show themselves in the general elections of 1900–1901, when the anti-Semites lost six seats in the Reichsrath. The elections were followed (26th January 1901) by a papal encyclical on Christian democracy, in which Christian Socialism was declared to be a term unacceptable to the Church, and the faithful were adjured to abstain from agitation of a demagogic and revolutionary character, and "to respect the rights of others." Nevertheless, in 1907 the Christian Socialists trebled their representation in the Reichsrath. This, however, was due more to their alliance with the German national parties than to any large increase of anti-Semitism in the electorate.

France.

The last country in Europe to make use of the teachings of German anti-Semitism in its party politics was France. The fact that the movement should have struck root in a republican country, where the ideals of democratic freedom have been so passionately cultivated, has been regarded as one of the paradoxes of our latter-day history. As a matter of fact, it is more surprising that it was not adopted earlier. All the social and political conditions which produced anti-Semitism in Germany were present in France, but in an aggravated form due primarily to the very republican *régime* which at first sight seemed to be a guarantee against it. In the monarchical states the dominance of the *bourgeoisie* was tempered in a measure by the power of the crown and the political activity of the aristocracy, which carried with them a very real restraining influence in the matter of political honour and morality. In France these restraining influences were driven out of public life by the republic. The nobility both of the *ancien régime* and the empire stood aloof, and politics were abandoned for the most part to professional adventurers, while the *bourgeoisie* assumed the form of an omnipotent plutocracy. This naturally attracted to France all the financial adventurers in Europe, and in the train of the immigration came not a few German Jews, alienated from their own country by the agitation of Marr and Stöcker. Thus the *bourgeoisie* was not only more powerful in France than in other countries, but the obnoxiousness of its Jewish element was accentuated by a tinge of the national enemy. The anti-clericalism of the *bourgeois* republic and its unexampled series of financial scandals, culminating in the Panama "Krach," thus sufficed to give anti-Semitism a strong hold on the public mind.

Nevertheless, it was not until 1882 that the anti-Jewish movement was seriously heard of in France. Paul Bontoux (b. 1820), who had formerly been in the employ of the Rothschilds,

but had been obliged to leave the firm in consequence of his disastrous speculations, had joined the Legitimist party, and had started the Union Générale with funds obtained from his new allies. Bontoux promised to break up the alleged financial monopoly of the Jews and Protestants and to found a new plutocracy in its stead, which should be mainly Roman Catholic and aristocratic. The bait was eagerly swallowed. For five years the Union Générale, with the blessing of the pope, pursued an apparently prosperous career. Immense schemes were undertaken, and the 125-fr. shares rose gradually to 3200 francs. The whole structure, however, rested on a basis of audacious speculation, and in January 1882 the Union Générale failed, with liabilities amounting to 212,000,000 francs. The cry was at once raised that the collapse was due to the manœuvres of the Jews, and a strong anti-Semitic feeling manifested itself in clerical and aristocratic circles. In 1886 violent expression was given to this feeling in a book since become famous, *La France juive*, by Edouard Drumont (b. 1844). The author illustrated the theories of German anti-Semitism with a *chronique scandaleuse* full of piquant personalities, in which the corruption of French national life under Jewish influences was painted in alarming colours. The book was read with avidity by the public, who welcomed its explanations of the obviously growing debauchery. The Wilson scandals and the suspension of the Panama Company in the following year, while not bearing out Drumont's anti-Semitism, fully justified his view of the prevailing corruption. Out of this condition of things rose the Boulangist movement, which rallied all the disaffected elements in the country, including Drumont's following of anti-Semites. It was not, however, until the flight of General Boulanger and the ruin of his party that anti-Semitism came forward as a political movement.

The chief author of the rout of Boulangism was a Jewish politician and journalist, Joseph Reinach (b. 1856), formerly private secretary to Gambetta, and one of the ablest men in France. He was a Frenchman by birth and education, but his father and uncles were Germans, who had founded an important banking establishment in Paris. Hence he was held to personify the alien Jewish domination in France, and the ex-Boulangists turned against him and his co-religionists with fury. The Boulangist agitation had for a second time involved the Legitimists in heavy pecuniary losses, and under the leadership of the marquis de Morès they now threw all their influence on the side of Drumont. An anti-Semitic league was established, and with Royalist assistance branches were organized all over the country. The Franco-Russian alliance in 1891, when the persecutions of the Jews by Pobêdonostsev were attracting the attention of Europe, served to invest Drumont's agitation with a fashionable and patriotic character. It was a sign of the spiritual approximation of the two peoples. In 1892 Drumont founded a daily anti-Semitic newspaper, *La Libre Parole*. With the organization of this journal a regular campaign for the discovery of scandals was instituted. At the same time a body of aristocratic swashbucklers, with the marquis de Morès and the comte de Lamase at their head, set themselves to terrorize the Jews and provoke them to duels. At a meeting held at Neuilly in 1891, Jules Guérin, one of the marquis de Morès's lieutenants, had demanded rhetorically *un cadavre de Juif*. He had not long to wait. Anti-Semitism was most powerful in the army, which was the only branch of the public service in which the reactionary classes were fully represented. The republican law compelling the seminarists to serve their term in the army had strengthened its Clerical and Royalist elements, and the result was a movement against the Jewish officers, of whom 500 held commissions. A series of articles in the *Libre Parole* attacking these officers led to a number of ferocious duels, and these culminated in 1892 in the death of an amiable and popular Jewish officer, Captain Armand Mayer, of the Engineers, who fell, pierced through the lungs by the marquis de Morès. This tragedy, rendered all the more painful by the discovery that Captain Mayer had chivalrously fought to shield a friend, aroused a great deal of popular indignation against the anti-Semites, and for a moment it was believed that the agitation had been killed with its victim.

Towards the end of 1892, the discovery of the widespread corruption practised by the Panama Company gave a fresh impulse to anti-Semitism. The revelations were in a large measure due to the industry of the *Libre Parole*; and they were all the more welcome to the readers of that journal since it was discovered that three Jews were implicated in the scandals, one of whom, baron de Reinach, was uncle and father-in-law to the hated destroyer of Boulangism. The escape of the other two, Dr Cornelius Herz and M. Arton, and the difficulties experienced in obtaining their extradition, deepened the popular conviction that the authorities were implicated in the scandals, and kept the public eye for a long time absorbed by the otherwise restricted Jewish aspects of the scandals. In 1894 the military side of the agitation was revived by the arrest of a prominent Jewish staff officer, Captain Alfred Dreyfus, on a charge of treason. From the beginning the hand of the anti-Semite was flagrant in the new sensation. The first hint of the arrest appeared in the *Libre Parole*; and before the facts had been officially communicated to the public that journal was busy with a campaign against the war minister, based on the apprehension that, in conspiracy with the *Juiverie* and his republican colleagues, he might exert himself to shield the traitor. Anti-Semitic feeling was now thoroughly aroused. Panama had prepared the people to believe anything; and when it was announced that a court-martial, sitting in secret, had convicted Dreyfus, there was a howl of execration against the Jews from one end of the country to the other, although the alleged crime of the convict and the evidence by which it was supported were quite unknown. Dreyfus was degraded and transported for life amid unparalleled scenes of public excitement.

The Dreyfus Case registers the climax not only of French, but of European anti-Semitism. It was the most ambitious and most unscrupulous attempt yet made to prove the nationalist hypothesis of the anti-Semites, and in its failure it afforded the most striking illustration of the dangers of the whole movement by bringing France to the verge of revolution. For a few months after the Dreyfus court-martial there was a comparative lull; but the highly strung condition of popular passion was illustrated by a violent debate on "The Jewish Peril" in the Chamber of Deputies (25th April 1895), and by two outrages with explosives at the Rothschild bank in Paris. Meanwhile the family of Dreyfus, absolutely convinced of his innocence, were casting about for the means of clearing his character and securing his liberation. They were wealthy, and their activity unsettled the public mind and aroused the apprehensions of the conspirators. Had the latter known how to preserve silence, the mystery would perhaps have been yet unsolved; but in their anxiety to allay all suspicions they made one false step, which proved the beginning of their ruin. Through their friends in the press they secured the publication of a facsimile of a document known as the *Bordereau*—a list of documents supposed to be in Dreyfus's handwriting and addressed apparently to the military attaché of a foreign power, which was alleged to constitute the chief evidence against the convict. It was hoped by this publication to put an end to the doubts of the so-called Dreyfusards. The result, however, was only to give them a clue on which they worked with remarkable ingenuity. To prove that the *Bordereau* was not in Dreyfus's handwriting was not difficult. Indeed, its authorship was recognized almost on the day of publication; but the Dreyfusards held their hands in order to make assurance doubly sure by further evidence. Meanwhile one of the officers of the general staff, Colonel Picquart, had convinced himself by an examination of the *dossier* of the trial that a gross miscarriage of justice had taken place. On mentioning his doubts to his superiors, who were animated partly by anti-Semitic feeling and partly by reluctance to confess to a mistake, he was ordered to the Tunisian hinterland on a dangerous expedition. Before leaving Paris, however, he took the precaution to confide his discovery to his legal adviser. Harassed by their anxieties, the conspirators made further communications to the newspapers; and the government, questioned and badgered in parliament, added to the revelations. The new disclosures, so far from

stopping the Dreyfusards, proved to them, among other things, that the conviction had been partially based on documents which had not been communicated to the counsel for the defence, and hence that the judges had been tampered with by the ministry of war behind the prisoner's back. So far, too, as these documents related to correspondence with foreign military attachés, it was soon ascertained that they were forgeries. In this way a terrible indictment was gradually drawn up against the ministry of war. The first step was taken towards the end of 1897 by a brother of Captain Dreyfus, who, in a letter to the minister of war, denounced Major Esterhazy as the real author of the *Bordereau*. The authorities, supported by parliament, declined to reopen the Dreyfus Case, but they ordered a court-martial on Esterhazy, which was held with closed doors and resulted in his acquittal. It now became clear that nothing short of an appeal to public opinion and a full exposure of all the iniquities that had been perpetrated would secure justice at the hands of the military chiefs. On behalf of Dreyfus, Émile Zola, the eminent novelist, formulated the case against the general staff of the army in an open letter to the president of the republic, which by its dramatic accusations startled the whole world. The letter was denounced as wild and fantastic even by those who were in favour of revision. Zola was prosecuted for libel and convicted, and had to fly the country; but the agitation he had started was taken in hand by others, notably M. Clemenceau, M. Reinach and M. Yves Guyot. In August 1898 their efforts found their first reward. A re-examination of the documents in the case by M. Cavaignac, then minister of war, showed that one was undoubtedly forged. Colonel Henry, of the intelligence department of the war office, then confessed that he had fabricated the document, and, on being sent to Mont Valérien under arrest, cut his throat.

In spite of this damaging discovery the war office still persisted in believing Dreyfus guilty, and opposed a fresh inquiry. It was supported by three successive ministers of war, and apparently an overwhelming body of public opinion. By this time the question of the guilt or innocence of Dreyfus had become an altogether subsidiary issue. As in Germany and Austria, the anti-Semitic crusade had passed into the hands of the political parties. On the one hand the Radicals and Socialists, recognizing the anti-republican aims of the agitators and alarmed by the clerical predominance in the army, had thrown in their lot with the Dreyfusards; on the other the reactionaries, anxious to secure the support of the army, took the opposite view, denounced their opponents as *sans patrie*, and declared that they were conspiring to weaken and degrade the army in the face of the national enemy. The controversy was, consequently, no longer for or against Dreyfus, but for or against the army, and behind it was a life-or-death struggle between the republic and its enemies. The situation became alarming. Rumours of military plots filled the air. Powerful leagues for working up public feeling were formed and organized; attempts to discredit the republic and intimidate the government were made. The president was insulted; there were tumults in the streets, and an attempt was made by M. Déroulède to induce the military to march on the Elysée and upset the republic. In this critical situation France, to her eternal honour, found men with sufficient courage to do the right. The Socialists, by rallying to the Radicals against the reactionaries, secured a majority for the defence of the republic in parliament. Brisson's cabinet transmitted to the court of cassation an application for the revision of the case against Dreyfus; and that tribunal, after an elaborate inquiry, which fully justified Zola's famous letter, quashed and annulled the proceedings of the court-martial, and remitted the accused to another court-martial, to be held at Rennes. Throughout these proceedings the military party fought tooth and nail to impede the course of justice; and although the innocence of Dreyfus had been completely established, it concentrated all its efforts to secure a fresh condemnation of the prisoner at Rennes. Popular passion was at fever heat, and it manifested itself in an attack on M. Labori, one of the counsel for the defence, who was shot and wounded on the eve of his cross-examination of the witnesses for the prosecution. To the amazement and indignation of the whole world outside France, the Rennes court-martial again found the prisoner guilty; but all reliance on the conscientiousness of the verdict was removed by a rider, which found "extenuating circumstances," and by a reduction of the punishment to ten years' imprisonment, to which was added a recommendation to mercy. The verdict was evidently an attempt at a compromise, and the government resolved to advise the president of the republic to pardon Dreyfus. This lame conclusion did not satisfy the accused; but his innocence had been so clearly proved, and on political grounds there were such urgent reasons for desiring a termination of the affair, that it was accepted without protest by the majority of moderate men.

The rehabilitation of Dreyfus, however, did not pass without another effort on the part of the reactionaries to turn the popular passions excited by the case to their own advantage. After the failure of Déroulède's attempt to overturn the republic, the various Royalist and Boulangist leagues, with the assistance of the anti-Semites, organized another plot. This was discovered by the government, and the leaders were arrested. Jules Guérin, secretary of the anti-Semitic league, shut himself up in the league offices in the rue Chabrol, Paris, which had been fortified and garrisoned by a number of his friends, armed with rifles. For more than a month these anti-Semites held the authorities at bay, and some 5000 troops were employed in the siege. The conspirators were all tried by the senate, sitting as a high court, and Guérin was sentenced to ten years' imprisonment. The evidence showed that the anti-Semitic organization had taken an active part in the anti-republican plot (see the report of the Commission d'Instruction in the *Petit Temps*, 1st November 1899).

The government now resolved to strike at the root of the mischief by limiting the power of the religious orders, and with this view a drastic Association bill was introduced into the chambers. This anti-clerical move provoked the wildest passions of the reactionaries, but it found an overwhelming support in the elections of 1902 and the bill became law. The war thus definitely reopened soon led to a revival of the Dreyfus controversy. The nationalists flooded the country with incendiary defamations of "the government of national treason," and Dreyfus on his part loudly demanded a fresh trial. It was clear that conciliation and compromise were useless. Early in 1905 M. Jaurès urged upon the chamber that the demand of the Jewish officer should be granted if only to tranquillize the country. The necessary *faits nouveaux* were speedily found by the minister of war, General André, and having been examined by a special commission of revision were ordered to be transmitted to the court of cassation for final adjudication. On the 12th of July 1906, the court, all chambers united, gave its judgment. After a lengthy review of the case it declared unanimously that the whole accusation against Dreyfus had been disproved, and it quashed the judgment of the Rennes court-martial *sans renvoi*. The explanation of the whole case is that Esterhazy and Henry were the real culprits; that they had made a trade of supplying the German government with military documents; and that once the *Bordereau* was discovered they availed themselves of the anti-Jewish agitation to throw suspicion on Dreyfus.

Thus ended this famous case, to the relief of the whole country and with the approval of the great majority of French citizens. Except a knot of anti-Semitic monomaniacs all parties bowed loyally to the judgment of the court of cassation. The government gave the fullest effect to the judgment. Dreyfus and Picquart were restored to the active list of the army with the ranks respectively of major and general of brigade. Dreyfus was also created a knight of the Legion of Honour, and received the decoration in public in the artillery pavilion of the military school. Zola, to whose efforts the triumph of truth was chiefly due, had not been spared to witness the final scene, but the chambers decided to give his remains a last resting-place in the Pantheon. When three months later M. Clémenceau formed his first cabinet he appointed General Picquart minister of war. Nothing indeed was left undone to repair the terrible series of wrongs which had grown out of the Dreyfus case. Nevertheless its destructive work could not be wholly healed. For over ten years it had been

a nightmare to France, and it now modified the whole course of French history. In the ruin of the French Church, which owed its disestablishment very largely to the Dreyfus conspiracy, may be read the most eloquent warning against the demoralizing madness of anti-Semitism.

In sympathy with the agitation in France there has been a similar movement in Algeria, where the European population have long resented the admission of the native Jews to the rights of French citizenship. The agitation has been marked by much violence, and most of the anti-Semitic deputies in the French parliament, including M. Drumont, have found constituencies in Algeria. As the local anti-Semites are largely Spaniards and Levantine riff-raff, the agitation has not the peculiar nationalist bias which characterizes continental anti-Semitism. Before the energy of the authorities it has lately shown signs of subsiding.

While the main activity of anti-Semitism has manifested itself in Germany, Russia, Rumania, Austria-Hungary and France, its vibratory influences have been felt in other countries when conditions favourable to its extension have presented themselves. In England more than one attempt to acclimatize the doctrines of Marr and Treitschke has been made. The circumstance that at the time of the rise of German anti-Semitism a premier of Hebrew race, Lord Beaconsfield, was in power first suggested the Jewish bogey to English political extremists. The Eastern crisis of 1876–1878, which was regarded by the Liberal party as primarily a struggle between Christianity, as represented by Russia, and a degrading Semitism, as represented by Turkey, accentuated the anti-Jewish feeling, owing to the anti-Russian attitude adopted by the government. Violent expression to the ancient prejudices against the Jews was given by Sir J. G. Tollemache Sinclair (*A Defence of Russia*, 1877). Mr T. P. O'Connor, in a life of Lord Beaconsfield (1878), pictured him as the instrument of the Jewish people, "moulding the whole policy of Christendom to Jewish aims." Professor Goldwin Smith, in several articles in the *Nineteenth Century* (1878, 1881 and 1882), sought to synthetize the growing anti-Jewish feeling by adopting the nationalist theories of the German anti-Semites. This movement did not fail to find an equivocal response in the speeches of some of the leading Liberal statesmen; but on the country generally it produced no effect. It was revived when the persecutions in Russia threatened England with a great influx of Polish Jews, whose mode of life was calculated to lower the standard of living in the industries in which they were employed, and it has left its trace in the anti-alien legislation of 1905. In 1883 Stöcker visited London, but received a very unflattering reception. Abortive attempts to acclimatize anti-Semitism have also been made in Switzerland, Belgium, Greece and the United States.

Great Britain, &c.

Anti-Semitism made a great deal of history during the thirty years up to 1908, but has left no permanent mark of a constructive kind on the social and political evolution of Europe. It is the fruit of a great ethnographic and political error, and it has spent itself in political intrigues of transparent dishonesty. Its racial doctrine is at best a crude hypothesis: its nationalist theory has only served to throw into striking relief the essentially economic bases of modern society, while its political activity has revealed the vulgarity and ignorance which constitute its main sources of strength. So far from injuring the Jews, it has really given Jewish racial separatism a new lease of life. Its extravagant accusations, as in the Tisza Eszlar and Dreyfus cases, have resulted in the vindication of the Jewish character. Its agitation generally, coinciding with the revival of interest in Jewish history, has helped to transfer Jewish solidarity from a religious to a racial basis. The bond of a common race, vitalized by a new pride in Hebrew history and spurred on to resistance by the insults of the anti-Semites, has given a new spirit and a new source of strength to Judaism at a moment when the approximation of ethical systems and the revolt against dogma were sapping its essentially religious foundations. In the whole history of Judaism, perhaps, there have been no more numerous or remarkable instances of reversions to the faith than in the period in question. The reply of the Jews to anti-Semitism has taken two interesting practical forms. In the first place there is the so-called Zionist movement, which is a kind of Jewish nationalism and is vitiated by the same errors that distinguish its anti-Semitic analogue (see ZIONISM). In the second place, there is a movement represented by the Maccabaeans' Society in London, which seeks to unite the Jewish people in an effort to raise the Jewish character and to promote a higher consciousness of the dignity of the race. It lays no stress on orthodoxy, but welcomes all who strive to render Jewish conduct an adequate reply to the theories of the anti-Semites. Both these movements are elements of fresh vitality to Judaism, and they are probably destined to produce important fruit in future years. A splendid spirit of generosity has also been displayed by the Jewish community in assisting and relieving the victims of the Jew-haters. Besides countless funds raised by public subscription, Baron de Hirsch founded a colossal scheme for transplanting persecuted Jews to new countries under new conditions of life, and endowed it with no less a sum than £9,000,000 (see HIRSCH, MAURICE DE).

Though anti-Semitism has been unmasked and discredited, it is to be feared that its history is not yet at an end. While there remain in Russia and Rumania over six millions of Jews who are being systematically degraded, and who periodically overflow the western frontier, there must continue to be a Jewish question in Europe; and while there are weak governments, and ignorant and superstitious elements in the enfranchized classes of the countries affected, that question will seek to play a part in politics.

LITERATURE.—No impartial history of modern anti-Semitism has yet been written. The most comprehensive works on the subject, *Israel among the Nations*, by A. Leroy-Beaulieu (1895), and *L'Anti-sémitisme, son histoire et ses causes*, by Bernard Lazare (1894), are collections of studies rather than histories. M. Lazare's work will be found most useful by the student on account of its detached standpoint and its valuable bibliographical notes. A good list of works relating to Jewish ethnography will be found at the end of M. Isidor Loeb's valuable article, "Juifs," in the *Dictionnaire universel de géographie* (1884). To these should be added, Adolf Jellinek, *Der Jüdische Stamm* (1869); Chwolson, *Die semitischen Völker* (1872); Nossig, *Materialien zur Statistik* (1887); Jacobs, *Jewish Statistics* (1891); and Andree, *Zur Volkskunde der Juden* (1881). A bibliography of the Jewish question from 1875 to 1884 has been published by Mr Joseph Jacobs (1885). Useful additions and rectifications will be found in the *Jewish World*, 11th September 1885. During the period since 1885 the anti-Semitic movement has produced an immense pamphlet literature. Some of these productions have already been referred to; others will be found in current bibliographies under the names of the personages mentioned, such as Stöcker, Ahlwardt, &c. On the Russian persecutions, besides the works quoted by Jacobs, see the pamphlet issued by the Russo-Jewish Committee in 1890, and the annual reports of the Russo-Jewish Mansion House Fund; *Les Juifs de Russie* (Paris, 1891); *Report of the Commissioners of Immigration upon the Causes which incite Immigration to the United States* (Washington, 1892); *The New Exodus*, by Harold Frederic (1892); *Les Juifs russes*, by Leo Errera (Brussels, 1893). The most valuable collection of facts relating to the persecutions of 1881–1882 are to be found in the *Feuilles Jaunes* (52 nos.), compiled and circulated for the information of the European press by the Alliance Israélite of Paris. Complete collections are very scarce. For the struggle during the past decade the *Russische Correspondenz* of Berlin should be consulted, together with its French and English editions. See also the publications of the *Bund* (Geneva; Imprimerie Israélite); Séménoff, *The Russian Government and the Massacres*, and *Quarterly Review*, October 1906. On the Rumanian question, see Bluntschli, *Roumania and the Legal Status of the Jews* (London, 1879); *Wir Juden* (Zürich, 1883); Schloss, *The Persecution of the Jews in Roumania* (London, 1885); Schloss, *Notes of Information* (1886); Sincerus, *Juifs en Roumanie* (London, 1901); Plotke, *Die rumänischen Juden unter dem Fürsten u. König Karl* (1901); Dehn, *Diplomatie u. Hochfinanz in der rumänischen Judenfrage* (1901); Conybeare, "Roumania as a Persecuting Power," *Nat. Rev.*, February 1901. On Hungary and the Tisza Eszlar Case, see (besides the references in Jacobs) Nathan, *Der Prozess von Tisza Eszlar* (Berlin, 1892). On this case and the Blood Accusation generally, see Wright, "The Jews and the Malicious Charge of Human Sacrifice," *Nineteenth Century*, 1883. The origins of the Austrian agitation are dealt with by Nitti, *Catholic Socialism* (1895). This work, though inclining to anti-Semitism, should be consulted for the Christian Socialist elements in the whole continental agitation. The most valuable source of information on the Austrian movement is the *Österreichische Wochenschrift*, edited by Dr Bloch. See also pamphlets and speeches by the anti-Semitic leaders, Liechtenstein, Lueger, Schoenerer, &c. The case of the French anti-Semites is stated by E. Drumont in his *France juive*.

and other works; the other side by Isidor Loeb, Bernard Lazare, Leonce Reynaud, &c. Of the Dreyfus Case there is an enormous literature: see especially the reports of the Zola and Picquart trials, the revision case before the Court of Cassation, the proceedings of the Rennes court-martial, and the final judgment of the Court of Cassation printed in full in the *Figaro*, July 15, 1906; also Reinach, *Histoire de l'affaire Dreyfus* (Paris, 1908, 6 vols.), and the valuable series of volumes by Captain Paul Marin, MM. Clémenceau, Lazare, Yves Guyot, Paschal Grousset, Urbain Gohier, de Haime, de Pressensé, and the remarkable letters of Dreyfus (*Lettres d'un innocent*). An English history of the case was published by F. C. Conybeare (1898), whose articles and those of Sir Godfrey Lushington and L. J. Maxse in the *National Review*, 1897–1900, will be found invaluable by the student. On the Algerian question, see M. Wahl in the *Revue des études juives*; L. Forest, *Naturalisation des Israélites algériens*; and E. Audinet in the *Revue générale de droit international publique*, 1897, No. 4. On the history of the anti-Semitic movement generally, see the annual reports of the Alliance Israélite of Paris and the Anglo-Jewish Association of London, also the annual summaries published at the end of the Jewish year by the *Jewish Chronicle* of London. The connexion of the movement with general party politics must be followed in the newspapers. The present writer has worked with a collection of newspaper cuttings numbering several thousands and ranging over thirty years. (L. W.)

ANTISEPTICS (Gr. *ἀντί*, against, and *σηπτικός*, putrefactive), the name given to substances which are used for the prevention of bacterial development in animal or vegetable matter. Some are true germicides, capable of destroying the bacteria, whilst others merely prevent or inhibit their growth. The antiseptic method of treating wounds (see SURGERY) was introduced by Lord Lister, and was an outcome of Pasteur's germ theory of putrefaction. For the growth of bacteria there must be a certain food supply, moisture, in most cases oxygen, and a certain minimum temperature (see BACTERIOLOGY). These conditions have been specially studied and applied in connexion with the preserving of food (see FOOD PRESERVATION) and in the ancient practice of embalming the dead, which is the earliest illustration of the systematic use of antiseptics (see EMBALMING). In early inquiries a great point was made of the prevention of putrefaction, and work was done in the way of finding how much of an agent must be added to a given solution, in order that the bacteria accidentally present might not develop. But for various reasons this was an inexact method, and to-day an antiseptic is judged by its effects on pure cultures of definite pathogenic microbes, and on their vegetative and spore forms. Their standardization has been effected in many instances, and a water solution of carbolic acid of a certain fixed strength is now taken as the standard with which other antiseptics are compared. The more important of those in use to-day are carbolic acid, the perchloride and biniodide of mercury, iodoform, formalin, salicylic acid, &c. Carbolic acid is germicidal in strong solution, inhibitory in weaker ones. The so-called "pure" acid is applied to infected living tissues, especially to tuberculous sinuses or wounds, after scraping them, in order to destroy any part of the tuberculous material still remaining. A solution of 1 in 20 is used to sterilize instruments before an operation, and towels or lint to be used for the patient. Care must always be taken to avoid absorption (see CARBOLIC ACID). The perchloride of mercury is another very powerful antiseptic used in solutions of strength 1 in 2000, 1 in 1000 and 1 in 500. This or the biniodide of mercury is the last antiseptic applied to the surgeon's and assistants' hands before an operation begins. They are not, however, to be used in the disinfection of instruments, nor where any large abraded surface would favour absorption. Boracic acid receives no mention here; though it is popularly known as an antiseptic, it is in reality only a soothing fluid, and bacteria will flourish comfortably in contact with it. Of the dry antiseptics iodoform is constantly used in septic or tuberculous wounds, and it appears to have an inhibitory action on *Bacillus tuberculosis*. Its power depends on the fact that it is slowly decomposed by the tissues, and free iodine given off. Among the more recently introduced antiseptics, chinosol, a yellow substance freely soluble in water, and lysol, another coal-tar derivative, are much used. But every antiseptic, however good, is more or less toxic and irritating to a wounded surface. Hence it is that the "antiseptic" method has been replaced in the surgery of to-day by the "aseptic" method (see SURGERY), which relies on keeping free from the invasion of bacteria rather than destroying them when present.

ANTISTHENES (*c.* 444–365 B.C.), the founder of the Cynic school of philosophy, was born at Athens of a Thracian mother, a fact which may account for the extreme boldness of his attack on conventional thought. In his youth he studied rhetoric under Gorgias, perhaps also under Hippias and Prodicus. Gomperz suggests that he was originally in good circumstances, but was reduced to poverty. However this may be, he came under the influence of Socrates, and became a devoted pupil. So eager was he to hear the words of Socrates that he used to walk daily from Peiraeus to Athens, and persuaded his friends to accompany him. Filled with enthusiasm for the Socratic idea of virtue, he founded a school of his own in the Cynosarges, the hall of the bastards (*νόθοι*). Thither he attracted the poorer classes by the simplicity of his life and teaching. He wore a cloak and carried a staff and a wallet, and this costume became the uniform of his followers. Diogenes Laertius says that his works filled ten volumes, but of these fragments only remain. His favourite style seems to have been the dialogue, wherein we see the effect of his early rhetorical training. Aristotle speaks of him as uneducated and simple-minded, and Plato describes him as struggling in vain with the difficulties of dialectic. His work represents one great aspect of Socratic philosophy, and should be compared with the Cyrenaic and Megarian doctrines.

BIBLIOGRAPHY.—Charles Chappuis, *Antisthène* (Paris, 1854); A. Müller, *De Antisthenis cynici vita et scriptis* (Dresden, 1860); T. Gomperz, *Greek Thinkers* (Eng. trans., 1905), vol. ii. pp. 142 ff., 150 ff. For his philosophy see CYNICS, and for his pupils, Diogenes and Crates, see articles under these headings.

ANTISTROPHE, the portion of an ode which is sung by the chorus in its returning movement from west to east, in response to the strophe, which was sung from east to west. It is of the nature of a reply, and balances the effect of the strophe. Thus, in Gray's ode called "The Progress of Poesy," the strophe, which dwelt in triumphant accents on the beauty, power and ecstasy of verse, is answered by the antistrophe, in a depressed and melancholy key—

> "Man's feeble race what ills await,
> Labour, and Penury, the racks of Pain,
> Disease and Sorrow's weeping Train,
> And Death, sad refuge from the storms of Fate," &c.

When the sections of the chorus have ended their responses, they unite and close in the epode, thus exemplifying the triple form in which the ancient sacred hymns of Greece were composed, from the days of Stesichorus onwards. As Milton says, "strophe, antistrophe and epode were a kind of stanza framed only for the music then used with the chorus that sang."

ANTITHESIS (the Greek for "setting opposite"), in rhetoric, the bringing out of a contrast in the meaning by an obvious contrast in the expression, as in the following:—"When there is need of silence, you speak, and when there is need of speech, you are dumb; when present, you wish to be absent, and when absent, you desire to be present; in peace you are for war, and in war you long for peace; in council you descant on bravery, and in the battle you tremble." Antithesis is sometimes double or alternate, as in the appeal of Augustus:—"Listen, young men, to an old man to whom old men were glad to listen when he was young." The force of the antithesis is increased if the words on which the beat of the contrast falls are alliterative, or otherwise similar in sound, as—"The fairest but the falsest of her sex." There is nothing that gives to expression greater point and vivacity than a judicious employment of this figure; but, on the other hand, there is nothing more tedious and trivial than a pseudo-antithetical style. Among English writers who have made the most abundant use of antithesis are Pope, Young, Johnson, and Gibbon; and especially Lyly in his *Euphues*. It is, however, a much more common feature in French than in

English; while in German, with some striking exceptions, it is conspicuous by its absence.

ANTITYPE (Gr. ἀντίτυπος), the correlative of "type," to which it corresponds as the stamp to the die, or vice versa. In the sense of copy or likeness the word occurs in the Greek New Testament (Heb. ix. 24; 1 Peter iii. 21), English "figure." By theological writers antitype is employed to denote the reality of which a type is the prophetic symbol. Thus, Christ is the antitype of many of the types of the Jewish ritual. By the fathers of the Greek church (*e.g.* Gregory Nazianzen) antitype is employed as a designation of the bread and wine in the sacrament of the Lord's Supper.

ANTIUM (mod. *Anzio*), an ancient Volscian city on the coast of Latium, about 33 m. S. of Rome. The legends as to its foundation, and the accounts of its early relations with Rome, are untrustworthy; but Livy's account of wars between Antium and Rome, early in the 4th century B.C., may perhaps be accepted. Antium is named with Ardea, Laurentum and Circeii, as under Roman protection, in the treaty with Carthage in 348 B.C. In 341 it lost its independence after a rising with the rest of Latium against Rome, and the beaks (*rostra*) of the six captured Antiatine ships decorated and gave their name to the orators' tribunal in the Roman Forum. At the end of the Republican period it became a resort of wealthy Romans, and the Julian and Claudian emperors frequently visited it; both Caligula and Nero were born there. The latter founded a colony of veterans and built a new harbour, the projecting moles of which are still extant. In the middle ages it was deserted in favour of Nettuno: at the end of the 17th century Innocent XII. and Clement XI. restored the harbour, not on the old site but to the east of it, with the opening to the east, a mistake which leads to its being frequently silted up; it has a depth of about 15 ft. Remains of Roman villas are conspicuous all along the shore, both to the east and to the north-west of the town. That of Nero cannot be certainly identified, but is generally placed at the so-called Arco Muto, where remains of a theatre (discovered in 1712 and covered up again) also exist. Many works of art have been found. Of the famous temple of Fortune (Horace, *Od.* i. 35) no remains are known. The sea is encroaching slightly at Anzio, but some miles farther north-west the old Roman coast-line now lies slightly inland (see TIBER). The Volscian city stood on higher ground and somewhat away from the shore, though it extended down to it. It was defended by a deep ditch, which can still be traced, and by walls, a portion of which, on the eastern side, constructed of rectangular blocks of tufa, was brought to light in 1897. The modern place is a summer resort and has several villas, among them the Villa Borghese.

See A. Nibby, *Dintorni di Roma*, i. 181; *Notizie degli scavi*, *passim*. (T. As.)

ANTIVARI (Montenegrin *Bar*, so called by the Venetians from its position opposite Bari in Italy), a seaport of Montenegro which until 1878 belonged to Turkey. Pop. (1900) about 2500. The old town is built inland, on a strip of country running between the Adriatic Sea and the Sutorman range of mountains, overshadowed by the peak of Rumiya (5148 ft.). At a few hundred yards' distance it is invisible, hidden among dense olive groves. Within, there is a ruinous walled village, and the shell of an old Venetian fortress, surrounded by mosques and bazaars; for Antivari is rather Turkish than Montenegrin. The fine bay of Antivari, with Prstan, its port, is distant about one hour's drive through barren and forbidding country, shut in by mountains. At the northern horn of the bay stands Spizza, an Austrian military station. Antivari contains the residence of its Roman Catholic archbishop, and, in the centre of the shore, Topolitsa, the square undecorated palace of the crown prince. Antivari is the name applied both to Prstan and the old town. The Austrian Lloyd steamers call at times, and the "Puglia" S.S. Company runs a regular service of steamers to and from Bari. As an outlet for Montenegrin commerce, however, Antivari cannot compete with the Austrian Cattaro, the harbour being somewhat difficult of access in stormy weather. Fishing and olive-oil refining are the main industries.

ANT-LION, the name given to neuropterous insects of the family *Myrmeleonidae*, with relatively short and apically clubbed antennae and four large densely reticulated wings in which the apical veins enclose regular oblong spaces. The perfect insects are for the most part nocturnal and are believed to be carnivorous. The best-known species, *Myrmeleon formicarius*, which may be found adult in the late summer, occurs in many countries on the European continent, though like the rest of this group it is not indigenous in England. Strictly speaking, however, the term ant-lion applies to the larval form, which has been known scientifically for over two hundred years, on account of its peculiar and forbidding appearance and its skilful and unique manner of entrapping prey by means of a pitfall. The abdomen is oval, sandy-grey in hue and beset with warts and bristles; the prothorax forms a mobile neck for the large square head, which carries a pair of long and powerful toothed mandibles. It is in dry and sandy soil that the ant-lion lays its trap. Having marked out the chosen site by a circular groove, it starts to crawl backwards, using its abdomen as a plough to shovel up the soil. By the aid of one front leg it places consecutive heaps of loosened particles upon its head, then with a smart jerk throws each little pile clear of the scene of operations. Proceeding thus it gradually works its way from the circumference towards the centre. When the latter is reached and the pit completed, the larva settles down at the bottom, buried in the soil with only the jaws projecting above the surface. Since the sides of the pit consist of loose sand they afford an insecure foothold to any small insect that inadvertently ventures over the edge. Slipping to the bottom the prey is immediately seized by the lurking ant-lion; or if it attempt to scramble again up the treacherous walls of the pit, is speedily checked in its efforts and brought down by showers of loose sand which are jerked at it from below by the larva. By means of similar head-jerks the skins of insects sucked dry of their contents are thrown out of the pit, which is then kept clear of refuse. A full-grown larva digs a pit about 2 in. deep and 3 in. wide at the edge. The pupa stage of the ant-lion is quiescent. The larva makes a globular case of sand stuck together with fine silk spun, it is said, from a slender spinneret at the posterior end of the body. In this it remains until the completion of the transformation into the sexually mature insect, which then emerges from the case, leaving the pupal integument behind. In certain species of *Myrmeleonidae*, such as *Dendroleon pantheormis*, the larva, although resembling that of *Myrmeleon* structurally, makes no pitfall, but seizes passing prey from any nook or crevice in which it shelters.

The exact meaning of the name ant-lion (Fr. *fourmilion*) is uncertain. It has been thought that it refers to the fact that ants form a large percentage of the prey of the insect, the suffix "lion" merely suggesting destroyer or eater. Perhaps, however, the name may only signify a large terrestrial biting apterous insect, surpassing the ant in size and predatory habits. (R. I. P.)

ANTOFAGASTA, a town and port of northern Chile and capital of the Chilean province of the same name, situated about 768 m. N. of Valparaiso in 23° 38′ 39″ S. lat. and 70° 24′ 39″ W. long. Pop. (est. 1902) 16,084. Antofagasta is the seaport for a railway running to Oruro, Bolivia, and is the only available outlet for the trade of the south-western departments of that republic. The smelting works for the neighbouring silver mines are located here, and a thriving trade with the inland mining towns is carried on. The town was founded in 1870 as a shipping port for the recently discovered silver mines of that vicinity, and belonged to Bolivia until 1879, when it was occupied by a Chilean military force.

The province of ANTOFAGASTA has an area of 46,611 sq. m. lying within the desert of Atacama and between the provinces of Tarapacá and Atacama. It is rich in saline and other mineral deposits, the important Caracoles silver mines being about 90 m. north-east of the port of Antofagasta. Like the other provinces of this region, Antofagasta produces for export copper, silver,

silver ores, lead, nitrate of soda, borax and salt. Iron and manganese ores are also found. Besides Antofagasta the principal towns are Taltal, Mejillones, Cobija (the old capital) and Tocopilla. Up to 1879 the province belonged to Bolivia, and was known as the department of Atacama, or the Litoral. It fell into the possession of Chile in the war of 1879–82, and was definitely ceded to that republic in 1885.

ANTOINE, ANDRÉ (1858–), French actor-manager, was born at Limoges, and in his early years was in business. But he was an enthusiastic amateur actor, and in 1887 he founded in Paris the Théâtre Libre, in order to realize his ideas as to the proper development of dramatic art. For an account of his work, which had enormous influence on the French stage, see DRAMA: *France*. In 1894 he gave up the direction of this theatre, and became connected with the Gymnase, and later (1896) with the Odéon.

ANTONELLI, GIACOMO (1806–1876), Italian cardinal, was born at Sonnino on the 2nd of April 1806. He was educated for the priesthood, but, after taking minor orders, gave up the idea of becoming a priest, and chose an administrative career. Created secular prelate, he was sent as apostolic delegate to Viterbo, where he early manifested his reactionary tendencies in an attempt to stamp out Liberalism. Recalled to Rome in 1841, he entered the office of the papal secretary of state, but four years later was appointed pontifical treasurer-general. Created cardinal (11th June 1847), he was chosen by Pius IX. to preside over the council of state entrusted with the drafting of the constitution. On the 10th of March 1848 Antonelli became premier of the first constitutional ministry of Pius IX., a capacity in which he displayed consummate duplicity. Upon the fall of his cabinet Antonelli created for himself the governorship of the sacred palaces in order to retain constant access to and influence over the pope. After the assassination of Pellegrino Rossi (15th November 1848) he arranged the flight of Pius IX. to Gaeta, where he was appointed secretary of state. Notwithstanding promises to the powers, he restored absolute government upon returning to Rome (12th April 1850) and violated the conditions of the surrender by wholesale imprisonment of Liberals. In 1855 he narrowly escaped assassination. As ally of the Bourbons of Naples, from whom he had received an annual subsidy, he attempted, after 1860, to facilitate their restoration by fomenting brigandage on the Neapolitan frontier. To the overtures of Ricasoli in 1861, Pius IX., at Antonelli's suggestion, replied with the famous "*Non possumus*," but subsequently (1867) accepted, too late, Ricasoli's proposal concerning ecclesiastical property. After the September Convention (1864) Antonelli organized the Legion of Antibes to replace French troops in Rome, and in 1867 secured French aid against Garibaldi's invasion of papal territory. Upon the reoccupation of Rome by the French after Mentana, Antonelli again ruled supreme, but upon the entry of the Italians in 1870 was obliged to restrict his activity to the management of foreign relations. He wrote, with papal approval, the letter requesting the Italians to occupy the Leonine city, and obtained from the Italians payment of the Peter's pence (5,000,000 lire) remaining in the papal exchequer, as well as 50,000 scudi—the first and only instalment of the Italian allowance (subsequently fixed by the Law of Guarantees, March 21, 1871) ever accepted by the Holy See. At Antonelli's death the Vatican finances were found to be in disorder, with a deficit of 45,000,000 lire. His personal fortune, accumulated during office, was considerable, and was bequeathed almost entirely to members of his family. To the Church he left little and to the pope only a trifling souvenir. From 1850 until his death he interfered little in affairs of dogma and church discipline, although he addressed to the powers circulars enclosing the Syllabus (1864) and the acts of the Vatican Council (1870). His activity was devoted almost exclusively to the struggle between the papacy and the Italian *Risorgimento*, the history of which is comprehensible only when the influence exercised by his unscrupulous, grasping and sinister personality is fully taken into account. He died on the 6th of November 1876.

ANTONELLO DA MESSINA (*c.* 1430–1479), Italian painter, was probably born at Messina about the beginning of the 15th century, and laboured at his art for some time in his native country. Happening to see at Naples a painting in oil by Jan Van Eyck, belonging to Alphonso of Aragon, he was struck by the peculiarity and value of the new method, and set out for the Netherlands to acquire a knowledge of the process from Van Eyck's disciples. He spent some time there in the prosecution of his art; returned with his secret to Messina about 1465; probably visited Milan; removed to Venice in 1472, where he painted for the Council of Ten; and died there in the middle of February 1479 (see Venturi's article in Thieme-Becker, *Künstlerlexikon*, 1907). His style is remarkable for its union—not always successful—of Italian simplicity with Flemish love of detail. His subjects are frequently single figures, upon the complete representation of which he bestows his utmost skill. There are extant—besides a number more or less dubious—twenty authentic productions, consisting of renderings of "Ecce Homo," Madonnas, saints, and half-length portraits, many of them painted on wood. The finest of all is said to be the nameless picture of a man in the Berlin museum. The National Gallery, London, has three works by him, including the "St Jerome in his Study." Antonello exercised an important influence on Italian painting, not only by the introduction of the Flemish invention, but also by the transmission of Flemish tendencies.

ANTONINI ITINERARIUM, a valuable register, still extant, of the stations and distances along the various roads of the Roman empire, seemingly based on official documents, which were probably those of the survey organized by Julius Caesar, and carried out under Augustus. Nothing is known with certainty as to the date or author. It is considered probable that the date of the original edition was the beginning of the 3rd century, while that which we possess is to be assigned to the time of Diocletian. If the author or promoter of the work is one of the emperors, it is most likely to be Antoninus Caracalla.

Editions by Wesseling, 1735, Parthey and Pindar, 1848. The portion relating to Britain was published under the title *Iter Britanniarum*, with commentary by T. Reynolds, 1799.

ANTONINUS, SAINT [ANTONIO PIEROZZI, also called DE FORCIGLIONI] (1389–1459), archbishop of Florence, was born at that city on the 1st of March 1389. He entered the Dominican order in his 16th year, and was soon entrusted, in spite of his youth, with the government of various houses of his order at Cortona, Rome, Naples and Florence, which he laboured zealously to reform. He was consecrated archbishop of Florence in 1446, and won the esteem and love of his people, especially by his energy and resource in combating the effects of the plague and earthquake in 1448 and 1453. He died on the 2nd of May 1459, and was canonized by Pope Adrian VI. in 1523. His feast is annually celebrated on the 13th of May. Antoninus had a great reputation for theological learning, and sat as papal theologian at the council of Florence (1439). Of his various works, the list of which is given in Quétif-Echard, *De Scriptoribus Ord. Praedicat.*, i. 818, the best-known are his *Summa theologica* (Venice, 1477; Verona, 1740) and the *Summa confessionalis* (Mondovi, 1472), invaluable to confessors.

See Bolland, *Acta Sanctorum*, i., and U. Chevalier, *Rep. des. s. hist.* (1905), pp. 285-286.

ANTONINUS LIBERALIS, Greek grammarian, probably flourished about A.D. 150. He wrote a collection of forty-one tales of mythical metamorphoses (Μεταμορφώσεων Συναγωγή), chiefly valuable as a source of mythological knowledge.

Westermann, *Mythographi Graeci* (1843); Oder, *De Antonino Liberali* (1886).

ANTONINUS PIUS [TITUS AURELIUS FULVUS BOIONIUS ARRIUS ANTONINUS], (A.D. 86–161), Roman emperor A.D. 138–161, the son of Aurelius Fulvus, a Roman consul whose family had originally belonged to Nemausus (Nîmes), was born near Lanuvium on the 19th of September 86. After the death of his father, he was brought up under the care of Arrius Antoninus, his maternal grandfather, a man of integrity and culture, and on terms of friendship with the younger Pliny. Having filled with more than usual success the offices of quaestor and praetor,

he obtained the consulship in 120; he was next chosen one of the four consulars for Italy, and greatly increased his reputation by his conduct as proconsul of Asia. He acquired much influence with the emperor Hadrian, who adopted him as his son and successor on the 25th of February 138, after the death of his first adopted son Aelius Verus, on condition that he himself adopted Marcus Annius Verus, his wife's brother's son, and Lucius, son of Aelius Verus, afterwards the emperors Marcus Aurelius and Lucius Aelius Verus (colleague of Marcus Aurelius). A few months afterwards, on Hadrian's death, he was enthusiastically welcomed to the throne by the Roman people, who, for once, were not disappointed in their anticipation of a happy reign. For Antoninus came to his new office with simple tastes, kindly disposition, extensive experience, a well-trained intelligence and the sincerest desire for the welfare of his subjects. Instead of plundering to support his prodigality, he emptied his private treasury to assist distressed provinces and cities, and everywhere exercised rigid economy (hence the nickname κυμινοπρίστης, "cummin-splitter"). Instead of exaggerating into treason whatever was susceptible of unfavourable interpretation, he turned the very conspiracies that were formed against him into opportunities of signalizing his clemency. Instead of stirring up persecution against the Christians, he extended to them the strong hand of his protection throughout the empire. Rather than give occasion to that oppression which he regarded as inseparable from an emperor's progress through his dominions, he was content to spend all the years of his reign in Rome, or its neighbourhood. Under his patronage the science of jurisprudence was cultivated by men of high ability, and a number of humane and equitable enactments were passed in his name. Of the public transactions of this period we have but scant information, but, to judge by what we possess, those twenty-two years were not remarkably eventful. One of his first acts was to persuade the senate to grant divine honours to Hadrian, which they had at first refused; this gained him the title of Pius (dutiful in affection). He built temples, theatres, and mausoleums, promoted the arts and sciences, and bestowed honours and salaries upon the teachers of rhetoric and philosophy. His reign was comparatively peaceful. Insurrections amongst the Moors, Jews, and Brigantes in Britain were easily put down. The one military result which is of interest to us now is the building in Britain of the wall of Antoninus from the Forth to the Clyde. In his domestic relations Antoninus was not so fortunate. His wife, Faustina, has almost become a byword for her lack of womanly virtue; but she seems to have kept her hold on his affections to the last. On her death he honoured her memory by the foundation of a charity for orphan girls, who bore the name of *Alimentariae Faustinianae*. He had by her two sons and two daughters; but they all died before his elevation to the throne, except Annia Faustina, who became the wife of Marcus Aurelius. Antoninus died of fever at Lorium in Etruria, about 12 m. from Rome, on the 7th of March 161, giving the keynote to his life in the last word that he uttered when the tribune of the night-watch came to ask the password—*aequanimitas*.

The only account of his life handed down to us is that of Julius Capitolinus, one of the *Scriptores Historiae Augustae*. See Bossart-Müller, *Zur Geschichte des Kaisers A.* (1868); Lacour-Gayet, *A. le Pieux et son Temps* (1888); Bryant, *The Reign of Antonine* (Cambridge Historical Essays, 1895); P. B. Watson, *Marcus Aurelius Antoninus* (London, 1884), chap. ii.

ANTONIO, known as "THE PRIOR OF CRATO" (1531–1595), claimant of the throne of Portugal, was the natural son of Louis (Luis), duke of Beja, by Yolande (Violante) Gomez, a Jewess, who is said to have died a nun. His father was a younger son of Emanuel, king of Portugal (1495–1521). Antonio was educated at Coimbra, and was placed in the order of St John. He was endowed with the wealthy priory of Crato. Little is known of his life till 1578. In that year he accompanied King Sebastian (1557–1578) in his invasion of Morocco, and was taken prisoner by the Moors at the battle of Alcazar-Kebir, in which the king was slain. Antonio is said to have secured his release on easy terms by a fiction. He was asked the meaning of the cross of St John which he wore on his doublet, and replied that it was the sign of a small benefice which he held from the pope, and would lose if he were not back by the 1st of January. His captor, believing him to be a poor man, allowed him to escape for a small ransom. On his return to Portugal he found that his uncle, the cardinal Henry, only surviving son of King John III. (1521–1557), had been recognized as king. The cardinal was old, and was the last legitimate male representative of the royal line (see PORTUGAL: *History*). The succession was claimed by Philip II. of Spain. Antonio, relying on the popular hostility to a Spanish ruler, presented himself as a candidate. He had endeavoured to prove that his father and mother had been married after his birth. There was, however, no evidence of the marriage. Antonio's claim, which was inferior not only to that of Philip II., but to that of the duchess of Braganza, was not supported by the nobles or gentry. His partisans were drawn exclusively from the inferior clergy, the peasants and workmen. The prior endeavoured to resist the army which Philip II. marched into Portugal to enforce his pretensions, but was easily routed by the duke of Alva, the Spanish commander, at Alcantara, on the 25th of August 1580. At the close of the year, or in the first days of 1581, he fled to France carrying with him the crown jewels, which included many valuable diamonds. He was well received by Catherine de' Medici, who had a claim of her own on the crown of Portugal, and looked upon him as a convenient instrument to be used against Philip II. By promising to cede the Portuguese colony of Brazil to her, and by the sale of part of his jewels, Antonio secured means to fit out a fleet manned by Portuguese exiles and French and English adventurers. As the Spaniards had not yet occupied the Azores he sailed to them, but was utterly defeated at sea by the marquis of Santa Cruz off Saint Michael's on the 27th of July 1582. He now returned to France, and lived for a time at Ruel near Paris. Peril from the assassins employed by Philip II. to remove him drove Antonio from one refuge to another, and he finally came to England. Elizabeth favoured him for much the same reasons as Catherine de' Medici. In 1589, the year after the Armada, he accompanied an English expedition under the command of Drake and Norris to the coast of Spain and Portugal. The force consisted partly of the queen's ships, and in part of privateers who went in search of booty. Antonio, with all the credulity of an exile, believed that his presence would provoke a general rising against Philip II., but none took place, and the expedition was a costly failure. In 1590 the pretender left England and returned to France, where he fell into poverty. His remaining diamonds were disposed of by degrees. The last and finest was acquired by M. de Sancy, from whom it was purchased by Sully and included in the jewels of the crown. During his last days he lived as a private gentleman on a small pension given him by Henry IV., and he died in Paris on the 26th of August 1595. He left two illegitimate sons, and his descendants can be traced till 1687. In addition to papers published to defend his claims Antonio was the author of the *Panegyrus Alphonsi Lusitanorum Regis* (Coimbra, 1550), and of a cento of the Psalms, *Psalmi Confessionales* (Paris 1592), which was translated into English under the title of *The Royal Penitent* by Francis Chamberleyn (London, 1659), and into German as *Heilige Betrachtungen* (Marburg, 1677).

AUTHORITIES.—Antonio is frequently mentioned in the French, English, and Spanish state papers of the time. A life of him, attributed to Gomes Vasconcellos de Figueredo, was published in a French translation by Mme de Sainctonge at Amsterdam (1696). A modern account of him, *Un prétendant portugais au XVI. siècle*, by E. Fournier (Paris, 1852), is based on authentic sources. See also *Dom Antonio Prior de Crato—notas de bibliographia*, by J. de Aranjo (Lisbon, 1897). (D. H.)

ANTONIO, NICOLAS (1617–1684), Spanish bibliographer, was born at Seville on the 31st of July 1617. After taking his degree at Salamanca (1636–1639), he returned to his native city, wrote his treatise *De Exilio* (which was not printed till 1659), and began his monumental register of Spanish writers. The fame of his learning reached Philip IV., who conferred the order of Santiago on him in 1645, and sent him as general agent to Rome in 1654.

Returning to Spain in 1679, Antonio died at Madrid in the spring of 1684. His *Bibliotheca Hispana nova*, dealing with the works of Spanish authors who flourished after 1500, appeared at Rome in 1672; the *Bibliotheca Hispana vetus*, a literary history of Spain from the time of Augustus to the end of the 15th century, was revised by Manuel Martí, and published by Antonio's friend, Cardinal José Saenz de Aguirre at Rome in 1696. A fine edition of both parts, with additional matter found in Antonio's manuscripts, and with supplementary notes by Francisco Perez Bayer, was issued at Madrid in 1787–1788. This great work, incomparably superior to any previous bibliography, is still unsuperseded and indispensable.

Of Antonio's miscellaneous writings the most important is the posthumous *Censura de historias fabulosas* (Valencia, 1742), in which erudition is combined with critical insight. His *Bibliotheca Hispana rabinica* has not been printed; the manuscript is in the national library at Madrid.

ANTONIO DE LEBRIJA [ANTONIUS NEBRISSENSIS], (1444–1522), Spanish scholar, was born at Lebrija in the province of Andalusia. After studying at Salamanca he resided for ten years in Italy, and completed his education at Bologna University. On his return to Spain (1473), he devoted himself to the advancement of classical learning amongst his countrymen. After holding the professorship of poetry and grammar at Salamanca, he was transferred to the university of Alcalá de Henares, where he lectured until his death in 1522, at the age of seventy-eight. His services to the cause of classical literature in Spain have been compared with those rendered by Valla, Erasmus and Budaeus to Italy, Holland and France. He produced a large number of works on a variety of subjects, including a Latin and Spanish dictionary, commentaries on Sedulius and Persius, and a Compendium of Rhetoric, based on Aristotle, Cicero and Quintilian. His most ambitious work was his chronicle entitled *Rerum in Hispania Gestarum Decades* (published in 1545 by his son as an original work by his father), which twenty years later was found to be merely a Latin translation of the Spanish chronicle of Pulgar, which was published at Saragossa in 1567. De Lebrija also took part in the production of the Complutense polyglot Bible published under the patronage of Cardinal Jimenes.

Antonio, *Bibliotheca Hispana Nova*, i. 132 (1888); Prescott, *History of Ferdinand and Isabella*, i. 410 (note); MacCrie, *The Reformation in Spain in the Sixteenth Century* (1829).

ANTONIUS, the name of a large number of prominent citizens of ancient Rome, of the gens Antonia. Antonius the triumvir claimed that his family was descended from Anton, son of Heracles. Of the Antonii the following are important.

1. MARCUS ANTONIUS (143–87 B.C.), one of the most distinguished Roman orators of his time, was quaestor in 113, and praetor in 102 with proconsular powers, the province of Cilicia being assigned to him. Here he was so successful against the pirates that a naval triumph was awarded him. He was consul in 99, censor 97, and held a command in the Marsic War in 90. An adherent of Sulla, he was put to death by Marius and Cinna when they obtained possession of Rome (87). Antonius's reputation for eloquence rests on the authority of Cicero, none of his orations being extant. He is one of the chief speakers in Cicero's *De Oratore*.

Velleius Paterculus ii. 22; Appian, *Bell. Civ.* i. 72; Dio Cassius xlv. 47; Plutarch, *Marius*, 44; Cicero, *Orator*, 5, *Brutus*, 37; Quintilian, *Instit.* iii. 1, 19; O. Enderlein, *De M. Antonio oratore* (Leipzig, 1882).

2. MARCUS ANTONIUS, nicknamed CRETICUS in derision, elder son of Marcus Antonius, the "orator," and father of the triumvir. He was praetor in 74 B.C., and received an extraordinary command (similar to that bestowed upon Pompey by the Gabinian law) to clear the sea of pirates, and thereby assist the operations against Mithradates VI. He failed in the task, and made himself unpopular by plundering the provinces (Sallust, *Hist.* iii., fragments ed. B. Maurenbrecher, p. 108; Velleius Paterculus ii. 31; Cicero, *In Verrem*, iii. 91). He attacked the Cretans, who had made an alliance with the pirates, but was totally defeated, most of his ships being sunk. Diodorus Siculus (xl. 1) states that he only saved himself by a disgraceful treaty. He died soon afterwards (72–71) in Crete. All authorities are agreed as to his avarice and incompetence.

3. GAIUS ANTONIUS, nicknamed HYBRIDA from his half-savage disposition (Pliny, *Nat. Hist.* viii. 213), second son of Marcus Antonius, the "orator," and uncle of the triumvir. He was one of Sulla's lieutenants in the Mithradatic War, and, after Sulla's return, remained in Greece to plunder with a force of cavalry. In 76 he was tried for his malpractices, but escaped punishment; six years later he was removed from the senate by the censors, but soon afterwards reinstated. In spite of his bad reputation, he was elected tribune in 71, praetor in 66, and consul with Cicero in 63. He secretly supported Catiline, but Cicero won him over by promising him the rich province of Macedonia. On the outbreak of the Catilinarian conspiracy, Antonius was obliged to lead an army into Etruria, but handed over the command on the day of battle to Marcus Petreius, on the ground of ill-health. He then went to Macedonia, where he made himself so detested by his oppression and extortions that he left the province, and was accused in Rome (59) both of having taken part in the conspiracy and of extortion in his province. It was said that Cicero had agreed with Antonius to share his plunder. Cicero's defence of Antonius two years before in view of a proposal for his recall, and also on the occasion of his trial, increased the suspicion. In spite of Cicero's eloquence, Antonius was condemned, and went into exile at Cephallenia. He seems to have been recalled by Caesar, since he was present at a meeting of the senate in 44, and was censor in 42.

Cicero, *In Cat.* iii. 6, *pro Flacco*, 38; Plutarch, *Cicero*, 12; Dio Cassius xxxvii. 39, 40; xxxviii. 10. On his trial see article in Pauly-Wissowa's *Realencyclopädie*.

4. MARCUS ANTONIUS, commonly called MARK ANTONY, the Triumvir, grandson of Antonius the "orator" and son of Antonius Creticus, related on his mother's side to Julius Caesar, was born about 83 B.C. Under the influence of his stepfather, Cornelius Lentulus Sura, he spent a profligate youth. For a time he co-operated with P. Clodius Pulcher, probably out of hostility to Cicero, who had caused Lentulus Sura to be put to death as a Catilinarian; the connexion was severed by a disagreement arising from his relations with Clodius's wife, Fulvia. In 58 he fled to Greece to escape his creditors. After a short time spent in attendance on the philosophers at Athens, he was summoned by Aulus Gabinius, governor of Syria, to take part in the campaigns against Aristobulus in Palestine, and in support of Ptolemy Auletes in Egypt. In 54 he was with Caesar in Gaul. Raised by Caesar's influence to the offices of quaestor, augur, and tribune of the plebs, he supported the cause of his patron with great energy, and was expelled from the senate-house when the Civil War broke out. Deputy-governor of Italy during Caesar's absence in Spain (49), second in command in the decisive battle of Pharsalus (48), and again deputy-governor of Italy while Caesar was in Africa (47), Antony was second only to the dictator, and seized the opportunity of indulging in the most extravagant excesses, depicted by Cicero in the *Philippics*. In 46 he seems to have taken offence because Caesar insisted on payment for the property of Pompey which Antony professedly had purchased, but had in fact simply appropriated. The estrangement was not of long continuance; for we find Antony meeting the dictator at Narbo the following year, and rejecting the suggestion of Trebonius that he should join in the conspiracy that was already on foot. In 44 he was consul with Caesar, and seconded his ambition by the famous offer of the crown at the festival of Lupercalia (February 15). After the murder of Caesar on the 15th of March, Antony conceived the idea of making himself sole ruler. At first he seemed disposed to treat the conspirators leniently, but at the same time he so roused the people against them by the publication of Caesar's will and by his eloquent funeral oration, that they were obliged to leave the city. He surrounded himself with a bodyguard of Caesar's veterans, and forced the senate to transfer to him the province of Cisalpine Gaul, which was then administered by Decimus Junius Brutus, one of the conspirators. Brutus refused to surrender the province, and Antony set out to attack him in October 44,

But at this time Octavian, whom Caesar had adopted as his son, arrived from Illyria, and claimed the inheritance of his "father." Octavian obtained the support of the senate and of Cicero; and the veteran troops of the dictator flocked to his standard. Antony was denounced as a public enemy, and Octavian was entrusted with the command of the war against him. Antony was defeated at Mutina (43) where he was besieging Brutus. The consuls Aulus Hirtius and C. Vibius Pansa, however, fell in the battle, and the senate became suspicious of Octavian, who, irritated at the refusal of a triumph and the appointment of Brutus to the command over his head, entered Rome at the head of his troops, and forced the senate to bestow the consulship upon him (August 19th). Meanwhile, Antony escaped to Cisalpine Gaul, effected a junction with Lepidus and marched towards Rome with a large force of infantry and cavalry. Octavian betrayed his party, and came to terms with Antony and Lepidus. The three leaders met at Bononia and adopted the title of *Triumviri reipublicae constituendae* as joint rulers. Gaul was to belong to Antony, Spain to Lepidus, and Africa, Sardinia and Sicily to Octavian. The arrangement was to last for five years. A reign of terror followed; proscriptions, confiscations, and executions became general; some of the noblest citizens were put to death, and Cicero fell a victim to Antony's revenge. In the following year (42) Antony and Octavian proceeded against the conspirators Cassius and Brutus, and by the two battles of Philippi annihilated the senatorial and republican parties. Antony proceeded to Greece, and thence to Asia Minor, to procure money for his veterans and complete the subjugation of the eastern provinces. On his passage through Cilicia in 41 he fell a victim to the charms of Cleopatra, in whose company he spent the winter at Alexandria. At length he was aroused by the Parthian invasion of Syria and the report of an outbreak between Fulvia his wife and Lucius his brother on the one hand and Octavian on the other. On arriving in Italy he found that Octavian was already victorious; on the death of Fulvia, a reconciliation was effected between the triumvirs, and cemented by the marriage of Antony with Octavia, the sister of his colleague. A new division of the Roman world was made at Brundusium, Lepidus receiving Africa, Octavian the west, and Antony the east. Returning to his province Antony made several attempts to subdue the Parthians, without any decided success. In 39 he visited Athens, where he behaved in a most extravagant manner, assuming the attributes of the god Dionysus. In 37 he crossed over to Italy, and renewed the triumvirate for five years at a meeting with Octavian. Returning to Syria, he resumed relations with Cleopatra. His treatment of Octavia, her brother's desire to get rid of him, and the manner in which he disposed of kingdoms and provinces in favour of Cleopatra alienated his supporters. In 32 the senate deprived him of his powers and declared war against Cleopatra. After two years spent in preparations, Antony was defeated at the battle of Actium (2nd September 31). Once more he sought refuge in the society of Cleopatra, who had escaped with sixty ships to Egypt. He was pursued by his enemies and his troops abandoned him. Thereupon he committed suicide in the mistaken belief that Cleopatra had already done so (30 B.C.). Antony had been married in succession to Fadia, Antonia, Fulvia and Octavia, and left behind him a number of children.

See ROME, *History*, II. "The Republic" (*ad fin.*); Caesar, *De Bello Gallico*, *De Bello Civili*; Plutarch, Lives of *Antony*, *Brutus*, *Cicero*, *Caesar*; Cicero, *Letters* (ed. Tyrrell and Purser) and *Philippics*; Appian, *Bell. Civ.* i.-v.; Dio Cassius xli.-liii. In addition to the standard histories, see V. Gardthausen, *Augustus und seine Zeit* (Leipzig, 1891–1904); W. Drumann, *Geschichte Roms* (2nd ed. P. Groebe, 1899), i. pp. 46-384; article by Groebe in Pauly-Wissowa's *Realencyclopädie*; and a short but vivid sketch by de Quincey in his *Essay on the Caesars*.

5. LUCIUS ANTONIUS, youngest son of Marcus Antonius Creticus, and brother of the triumvir. In 44, as tribune of the people, he brought forward a law authorizing Caesar to nominate the chief magistrates during his absence from Rome. After the murder of Caesar, he supported his brother Marcus. He proposed an agrarian law in favour of the people and Caesar's veterans, and took part in the operations at Mutina (43). In 41 he was consul, and had a dispute with Octavian, which led to the so-called Perusian War, in which he was supported by Fulvia (Mark Antony's wife), who was anxious to recall her husband from Cleopatra's court. Later, observing the bitter feelings that had been evoked by the distribution of land among the veterans of Caesar, Antonius and Fulvia changed their attitude, and stood forward as the defenders of those who had suffered from its operation. Antonius marched on Rome, drove out Lepidus, and promised the people that the triumvirate should be abolished. On the approach of Octavian, he retired to Perusia in Etruria, where he was besieged by three armies, and compelled to surrender (winter of 41). His life was spared, and he was sent by Octavian to Spain as governor. Nothing is known of the circumstances or date of his death. Cicero, in his *Philippics*, actuated in great measure by personal animosity, gives a highly unfavourable view of his character.

Appian, *Bellum Civile*, v. 14 ff.; Dio Cassius xlviii. 5-14.

6. GAIUS ANTONIUS, second son of Marcus Antonius Creticus, and brother of the triumvir. In 49 he was legate of Caesar and, with P. Cornelius Dolabella, was entrusted with the defence of Illyricum against the Pompeians. Dolabella's fleet was destroyed; Antonius was shut up in the island of Curicta and forced to surrender. In 44 he was city praetor, his brothers Marcus and Lucius being consul and tribune respectively in the same year. Gaius was appointed to the province of Macedonia, but on his way thither fell into the hands of M. Junius Brutus on the coast of Illyria. Brutus at first treated him generously, but ultimately put him to death (42).

Plutarch, *Brutus*, 28; Dio Cassius xlvii. 21-24. On the whole family, see the articles in Pauly-Wissowa's *Realencyclopädie*, i. pt. 2 (1894).

ANTONOMASIA, in rhetoric, the Greek term for a substitution of any epithet or phrase for a proper name; as "Pelides," or "the son of Peleus," for Achilles; "the Stagirite" for Aristotle; "the author of *Paradise Lost*" for Milton; "the little corporal" for Napoleon I.; "Macedonia's madman" for Alexander the Great, &c. &c. The opposite substitution of a proper name for some generic term is also sometimes called antonomasia; as "a Cicero" for an orator.

ANTRAIGUES, EMMANUEL HENRI LOUIS ALEXANDRE DE LAUNAY, COMTE D' (*c.* 1755–1812), French publicist and political adventurer, was a nephew of François Emmanuel de Saint-Priest (1735–1821), one of the last ministers of Louis XVI. He was a cavalry captain, but, having little taste for the army, left it and travelled extensively, especially in the East. On his return to Paris, he sought the society of philosophers and artists, visited Voltaire at Ferney for three months, but was more attracted by J. J. Rousseau, with whom he became somewhat intimate. He published a *Mémoire sur les états-généraux*, supported the Revolution enthusiastically when it broke out, was elected deputy, and took the oath to the constitution; but he suddenly changed his mind completely, became a defender of the monarchy and emigrated in 1790. He was the secret agent of the comte de Provence (Louis XVIII.) at different courts of Europe, and at the same time received money from the courts he visited. He published a number of pamphlets, *Des monstres ravagent partout*, *Point d'accommodement*, &c. At Venice, where he was attaché to the Russian legation, he was arrested in 1797, but escaped to Russia. Sent as Russian attaché to Dresden, he published a violent pamphlet against Napoleon I., and was expelled by the Saxon government. He then went to London, and it was universally believed that he betrayed the secret articles of the treaty of Tilsit to the British cabinet, but his recent biographer, Pingaud, contests this. In 1812 he and his wife Madame Saint-Huberty, an operatic singer, were assassinated by an Italian servant whom they had dismissed. It has never been known whether the murder was committed from private or political motives.

See H. Vaschalde, *Notice bibliographique sur Louis Alexandre de Launay, comte d'Antraigues, sa vie et ses œuvres*; Léonce Pingaud, *Un Agent secret sous la révolution et l'empire, le comte d'Antraigues* (Paris, 1893); Édouard de Goncourt, *La Saint-Huberty et l'opéra au XVIIIe siècle*.

ANTRIM, RANDAL MACDONNELL, 1ST EARL OF (d. 1636), called "Arranach," having been brought up in the Scottish island of Arran by the Hamiltons, was the 4th son of Sorley Boy MacDonnell (*q.v.*), and of Mary, daughter of Conn O'Neill, 1st earl of Tyrone. He fought at first against the English government, participating in his brother James's victory over Sir John Chichester at Carrickfergus in November 1597, and joining in O'Neill's rebellion in 1600. But on the 16th of December he signed articles with Sir Arthur Chichester and was granted protection; in 1601 he became head of his house by his elder brother's death, his pardon being confirmed to him; and in 1602 he submitted to Lord Mountjoy and was knighted. On the accession of James I. in 1603 he obtained a grant of the Route and the Glynns (Glens) districts, together with the island of Rathlin, and remained faithful to the government in spite of the unpopularity he thereby incurred among his kinsmen, who conspired to depose him. In 1607 he successfully defended himself against the charge of disloyalty on the occasion of the flight of the earls of Tyrone and Tyrconnell, and rendered services to the government by settling and civilizing his districts, being well received the following year by James in London. In 1618 he was created Viscount Dunluce, and subsequently he was appointed a privy councillor and lord-lieutenant of the county of Antrim. On the 12th of December 1620 he was created earl of Antrim. In 1621 he was charged with harbouring Roman Catholic priests, confessed his offence and was pardoned. He offered his assistance in 1625 during the prospect of a Spanish invasion, but was still regarded as a person that needed watching. His arbitrary conduct in Ireland in 1627 was suggested as a fit subject for examination by the Star Chamber, but his fidelity to the government was strictly maintained to the last. In 1631 he was busy repairing Protestant churches, and in 1634 he attended the Irish parliament. He made an important agreement in 1635 for the purchase from James Campbell, Lord Cantire, of the lordship of Cantire, or Kintyre, of which the MacDonnells had been dispossessed in 1600 by Argyll; but his possession was successfully opposed by Lord Lorne. He died on the 10th of December 1636. Antrim married Alice, daughter of Hugh O'Neill, earl of Tyrone, by whom, besides six daughters, he had Randal, 2nd earl and 1st marquess of Antrim (*q.v.*), and Alexander, 3rd earl. Three other sons, Maurice, Francis and James, were probably illegitimate. The earldom has continued in the family down to the present day, the 11th earl (b. 1851) succeeding in 1869.

See also *An Historical Account of the MacDonnells of Antrim*, by G. Hill (1873).

ANTRIM, RANDAL MACDONNELL, 1ST MARQUESS OF (1609–1683), son of the 1st earl of Antrim, was born in 1609 and educated as a Roman Catholic. He travelled abroad, and on his return in 1634 went to court, next year marrying Katherine Manners, widow of the 1st duke of Buckingham, and living on her fortune for some years in great splendour. In 1639, on the outbreak of the Scottish war, he initiated a scheme of raising a force in Ireland to attack Argyll in Scotland and recover Kintyre (or Cantire), a district formerly possessed by his family; but the plan, discouraged and ridiculed by Strafford, miscarried.[1] Soon afterwards he returned to Ireland, and sought in 1641 to create a diversion, together with Ormonde, for Charles I. against the parliament. He joined in his schemes Lord Slane and Sir Phelim O'Neill, later leaders of the rebellion, but on the outbreak of the rebellion in the autumn he dissociated himself from his allies and retired to his castle at Dunluce. His suspicious conduct, however, and his Roman Catholicism, caused him to be regarded as an enemy by the English party. In May 1642 he was captured at Dunluce Castle by the parliamentary general Robert Munro, and imprisoned at Carrickfergus. Escaping thence he joined the queen at York; and subsequently, having proceeded to Ireland to negotiate a cessation of hostilities, he was again captured with his papers in May 1643 and confined at Carrickfergus, thence once more escaping and making his way to Kilkenny, the headquarters of the Roman Catholic confederation. He returned to Oxford in December with a scheme for raising 10,000 Irish for service in England and 2000 to join Montrose in Scotland, which through the influence of the duchess of Buckingham secured the consent of the king. On the 26th of January 1644 Antrim was created a marquess. He returned to Kilkenny in February, took the oath of association, and was made a member of the council and lieutenant-general of the forces of the Catholic confederacy. The confederacy, however, giving him no support in his projects, he threw up his commission, and with Ormonde's help despatched about 1600 men in June to Montrose's assistance in Scotland, subsequently returning to Oxford and being sent by the king in 1645 with letters for the queen at St Germains. He proceeded thence to Flanders and fitted out two frigates with military stores, which he brought to the prince of Wales at Falmouth. He visited Cork and afterwards in July 1646 joined his troops in Scotland, with the hope of expelling Argyll from Kintyre; but he was obliged to retire by order of the king, and returning to Ireland threw himself into the intrigues between the various factions. In 1647 he was appointed with two others by the confederacy to negotiate a treaty with the prince of Wales in France, and though he anticipated his companions by starting a week before them, he failed to secure the coveted lord-lieutenancy, which was confirmed to Ormonde. He now ceased to support the Roman Catholics or the king's cause; opposed the treaty between Ormonde and the confederates; supported the project of union between O'Neill and the parliament; and in 1649 entered into communications with Cromwell, for whom he performed various services, though there appears no authority to support Carte's story that Antrim was the author of a forged agreement for the betrayal of the king's army by Lord Inchiquin.[1] Subsequently he joined Ireton, and was present at the siege of Carlow. He returned to England in December 1650, and in lieu of his confiscated estate received a pension of £500 and later of £800, together with lands in Mayo. At the Restoration Antrim was excluded from the Act of Oblivion on account of his religion, and on presenting himself at court was imprisoned in the Tower, subsequently being called before the lords justices in Ireland. In 1663 he succeeded, in spite of Ormonde's opposition, in securing a decree of innocence from the commissioners of claims. This raised an outcry from the adventurers who had been put in possession of his lands, and who procured a fresh trial; but Antrim appealed to the king, and through the influence of the queen mother obtained a pardon, his estates being restored to him by the Irish Act of Explanation in 1665.[2] Antrim died on the 3rd of February 1683. He is described by Clarendon as of handsome appearance but "of excessive pride and vanity and of a marvellous weak and narrow understanding." He married secondly Rose, daughter of Sir Henry O'Neill, but had no children, being succeeded in the earldom by his brother Alexander, 3rd earl of Antrim.

See *Hibernia Anglicana*, by R. Cox (1689–1690) esp. app. xlix. vol. ii. 206; *History of the Irish Confederation*, by J. T. Gilbert (1882–1891); *Aphorismical Discovery* (Irish Archaeological Society, 1879–1880); *Thomason Tracts* (Brit. Mus.), E 59 (18), 149 (12), 138 (7), 153 (19), 61 (23); *Murder will out, or the King's Letter justifying the Marquess of Antrim* (1689); *Hist. MSS. Comm. Series—MSS. of Marq. of Ormonde.* (P. C. Y.)

ANTRIM, a county in the north-east corner of Ireland, in the province of Ulster. It is bounded N. and E. by the narrow seas separating Ireland from Scotland, the Atlantic Ocean and Irish Sea, S. by Belfast Lough and the Lagan river dividing it from the county Down, W. by Lough Neagh, dividing it from the counties Armagh and Tyrone, and by county Londonderry, the boundary with which is the river Bann.

The area is 751,965 acres or about 1175 sq. m. A large portion of the county is hilly, especially in the east, where the highest elevations are attained, though these are nowhere great. The range runs north and south, and, following this direction

[1] Strafford's *Letters*, ii. 300.

[1] *Life of Ormonde*, iii. 509; see also *Cal. of State Papers, Ireland, 1660–1662*, pp. 294, 217; *Cal. of Clarendon St. Pap.*, ii. 69, and Gardiner's *Commonwealth*, i. 153.

[2] Hallam, *Const. Hist.*, iii. 396 (ed. 1855).

the highest points are Knocklayd (1695 ft.), Slieveanorra (1676), Trostan (1817), Slemish (1457), and Divis (1567). The inland slope is gradual, but on the northern shore the range terminates in abrupt and almost perpendicular declivities, and here, consequently, some of the finest coast scenery in the island is found, widely differing, with its unbroken lines of cliffs, from the indented coast-line of the west. The most remarkable cliffs are those formed of perpendicular basaltic columns, extending for many miles, and most strikingly displayed in Fair Head and the celebrated Giant's Causeway. From the eastern coast the hills rise instantly but less abruptly, and the indentations are wider and deeper. On both coasts there are several frequented watering-places, of which may be mentioned on the north Portrush (with well-known golf links), Port Ballintrae and Ballycastle; on the east Cushendun, Cushendall and Milltown on Red Bay, Carn Lough and Glenarm, Larne, and Whitehead on Belfast Lough. All are somewhat exposed to the easterly winds prevalent in spring. The only island of size is Rathlin, off Ballycastle, 6½ m. in length by 1½ in breadth, 7 m. from the coast, and of similar basaltic and limestone formation to that of the mainland. It is partially arable, and supports a small population. The so-called Island Magee is a peninsula separating Larne Lough from the Irish Channel.

The valleys of the Bann and Lagan, with the intervening shores of Lough Neagh, form the fertile lowlands. These two rivers, both rising in county Down, are the only ones of importance. The latter flows to Belfast Lough, the former drains Lough Neagh, which is fed by a number of smaller streams, among them the Crumlin, whose waters have petrifying powers. The fisheries of the Bann and of Lough Neagh (especially for salmon) are of value both commercially and to sportsmen, the small town of Toome, at the outflow of the river, being the centre. Immediately below this point lies Lough Beg, the "Small Lake," about 15 ft. lower than Lough Neagh, which it excels in the pleasant scenery of its banks. The smaller streams are of great use in working machinery.

Geology.—On entering the county at the south, a scarped barrier of hills is seen beyond the Lagan valley, marking the edge of the basaltic plateaus, and running almost continuously round the coast to Red Bay. Below it, Triassic beds are exposed from Lisburn to Island Magee, giving sections of red sands and marls. Above these, marine Rhaetic beds appear at intervals, notably near Larne, where they are succeeded by Lower Lias shales and limestones. At Portrush, the Lower Lias is seen on the shore, crowded with ammonites, but silicified and metamorphosed by invading dolerite. The next deposits, as the scarps are approached, are greensands of "Selbornian" age, succeeded by Cenomanian, and locally by Turonian, sands. The Senonian series is represented by the White Limestone, a hardened chalk with flints, which is often glauconitic and conglomeratic at the base. Denudation in earliest Eocene times has produced flint gravels above the chalk, and an ancient stream deposit of chalk pebbles occurs at Ballycastle. The volcanic fissures that allowed of the upwelling of basalt are represented by numerous dykes, many cutting the earlier lava-flows as well as all the beds below them. The accumulations of lava gave rise to the plateaus which form almost the whole interior of the county. In a quiet interval, the Lower Eocene plant-beds of Glenarm and Ballypalady were formed in lakes, where iron-ores also accumulated. Rhyolites were erupted locally near Tardree, Ballymena and Glenarm. The later basalts are especially marked by columnar jointing, which determines the famous structures of the Giant's Causeway and the coast near Bengore Head. Volcanic necks may be recognized at Carrick-a-rede, in the intrusive mass of dolerite at Slemish, at Carnmoney near Belfast, and a few other points. Fair Head is formed of intrusive dolerite, presenting a superb columnar seaward face. Faulting, probably in Pliocene times, lowered the basaltic plateaus to form the basin of Lough Neagh, leaving the eastern scarp at heights ranging up to 1800 ft. The glens of Antrim are deep notches cut by seaward-running streams through the basalt scarp, their floors being formed of Triassic or older rocks. Unlike most Irish counties, Antrim owes its principal features to rocks of Mesozoic and Cainozoic age. At Cushendun, however, a coarse conglomerate is believed to be Devonian, while Lower Carboniferous Sandstones, with several coal-seams, form a small productive basin at Ballycastle. The dolerite of Fair Head sends off sheets along the bedding-planes of these carboniferous strata. "Dalradian" schists and gneisses, with some dark limestones, come out in the north-east of the county, forming a moorland-region between Cushendun and Ballycastle. The dome of Knocklayd, capped by an outlier of chalk and basalt, consists mostly of this far more ancient series. Glacial gravels are well seen near Antrim town, and as drumlins between Ballymena and Ballycastle. The drift-phenomena connected with the flow of ice from Scotland are of special interest. Recently elevated marine clays, of post-glacial date, fringe the south-eastern coast, while gravels with marine shells, side by side with flint implements chipped by early man, have been lifted some 20 ft. above sea-level near Larne.

Rock-salt some 80 ft. thick is mined in the Trias near Carrickfergus. The Keuper clays yield material for bricks. Bauxite, probably derived from the decay of lavas, is found between Glenarm and Broughshane, associated with brown and red pisolitic iron-ores; both these materials are worked commercially. Bauxite occurs also near Ballintoy. The Ballycastle coal is raised and sold locally.

Industries.—The climate is very temperate. The soil varies greatly according to the district, being in some cases a rich loam, in others a chalky marl, and elsewhere showing a coating of peat. The proportion of barren land to the total area is roughly as 1 to 9; and of tillage to pasture as 2 to 3. Tillage is therefore, relatively to other counties, well advanced, and oats and potatoes are largely, though decreasingly, cultivated. Flax is a less important crop than formerly. The numbers of cattle, sheep, pigs and poultry are generally increasing. Dutch, Ayrshire and other breeds are used to improve the breed of cattle by crossing. Little natural wood remains in the county, but plantations flourish on the great estates, and orchards have proved successful.

The linen manufacture is the most important industry. Cotton-spinning by jennies was first introduced by Robert Joy and Thomas M'Cabe of Belfast in 1777; and an estimate made twenty-three years later showed upwards of 27,000 hands employed in this industry within 10 m. of Belfast, which remains the centre for it. Women are employed in the working of patterns on muslin. There are several paper-mills at Bushmills in the north; whisky-distilling is carried on; and there are valuable sea-fisheries divided between the district of Ballycastle and Carrickfergus, while the former is the headquarters of a salmon-fishery district. The workings at the Ballycastle collieries are probably the oldest in Ireland. In 1770 the miners accidentally discovered a complete gallery, which has been driven many hundred yards into the bed of coal, branching into thirty-six chambers dressed quite square, and in a workman-like manner. No tradition of the mine having been formerly worked remained in the neighbourhood. The coal of some of the beds is bituminous, and of others anthracite.

Communications.—Except that the Great Northern railway line from Belfast to the south and west runs for a short distance close to the southern boundary of the county, with a branch from Lisburn to the town of Antrim, the principal lines of communication are those of the Northern Counties system, under the control of the Midland railway of England. The chief routes are:—Belfast, Antrim, Ballymena (and thence to Coleraine and Londonderry); a line diverging from this at White Abbey to Carrickfergus and Larne, the port for Stranraer in Scotland; branches from Ballymena to Larne and to Parkmore; and from Coleraine to Portrush. The Ballycastle railway runs from Ballymoney to Ballycastle on the north coast; and the Giant's Causeway and Portrush is an electric railway (the first to be worked in the United Kingdom). The Lagan Canal connects Lough Neagh with Belfast Lough.

Population and Administration.—The population in 1891 was

208,010, and in 1901, 196,090. The county is among those least seriously affected by emigration. Of the total about 50 % are Presbyterians, about 20 % each Protestant Episcopalians and Roman Catholics; Antrim being one of the most decidedly Protestant counties in Ireland. Of the Presbyterians the greater part are in connexion with the General Synod of Ulster, and the other are Remonstrants, who separated from the Synod in 1829, or United Presbyterians. The principal towns are Antrim (pop. 1826), Ballymena (10,886), Ballymoney (2952), Carrickfergus (4208), Larne (6670), Lisburn (11,461) and Portrush (1941). Belfast though constituting a separate county ranks as the metropolis of the district. Ballyclare, Bushmills, Crumlin, Portglenone and Randalstown are among the lesser towns. Belfast and Larne are the chief ports. The county comprises 14 baronies and 79 civil parishes and parts of parishes. The constabulary force has its headquarters at Ballymena. The assize town is Belfast, and quarter sessions are held at Ballymena, Ballymoney, Belfast, Larne and Lisburn. The county is divided between the Protestant dioceses of Derry and Down, and the Roman Catholic dioceses of Down and Connor, and Dromore. It is divided into north, mid, east and south parliamentary divisions, each returning one member.

History and Antiquities.—At what date the county of Antrim was formed is not known, but it appears that a certain district bore this name before the reign of Edward II. (early 14th century), and when the shiring of Ulster was undertaken by Sir John Perrot in the 16th century, Antrim and Down were already recognized divisions, in contradistinction to the remainder of the province. The earliest known inhabitants were of Celtic origin, and the names of the townlands or subdivisions, supposed to have been made in the 13th century, are pure Celtic. Antrim was exposed to the inroads of the Danes, and also of the northern Scots, who ultimately effected permanent settlements. The antiquities of the county consist of cairns, mounts or forts, remains of ecclesiastical and military structures, and round towers. The principal cairns are: one on Colin mountain, near Lisburn; one on Slieve True, near Carrickfergus; and two on Colinward. The cromlechs most worthy of notice are: one near Cairngrainey, to the north-east of the old road from Belfast to Templepatrick; the large cromlech at Mount Druid, near Ballintoy; and one at the northern extremity of Island Magee. The mounts, forts and intrenchments are very numerous. There are three round towers: one at Antrim, one at Armoy, and one on Ram Island in Lough Neagh, only that at Antrim being perfect. There are some remains of the ecclesiastic establishments at Bonamargy, where the earls of Antrim are buried, Kells, Glenarm, Glynn, Muckamore and White Abbey. The noble castle of Carrickfergus is the only one in perfect preservation. There are, however, remains of other ancient castles, as Olderfleet, Carn's, Shane's, Glenarm, Garron Tower, Redbay, &c., but the most interesting of all is the castle of Dunluce, remarkable for its great extent and romantic situation. Mount Slemish, about 8 m. east of Ballymena, is notable as being the scene of St Patrick's early life. Island Magee had, besides antiquarian remains, a notoriety as a home of witchcraft, and was the scene of an act of reprisal for the much-disputed massacre of Protestants about 1641, by the soldiery of Carrickfergus.

ANTRIM, a market-town in the west of the county Antrim, Ireland, in the south parliamentary division, on the banks of the Six-Mile Water, half a mile from Lough Neagh, in a beautiful and fertile valley. Pop. (1901) 1826. It is $21\frac{3}{4}$ m. north-west of Belfast by the Northern Counties (Midland) railway, and is also the terminus of a branch of the Great Northern railway from Lisburn. There is nothing in the town specially worthy of notice, but the environs, including Shane's Castle and Antrim Castle, possess features of considerable interest. About a mile from the town is one of the most perfect of the round towers of Ireland, 93 ft. high and 50 in circumference at the base. It stands in the grounds of Steeple, a neighbouring seat, where is also the "Witches' Stone," a prehistoric monument. A battle was fought near Antrim between the English and Irish in the reign of Edward III.; and in 1642 a naval engagement took place on Lough Neagh, for Viscount Massereene and Ferrard (who founded Antrim Castle in 1662) had a right to maintain a fighting fleet on the lough. On the 7th of June 1798 there was a smart action in the town between the king's troops and a large body of rebels, in which the latter were defeated, and Lord O'Neill mortally wounded. Before the Union Antrim returned two members to parliament by virtue of letters patent granted in 1666 by Charles II. There are manufactures of paper, linen, and woollen cloth. The government is in the hands of town commissioners.

ANTRUSTION, the name of the members of the bodyguard or military household of the Merovingian kings. The word, of which the formation has been variously explained, is derived from the O.H.Germ. *trost*, comfort, aid, fidelity, trust, through the latinized form *trustis*. Our information about the antrustions is derived from one of the *formulae* of Marculfus (i. 18, ed. Zeumer, p. 55) and from various provisions of the Salic law (see du Cange, *Glossarium*, *s.* "trustis"). Any one desiring to enter the body of Antrustions had to present himself armed at the royal palace, and there, with his hands in those of the king, take a special oath or *trustis* and *fidelitas*, in addition to the oath of fidelity sworn by every subject at the king's accession. This done, he was considered to be *in truste dominica* and bound to the discharge of all the services this involved. In return for these, the antrustion enjoyed certain valuable advantages, as being specially entitled to the royal assistance and protection; his *wergeld* is three times that of an ordinary Frank; the slayer of a Frank paid compensation of 200 *solidi*, that of an antrustion had to find 600. The antrustion was always of Frankish descent, and only in certain exceptional cases were Gallo-Romans admitted into the king's bodyguard. These Gallo-Romans then took the name of *convivae regis*, and the *wergeld* of 300 *solidi* was three times that of a *homo romanus*. The antrustions, belonging as they did to one body, had strictly defined duties towards one another; thus one antrustion was forbidden to bear witness against another under penalty of 15 *solidi* compensation.

The antrustions seem to have played an important part at the time of Clovis. It was they, apparently, who formed the army which conquered the land, an army composed chiefly of Franks, and of a few Gallo-Romans who had taken the side of Clovis. After the conquest, the rôle of the antrustions became less important. For each of their expeditions, the kings raised an army of citizens in which the Gallo-Romans mingled more and more with the Franks; they only kept one small permanent body which acted as their bodyguard (*trustis dominica*), some members of which were from time to time told off for other tasks, such as that of forming garrisons in the frontier towns. The institution seems to have disappeared during the anarchy with which the 8th century opened. It has wrongly been held to be the origin of vassalage. Only the king had antrustions; every lord could have vassals. The antrustions were a military institution; vassalage was a social institution, the origins of which are very complex.

All historians of Merovingian institutions and law have treated of the antrustions, and each one has his different system. The principal authorities are:—Waitz, *Deutsche Verfassungsgeschichte*, 3rd ed. vol. ii. pp. 335 et seq.; Brunner, *Deutsche Rechtsgeschichte*, vol. ii. p. 97 et seq.; Fustel de Coulanges, *La Monarchie franque*, p. 80 et seq.; Maxime Deloche, *La Trustis et l'antrustion royal sous les deux premières races* (Paris, 1873), collecting and discussing the principal texts; Guilhermoz, *Les Origines de la noblesse* (Paris, 1902), suggesting a system which is new in part. (C. Pf.)

ANTWERP, the most northern of the nine provinces of Belgium. It is conterminous with the Dutch frontier on the north. Malines, Lierre and Turnhout are among the towns of the province. Its importance, however, is derived from the fact that it contains the commercial metropolis of Belgium. It is divided into three administrative districts (*arrondissements*), viz. Antwerp, Malines and Turnhout. These are subdivided into 25 cantons and 152 communes. The area is 707,932 acres or 1106 sq. m. Pop. (1904) 888,980, showing an average of 804 inhabitants to the square mile.

ANTWERP (Fr. *Anvers*), capital of the above province, an important city on the right bank of the Scheldt, Belgium's chief centre of commerce and a strong fortified position.

Modern Antwerp is a finely laid out city with a succession of broad avenues which mark the position of the first enceinte. There are long streets and terraces of fine houses belonging to the merchants and manufacturers of the city which amply testify to its prosperity, and recall the 16th century distich that Antwerp was noted for its moneyed men ("Antwerpia nummis"). Despite the ravages of war and internal disturbances it still preserves some memorials of its early grandeur, notably its fine cathedral. This church was begun in the 14th century, but not finished till 1518. Its tower of over 400 ft. is a conspicuous object to be seen from afar over the surrounding flat country. A second tower which formed part of the original plan has never been erected. The proportions of the interior are noble, and in the church are hung three of the masterpieces of Rubens, viz. "The Descent from the Cross," "The Elevation of the Cross," and "The Assumption." Another fine church in Antwerp is that of St James, far more ornate than the cathedral, and containing the tomb of Rubens, who devoted himself to its embellishment. The Bourse or exchange, which claims to be the first distinguished by the former name in Europe, is a fine new building finished in 1872, on the site of the old Bourse erected in 1531 and destroyed by fire in 1858. Fire has destroyed several other old buildings in the city, notably in 1891 the house of the Hansa League on the northern quays. A curious museum is the Maison Plantin, the house of the great printer C. Plantin (*q.v.*) and his successor Moretus, which stands exactly as it did in the time of the latter. The new picture gallery close to the southern quays is a fine building divided into ancient and modern sections. The collection of old masters is very fine, containing many splendid examples of Rubens, Van Dyck, Titian and the chief Dutch masters. Antwerp, famous in the middle ages and at the present time for its commercial enterprise, enjoyed in the 17th century a celebrity not less distinct or glorious in art for its school of painting, which included Rubens, Van Dyck, Jordaens, the two Teniers and many others.

Commerce.—Since 1863, when Antwerp was opened to the trade of the outer world by the purchase of the Dutch right to levy toll, its position has completely changed, and no place in Europe has made greater progress in this period than the ancient city on the Scheldt. The following figures for the years 1904 and 1905 show that its trade is still rapidly increasing:—

Year.	Exports.		Imports.	
	Tonnage.	Value.	Tonnage.	Value.
1904	6,578,558	£71,349,678	8,427,894	£79,539,100
1905	7,153,655	£80,032,355	9,061,781	£91,194,517

The growth of its commerce in recent times may be measured by a comparison of the following figures. In 1888, 4272 ships entered the port and 4302 sailed from it. In 1905, 6095 entered the port and 6065 sailed from it—an increase of nearly 50%. In 1888 the total tonnage was 7,800,000; in 1905 it had risen to 19,662,000. These figures explain how and why Antwerp has outgrown its dock accommodation. The eight principal basins or docks already existing in 1908 were (1) the Little or Bonaparte dock; (2) the Great dock, also constructed in Napoleon's time; (3) the Kattendijk, built in 1860 and enlarged in 1881; (4) the Wood dock; (5) the Campine dock, used especially for minerals; (6) the Asia dock, which is in direct communication with the Meuse by a canal as well as with the Scheldt; (7) the Lefebvre dock; and (8) the America dock, which was only opened in 1905. Two new docks, called "intercalary" because they would fit into whatever scheme might be adopted for the rectification of the course of the Scheldt, were still to be constructed, leading out of the Lefebvre dock and covering 70 acres. With the completion of the new maritime lock, ships drawing 30 ft. of water would be able to enter these new docks and also the Lefebvre and America docks. In connexion with the projected *grande coupure* (that is, a cutting through the neck of the loop in the river Scheldt immediately below Antwerp), the importance of these four docks would be greatly increased because they would then flank the new main channel of the river. When the Belgian Chambers voted in February 1906 the sums necessary for the improvement of the harbour of Antwerp no definite scheme was sanctioned, the question being referred to a special mixed commission. The improvements at Antwerp are not confined to the construction of new docks. The quays flanking the Scheldt are 3½ m. in length. They are constructed of granite, and no expense has been spared in equipping them with hydraulic cranes, warehouses, &c.

Fortifications.—Besides being the chief commercial port of Belgium, Antwerp is the greatest fortress of that country. Nothing, however, remains of the former enceinte or even of the famous old citadel defended by General Chassé in 1832, except the *Steen*, which has been restored and contains a museum of arms and antiquities. After the establishment of Belgian independence Antwerp was defended only by the citadel and an enceinte of about 2½ m. round the city. No change occurred till 1859, when the system of Belgian defence was radically altered by the dismantlement of seventeen of the twenty-two fortresses constructed under Wellington's supervision in 1815–1818. At Antwerp the old citadel and enceinte were removed. A new enceinte 8 m. in length was constructed, and the villages of Berchem and Borgerhout, now parishes of Antwerp, were absorbed within the city. This enceinte still exists, and is a fine work of art. It is protected by a broad wet ditch (plans in article FORTIFICATION), and in the caponiers are the magazines and store chambers of the fortress. The enceinte is pierced by nineteen openings or gateways, but of these seven are not used by the public. As soon as the enceinte was finished eight detached forts from 2 to 2½ m. distant from the enceinte were constructed. They begin on the north near Wyneghem and the zone of inundation, and terminate on the south at Hoboken. In 1870 Fort Merxem and the redoubts of Berendrecht and Oorderen were built for the defence of the area to be inundated north of Antwerp. In 1878, in consequence of the increased range of artillery and the more destructive power of explosives, it was recognized that the fortifications of Antwerp were becoming useless and out of date. It was therefore decided to change it from a fortress to a fortified position by constructing an outer line of forts and batteries at a distance varying from 6 to 9 m. from the enceinte. This second line was to consist of fifteen forts, large and small. Up to 1898 only five had been constructed, but in that and the two following years five more were finished, leaving another five to complete the line. A mixed commission selected the points at which they were to be placed. With the completion of this work, which in 1908 was being rapidly pushed on, Antwerp might be regarded as one of the best fortified positions in Europe, and so long as its communications by sea are preserved intact it will be practically impregnable.

Two subsidiary or minor problems remained over. (1) The much-discussed removal of the existing enceinte in order to give Antwerp further growing space. If it were removed there arose the further question, should a new enceinte be made at the first line of outer forts, or should an enceinte be dispensed with? An enceinte following the line of those forts would be 30 m. in length. Then if the city grew up to this extended enceinte the outer forts would be too near. To screen the city from bombardment they would have to be carried 3 m. further out, and the whole Belgian army would scarcely furnish an adequate garrison for this extended position. A new enceinte, or more correctly a rampart of a less permanent character, connecting the eight forts of the inner line and extending from Wyneghem to a little south of Hoboken, was decided upon in 1908. (2) The second problem was the position on the left bank of the Scheldt. All the defences enumerated are on the right bank. On the left bank the two old forts Isabelle and Marie alone defend the Scheldt. It is assumed (probably rightly) that no enemy could get round to this side in sufficient strength to deliver any attack that the existing forts could not easily

repel. The more interesting question connected with the left bank is whether it does not provide, as Napoleon thought, the most natural outlet for the expansion of Antwerp. Proposals to connect the two banks by a tunnel under the Scheldt have been made from time to time in a fitful manner, but nothing whatever had been done by 1908 to realize what appears to be a natural and easy project.

Population.—The following statistics show the growth of population in and since the 19th century. In 1800 the population was computed not to exceed 40,000. At the census of 1846 the total was 88,487; of 1851, 95,501; of 1880, 169,100; of 1900, 272,830; and of 1904, 291,949. To these figures ought to be added the populations (1904) of Borgerhout (43,391) and Berchem (26,383), as they are part of the city, which would give Antwerp a total population of 361,723.

History.—The suggested origin of the name Antwerp from *Hand-werpen* (hand-throwing), because a mythical robber chief indulged in the practice of cutting off his prisoners' hands and throwing them into the Scheldt, appeared to Motley rather far-fetched, but it is less reasonable to trace it, as he inclines to do, from *an t werf* (on the wharf), seeing that the form *Andhunerbo* existed in the 6th century on the separation of Austrasia and Neustria. Moreover, hand-cutting was not an uncommon practice in Europe. It was perpetuated from a savage past in the custom of cutting off the right hand of a man who died without heir, and sending it as proof of *main-morte* to the feudal lord. Moreover, the two hands and a castle, which form the arms of Antwerp, will not be dismissed as providing no proof by any one acquainted with the scrupulous care that heralds displayed in the golden age of chivalry before assigning or recognizing the armorial bearings of any claimant.

In the 4th century Antwerp is mentioned as one of the places in the second Germany, and in the 11th century Godfrey of Bouillon was for some years best known as marquis of Antwerp. Antwerp was the headquarters of Edward III. during his early negotiations with van Artevelde, and his son Lionel, earl of Cambridge, was born there in 1338.

It was not, however, till after the closing of the Zwyn and the decay of Bruges that Antwerp became of importance. At the end of the 15th century the foreign trading gilds or houses were transferred from Bruges to Antwerp, and the building assigned to the English nation is specifically mentioned in 1510. In 1560, a year which marked the highest point of its prosperity, six nations, viz. the Spaniards, the Danes and the Hansa together, the Italians, the English, the Portuguese and the Germans, were named at Antwerp, and over 1000 foreign merchants were resident in the city. Guicciardini, the Venetian envoy, describes the activity of the port, into which 500 ships sometimes passed in a day, and as evidence of the extent of its land trade he mentioned that 2000 carts entered the city each week. Venice had fallen from its first place in European commerce, but still it was active and prosperous. Its envoy, in explaining the importance of Antwerp, states that there was as much business done there in a fortnight as in Venice throughout the year.

The religious troubles that marked the second half of the 16th century broke out in Antwerp as in every other part of Belgium excepting Liége. In 1576 the Spanish soldiery plundered the town during what was called "the Spanish Fury," and 6000 citizens were massacred. Eight hundred houses were burnt down, and over two millions sterling of damage was wrought in the town on that occasion.

In 1585 a severe blow was struck at the prosperity of Antwerp when Parma captured it after a long siege and sent all its Protestant citizens into exile. The recognition of the independence of the United Provinces by the treaty of Münster in 1648 carried with it the death-blow to Antwerp's prosperity as a place of trade, for one of its clauses stipulated that the Scheldt should be closed to navigation. This impediment remained in force until 1863, although the provisions were relaxed during French rule from 1795 to 1814, and also during the time Belgium formed part of the kingdom of the Netherlands (1815 to 1830). Antwerp had reached the lowest point of its fortunes in 1800, and its population had sunk under 40,000, when Napoleon, realizing its strategical importance, assigned two millions for the construction of two docks and a mole.

One other incident in the chequered history of Antwerp deserves mention. In 1830 the city was captured by the Belgian insurgents, but the citadel continued to be held by a Dutch garrison under General Chassé. For a time this officer subjected the town to a periodical bombardment which inflicted much damage, and at the end of 1832 the citadel itself was besieged by a French army. During this attack the town was further injured. In December 1832, after a gallant defence, Chassé made an honourable surrender.

See J. L. Motley's *Rise of the Dutch Republic*; C. Scribanii, *Origines Antwerpiensium*; Gens, *Hist. de la ville d'Anvers*; Mertens and Torfs, *Geschiedenis van Antwerp*; Génard, *Anvers à travers les âges*; *Annuaire statisque de la Belgique.* (D. C. B.)

ANU, a Babylonian deity, who, by virtue of being the first figure in a triad consisting of Anu, Bel and Ea, came to be regarded as the father and king of the gods. Anu is so prominently associated with the city of Erech in southern Babylonia that there are good reasons for believing this place to have been the original seat of the Anu cult. If this be correct, then the goddess Nanâ (or Ishtar) of Erech was presumably regarded as his consort. The name of the god signifies the "high one" and he was probably a god of the atmospheric region above the earth—perhaps a storm god like Adad (*q.v.*), or like Yahweh among the ancient Hebrews. However this may be, already in the old-Babylonian period, *i.e.* before Khammurabi, Anu was regarded as the god of the heavens and his name became in fact synonymous with the heavens, so that in some cases it is doubtful whether, under the term, the god or the heavens is meant. It would seem from this that the grouping of the divine powers recognized in the universe into a triad symbolizing the three divisions, heavens, earth and the watery deep, was a process of thought which had taken place before the third millennium. To Anu was assigned the control of the heavens, to Bel the earth, and to Ea the waters. The doctrine once established remained an inherent part of the Babylonian-Assyrian religion and led to the more or less complete disassociation of the three gods constituting the triad from their original local limitations. An intermediate step between Anu viewed as the local deity of Erech (or some other centre), Bel as the god of Nippur, and Ea as the god of Eridu is represented by the prominence which each one of the centres associated with the three deities in question must have acquired, and which led to each one absorbing the qualities of other gods so as to give them a controlling position in an organized pantheon. For Nippur we have the direct evidence that its chief deity, En-lil or Bel, was once regarded as the head of an extensive pantheon. The sanctity and, therefore, the importance of Eridu remained a fixed tradition in the minds of the people to the latest days, and analogy therefore justifies the conclusion that Anu was likewise worshipped in a centre which had acquired great prominence. The summing-up of divine powers manifested in the universe in a threefold division represents an outcome of speculation in the schools attached to the temples of Babylonia, but the selection of Anu, Bel and Ea for the three representatives of the three spheres recognized, is due to the importance which, for one reason or the other, the centres in which Anu, Bel and Ea were worshipped had acquired in the popular mind. Each of the three must have been regarded in his centre as the most important member in a larger or smaller group, so that their union in a triad marks also the combination of the three distinctive pantheons into a harmonious whole.

In the astral theology of Babylonia and Assyria, Anu, Bel and Ea became the three zones of the ecliptic, the northern, middle and southern zone respectively. The purely theoretical character of Anu is thus still further emphasized, and in the annals and votive inscriptions as well as in the incantations and hymns, he is rarely introduced as an active force to whom a personal appeal can be made. His name becomes little more than a synonym for the heavens in general and even his title as king

or father of the gods has little of the personal element in it. A consort Antum (or as some scholars prefer to read, Anatum) is assigned to him, on the theory that every deity must have a female associate, but Antum is a purely artificial product—a lifeless symbol playing even less of a part in what may be called the active pantheon than Anu.

For works of reference see BABYLONIAN AND ASSYRIAN RELIGION.

(M. JA.)

ANUBIS (in Egyptian *Anûp*, written *Inpw* in hieroglyphs), the name of one of the most important of the Egyptian gods. There were two types of canine divinities in Egypt, their leading representatives being respectively Anubis and Ophois (*Wp-wi-wt*, "opener of the ways"): the former type is symbolized by the recumbent animal , the other by a similar animal (in a stiff standing attitude), carried as an emblem on a standard in war or in religious processions. The former comprised two beneficent gods of the necropolis; the latter also were beneficent, but warlike, divinities. They thus corresponded, at any rate in some measure, respectively to the fiercer and milder aspects of the dog-tribe. In late days the Greeks report that κύνες (dogs) were the sacred animals of Anubis while those of Ophois were λύκοι (wolves). The above figure is coloured black as befits a funerary and nocturnal animal: it is more attenuated than even a greyhound, but it has the bushy tail of the fox or the jackal. Probably these were the original genii of the necropolis, and in fact the same lean animal figured *passant* is *s:b* "jackal" or "fox." The domestic dog would be brought into the sacred circle through the increased veneration for animals, and the more pronounced view in later times of Anubis as servant, messenger and custodian of the gods.

Anubis was the principal god in the capitals of the XVIIth and XVIIIth nomes of Upper Egypt, and secondary god in the XIIIth and probably in the XIIth nome; but his cult was universal. To begin with, he was the god of the dead, of the cemetery, of all supplies for the dead, and therefore of embalming when that became customary. In very early inscriptions the funerary prayers in the tombs are addressed to him almost exclusively, and he always took a leading place in them. In the scene of the weighing of the soul before Osiris, dating from the New-kingdom onwards, Anubis attends to the balance while Thoth registers the result. Anubis was believed to have been the embalmer of Osiris: the mummy of Osiris, or of the deceased, on a bier, tended by this god, is a very common subject on funerary tablets of the late periods. Anubis came to be considered especially the attendant of the gods and conductor of the dead, and hence was commonly identified with Hermes (cf. the name Hermanubis); but the rôle of Hermes as the god of eloquence, inventor of arts and recorder of the gods was taken by Thoth. In those days Anubis was considered to be son of Osiris by Nephthys; earlier perhaps he was son of Rē, the sun-god. In the 2nd century A.D. his aid was "compelled" by the magicians and necromancers to fetch the gods and entertain them with food (especially in the ceremony of gazing into the bowl of oil), and he is invoked by them sometimes as the "Good Ox-herd." The cult of Anubis must at all times have been very popular in Egypt, and, belonging to the Isis and Serapis cycle, was introduced into Greece and Rome.

See Erman, *Egyptian Religion*; Budge, *Gods of the Egyptians*; Meyer, in *Zeits. f. Aeg. Spr.* 41-97. (F. LL. G.)

ANURADHAPURA, a ruined city of Ceylon, famous for its ancient monuments. It is situated in the North-central province. Anuradhapura became the capital of Ceylon in the 5th century B.C., and attained its highest magnificence about the commencement of the Christian era. In its prime it ranked beside Nineveh and Babylon in its colossal proportions—its four walls, each 16 m. long, enclosing an area of 256 sq. m.,—in the number of its inhabitants, and the splendour of its shrines and public edifices. It suffered much during the earlier Tamil invasions, and was finally deserted as a royal residence in A.D. 769. It fell completely into decay, and it is only of recent years that the jungle has been cleared away, the ruins laid bare, and some measure of prosperity brought back to the surrounding country by the restoration of hundreds of village tanks. The ruins consist of three classes of buildings, *dagobas*, monastic buildings, and *pokunas*. The *dagobas* are bell-shaped masses of masonry, varying from a few feet to over 1100 in circumference. Some of them contain enough masonry to build a town for twenty-five thousand inhabitants. Remains of the monastic buildings are to be found in every direction in the shape of raised stone platforms, foundations and stone pillars. The most famous is the Brazen Palace erected by King Datagamana about 164 B.C. The *pokunas* are bathing-tanks or tanks for the supply of drinking-water, which are scattered everywhere through the jungle. The city also contains a sacred Bo-tree, which is said to date back to the year 245 B.C. The railway was extended from Matale to Anuradhapura in 1905. Population: town, 3672; province, 79,110.

ANVIL (from Anglo-Saxon *anfilt* or *onfilti*, either that on which something is "welded" or "folded," cf. German *falzen*, to fold, or connected with other Teutonic forms of the word, cf. German *amboss*, in which case the final syllable is from "beat," and the meaning is "that on which something is beaten"), a mass of iron on which material is supported while being shaped under the hammer (see FORGING). The common blacksmith's anvil is made of wrought iron, often in America of cast iron, with a smooth working face of hardened steel. It has at one end a projecting conical *beak* or *bick* for use in hammering curved pieces of metal; occasionally the other end is also provided with a bick, which is then partly rectangular in section. There is also a square hole in the face, into which tools, such as the anvil-cutter or chisel, can be dropped, cutting edge uppermost. For power hammers the anvil proper is supported on an anvil block which is of great massiveness, sometimes weighing over 200 tons for a 12-ton hammer, and this again rests on a strong foundation of timber and masonry or concrete. In anatomy the term anvil is applied to one of the bones of the middle ear, the *incus*, which is articulated with the *malleus*.

ANVILLE, JEAN BAPTISTE BOURGUIGNON D' (1697–1782), perhaps the greatest geographical author of the 18th century, was born at Paris on the 11th of July 1697. His passion for geographical research displayed itself from early years: at the age of twelve he was already amusing himself by drawing maps for Latin authors. Later, his friendship with the antiquarian, Abbé Longuerue, greatly aided his studies. His first serious map, that of Ancient Greece, was published when he was fifteen, and at the age of twenty-two he was appointed one of the king's geographers, and began to attract the attention of the first authorities. D'Anville's studies embraced everything of geographical nature in the world's literature, as far as he could master it: for this purpose he not only searched ancient and modern historians, travellers and narrators of every description, but also poets, orators and philosophers. One of his cherished objects was to reform geography by putting an end to the blind copying of older maps, by testing the commonly accepted positions of places through a rigorous examination of all the descriptive authority, and by excluding from cartography every name inadequately supported. Vast spaces, which had before been covered with countries and cities, were thus suddenly reduced almost to a blank.

D'Anville was at first employed in the humbler task of illustrating by maps the works of different travellers, such as Marchais, Charlevoix, Labat and Duhalde. For the history of China by the last-named writer he was employed to make an atlas, which was published separately at the Hague in 1737. In 1735 and 1736 he brought out two treatises on the figure of the earth; but these attempts to solve geometrical problems by literary material were, to a great extent, refuted by Maupertuis' measurements of a degree within the polar circle. D'Anville's historical method was more successful in his 1743 map of Italy, which first indicated numerous errors in the mapping of that country, and was accompanied by a valuable memoir (a novelty in such work), showing

in full the sources of the design. A trigonometrical survey which Benedict XIV. soon after had made in the papal states strikingly confirmed the French geographer's results. In his later years d'Anville did yeoman service for ancient and medieval geography, accomplishing something like a revolution in the former; mapping afresh all the chief countries of the pre-Christian civilizations (especially Egypt), and by his *Mémoire et abrégé de géographie ancienne et générale* and his *États formés en Europe après la chute de l'empire romain en occident* (1771) rendering his labours still more generally useful. In 1754, at the age of fifty-seven, he became a member of the Académie des Inscriptions et Belles Lettres, whose transactions he enriched with many papers. In 1775 he received the only place in the Académie des Sciences which is allotted to geography; and in the same year he was appointed, without solicitation, first geographer to the king. His last employment consisted in arranging his collection of maps, plans and geographical materials. It was the most extensive in Europe, and had been purchased by the king, who, however, left him the use of it during his life. This task performed, he sank into a total imbecility both of mind and body, which continued for two years, till his death in January 1782.

D'Anville's published memoirs and dissertations amounted to 78, and his maps to 211. A complete edition of his works was announced in 1806 by de Manne in 6 vols. quarto, only two of which had appeared when the editor died in 1832. See Dacier's *Éloge de d'Anville* (Paris, 1802). Besides the separate works noticed above, d'Anville's maps executed for Rollin's *Histoire ancienne* and *Histoire romaine*, and his *Traité des mesures anciennes et modernes* (1769), deserve special notice.

ANWARI [Auhad-uddin Ali Anwari], Persian poet, was born in Khorasan early in the 12th century. He enjoyed the especial favour of the sultan Sinjar, whom he attended in all his warlike expeditions. On one occasion, when the sultan was besieging the fortress of Hazarasp, a fierce poetical conflict was maintained between Anwari and his rival Rashidi, who was within the beleaguered castle, by means of verses fastened to arrows. Anwari died at Balkh towards the end of the 12th century. The *Diwan*, or collection of his poems, consists of a series of long poems, and a number of simpler lyrics. His longest piece, *The Tears of Khorassan*, was translated into English verse by Captain Kirkpatrick (see also PERSIA: *Literature*).

ANWEILER, or ANNWEILER, a town of Germany, in the Bavarian Palatinate, on the Queich, 8 m. west of Landau, and on the railway from that place to Zweibrücken. Pop. 3700. It is romantically situated in the part of the Haardt called the Pfälzer Schweiz (Palatinate Switzerland), and is surrounded by high hills which yield a famous red sandstone. On the Sonnenberg (1600 ft.) lie the ruins of the castle of Trifels, in which Richard Cœur de Lion was imprisoned in 1193. The industries include cloth-weaving, tanning, dyeing and saw mills. There is also a considerable trade in wine.

ANZENGRUBER, LUDWIG (1839–1889), Austrian dramatist and novelist, was born at Vienna on the 29th of November 1839. He was educated at the *Realschule* of his native town, and then entered a bookseller's shop; from 1860 to 1867 he was an actor, without, however, displaying any marked talent, although his stage experience later stood him in good stead. In 1869 he became a clerk in the Viennese police department, but having in the following year made a success with his anti-clerical drama, *Der Pfarrer von Kirchfeld*, he gave up his appointment and devoted himself entirely to literature. He died at Vienna on the 10th of December 1889. Anzengruber was exceedingly fertile in ideas, and wrote a great many plays. They are mostly of Austrian peasant life, and although somewhat melancholy in tone are interspersed with bright and witty scenes. Among the best known are *Der Meineidbauer* (1871), *Die Kreuzelschreiber* (1872), *Der G'wissenswurm* (1874), *Hand und Herz* (1875), *Doppelselbstmord* (1875), *Das vierte Gebot* (1877), and *Der Fleck auf der Ehr'* (1889). Anzengruber also published a novel of considerable merit, *Der Schandfleck* (1876; remodelled 1884); and various short stories and tales of village life collected under the title *Wolken und Sunn'schein* (1888).

Anzengruber's collected works, with a biography, were published in 10 vols. in 1890 (3rd ed. 1897); his correspondence has been edited by A. Bettelheim (1902). See A. Bettelheim, *L. Anzengruber* (1890); L. Rosner, *Erinnerungen an L. Anzengruber* (1890); H. Sittenberger, *Studien zur Dramaturgie der Gegenwart* (1899); S. Friedmann, *L. Anzengruber* (1902).

ANZIN, a town of northern France, in the department of Nord, on the Scheldt, 1½ m. N.W. of Valenciennes, of which it is a suburb. Pop. (1906) 14,077. Anzin is the centre of important coal-mines of the Valenciennes basin belonging to the Anzin Company, the formation of which dates to 1717. The metallurgical industries of the place are extensive, and include iron and copper founding and the manufacture of steam-engines, machinery, chain-cables and a great variety of heavy iron goods. There are also glass-works and breweries.

AONIA, a district of ancient Boeotia, containing the mountains Helicon and Cithaeron, and thus sacred to the Muses, who are called by Pope the "Aonian maids."

AORIST (from Gr. ἀόριστος, indefinite), the name given in Greek grammar to certain past tenses of verbs (first aorist, second aorist).

AOSTA (anc. *Augusta Praetoria Salassorum*), a town and episcopal see of Piedmont, Italy, in the province of Turin, 80 m. N.N.W. by rail of the town of Turin, and 48 m. direct, situated 1910 ft. above sea-level, at the confluence of the Buthier and the Dora Baltea, and at the junction of the Great and Little St Bernard routes. Pop. (1901) 7875. The cathedral, reconstructed in the 11th century (to which one of its campanili and some architectural details belong), was much altered in the 14th and 17th; it has a rich treasury including an ivory diptych of 406 with a representation of Honorius. The church of St Ours, founded in 425, and rebuilt in the 12th century, has good cloisters (1133); the 15th-century priory is picturesque. The castle of Bramafam (11th century) is interesting. Cretinism is common in the district.

After the fall of the Roman empire the valley of Aosta fell into the hands of the Burgundian kings; and after many changes of masters, it came under the rule of Count Humbert I. of Savoy (Biancamano) in 1032. The privilege of holding the assembly of the states-general was granted to the inhabitants in 1189. An executive council was nominated from this body in 1536, and continued to exist until 1802. After the restoration of the rule of Savoy it was reconstituted and formally recognized by Charles Albert, king of Sardinia, at the birth of his grandson Prince Amedeo, who was created duke of Aosta. Aosta was the birthplace of Anselm. For ancient remains see AUGUSTA PRAETORIA SALASSORUM.

APACHE (apparently from the Zuni name, = "enemy," given to the Navaho Indians), a tribe of North American Indians of Athapascan stock. The Apaches formerly ranged over south-eastern Arizona and south-western Mexico. The chief divisions of the Apaches were the Arivaipa, Chiricahua, Coyotero, Faraone Gileno, Llanero, Mescalero, Mimbreno, Mogollon, Naisha, Tchikun and Tchishi. They were a powerful and warlike tribe, constantly at enmity with the whites. The final surrender of the tribe took place in 1886, when the Chiricahuas, the division involved, were deported to Florida and Alabama, where they underwent military imprisonment. The Apaches are now in reservations in Arizona, New Mexico and Oklahoma, and number between 5000 and 6000.

For details see *Handbook of American Indians*, ed. F. W. Hodge, (Washington, 1907); also INDIANS, NORTH AMERICAN.

APALACHEE (apparently a Choctaw name, = "people on the other side"), a tribe of North American Indians of Muskhogean stock. They have been known since the 16th century, and formerly ranged the country around Apalachee Bay, Florida. About 1600 the Spanish Franciscans founded a successful mission among them, but early in the 18th century the tribe suffered defeat at the hands of the British, the mission churches were burnt, the priests killed, and the tribe practically annihilated, more than one thousand of them being sold as slaves.

See *Handbook of American Indians*, ed. F. W. Hodge (Washington, 1907).

APALACHICOLA, a city, port of entry, and the county-seat of Franklin county, Florida, U.S.A., in the N.W. part of the

state, on Apalachicola Bay and at the mouth of the Apalachicola river. Pop. (1890) 2727; (1900) 3077, of whom 1589 were of negro descent; (1905) 3244; (1910) 3065. It is served by the Apalachicola Northern railway (to Chattahoochee, Florida), and by river steamers which afford connexion with railways at Carrabelle about 25 m. distant, at Chatahoochee (or River Junction), and at Columbus and Bainbridge, Georgia, and by ocean-going vessels with American and foreign ports. The city has a monument (1900) to John Gorrie (1803–1855), a physician who discovered the cold-air process of refrigeration in 1849 (and patented an ice-machine in 1850), as the result of experiments to lower the temperatures of fever patients. The bay is well protected by St Vincent, Flag, Sand, and St George's islands; and the shipping of lumber, naval stores and cotton, which reach the city by way of the river, forms the principal industry. Before the development of railways in the Gulf states, Apalachicola was one of the principal centres of trade in the southern states, ranking third among the Gulf ports in 1835. In 1907 the Federal government projected a channel across the harbour bar 100 ft. wide and 10 ft. deep and a channel 150 ft. wide and 18 ft. deep for Link Channel and the West Pass. In 1907 the exports were valued at $317,838; the imports were insignificant. The value of the total domestic and foreign commerce of the port for the year ending on the 30th of June 1907 was estimated at $1,240,000 (76,000 tons). The fishery products, including oysters, tarpon, sturgeon, caviare and sponges, are also important.

APAMEA, the name of several towns in western Asia.

1. A treasure city and stud-depot of the Seleucid kings in the valley of the Orontes. It was so named by Seleucus Nicator, after Apama, his wife. Destroyed by Chosroes in the 7th century A.D., it was partially rebuilt and known as *Fāmia* by the Arabs; and overthrown by an earthquake in 1152. It kept its importance down to the time of the Crusades. The acropolis hill is now occupied by the ruins of Kalat el-Mudik.

See R. F. Burton and T. Drake, *Unexplored Syria*; E. Sachau, *Reise in Syrien*, 1883.

2. A city in Phrygia, founded by Antiochus Soter (from whose mother, Apama, it received its name), near, but on lower ground than, Celaenae. It was situated where the Marsyas leaves the hills to join the Maeander, and it became a seat of Seleucid power, and a centre of Graeco-Roman and Graeco-Hebrew civilization and commerce. There Antiochus the Great collected the army with which he met the Romans at Magnesia, and there two years later the treaty between Rome and the Seleucid realm was signed. After Antiochus' departure for the East, Apamea lapsed to the Pergamenian kingdom and thence to Rome in 133, but it was resold to Mithradates V., who held it till 120. After the Mithradatic wars it became and remained a great centre for trade, largely carried on by resident Italians and by Jews. In 84 Sulla made it the seat of a *conventus* of the Asian province, and it long claimed primacy among Phrygian cities. Its decline dates from the local disorganization of the empire in the 3rd century A.D.; and though a bishopric, it was not an important military or commercial centre in Byzantine times. The Turks took it first in 1070, and from the 13th century onwards it was always in Moslem hands. For a long period it was one of the greatest cities of Asia Minor, commanding the Maeander road; but when the trade routes were diverted to Constantinople it rapidly declined, and its ruin was completed by an earthquake. A Jewish tradition, possibly arising from a name *Cibotus* (ark), which the town bore, identified a neighbouring mountain with Ararat. The famous "Noah" coins of the emperor Philip commemorate this belief. The site is now partly occupied by *Dineir* (*q.v.*, sometimes locally known also as *Geiklar*, "the gazelles," perhaps from a tradition of the Persian hunting-park, seen by Xenophon at Celaenae), which is connected with Smyrna by railway; there are considerable remains, including a great number of important Graeco-Roman inscriptions.

See W. M. Ramsay, *Cities and Bishoprics of Phrygia*, vol. ii.; G. Weber, *Dineir-Celènes* (1892); D. G. Hogarth in *Journ. Hell. Studies* (1888); O. Hirschfeld in *Trans. Berlin Academy* (1875).

(D. G. H.)

3. A town on the left bank of the Euphrates, at the end of a bridge of boats (*zeugma*); the Til-Barsip of the Assyrian inscriptions, now Birejik (*q.v.*).

4. The earlier Myrlea of Bithynia, now Mudania (*q.v.*), the port of Brusa. The name was given it by Prusias I., who rebuilt it.

5. A city mentioned by Stephanus and Pliny as situated near the Tigris, the identification of which is still uncertain.

6. A Greek city in Parthia, near Rhagae.

APARRI, a town of the province of Cagayán, Luzon, Philippine Islands, on the Grande de Cagayán river near its mouth, about 55 m. N. of Tuguegarao, the capital. Pop. (1903) 18,252. The valley is one of the largest tobacco-producing sections in the Philippines; and the town has a considerable coastwise trade. Here, too, is a meteorological station.

APATITE, a widely distributed mineral, which, when found in large masses, is of considerable economic value as a phosphate. As a mineral species it was first recognized by A. G. Werner in 1786 and named by him from the Greek ἀπατᾶν, to deceive, because it had previously been mistaken for other minerals, such as beryl, tourmaline, chrysolite, amethyst, &c. Although long known to consist mainly of calcium phosphate, it was not until 1827 that G. Rose found that fluorine or chlorine is an essential constituent. Two chemical varieties of apatite are to be distinguished, namely a fluor-apatite, (CaF) $Ca_4P_2O_{12}$, and a chlor-apatite, (CaCl) $Ca_4P_3O_{13}$: the former, which is much the commoner, contains 42·3% of phosphorus pentoxide (P_2O_5) and 3·8% fluorine, and the latter 4·10% P_2O_5 and 6·8% chlorine. Fluorine and chlorine replace each other in indefinite proportions, and they may also be in part replaced by hydroxyl, so that the general formula becomes [Ca (F, Cl, OH)] $Ca_4P_3O_{12}$, in which the univalent group Ca(F, Cl, OH) takes the place of one hydrogen atom in orthophosphoric acid H_3PO_4. The formula is sometimes written in the form $3Ca_3(PO_4)_2+CaF_2$. Mangan-apatite is a variety in which calcium is largely replaced by manganese (up to 10% MnO). Cerium, didymium, yttrium, &c., oxides may also sometimes be present, in amounts up to 5%.

Apatite frequently occurs as beautifully developed crystals, sometimes a foot or more in length, belonging to that division of the hexagonal system in which there is pyramidal hemihedrism. In this type of symmetry, of which apatite is the best

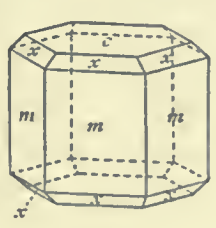


FIG. 1.

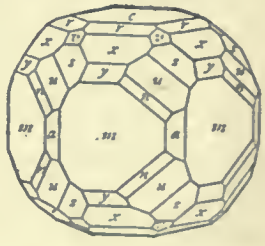


FIG. 2.

example, there is only one plane of symmetry, which is perpendicular to the hexad axis. The arrangement of the pyramidal faces *n* and *u* in fig. 2 show the hemihedral character and absence of the full number of planes and axes of symmetry. Fig. 2 represents a highly modified crystal from St Gotthard; a more common form is shown in fig. 1, which is bounded by the hexagonal prism *m*, hexagonal bipyramid *x* and basal pinacoid *c*.

In its general appearance, apatite exhibits wide variations. Crystals may be colourless and transparent or white and opaque, but are often coloured, usually some shade of green or brown, occasionally violet, sky-blue, yellow, &c. The lustre is vitreous, inclining to sub-resinous. There is an imperfect cleavage parallel to the basal pinacoid, and the fracture is conchoidal. Hardness 5, specific gravity 3·2.

Yellowish-green prismatic crystals from Jumilla in Murcia in Spain have long been known under the name asparagus-stone. Lazurapatite is a sky-blue variety found as crystals with lapis-lazuli in Siberia; and moroxite is the name given to dull greenish-blue crystals from Norway and Canada. Francolite, from Wheal Franco, near Tavistock in Devonshire, and also from several Cornish mines, occurs as crystallized stalactitic masses. In

addition to these crystallized varieties, there are massive varieties, fibrous, concretionary, stalactitic, or earthy in form, which are included together under the name phosphorite (*q.v.*), and it is these massive varieties, together with various rock-phosphates (phosphatic nodules, coprolites, guano, &c.) which are of such great economic importance: crystallized apatite is mined for phosphates only in Norway and Canada.

With regard to its mode of occurrence, apatite is found under a variety of conditions. In igneous rocks of all kinds it is invariably present in small amounts as minute acicular crystals, and was one of the first constituents of the rock to crystallize out from the magma. The extensive deposits of chlor-apatite near Kragerö and Bamle, near Brevik, in southern Norway, are in connexion with gabbro, the felspar of which has been altered, by emanations containing chlorine, to scapolite, and titanium minerals have been developed. The apatite occurring in connexion with granite and veins of tin-stone is, on the other hand, a fluor-apatite, and, like the other fluorine-bearing minerals characteristic of tin-veins, doubtless owes its origin to the emanations of tin fluoride which gave rise to the tin-ore. Special mention may be here made of the beautiful violet crystals of fluor-apatite which occur in the veins of tin-ore in the Erzgebirge, and of the brilliant bluish-green crystals encrusting cavities in the granite of Luxullian in Cornwall. Another common mode of occurrence of apatite is in metamorphic crystalline rocks, especially in crystalline limestones: in eastern Canada extensive beds of apatite occur in the limestones associated with the Laurentian gneisses. Still another mode of occurrence is presented by beautifully developed and transparent crystals found with crystals of felspar and quartz lining the crevices in the gneiss of the Alps. Crystallized apatite is also occasionally found in metalliferous veins, other than those of tin, and in beds of iron ore; whilst if the massive varieties (phosphorite) be considered many other modes of occurrence might be cited. (L. J. S.)

APATURIA (Ἀπατούρια), an ancient Greek festival held annually by all the Ionian towns except Ephesus and Colophon (Herodotus i. 147). At Athens it took place in the month of Pyanepsion (October to November), and lasted three days, on which occasion the various phratries (*i.e.* clans) of Attica met to discuss their affairs. The name is a slightly modified form of ἀπατόρια = ἀμπατόρια, ὁμοπατόρια, the festival of "common relationship." The ancient etymology associated it with ἀπάτη (deceit), a legend existing that the festival originated in 1100 B.C. in commemoration of a single combat between a certain Melanthus, representing King Thymoetes of Attica, and King Xanthus of Boeotia, in which Melanthus successfully threw his adversary off his guard by crying that a man in a black goat's skin (identified with Dionysus) was helping him (Schol. Aristophanes, *Acharnians*, 146). On the first day of the festival, called Dorpia or Dorpeia, banquets were held towards evening at the meeting-place of the phratries or in the private houses of members. On the second, Anarrhysis (from ἀναρρύειν, to draw back the victim's head), a sacrifice of oxen was offered at the public cost to Zeus Phratrius and Athena. On the third day, Cureotis (κουρεῶτις), children born since the last festival were presented by their fathers or guardians to the assembled phratores, and, after an oath had been taken as to their legitimacy and the sacrifice of a goat or a sheep, their names were inscribed in the register. The name κουρεῶτις is derived either from κοῦρος, that is, the day of the young, or less probably from κείρω, because on this occasion young people cut their hair and offered it to the gods. The victim was called μεῖον. On this day also it was the custom for boys still at school to declaim pieces of poetry, and to receive prizes (Plato, *Timaeus*, 21 B). According to Hesychius these three days of the festival were followed by a fourth, called ἐπίβδα, but this is merely a general term for the day after any festival.

APE (Old Eng. *apa*; Dutch *aap*; Old Ger. *affo*; Welsh *epa*; Old Bohemian *op*; a word of uncertain origin, possibly an imitation of the animal's chatter), the generic English name, till the 16th century, for animals of the monkey tribe, and still used specifically for the tailless, manlike representatives of the order Primates (*q.v.*). The word is now generally a synonym for "monkey," but the common verb for both (as transferred figuratively to human beings) is "to ape," *i.e.* to imitate.

APELDOORN, a town in the province of Gelderland, Holland, and a junction station 26½ m. by rail W. of Amersfoort. It is connected by canal north and south with Zwolle and Zutphen respectively. Pop. (1900) 25,834. The neighbourhood of Apeldoorn is very picturesque and well wooded. The Protestant church was restored after a fire in 1890. Close by is the favourite country-seat of the royal family of Holland called the Loo. It was originally a hunting-lodge of the dukes of Gelderland, but in its present form dates chiefly from the time of the Stadtholder William III., king of England. Apeldoorn possesses large paper-mills.

APELLA, the official title of the popular assembly at Sparta, corresponding to the ecclesia in most other Greek states. Every full citizen who had completed his thirtieth year was entitled to attend the meetings, which, according to Lycurgus's ordinance, must be held at the time of each full moon within the boundaries of Sparta. They had in all probability taken place originally in the Agora, but were later transferred to the neighbouring building known as the Skias (Paus. iii. 12. 10). The presiding officers were at first the kings, but in historical times the ephors, and the voting was conducted by shouts; if the president was doubtful as to the majority of voices, a division was taken and the votes were counted. Lycurgus had ordained that the apella must simply accept or reject the proposals submitted to it, and though this regulation fell into neglect, it was practically restored by the law of Theopompus and Polydorus which empowered the kings and elders to set aside any "crooked" decision of the people (Plut. *Lycurg.* 6). In later times, too, the actual debate was almost, if not wholly, confined to the kings, elders, ephors and perhaps the other magistrates. The apella voted on peace and war, treaties and foreign policy in general: it decided which of the kings should conduct a campaign and settled questions of disputed succession to the throne: it elected elders, ephors and other magistrates, emancipated helots and perhaps voted on legal proposals. There is a single reference (Xen. *Hell.* iii. 3. 8) to a "small assembly" (ἡ μικρὰ καλουμένη ἐκκλησία) at Sparta, but nothing is known as to its nature or competence. The term apella does not occur in extant Spartan inscriptions, though two decrees of Gythium belonging to the Roman period refer to the μεγάλαι ἀπέλλαι (Le Bas-Foucart, *Voyage archéologique*, ii., Nos. 242*a*, 243).

See G. Gilbert, *Constitutional Antiquities of Sparta and Athens* (Eng. trans., 1895), pp. 49 ff.; *Studien zur altspartanischen Geschichte* (Göttingen, 1872), pp. 131 ff.; G. F. Schömann, *Antiquities of Greece: The State* (Eng. trans., 1880), pp. 234 ff.; *De ecclesiis Lacedaemoniorum* (Griefswald, 1836) [=*Opusc. academ.* i. pp. 87 ff.]; C. O. Müller, *History and Antiquities of the Doric Race* (Eng. trans., 2nd ed. 1839), book iii. ch. 5, §§ 8-10; G. Busolt, *Die griechischen Staats- und Rechtsaltertümer*, 1887 (in Iwan Müller's *Handbuch der klassischen Altertumswissenschaft*, iv. 1), § 90; *Griechische Geschichte* (2nd ed.), i. p. 552 ff. (M. N. T.)

APELLES, probably the greatest painter of antiquity. He lived from the time of Philip of Macedon till after the death of Alexander. He was of Ionian origin, but after he had attained some celebrity he became a student at the celebrated school of Sicyon, where he worked under Pamphilus. He thus combined the Dorian thoroughness with the Ionic grace. Attracted to the court of Philip, he painted him and the young Alexander with such success that he became the recognized court painter of Macedon, and his picture of Alexander holding a thunderbolt ranked with the Alexander with the spear of the sculptor Lysippus. Other works of Apelles had a great reputation in antiquity, such as the portraits of the Macedonians Clitus, Archelaus and Antigonus, the procession of the high priest of Artemis at Ephesus, Artemis amid a chorus of maidens, a great allegorical picture representing Calumny, and the noted painting representing Aphrodite rising out of the sea. Of none of these works have we any copy, unless indeed we may consider a painting of Alexander as Zeus in the house of the Vettii at Pompeii as a reminiscence of his work; but some of

the Italian artists of the Renaissance repeated the subjects, in a vain hope of giving some notion of the composition of them.

Few things are more hopeless than the attempt to realize the style of a painter whose works have vanished. But a great wealth of stories, true or invented, clung to Apelles in antiquity; and modern archaeologists have naturally tried to discover what they indicate. We are told, for example, that he attached great value to the drawing of outlines, practising every day. The tale is well known of his visit to Protogenes, and the rivalry of the two masters as to which could draw the finest and steadiest line. The power of drawing such lines is conspicuous in the decoration of red-figured vases of Athens. Apelles is said to have treated his rival with generosity, for he increased the value of his pictures by spreading a report that he meant to buy them and sell them as his own. Apelles allowed the superiority of some of his contemporaries in particular matters: according to Pliny he admired the *dispositio* of Melanthius, *i.e.* the way in which he spaced his figures, and the *mensurae* of Asclepiodorus, who must have been a great master of symmetry and proportion. It was especially in that undefinable quality "grace" that Apelles excelled. He probably used but a small variety of colours, and avoided elaborate perspective: simplicity of design, beauty of line and charm of expression were his chief merits. When the naturalism of some of his works is praised—for example, the hand of his Alexander is said to have stood out from the picture—we must remember that this is the merit always ascribed by ignorant critics to works which they admire. In fact the age of Alexander was one of notable idealism, and probably Apelles succeeded in a marked degree in imparting to his figures a beauty beyond nature.

Apelles was also noted for improvements which he introduced in technique. He had a dark glaze, called by Pliny *atramentum*, which served both to preserve his paintings and to soften their colour. There can be little doubt that he was one of the most bold and progressive of artists. (P. G.)

APELLICON, a wealthy native of Teos, afterwards an Athenian citizen, a famous book collector. He not only spent large sums in the acquisition of his library, but stole original documents from the archives of Athens and other cities of Greece. Being detected, he fled in order to escape punishment, but returned when Athenion (or Aristion), a bitter opponent of the Romans, had made himself tyrant of the city with the aid of Mithradates. Athenion sent him with some troops to Delos, to plunder the treasures of the temple, but he showed little military capacity. He was surprised by the Romans under the command of Orobius (or Orbius), and only saved his life by flight. He died a little later, probably in 84 B.C.

Apellicon's chief pursuit was the collection of rare and important books. He purchased from the family of Neleus of Skepsis in the Troad manuscripts of the works of Aristotle and Theophrastus (including their libraries), which had been given to Neleus by Theophrastus himself, whose pupil Neleus had been. They had been concealed in a cellar to prevent their falling into the hands of the book-collecting princes of Pergamum, and were in a very dilapidated condition. Apellicon filled in the lacunae, and brought out a new, but faulty, edition. In 84 Sulla removed Apellicon's library to Rome (Strabo xiii. p. 609; Plutarch, *Sulla*, 26). Here the MSS. were handed over to the grammarian Tyrannion, who took copies of them, on the basis of which the peripatetic philosopher Andronicus of Rhodes prepared an edition of Aristotle's works. Apellicon's library contained a remarkable old copy of the *Iliad*. He is said to have published a biography of Aristotle, in which the calumnies of other biographers were refuted.

APENNINES (Gr. Ἀπέννινος, Lat. *Appenninus*—in both cases used in the singular), a range of mountains traversing the entire peninsula of Italy, and forming, as it were, the backbone of the country. The name is probably derived from the Celtic *pen*, a mountain top: it originally belonged to the northern portion of the chain, from the Maritime Alps to Ancona; and Polybius is probably the first writer who applied it to the whole chain, making, indeed, no distinction between the Apennines and the Maritime Alps, and extending the former name as far as Marseilles. Classical authors do not differentiate the various parts of the chain, but use the name as a general name for the whole. The total length is some 800 m. and the maximum width 70 to 80 m.

Divisions.—Modern geographers divide the range into three parts, northern, central and southern.

1. The northern Apennines are generally distinguished (though there is no real solution of continuity) from the Maritime Alps at the Bocchetta dell' Altare, some 5 m. W. of Savona on the high road to Turin.[1] They again are divided into three parts—the Ligurian, Tuscan and Umbrian Apennines. The Ligurian Apennines extend as far as the pass of La Cisa in the upper valley of the Magra (anc. *Macra*) above Spezia; at first they follow the curve of the Gulf of Genoa, and then run east-south-east parallel to the coast. On the north and north-east lie the broad plains of Piedmont and Lombardy, traversed by the Po, the chief tributaries of which from the Ligurian Apennines are the Scrivia (*Olubria*), Trebbia (*Trebia*) and Taro (*Tarus*). The Tanaro (*Tanarus*), though largely fed by tributaries from the Ligurian Apennines, itself rises in the Maritime Alps, while the rivers on the south and south-west of the range are short and unimportant. The south side of the range rises steeply from the sea, leaving practically no coast strip: its slopes are sheltered and therefore fertile and highly cultivated, and the coast towns are favourite winter resorts (see RIVIERA). The highest point (the Monte Bue) reaches 5915 ft. The range is crossed by several railways—the line from Savona to Turin (with a branch at Ceva for Acqui), that from Genoa to Ovada and Acqui, the main lines from Genoa to Novi, the junction for Turin and Milan (both of which[2] pass under the Monte dei Giovi, the ancient Mons Ioventius, by which the ancient Via Postumia ran from Genua to Dertona), and that from Spezia to Parma under the pass of La Cisa.[3] All these traverse the ridge by long tunnels—that on the new line from Genoa to Honco is upwards of 5 m. in length.

The Tuscan Apennines extend from the pass of La Cisa to the sources of the Tiber. The main chain continues to run in an east-south-east direction, but traverses the peninsula, the west coast meanwhile turning almost due south. From the northern slopes many rivers and streams run north and north-north-east into the Po, the Secchia (*Secia*) and Panaro (*Scultenna*) being among the most important, while farther east most of the rivers are tributaries of the Reno (anc. *Rhenus*). Other small streams, *e.g.* the Ronco (*Bedesis*) and Montone (*Utis*), which flow into the sea together east of Ravenna, were also tributaries of the Po; and the Savio (*Sapis*) and the Rubicon seem to be the only streams from this side of the Tuscan Apennines that ran directly into the sea in Roman days. From the south-west side of the main range the Arno (*q.v.*) and Serchio run into the Mediterranean. This section of the Apennines is crossed by two railways, from Pistoia to Bologna and from Florence to Faenza, and by several good high roads, of which the direct road from Florence to Bologna over the Futa pass is of Roman origin; and certain places in it are favourite summer resorts. The highest point of the chain is Monte Cimone (7103 ft.). The so-called Alpi Apuane (the *Apuani* were an ancient people of Liguria), a detached chain south-west of the valley of the Serchio, rise to a maximum height of 6100 ft. They contain the famous marble quarries of Carrara. The greater part of Tuscany, however, is taken up by lower hills, which form no part of the Apennines, being divided from the main chain by the valleys of the Arno, Chiana (*Clanis*) and Paglia (*Pallia*). Towards the west they are rich in minerals and chemicals, which the Apennines proper do not produce.

The Umbrian Apennines extend from the sources of the Tiber to (or perhaps rather beyond) the pass of Scheggia near Cagli, where the ancient Via Flaminia crosses the range. The highest point is the Monte Nerone (5010 ft.). The chief river is the Tiber itself: the others, among which the Foglia (*Pisaurus*), Metauro

[1] The ancient Via Aemilia, built in 109 B.C., led over this pass, but originally turned east to Dertona (mod. *Tortona*).
[2] There are two separate lines from Sampierdarena to Ronco.
[3] This pass was also traversed by a nameless Roman road.

(*Metaurus*) and Esino[1] may be mentioned, run north-east into the Adriatic, which is some 30 m. from the highest points of the chain. This portion of the range is crossed near its southern termination by a railway from Foligno to Ancona (which at Fabriano has a branch to Macerata and Porto Civitanova, on the Adriatic coast railway), which may perhaps be conveniently regarded as its boundary.[2] By some geographers, indeed, it is treated as a part of the central Apennines.

2. The central Apennines are the most extensive portion of the chain, and stretch as far as the valley of the Sangro (*Sangrus*). To the north are the Monti Sibillini, the highest point of which is the Monte Vettore (8128 ft.). Farther south three parallel chains may be traced, the westernmost of which (the Monti Sabini) culminates to the south in the Monte Viglio (7075 ft.), the central chain in the Monte Terminillo (7260 ft.), and farther south in the Monte Velino (8160 ft.), and the eastern in the Gran Sasso d'Italia (9560 ft.), the highest summit of the Apennines, and the Maiella group (Monte Amaro, 9170 ft.). Between the western and central ranges are the plain of Rieti, the valley of the Salto (*Himella*), and the Lago Fucino; while between the central and eastern ranges are the valleys of Aquila and Sulmona. The chief rivers on the west are the Nera (*Nar*), with its tributaries the Velino (*Velinus*) and Salto, and the Anio, both of which fall into the Tiber. On the east there is at first a succession of small rivers which flow into the Adriatic, from which the highest points of the chain are some 25 m. distant, such as the Potenza (*Flosis*), Chienti (*Cluentus*), Tenna (*Tinna*), Tronto (*Truentus*), Tordino (*Helvinus*), Vomano (*Vomanus*), &c. The Pescara (*Aternus*), which receives the Aterno from the north-west and the Gizio from the south-east, is more important; and so is the Sangro.

The central Apennines are crossed by the railway from Rome to Castelammare Adriatico via Avezzano and Sulmona: the railway from Orte to Terni (and thence to Foligno) follows the Nera valley; while from Terni a line ascends to the plain of Rieti, and thence crosses the central chain to Aquila, whence it follows the valley of the Aterno to Sulmona. In ancient times the Via Salaria, Via Caecilia and Via Valeria-Claudia all ran from Rome to the Adriatic coast. The volcanic mountains of the province of Rome are separated from the Apennines by the Tiber valley, and the Monti Lepini, or Volscian mountains, by the valleys of the Sacco and Liri.

3. In the southern Apennines, to the south of the Sangro valley, the three parallel chains are broken up into smaller groups; among them may be named the Matese, the highest point of which is the Monte Miletto (6725 ft.). The chief rivers on the south-west are the Liri or Garigliano (anc. *Liris*), with its tributary the Sacco (*Trerus*), the Volturno (*Volturnus*), Sebeto (*Sabatus*), Sarno (*Sarnus*), on the north the Trigno (*Trinius*), Biferno (*Tifernus*), and Fortore (*Frento*). The promontory of Monte Gargano, on the east, is completely isolated, and so are the volcanic groups near Naples. The district is traversed from north-west to south-east by the railway from Sulmona to Benevento and on to Avellino, and from south-west to north-east by the railways from Caianello via Isernia to Campobasso and Termoli, from Caserta to Benevento and Foggia, and from Nocera and Avellino to Rocchetta S. Antonio, the junction for Foggia, Spinazzola (for Barletta, Bari, and Taranto) and Potenza. Roman roads followed the same lines as the railways: the Via Appia ran from Capua to Benevento, whence the older road went to Venosa and Taranto and so to Brindisi, while the Via Traiana ran nearly to Foggia and thence to Bari.

The valley of the Ofanto (*Aufidus*), which runs into the Adriatic close to Barletta, marks the northern termination of the first range of the Lucanian Apennines (now Basilicata), which runs from east to west, while south of the valleys of the Sele (on the west) and Basiento (on the east)—which form the line followed by the railway from Battipaglia via Potenza to Metaponto—the second range begins to run due north and south as far as the plain of Sibari (*Sybaris*). The highest point is the Monte Pollino (7325 ft.). The chief rivers are the Sele (*Silarus*)—joined by the Negro (*Tanager*) and Calore (*Calor*)—on the west, and the Bradano (*Bradanus*), Basiento (*Casuentus*), Agri (*Aciris*), Sinni (*Siris*) on the east, which flow into the gulf of Taranto; to the south of the last-named river there are only unimportant streams flowing into the sea east and west, inasmuch as here the width of the peninsula diminishes to some 40 m. The railway running south from Sicignano to Lagonegro, ascending the valley of the Negro, is planned to extend to Cosenza, along the line followed by the ancient Via Popilia, which beyond Cosenza reached the west coast at Terina and thence followed it to Reggio. The Via Herculia, a branch of the Via Traiana, ran from Aequum Tuticum to the ancient Nerulum. At the narrowest point the plain of Sibari, through which the rivers Coscile (*Sybaris*) and Crati (*Crathis*) flow to the sea, occurs on the east coast, extending halfway across the peninsula. Here the limestone Apennines proper cease and the granite mountains of Calabria (anc. *Bruttii*) begin. The first group extends as far as the isthmus formed by the gulfs of S. Eufemia and Squillace; it is known as the Sila, and the highest point reached is 6330 ft. (the Botte Donato). The forests which covered it in ancient times supplied the Greeks and Sicilians with timber for shipbuilding. The railway from S. Eufemia to Catanzaro and Catanzaro Marina crosses the isthmus, and an ancient road may have run from Squillace to Monteleone. The second group extends to the south end of the Italian peninsula, culminating in the Aspromonte (6420 ft.) to the east of Reggio di Calabria. In both groups the rivers are quite unimportant.

Character.—The Apennines are to some extent clothed with forests, though these were probably more extensive in classical times (Pliny mentions especially pine, oak and beech woods, *Hist. Nat.* xvi. 177); they have indeed been greatly reduced in comparatively modern times by indiscriminate timber-felling, and though serious attempts at reafforestation have been made by the government, much remains to be done. They also furnish considerable summer pastures, especially in the Abruzzi: Pliny (*Hist. Nat.* xi. 240) praises the cheese of the Apennines. In the forests wolves were frequent, and still are found, the flocks being protected against them by large sheep-dogs; bears, however, which were known in Roman times, have almost entirely disappeared. Nor are the wild goats called *rotae*, spoken of by Varro (*R. R.* II. i. 5), which may have been either chamois or steinbock, to be found. Brigandage appears to have been prevalent in Roman times in the remoter parts of the Apennines, as it was until recently: an inscription found near the Furlo pass was set up in A.D. 246 by an *evocatus Augusti* (a member of a picked corps) on special police duty with a detachment of twenty men from the Ravenna fleet (G. Henzen in *Römische Mitteilungen*, 1887, 14). Snow lies on the highest peaks of the Apennines for almost the whole year. The range produces no minerals, but there are a considerable number of good mineral springs, some of which are thermal (such as Bagni di Lucca, Monte Catini, Monsummano, Porretta, Telese, &c.), while others are cool (such as Nocera, Sangemini, Cinciano, &c.), the water of which is both drunk on the spot and sold as table water elsewhere. (T. As.)

Geology.—The Apennines are the continuation of the Alpine chain, but the individual zones of the Alps cannot be traced into the Apennines. The zone of the Briançonnais (see Alps) may be followed as far as the Gulf of Genoa, but scarcely beyond, unless it is represented by the Trias and older beds of the Apuan Alps. The inner zone of crystalline and schistose rocks which forms the main chain of the Alps, is absent in the Apennines except towards the southern end. The Apennines, indeed, consist almost entirely of Mesozoic and Tertiary beds, like the outer zones of the Alps. Remnants of a former inner zone of more ancient rocks may be seen in the Apuan Alps, in the islands off the Tuscan coast, in the Catena Metallifera, Cape Circeo and the island of Zannone, as well as in the Calabrian peninsula. These remnants lie at a comparatively low level, and excepting

[1] This river (anc. *Aesis*) was the boundary of Italy proper in the 3rd and 2nd centuries B.C.

[2] The Monte Conero, to the south of Ancona, was originally an island of the Pliocene sea.

the Apuan Alps and the Calabrian peninsula they do not now form any part of the Apennine chain. But that in Tertiary times there was a high interior zone of crystalline rocks is indicated by the character of the Eocene beds in the southern Apennines. These are formed to a large extent of thick conglomerates which are full of pebbles and boulders of granite and schist. Many of the boulders are of considerable size and they are often still angular. There is now no crystalline region from which they could reach their present position; and this and other considerations have led the followers of E. Suess to conclude that even in Tertiary times a large land mass consisting of ancient rocks occupied the space which is now covered by the southern portion of the Tyrrhenian Sea. This old land mass has been called Tyrrhenis, and probably extended from Sicily into Latium and as far west as Sardinia. On the Italian border of this land there was raised a mountain chain with an inner crystalline zone and an outer zone of Mesozoic and Tertiary beds. Subsequent faulting has caused the subsidence of the greater part of Tyrrhenis, including nearly the whole of the inner zone of the mountain chain, and has left only the outer zones standing as the present Apennines.

Be this as it may, the Apennines, excepting in Calabria, are formed chiefly of Triassic, Jurassic, Cretaceous, Eocene and Miocene beds. In the south the deposits, from the Trias to the middle Eocene, consist mainly of limestones, and were laid down, with a few slight interruptions, upon a quietly subsiding sea-floor. In the later part of the Eocene period began the folding which gave rise to the existing chain. The sea grew shallow, the deposits became conglomeratic and shaly, volcanic eruptions began, and the present folds of the Apennines were initiated. The folding and consequent elevation went on until the close of the Miocene period when a considerable subsidence took place and the Pliocene sea overspread the lower portions of the range. Subsequent elevation, without folding, has raised these Pliocene deposits to a considerable height—in some cases over 3000 ft. and they now lie almost undisturbed upon the older folded beds. This last elevation led to the formation of numerous lakes which are now filled up by Pleistocene deposits. Both volcanic eruptions and movements of elevation and depression continue to the present day on the shores of the Tyrrhenian Sea. In the northern Apennines the elevation of the sea floor appears to have begun at an earlier period, for the Upper Cretaceous of that part of the chain consists largely of sandstones and conglomerates. In Calabria the chain consists chiefly of crystalline and schistose rocks; it is the Mesozoic and Tertiary zone which has here been sunk beneath the sea. Similar rocks are found beneath the Trias farther north, in some of the valleys of Basilicata. Glaciers no longer exist in the Apennines, but Post-Pliocene moraines have been observed in Basilicata.

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APENRADE, a town of Germany in the Prussian province of Schleswig, beautifully situated on the Apenrade Fjord, an arm of the Little Belt, 38 m. N. of the town of Schleswig. Pop. (1900) 5952. It is connected by a branch line with the main railway of Schleswig, and possesses a good harbour, which affords shelter for a large carrying trade. Fishing, shipbuilding and various small factories provide occupation for the population. The town is a bathing resort, as is Elisenlund close by.

APERTURE (from Lat. *aperire*, to open), an opening. In optics, it is that portion of the diameter of an object-glass or mirror through which light can pass free from obstruction. It is equal to the actual diameter of the cylinder of rays admitted by a telescope.

APEX, the Latin word (pl. *apices*) for the top, tip or peak of anything. A diminutive "apiculus" is used in botany.

APHANITE, a name given (from the Gr. ἀφανής, invisible) to certain dark-coloured igneous rocks which are so fine-grained that their component minerals are not detected by the unaided eye. They consist essentially of plagioclase felspar, with hornblende or augite, and may contain also biotite, quartz and a limited amount of orthoclase. Although a few authorities still recognize the aphanites as a distinct class, most systematic petrologists, at the present time, have discarded it, and regard these rocks as merely structural facies of other species. Those which contain hornblende are uniform, fine-grained diorites, vogesites, &c., while when pyroxene predominates they are ascribed to the dolerites, quartz-dolerites, &c. Hence, any rock which is compact, crystalline and fine grained, is frequently said to be *aphanitic*, without implying exactly to which of the principal rock groups it really belongs.

APHASIA[1] (from Gr. ἀ, privative, and φάσις, speech), a term which means literally inability to speak, and is used to denote various defects in the comprehension and expression of both spoken and written language which result from lesions of the brain. Aphasic disorders may be classed in two groups:—first, receptive or sensory aphasia, which comprises (*a*) inability to understand spoken language (auditory aphasia), and (*b*) inability to read (visual aphasia, or *alexia*); second, emissive or motor aphasia, under which category are included (*a*) inability to speak (motor vocal aphasia, or *aphemia*), and (*b*) inability to write (motor graphic aphasia, or *agraphia*). It has been shown that each of these defects is produced by destruction of a special region of the cortex of the brain. These regions, which are termed the speech centres, are, in right-handed people, situated in the left cerebral hemisphere; this is the reason why aphasia is so commonly associated with paralysis of the right side of the body.

A study of the acquisition of the faculty of speech throws light upon the education of the speech centres, and helps to elucidate their physiological interaction and the phenomena of aphasia. The auditory speech centre is the first to show signs of functional activity, for within a few months of birth the child begins to *understand* spoken language. Some months later the motor vocal speech centre begins to functionate. The memories of the auditory word images which are stored up in the auditory speech centre play a most important part in the process of learning to speak. The child born deaf grows up mute. The visual speech centre comes into activity when the child is taught to read. Again, when he learns to write and thus begins to educate his graphic centre, he is constantly calling upon his visual speech centre for the visual images of the words he wishes to produce. From these remarks it will be seen that there is a very intimate association between the auditory speech centre and the motor vocal speech centre, also between the visual speech centre and the graphic centre.

Auditory Aphasia.—The auditory speech centre is situated in the posterior part of the first and second temporo-sphenoidal convolutions on the left side of the brain. Destruction of this centre causes "auditory aphasia." Hearing is unimpaired but spoken language is quite unintelligible. The subject of auditory aphasia may be compared to an individual who is listening to a foreign language of which he does not understand a word. Word deafness, a term often used as synonymous with auditory aphasia, is misleading and should be abandoned. Auditory aphasia commonly interferes with vocal expression, for the

[1] In 1906 Pierre Marie of Paris expressed views (*La Semaine medicale*, May 23 and October 17, and elsewhere) upon the question of aphasia which have given rise to much animated controversy, since they are in many respects at complete variance with the classical conception which has been represented in the present article. Marie holds that Broca's convolution plays no special rôle in the function of speech. He admits that a lesion in the region of the lenticular nucleus is followed by inability to speak, but this defect is, in his opinion, to be regarded as an anarthria. He further admits the production of sensory aphasia—the aphasia of Wernicke, as he prefers to call it after its discoverer—by lesions which destroy the angular and supramarginal gyri, and the upper two temporo-sphenoidal convolutions, but he regards the essential foundation of sensory aphasia as a diminution of intelligence. There are, in his opinion, no sensory images of language. Motor aphasia is, he believes, nothing more than a combination of sensory aphasia and anarthria. These conclusions have been vigorously attacked, more especially by Dejerine of Paris (*La Presse medicale*, July 1906, and elsewhere).

majority of people when they speak do so by recalling the auditory memories of words stored up in the auditory speech centre. *Amnesia verbalis* is employed to designate failure to call up in the memory the images of words which are needed for purposes of vocal expression or silent thought.

Visual Aphasia or Alexia.—The visual speech centre, which is located in the left angular gyrus, is connected with the two centres for vision which are situated one in either occipital lobe. Destruction of the visual speech centre produces visual aphasia or alexia. Word blindness, sometimes used as the equivalent of visual aphasia, is, like word deafness, a misleading term. The individual is not blind, he sees the words and letters perfectly, but they appear to him as unintelligible cyphers. When the visual speech centre is destroyed, the memories of the visual images of words are obliterated and interference with writing, a consequence of *amnesia verbalis*, results. On the other hand, when the lesion is situated deeply in the occipital lobe, and does not implicate the cortex, but merely cuts off the connexions of the angular gyrus with both visual centres, agraphia is not produced, for the visual word centre and its connexion with the graphic centre are still intact (pure, or sub-cortical word blindness).

Motor Vocal Aphasia or Aphemia.—The centre for motor vocal speech is situated in the posterior part of the third left frontal convolution and extends on to the foot of the left ascending frontal convolution (Broca's convolution). Complete destruction of this region produces loss of speech, although it often happens that a few words, such as "yes" and "no," and, it may be, emotional exclamations such as "Oh! dear!" and the like are retained. The utterance of unintelligible sounds is still possible, however, and there is neither defective voice production (*aphonia*) nor paralysis of the mechanism of articulation. The individual can recall the auditory and visual images of the words which he wishes to use, but his memory for the complicated, co-ordinated movements which he acquired in the process of learning to speak, and which are necessary for vocal expression, has been blotted out. In the great majority of cases of motor vocal aphasia there is associated agraphia, a circumstance which is perhaps to be accounted for by the proximity of the graphic centre. When the lesion is situated below the cortex of Broca's convolution but destroys the fibres which pass from it towards the internal capsule, agraphia is not produced (sub-cortical or pure motor vocal aphasia). Destruction of the auditory speech centre is, as we have seen, commonly accompanied by more or less interference with vocal speech, a consequence of *amnesia verbalis*.

Agraphia.—Discussion still rages as to the presence of a special writing centre. Those who favour the separate existence of a graphic centre locate it in the second left frontal convolution. It may be that the want of unanimity as to the graphic centre is to be explained by an anatomical relationship so close between the graphic centre and that for the fine movement of the hand that a lesion in this situation which produces agraphia must at the same time cause a paralysis of the hand. Destruction of the visual speech centre by obliterating the visual memories of words (*amnesia verbalis*) produces agraphia. Further, several instances are on record in which agraphia has followed destruction of the commissure between the visual speech centre and the graphic centre. As already mentioned, agraphia is very often associated with motor vocal aphasia.

A number of aphasic defects are met with in addition to those already mentioned. Thus *paraphasia* is a condition in which the patient makes use of words other than those he intends. He may mix up his words so that his conversation is quite unintelligible. In the most pronounced forms he gabbles away, employing unrecognizable sounds in place of words (*jargon and gibberish aphasia*). *Paragraphia* is a similar defect which occurs in writing. Both paraphasia and paragraphia may be produced by partial lesions of the sensory speech centres or of the commissures which connect these with the motor centres. *Object blindness* (syn. mind-blindness) refers to an inability to recognize an object or its uses by the aid of sight alone. The probable explanation would seem to be that the ordinary centre for vision has been isolated from the other sensory centres with which it is connected. Not uncommonly there is associated visual aphasia. *Optic aphasia* was introduced to designate a somewhat similar state in which, although the uses of an object are recognized, the patient cannot name it at sight, yet, if it is of such a nature that it appeals directly to one of the other senses, he may at once be able to name it. *Tactile aphasia* is a rare defect in which there exists an inability to recognize an object by touch alone although the qualities which, under normal circumstances, suffice for its detection can be accurately described. *Amusia*, or loss of the musical faculty, may occur in association with or independent of aphasia. There is reason for believing that special receptive and emissive centres exist for the musical sense exactly analogous to those for speech.

The speech centres are all supplied by the left middle cerebral artery. When this artery is blocked close to its origin by an *embolus* or *thrombus*, total aphasia results. It may be, however, that only one of the smaller branches of the artery is obstructed, and, according to the region of the brain to which this branch is distributed, one or more of the speech centres may be destroyed. Occlusion of the left posterior cerebral artery causes extensive softening of the occipital lobe and produces pure word blindness. Further, a tumour, abscess, haemorrhage or meningitis may be so situated as to damage or destroy the individual speech centres or their connecting commissures. The amount of recovery to be expected in any given case depends upon the nature, situation and extent of the lesion, and upon the age of the patient. Even after complete destruction of the speech centres, perfect recovery may take place, for the centres in the right hemisphere of the brain are capable of education. This is only possible in young individuals. In the great majority of instances the nature of the lesion is such as to render futile all treatment directed towards its removal. In suitable cases, however, the education of the right side of the brain may be very greatly assisted by an intelligent application of scientific methods.

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APHELION (from Gr. ἀπό, from, and ἥλιος, sun), in astronomy, that point of the orbit of a planet at which it is most distant from the sun. Apogee, Apocentre, Aposaturnium, &c. are terms applied to those points of the orbit of a body moving around a centre of force—as the Earth, Saturn, &c.—at which it is farthest from the central body.

APHEMIA (from Gr. ἀ, without, and φήμη, speech), in pathology, the loss of the power of speech (see APHASIA).

APHIDES (pl. of Aphis), minute insects, also known as "plant-lice," "blight," and "green-fly," belonging to the homopterous division of the order Hemiptera, with long antennae and legs, two-jointed, two-clawed tarsi, and usually a pair of abdominal tubes through which a waxy secretion is exuded. These tubes were formerly supposed to secrete the sweet substance known as "honey-dew" so much sought after by ants; but this is now known to come from the alimentary canal. Both winged and wingless forms of both sexes occur, and the wings when present are normal in number, that is to say two pairs. Apart from their importance from the economic standpoint, Aphides are chiefly remarkable for the phenomena connected with the propagation of the species. The following brief summary of what takes place in the plant-louse of the rose (*Aphis rosae*), may be regarded as typical of the family, though exceptions occur in other species. Eggs produced in the autumn by fertilized females remain on the plant through the winter and hatching in the spring give rise to female individuals which may be winged or wingless. From these females are born

parthenogenetically, that is to say without the intervention of males, and by a process that has been compared to internal budding, large numbers of young resembling their parents in every particular except size, which themselves reproduce their kind in the same way. This process continues throughout the summer, generation after generation being produced until the number of descendants from a single individual of the spring-hatched brood may amount to very many thousands. In the autumn winged males appear, union between the sexes takes place and the females lay the fertilized eggs which are destined to carry the species through the cold months of winter. If, however, the food-plant is grown in a conservatory where protection against cold is afforded, the aphides may go on reproducing agamogenetically without cessation for many years together. Not the least interesting features connected with this strange life-history are the facts that the young may be born by the oviparous or viviparous methods and either gamogenetically or agamogenetically, and may develop into winged forms or remain wingless, and that the males only appear in any number at the close of the season. Although the factors which determine these phenomena are not clearly understood, it is believed that the appearance of the males is connected with the increasing cold of autumn and the growing scarcity of food, and that the birth of winged females is similarly associated with decrease in the quantity or vitiation of the quality of the nourishment imbibed. Sometimes the winged females migrate from the plant they were born on to start fresh colonies on others often of quite a different kind. Thus the apple blight (*Aphis mali*) after producing many generations of apterous females on its typical food-plant gives rise to winged forms which fly away and settle upon grass or corn-stalks.

Closely related to the typical aphides is *Phylloxera vastatrix*, the insect which causes enormous loss by attacking the leaves and roots of vines. Its life-history is somewhat similar to that of *Aphis rosae* summarized above. In the autumn a single fertile egg is laid by apterous females in a crevice of the bark of the vine where it is protected during the winter. From this egg in the spring emerges an apterous female who makes a gall in the new leaf and lays therein a large number of eggs. Some of the apterous young that are hatched from these form fresh galls and continue to multiply in the leaves, others descend to the root of the plant, becoming what are known as root-forms. These, like the parent form of spring, reproduce parthenogenetically, giving rise to generation after generation of egg-laying individuals. In the course of the summer, from some of these eggs are hatched females which acquire wings and lay eggs from which wingless males and females are born. From the union of the sexes comes the fertile egg from which the parent form of spring is hatched.

See generally G. B. Buckton, *British Aphides* (Ray Soc. 1876–1883); also Economic Entomology. (R. I. P.)

APHORISM (from the Gr. ἀφορίζειν, to define), literally a distinction or a definition, a term used to describe a principle expressed tersely in a few telling words or any general truth conveyed in a short and pithy sentence, in such a way that when once heard it is unlikely to pass from the memory. The name was first used in the *Aphorisms* of Hippocrates, a long series of propositions concerning the symptoms and diagnosis of disease and the art of healing and medicine. The term came to be applied later to other sententious statements of physical science, and later still to statements of all kinds of principles. Care must be taken not to confound *aphorisms* with *axioms*. Aphorisms came into being as the result of experience, whereas axioms are self-evident truths, requiring no proof, and appertain to pure reason. Aphorisms have been especially used in dealing with subjects to which no methodical or scientific treatment was applied till late, such as art, agriculture, medicine, jurisprudence and politics. The *Aphorisms* of Hippocrates form far the most celebrated as well as the earliest collection of the kind, and it may be interesting to quote a few examples. "Old men support abstinence well: people of a ripe age less well: young folk badly, and children less well than all the rest, particularly those of them who are very lively." "Those who are very fat by nature are more exposed to die suddenly than those who are thin." "Those who eject foaming blood, eject it from the lung." "When two illnesses arrive at the same time, the stronger silences the weaker." The first aphorism, perhaps the best known of all, which serves as a kind of introduction to the book, runs as follows:—"Life is short, art is long, opportunity fugitive, experimenting dangerous, reasoning difficult: it is necessary not only to do oneself what is right, but also to be seconded by the patient, by those who attend him, by external circumstances." Another famous collection of aphorisms is that of the school of Salerno in Latin verse, in which Joannes de Meditano, one of the most celebrated doctors of the school of medicine of Salerno, has summed up the precepts of this school. The book was dedicated to a king of England. It is a disputed point as to which king, some authorities dating the publication as at 1066, others assigning a later date. The dedication gives the following excellent advice:—

"Anglorum regi scribit schola tota Salernae.
Si vis incolumem, si vis te reddere sanum,
Curas tolle graves: irasci crede profanum:
Parce mero: coenato parum; non sit tibi vanum
Surgere post epulas: somnum fuge meridianum:
Ne mictum retine, nec comprime fortiter anum:
Haec bene si serves, tu longo tempore vives."

Another collection of aphorisms, also medical and also in Latin, is that of the Dutchman Hermann Boerhaave, published at Leiden in the year 1709; it gives a terse summary of the medical knowledge prevailing at the time, and is of great interest to the student of the history of medicine.

APHRAATES (a Greek form of the Persian name Aphrahaṭ or Pharhādh), a Syriac writer belonging to the middle of the 4th century A. D., who composed a series of twenty-three expositions or homilies on points of Christian doctrine and practice. The first ten were written in 337, the following twelve in 344, and the last in 345.[1] The author was early known as *ḥakkimā phārsāyā* ("the Persian sage"), was a subject of Sapor II., and was probably of heathen parentage and himself a convert from heathenism. He seems at some time in his life to have assumed the name of Jacob, and is so entitled in the colophon to a MS. of A.D. 512 which contains twelve of his homilies. Hence he was already by Gennadius of Marseilles (before 496) confused with Jacob, bishop of Nisibis; and the ancient Armenian version of nineteen of the homilies has been published under this latter name. But (1) Jacob of Nisibis, who attended the council of Nicaea, died in 338; and (2) our author, being a Persian subject, cannot have lived at Nisibis, which became Persian only by Jovian's treaty of 363. That his name was Aphrahaṭ or Pharhādh we learn from comparatively late writers—Bar Bahlul (10th century), Elias of Nisibis (11th), Bar-Hebraeus, and 'Abhd-Ishō'. George, bishop of the Arabs, writing in A.D. 714 to a friend who had sent him a series of questions about the "Persian sage," confesses ignorance of his name, home and rank, but infers from his homilies that he was a monk, and of high esteem among the clergy. The fact that in 344 he was selected to draw up a circular letter from a council of bishops and other clergy to the churches of Seleucia and Ctesiphon and elsewhere—included in our collection as homily 14—is held by Dr W. Wright and others to prove that he was a bishop. According to a marginal note in a 14th-century MS. (B.M. Orient. 1017), he was "bishop of Mar Mattai," a famous monastery near Mosul, but it is unlikely that this institution existed so early. The homilies of Aphraates are intended to form, as Professor Burkitt has shown, "a full and ordered exposition of the Christian faith." The standpoint is that of the Syriac-speaking church, before it was touched by the Arian controversy. Beginning with faith as the foundation, the writer proceeds to build up the structure of doctrine and duty. The first ten homilies, which form one division completed in 337, are without polemical reference;

[1] Hom. 1–22 begin with the letters of the Syriac alphabet in succession. Their present order in the Syriac MSS. is therefore right. The ancient Armenian version, published by Antonelli in 1756, has only 19 of the homilies, and those in a somewhat different order.

their subjects are faith, love, fasting, prayer, wars (a somewhat mysterious setting forth of the conflict between Rome and Persia under the imagery of Daniel), the sons of the covenant (monks or ascetics), penitents, the resurrection, humility, pastors. Those numbered 11–22, written in 344, are almost all directed against the Jews; the subjects are circumcision, passover, the sabbath, persuasion (the encyclical letter referred to above), distinction of meats, the substitution of the Gentiles for the Jews, that Christ is the Son of God, virginity and holiness, whether the Jews have been finally rejected or are yet to be restored, provision for the poor, persecution, death and the last times. The 23rd homily, on the "grape kernel" (Is. lxv. 8), written in 344, forms an appendix on the Messianic fulfilment of prophecy, together with a treatment of the chronology from Adam to Christ. Aphraates impresses a reader favourably by his moral earnestness, his guilelessness, his moderation in controversy, the simplicity of his style and language, his saturation with the ideas and words of Scripture. On the other hand, he is full of cumbrous repetition, he lacks precision in argument and is prone to digression, his quotations from Scripture are often inappropriate, and he is greatly influenced by Jewish exegesis. He is particularly fond of arguments about numbers. How wholly he and his surroundings were untouched by the Arian conflict may be judged from the 17th homily—"that Christ is the Son of God." He argues that, as the name "God" or "Son of God" was given in the O.T. to men who were worthy, and as God does not withhold from men a share in His attributes—such as sovereignty and fatherhood—it was fitting that Christ who has wrought salvation for mankind should obtain this highest name. From the frequency of his quotations, Aphraates is a specially important witness to the form in which the Gospels were read in the Syriac church in his day; Zahn and others have shown that he—mainly at least—used the *Diatessaron*. Finally, he bears important contemporary witness to the sufferings of the Christian church in Persia under Sapor (Shapur) II. as well as the moral evils which had infected the church, to the sympathy of Persian Christians with the cause of the Roman empire, to the condition of early monastic institutions, to the practice of the Syriac church in regard to Easter, &c.

Editions by W. Wright (London, 1869), and J. Parisot (with Latin translation, Paris, 1894); the ancient Armenian version of 19 homilies edited, translated into Latin, and annotated by Antonelli (Rome, 1756). Besides translations of particular homilies by G. Bickell and E. W. Budge, the whole have been translated by G. Bert (Leipzig, 1888). Cf. also C. J. F. Sasse, *Proleg. in Aphr. Sapientis Persae sermones homileticos* (Leipzig, 1879); J. Forget, *De Vita et Scriptis Aphraatis* (Louvain, 1882); F. C. Burkitt, *Early Eastern Christianity* (London, 1904); J. Labourt, *Le Christianisme dans l'empire perse* (Paris, 1904); J. Zahn, *Forschungen* I.; "Aphraates and the Diatessaron," vol. ii. pp. 180-186 of Burkitt's *Evangelion Da-Mepharreshe* (Cambridge, 1904); articles on "Aphraates and Monasticism," by R. H. Connolly and Burkitt in *Journal of Theological Studies* (1905) pp. 522-539; (1906) pp. 10-15. (N. M.)

APHRODITE,[1] the Greek goddess of love and beauty, counterpart of the Roman Venus. Although her myth and cult were essentially Semitic, she soon became Hellenized and was admitted to a place among the deities of Olympus. Some mythologists hold that there already existed in the Greek system an earlier goddess of love, of similar attributes, who was absorbed by the Asiatic importation; and one writer (A. Enmann) goes so far as to deny the oriental origin of Aphrodite altogether. It is therefore necessary first to examine the nature and characteristics of her Eastern prototype, and then to see how far they reappear in the Greek Aphrodite.

Among the Semitic peoples (with the notable exception of the Hebrews) a supreme female deity was worshipped under different names—the Assyrian Ishtar, the Phoenician Ashtoreth (Astarte), the Syrian Atargatis (Derketo), the Babylonian Belit (Mylitta), the Arabian Ilat (Al-ilat). The article "Aphrodite" in Roscher's *Lexikon der Mythologie* is based upon the theory that all these were originally moon-goddesses, on which assumption all their functions are explained. This view, however, has not met with general acceptance, on the ground that, in Semitic mythology, the moon is always a male divinity; and that the full moon and crescent, found as attributes of Astarte, are due to a misinterpretation of the sun's disk and cow's horns of Isis, the result of the dependence of Syrian religious art upon Egypt. On the other hand, there is some evidence in ancient authorities (Herodian v. 6, 10; Lucian, *De Dea Syria*, 4) that Astarte and the moon were considered identical.

This oriental Aphrodite was worshipped as the bestower of all animal and vegetable fruitfulness, and under this aspect especially as a goddess of women. This worship was degraded by repulsive practices (*e.g.* religious prostitution, self-mutilation), which subsequently made their way to centres of Phoenician influence, such as Corinth and Mount Eryx in Sicily. In this connexion may be mentioned the idea of a divinity, half male, half female, uniting in itself the active and passive functions of creation, a symbol of luxuriant growth and productivity. Such was the bearded Aphrodite of Cyprus, called Aphroditos by Aristophanes according to Macrobius, who mentions a statue of the androgynous divinity in his *Saturnalia* (iii. 8. 2; see also HERMAPHRODITUS). The moon, by its connexion with menstruation, and as the cause of the fertilizing dew, was regarded as exercising an influence over the entire animal and vegetable creation.

The Eastern Aphrodite was closely related to the sea and the element of moisture; in fact, some consider that she made her first appearance on Greek soil rather as a marine divinity than as a nature goddess. According to Syrian ideas, as a fish goddess, she represented the fructifying power of water. At Ascalon there was a lake full of fish near the temple of Atargatis-Derketo, into which she was said to have been thrown together with her son Ichthys (fish) as a punishment for her arrogance, and to have been devoured by fishes; according to another version, ashamed of her amour with a beautiful youth, which resulted in the birth of Semiramis, she attempted to drown herself, but was changed into a fish with human face (see ATARGATIS). At Hierapolis (Bambyce) there was a pool with an altar in the middle, sacred to the goddess, where a festival was held, at which her images were carried into the water. Her connexion with the sea is explained by the influence of the moon on the tides, and the idea that the moon, like the sun and the stars, came up from the ocean.

The oriental Aphrodite is connected with the lower world, and came to be looked upon as one of its divinities. Thus, Ishtar descends to the kingdom of Ilat the queen of the dead, to find the means of restoring her favourite Tammuz (Adon, Adonis) to life. During her stay all animal and vegetable productivity ceases, to begin again with her return to earth—a clear indication of the conception of her as a goddess of fertility. This legend, which strikingly resembles that of Persephone, probably refers to the decay of vegetation in winter, and the reawakening of nature in spring (cf. HYACINTHUS). The lunar theory connects it with the disappearance of the moon at the time of change or during an eclipse.

Another aspect of her character is that of a warlike goddess, armed with spear or bow, sometimes wearing a mural crown, as sovereign lady and protectress of the locality where she was worshipped. The spear and arrows are identified with the beams of the sun and moon.

The attributes of the goddess were the ram, the he-goat, the dove, certain fish, the cypress, myrtle and pomegranate, the animals being symbolical of fertility, the plants remedies against sterility.

The worship of Aphrodite at an early date was introduced into Cyprus, Cythera and Crete by Phoenician colonists, whence it spread over the whole of Greece, and as far west as Italy and Sicily. In Crete she has been identified with Ariadne, who, according to one version of her story, was put ashore in Cyprus, where she died and was buried in a grove called after the name

[1] No satisfactory etymology of the name has been given; although the first part is usually referred to *ἀφρός* ("the sea foam"), it is equally probable that it is of Eastern origin. F. Homoll (*Jahrbücher für classische Philologie*, cxxv., 1882) explains it as a corruption of Ashtoreth; for other derivations see O. Gruppe, *Griechische Mythologie*, ii. p. 1348, note 2.

of Ariadne-Aphrodite (L. R. Farnell, *Cults of the Greek States*, ii. p. 663). Cyprus was regarded as her true home by the Greeks, and Cythera was one of the oldest seats of her worship (cf. her titles Cytherea, Cypris, Paphia, Amathusia, Idalia—the last three from places in Cyprus). In both these islands there lingered a definite tradition of a connexion with the cult of the oriental Aphrodite Urania, an epithet which will be referred to later. The oriental features of her worship as practised at Corinth are due to its early commercial relations with Asia Minor; the fame of her temple worship on Mount Eryx spread to Carthage, Rome and Latium.

In the *Iliad*, Aphrodite is the daughter of Zeus and Dione, a name by which she herself is sometimes called. This has been supposed to point to a confusion between Aphrodite and Hebe, the daughter of Zeus and Hera, Dione being an Epirot name for the last-named goddess. In the *Odyssey*, she is the wife of Hephaestus, her place being taken in the *Iliad* by Charis, the personification of grace and divine skill, possibly supplanted by Aphrodite, the goddess of love and beauty. Her amour with Ares, by whom she became the mother of Harmonia, the wife of Cadmus, is famous (*Od.* viii. 266). From her relations with these acknowledged Hellenic divinites it is argued that there once existed a primitive Greek goddess of love. This view is examined in detail and rejected by Farnell (*Cults*, ii. pp. 619-626).

It is admitted that few traces remain of direct relations of the Greek goddess to the moon, although such possibly survive in the epithets *πασιφαής*, *ἀστερία*, *οὐρανία*. It is suggested that this is due to the fact that, at the time of the adoption of the oriental goddess, the Greeks already possessed lunar divinities in Hecate, Selene, Artemis. But, although her connexion with the moon has practically disappeared, in all other aspects a development from the Semitic divinity is clearly manifest.

Aphrodite as the goddess of all fruitfulness in the animal and vegetable world is especially prominent. In the Homeric hymn to Aphrodite she is described as ruling over all living things on earth, in the air, and in the water, even the gods being subject to her influence. She is the goddess of gardens, especially worshipped in spring and near lowlands and marshes, favourable to the growth of vegetation. As such in Crete she is called Antheia ("the flower-goddess"), at Athens *ἐν κήποις* ("in the gardens"), and *ἐν καλάμοις* ("in the reed-beds") or *ἐν ἕλει* ("in the marsh") at Samos. Her character as a goddess of vegetation is clearly shown in the cult and ritual of Adonis (*q.v.*; also Farnell, ii. p. 644) and Attis (*q.v.*). In the animal world she is the goddess of sexual impulse; amongst men, of birth, marriage, and family life. To this aspect may be referred the names Genetyllis ("bringing about birth"), Arma (*ἅρω*, "to join," *i.e.*, in marriage, cf. Harmonia), Nymphia ("bridal goddess"), Kourotrophos ("rearer of boys"). Aphrodite Apaturus (see G. M. Hirst in *Journal of Hellenic Studies*, xxiii., 1903) refers to her connexion with the clan and the festival Apaturia, at which children were admitted to the *phratria*. It is pointed out by Farnell that this cult of Aphrodite, as the patroness of married life, is probably a native development of the Greek religion, the oriental legends representing her by no means as an upholder of the purer relations of man and woman. As the goddess of the grosser form of love she inspires both men and women with passion (*ἐπιστροφία*, "turning them to" thoughts of love), or the reverse (*ἀποστροφία*, "turning them away"). Upon her male favourites (Paris, Theseus) she bestows the fatal gift of seductive beauty, which generally leads to disastrous results in the case of the woman (Helen, Ariadne). As *μηχανῖτις* ("contriver") she acts as an intermediary for bringing lovers together, a similar idea being expressed in *πρᾶξις* (of "success" in love, or = *creatrix*). The two epithets *ἀνδροφόνος* ("man-slayer") and *σώσανδρα* ("man-preserver") find an illustration in the pseudo-Plautine (in the *Mercator*) address to Astarte, who is described as the life and death, the saviour and destroyer of men and gods. It was natural that a personality invested with such charms should be regarded as the ideal of womanly beauty, but it is remarkable that the only probable instance in which she appears as such is as Aphrodite *μορφώ* ("form") at Sparta (O. Gruppe suggests the meaning "ghost," C. Tümpel the "dark one," referring to Aphrodite's connexion with the lower world). The function of Aphrodite as the patroness of courtesans represents the most degraded form of her worship as the goddess of love, and is certainly of Phoenician or Eastern origin. In Corinth there were more than a thousand of these *ἱερόδουλοι* ("temple slaves"), and wealthy men made it a point of honour to dedicate their most beautiful slaves to the service of the goddess.

Like her oriental prototype, the Greek Aphrodite was closely connected with the sea. Thus, in the Hesiodic account of her birth, she is represented as sprung from the foam which gathered round the mutilated member of Uranus, and her name has been explained by reference to this. Further proof may be found in many of her titles—*ἀναδυομένη* ("rising from the sea"), *εὔπλοια* ("giver of prosperous voyages"), *γαληναία* ("goddess of fair weather"), *κατασκοπία* ("she who keeps a look-out from the heights")—in the attribute of the dolphin, and the veneration in which she was held by seafarers. Aphrodite Aineias, the protectress of the Trojan hero, is probably also another form of the maritime goddess of the East (see E. Wörner, article "Aineias" in Roscher's *Lexikon*, and Farnell, ii. p. 638), which originated in the Troad, where Aphrodite Aineias may have been identical with the earth-goddess Cybele. The title *ἔφιππος* is connected with the legend of Aeneas, who is said to have dedicated to his mother a statue that represented her on horseback. Remembering the importance of the horse in the cult of the sea-god Poseidon, it is natural to associate it with Aphrodite as the sea-goddess, although it may be explained with reference to her character as a goddess of vegetation, the horse being an embodiment of the corn-spirit (see J. G. Frazer, *The Golden Bough*, ii., 1900, p. 281).

Like Ishtar, Aphrodite was connected with the lower world. Thus, at Delphi there was an image of Aphrodite *ἐπιτυμβία* ("Aphrodite of the tomb"), to which the dead were summoned to receive libations; the epithets *τυμβώρυχος* ("grave-digger"), *μυχία* ("goddess of the depths"), *μελαινίς* ("the dark one"), the grave of Ariadne-Aphrodite at Amathus, and the myth of Adonis, point in the same direction.

The cult of the armed Aphrodite probably belongs to the earlier period of her worship in Greece, and down to the latest period of Greek history she retained this character in some of the Greek states. The cult is found not only where oriental influence was strongest, but in places remote from it, such as Sparta, where she was known by the name of Areia ("the warlike"), and there are numerous references in the *Anthology* to an Aphrodite armed with helmet and spear. It is possible that the frequent association of Aphrodite with Ares is to be explained by an armed Aphrodite early worshipped at Thebes, the most ancient seat of the worship of Ares.

The most distinctively oriental title of the Greek Aphrodite is Urania, the Semitic "queen of the heavens." It has been explained by reference to the lunar character of the goddess, but more probably signifies "she whose seat is in heaven," whence she exercises her sway over the whole world—earth, sea, and air alike. Her cult was first established in Cythera, probably in connexion with the purple trade, and at Athens it is associated with the legendary Porphyrion, the purple king. At Thebes, Harmonia (who has been identified with Aphrodite herself) dedicated three statues, of Aphrodite Urania, Pandemos, and Apostrophia. A few words must be added on the second of these titles. There is no doubt that Pandemos was originally an extension of the idea of the goddess of family and city life to include the whole people, the political community. Hence the name was supposed to go back to the time of Theseus, the reputed author of the reorganization of Attica and its demes. Aphrodite Pandemos was held in equal regard with Urania; she was called *σεμνή* ("holy"), and was served by priestesses upon whom strict chastity was enjoined. In time, however, the meaning of the term underwent a change, probably due to the philosophers and moralists, by whom a radical distinction was drawn between Aphrodite Urania and Pandemos. According to Plato

(*Symposium*, 180), there are two Aphrodites, "the elder, having no mother, who is called the heavenly Aphrodite—she is the daughter of Uranus; the younger, who is the daughter of Zeus and Dione—her we call common." The same distinction is found in Xenophon's *Symposium* (viii. 9), although the author is doubtful whether there are two goddesses, or whether Urania and Pandemos are two names for the same goddess, just as Zeus, although one and the same, has many titles; but in any case, he says, the ritual of Urania is purer, more serious, than that of Pandemos. The same idea is expressed in the statement (quoted by Athenaeus, 569*d*, from Nicander of Colophon) that after Solon's time courtesans were put under the protection of Aphrodite Pandemos. But there is no doubt that the cult of Aphrodite was on the whole as pure as that of any other divinities, and although a distinction may have existed in later times between the goddess of legal marriage and the goddess of free love, these titles do not express the idea. Aphrodite Urania was represented in Greek art on a swan, a tortoise or a globe; Aphrodite Pandemos as riding on a goat, symbolical of wantonness. (For the legend of Theseus and Aphrodite ἐπιτραγία, "on the goat," see Farnell, *Cults*, ii. p. 633.)

To her oriental attributes the following may be added: the sparrow and hare (productivity), the wry-neck (as a love-charm, of which Aphrodite was considered the inventor), the swan and dolphin (as a marine divinity), the tortoise (explained by Plutarch as a symbol of domesticity, but connected by Gruppe with the marine deity), the rose, the poppy, and the lime tree.

In ancient art Aphrodite was at first represented clothed, sometimes seated, but more frequently standing; then naked, rising from the sea, or after the bath. Finally, all idea of the divine vanished, and the artists merely presented her as the type of a beautiful woman, with oval face, full of grace and charm, languishing eyes, and laughing mouth, which replaced the dignified severity and repose of the older forms. The most famous of her statues in ancient times was that at Cnidus, the work of Praxiteles, which was imitated on the coins of that town, and subsequently reproduced in various copies, such as the Vatican and Munich. Of existing statues the most famous is the Aphrodite of Melos (Venus of Milo), now in the Louvre, which was found on the island in 1820 amongst the ruins of the theatre; the Capitoline Venus at Rome and the Venus of Capua, represented as a goddess of victory (these two exhibit a lofty conception of the goddess); the Medicean Venus at Florence, found in the porticus of Octavia at Rome and (probably wrongly) attributed to Cleomenes; the Venus stooping in the bath, in the Vatican; and the Callipygos at Naples, a specimen of the most sensual type.

For the oriental Aphrodite see E. Meyer, article "Astarte" in W. H. Roscher's *Lexikon der Mythologie*, and Wolf Baudissin, articles "Astarte" and "Atargatis" in Herzog-Hauck's *Real-encyklopädie für protestantische Theologie*; for the Greek, articles in Roscher's *Lexikon* and Pauly-Wissowa's *Realencyclopädie*; L. Preller, *Griechische Mythologie* (4th ed. by C. Robert); L. R. Farnell, *Cults of the Greek States*, ii. (1896); O. Gruppe, *Griechische Mythologie und Religionsgeschichte*, ii. (1906); L. Dyer, *The Gods in Greece* (1891); A. Enmann, *Kypros und der Ursprung des Aphrodite-Kults* (1886). W. H. Engel, *Kypros*, ii. (1841), and J. B. Lajard, *Recherches sur le culte de Vénus* (1837), may still be consulted with advantage. For Aphrodite in art see J. J. Bernoulli, *Aphrodite* (1873); W. J. Stillman, *Venus and Apollo in Painting and Sculpture* (1897). In the article GREEK ART, figs. 71 (pl. v.) and 77 (pl. vi.) represent Aphrodite of Cnidus and Melos respectively. (J. H. F.)

APHTHONIUS, of Antioch, Greek sophist and rhetorician, flourished in the second half of the 4th century A.D., or even later. Nothing is known of his life, except that he was a friend of Libanius and of a certain Eutropius, perhaps the author of the epitome of Roman history. We possess by him Προγυμνάσματα, a text-book on the elements of rhetoric, with exercises for the use of the young before they entered the regular rhetorical schools. They apparently formed an introduction to the Τέχνη of Hermogenes. His style is pure and simple, and ancient critics praise his "Atticism." The book maintained its popularity as late as the 17th century, especially in Germany. A collection of forty fables by Aphthonius, after the style of Aesop, is also extant.

Spengel, *Rhetores Graeci*, ii.; Finckh, *Aphthonii Progymnasmata* (1865); Hoppichler, *De Theone, Hermogene, Aphthonioque Progymnasmatum Scriptoribus* (1884); edition of the fables by Furia (1810).

APHTHONIUS, AELIUS FESTUS, Latin grammarian, possibly of African origin, lived in the 4th century A.D. He wrote a metrical handbook in four books, which has been incorporated by Marius Victorinus in his system of grammar.

Keil, *Grammatici Latini*, vi.; Schultz, *Quibus Auctoribus Aelius Festus Aphthonius usus sit* (1885).

APICIUS, the name of three celebrated Roman epicures. The second of these, M. Gavius Apicius, who lived under Tiberius, is the most famous (Seneca, *Consol. ad Helviam*, 10). He invented various cakes and sauces, and is said to have written on cookery. The extant *De Re Coquinaria* (ed. Schuch, 1874), a collection of receipts, ascribed to one Caelius Apicius, is founded on Greek originals, and belongs to the 3rd century A.D. It is probable that the real title was Caelii *Apicius*, Apicius being the name of the work (cp. Taciti *Agricola*), and *De Re Coquinaria* a sub-title.

APICULTURE (from Lat. *apis*, a bee), bee-keeping (see BEE). So also other compounds of *api-*. *Apiarium* or apiary, a bee-house or hive, is used figuratively by old writers for a place of industry, *e.g.* a college.

APION, Greek grammarian and commentator on Homer, born at Oasis in Libya, flourished in the first half of the 1st century A.D. He studied at Alexandria, and headed a deputation sent to Caligula (in 38) by the Alexandrians to complain of the Jews: his charges were answered by Josephus in his *Contra Apionem*. He settled at Rome—it is uncertain when—and taught rhetoric till the reign of Claudius. Apion was a man of great industry and learning, but extremely vain. He wrote several works, which are lost. The well-known story of Androclus and the lion, preserved in Aulus Gellius, is from his Αἰγυπτιακά; fragments of his Γλῶσσαι Ὁμηρικαί are printed in the *Etymologicum Gudianum*, ed. Sturz, 1818.

APIS or HAPIS, the sacred bull of Memphis, in Egyptian *Ḥp*, *Ḥape*, *Hope*. By Manetho his worship is said to have been instituted by Kaiechos of the Second Dynasty. Hape is named on very early monuments, but little is known of the divine animal before the New Kingdom. He was entitled "the renewal of the life" of the Memphite god Ptah: but after death he became Osorapis, *i.e.* the Osiris Apis, just as dead men were assimilated to Osiris, the king of the underworld. This Osorapis was identified with Serapis, and may well be really identical with him (see SERAPIS): and Greek writers make the Apis an incarnation of Osiris, ignoring the connexion with Ptah. Apis was the most important of all the sacred animals in Egypt, and, like the others, its importance increased as time went on. Greek and Roman authors have much to say about Apis, the marks by which the black bull-calf was recognized, the manner of his conception by a ray from heaven, his house at Memphis with court for disporting himself, the mode of prognostication from his actions, the mourning at his death, his costly burial and the rejoicings throughout the country when a new Apis was found. Mariette's excavation of the Serapeum at Memphis revealed the tombs of over sixty animals, ranging from the time of Amenophis III. to that of Ptolemy Alexander. At first each animal was buried in a separate tomb with a chapel built above it. Khamuis, the priestly son of Rameses II. (*c.* 1300 B.C.), excavated a great gallery to be lined with the tomb chambers; another similar gallery was added by Psammetichus I. The careful statement of the ages of the animals in the later instances, with the regnal dates for their birth, enthronization and death have thrown much light on the chronology from the XXIInd dynasty onwards. The name of the mother-cow and the place of birth are often recorded. The sarcophagi are of immense size, and the burial must have entailed enormous expense. It is therefore remarkable that the priests contrived to bury one of the animals in the fourth year of Cambyses.

See Jablonski, *Pantheon*, ii.; Budge, *Gods of the Egyptians*, ii. 350; Mariette-Maspero, *Le Sérapéum de Memphis*. (F. LL. G.)

APLITE, in petrology, the name given to intrusive rock in which quartz and felspar are the dominant minerals. Aplites are usually very fine-grained, white, grey or flesh-coloured, and their constituents are visible only with the help of a magnifying lens. Dykes and threads of aplite are very frequently to be observed traversing granitic bosses; they occur also, though in less numbers, in syenites, diorites, quartz-diabases and gabbros. Without doubt they have usually a genetic affinity to the rocks they intersect. The aplites of granite areas, for example, are the last part of the magma to crystallize, and correspond in composition to the quartzo-felspathic aggregates which fill up the interspaces between the early minerals in the main body of the rock. They bear a considerable resemblance to the eutectic mixtures which are formed on the cooling of solutions of mineral salts, and remain liquid till the excess of either of the components has separated out, finally solidifying *en masse* when the proper proportions of the constituents and a suitable temperature are reached. The essential components of the aplites are quartz and alkali felspar (the latter usually orthoclase or microperthite). Crystallization has been apparently rapid (as the rocks are so fine-grained), and the ingredients have solidified almost at the same time. Hence their crystals are rather imperfect and fit closely to one another in a sort of fine mosaic of nearly equi-dimensional grains. Porphyritic felspars occur occasionally and quartz more seldom; but the relation of the aplites to quartz-porphyries, granophyres and felsites is very close, as all these rocks have nearly the same chemical composition. Yet the aplites associated with diorites and quartz-diabases differ in minor respects from the common aplites, which accompany granites. The accessory minerals of these rocks are principally oligoclase, muscovite, apatite and zircon. Biotite and all ferromagnesian minerals rarely appear in them, and never are in considerable amount. Riebeckite-granites (paisanites) have close affinities to aplites, shown especially in the prevalence of alkali felspars. Tourmaline also occurs in some aplites. The rocks of this group are very frequent in all areas where masses of granite are known. They form dykes and irregular veins which may be only a few inches or many feet in diameter. Less frequently aplite forms stocks or bosses, or occupies the edges or irregular portions of the interior of outcrops of granite. The syenite-aplites consist mainly of alkali felspar; the diorite-aplites of plagioclase; there are nepheline-bearing aplites which intersect some elaeolite-syenites. In all cases they bear the same relation to the parent masses. By increase of quartz aplites pass gradually, in a few localities, through highly quartzose modifications (beresite, &c.) into quartz veins. (J. S. F.)

APNOEA (Gr. ἄπνοια, from ἀ-, privative, πνέειν, to breathe), a technical term for suspension of breathing.

APOCALYPSE (Gr. ἀποκάλυψις, disclosure), a term applied to the disclosure to certain privileged persons of something hidden from the mass of men. The Greek root corresponds in the Septuagint to the Heb. *gālāh*, to reveal. The last book of the New Testament bears in Greek the title Ἀποκάλυψις Ἰωάννου, and is frequently referred to as the Apocalypse of John, but in the English Bible it appears as the Revelation of St John the Divine (see REVELATION). Earlier among the hellenistic Jews the term was used of a number of writings which depicted in a prophetic and parabolic way the end or future state of the world (*e.g. Apocalypse of Baruch*), the whole class is now commonly known as Apocalyptic Literature (*q.v.*).

APOCALYPSE, KNIGHTS OF THE, a secret society founded in Italy in 1693 to defend the church against the expected Antichrist. Agostino Gabrino, the son of a merchant of Brescia, was its founder. On Palm Sunday 1693, when the choir of St Peter's was chanting *Quis est iste Rex Gloriae?* Gabrino, sword in hand, rushed to the altar crying *Ego sum Rex Gloriae.* Though Gabrino was treated as a madman, the society flourished, until a member denounced it to the Inquisition, who arrested the knights. Though chiefly mechanics they always carried swords even when at work, and wore on their breasts a star with seven rays. Gabrino styled himself monarch of the Holy Trinity. He was credited by his enemies with a desire to introduce polygamy.

APOCALYPTIC LITERATURE. The Apocalyptic literature of Judaism and Christianity embraces a considerable period, from the centuries following the exile down to the close of the middle ages. In the present survey we shall limit ourselves to the great formative periods in this literature—in Judaism to 200 B.C. to A.D. 100, and in Christianity to A.D. 50 to 350 or thereabouts.

The transition from prophecy to apocalyptic (ἀποκαλύπτειν, to reveal something hidden) was gradual and already accomplished within the limits of the Old Testament. Beginning in the bosom of prophecy, and steadily differentiating itself from it in its successive developments, it never came to stand in absolute contrast to it. Apocalyptical elements disclose themselves in the prophetical books of Ezekiel, Joel, Zechariah, while in Isaiah xxiv.–xxvii. and xxxiii. we find well-developed apocalypses; but it is not until we come to Daniel that we have a fully matured and classical example of this class of literature. The way, however, had in an especial degree been prepared for the apocalyptic type of thought and literature by Ezekiel, for with him the word of God had become identical with a written book (ii. 9–iii. 3) by the eating of which he learnt the will of God, just as primitive man conceived that the eating of the tree in Paradise imparted spiritual knowledge. When the divine word is thus conceived as a written message, the sole office of the prophet is to communicate what is written. Thus the human element is reduced to zero, and the conception of prophecy becomes mechanical. And as the personal element disappears in the conception of the prophetic calling, so it tends to disappear in the prophetic view of history, and the future comes to be conceived not as the organic result of the present under the divine guidance, but as mechanically determined from the beginning in the counsels of God, and arranged under artificial categories of time. This is essentially the apocalyptic conception of history, and Ezekiel may be justly represented as in certain essential aspects its founder in Israel.

We shall now consider (I.) Apocalyptic, its origin and general characteristics; (II.) Old Testament Apocalyptic; (III.) New Testament Apocalyptic.

I. APOCALYPTIC—ITS ORIGIN AND GENERAL CHARACTERISTICS

i. *Sources of Apocalyptic.*—The origin of Apocalyptic is to be sought in (*a*) unfulfilled prophecy and in (*b*) traditional elements drawn from various sources.

(*a*) The origin of Apocalyptic is to be sought in *unfulfilled prophecy.* That certain prophecies relating to the coming kingdom of God had clearly not been fulfilled was a matter of religious difficulty to the returned exiles from Babylon. The judgments predicted by the pre-exilic prophets had indeed been executed to the letter, but where were the promised glories of the renewed kingdom and Israel's unquestioned sovereignty over the nations of the earth? One such unfulfilled prophecy Ezekiel takes up and reinterprets in such a way as to show that its fulfilment is still to come. The prophets Jeremiah (iv.–vi.) and Zephaniah had foretold the invasion of Judah by a mighty people from the north. But as this northern foe had failed to appear Ezekiel re-edited this prophecy in a new form as a final assault of Gog and his hosts on Jerusalem, and thus established a permanent dogma in Jewish apocalyptic, which in due course passed over into Christian.

But the non-fulfilment of prophecies relating to this or that individual event or people served to popularize the methods of apocalyptic in a very slight degree in comparison with the non-fulfilment of the greatest of all prophecies—the advent of the Messianic kingdom. Thus, though Jeremiah had promised that after seventy years (xxv. 11., xxix. 10) Israel should be restored to their own land (xxiv. 5, 6), and then enjoy the blessings of the Messianic kingdom under the Messianic king (xxiii. 5, 6), this period passed by and things remained as of old. Haggai and Zechariah explained the delay by the failure of Judah to rebuild

the temple, and so generation after generation the hope of the kingdom persisted, sustained most probably by ever-fresh reinterpretations of ancient prophecy, till in the first half of the 2nd century the delay is explained in the Books of Daniel and Enoch as due not to man's shortcomings but to the counsels of God. The 70 years of Jeremiah are interpreted by the angel in Daniel (ix. 25-27) as 70 weeks of years, of which 69½ have already expired, while the writer of Enoch (lxxxv.–xc.) interprets the 70 years of Jeremiah as the 70 successive reigns of the 70 angelic patrons of the nations, which are to come to a close in his own generation.

But the above periods came and passed by, and again the expectations of the Jews were disappointed. Presently the Greek empire of the East was overthrown by Rome, and in due course this new phenomenon, so full of meaning for the Jews, called forth a new interpretation of Daniel. The fourth and last empire which, according to Daniel vii. 19-25, was to be Greek, was now declared to be Roman by the Apocalypse of Baruch (xxxvi.–xl.) and 4 Ezra (x. 60–xii. 35). Once more such ideas as those of "the day of Yahweh" and the "new heavens and a new earth" were constantly re-edited with fresh nuances in conformity with their new settings. Thus the inner development of Jewish apocalyptic was always conditioned by the historical experiences of the nation.

(*b*) Another source of apocalyptic was *primitive mythological and cosmological traditions*, in which the eye of the seer could see the secrets of the future no less surely than those of the past. Thus the six days of the world's creation, followed by a seventh of rest, were regarded as at once a history of the past and a forecasting of the future. As the world was made in six days its history would be accomplished in six thousand years, since each day with God was as a thousand years and a thousand years as one day; and as the six days of creation were followed by one of rest, so the six thousand years of the world's history would be followed by a rest of a thousand years (2 Enoch xxxii. 2–xxxiii. 2). Of primitive mythological traditions we might mention the primeval serpent, leviathan, behemoth, while to ideas native to or familiar in apocalyptic belong those of the seven archangels, the angelic patrons of the nations (Deut. xxxii. 8, in LXX.; Isaiah xxiv. 21; Dan. x. 13, 20, &c.), the mountain of God in the north (Isaiah xiv. 13; Ezek. i. 4, &c.), the garden of Eden.

ii. *Object and Contents of Apocalyptic.*—The object of this literature in general was to solve the difficulties connected with the righteousness of God and the suffering condition of His righteous servants on earth. The righteousness of God postulated according to the law the temporal prosperity of the righteous and the *temporal* prosperity of necessity; for as yet there was no promise of life or recompense beyond the grave. But this connexion was not found to obtain as a rule in life, and the difficulties arising from this conflict between promise and experience centred round the lot of the righteous as a community and the lot of the righteous man as an individual. Old Testament prophecy had addressed itself to both these problems, though it was hardly conscious of the claims of the latter. It concerned itself essentially with the present, and with the future only as growing organically out of the present. It taught the absolute need of personal and national righteousness, and foretold the ultimate blessedness of the righteous nation on the present earth. But its views were not systematic and comprehensive in regard to the nations in general, while as regards the individual it held that God's service here was its own and adequate reward, and saw no need of postulating another world to set right the evils of this. But later, with the growing claims of the individual and the acknowledgment of these in the religious and intellectual life, both problems, and especially the latter, pressed themselves irresistibly on the notice of religious thinkers, and made it impossible for any conception of the divine rule and righteousness to gain acceptance, which did not render adequate satisfaction to the claims of both problems. To render such satisfaction was the task undertaken by apocalyptic, as well as to vindicate the righteousness of God alike in respect of the individual and of the nation. To justify their contention they sketched in outline the history of the world and mankind, the origin of evil and its course, and the final consummation of all things. Thus they presented in fact a theodicy, a rudimentary philosophy of religion. The righteous as a nation should yet possess the earth, even in this world the faithful community should attain its rights in an eternal Messianic kingdom on earth, or else in temporary blessedness here and eternal blessedness hereafter. So far as regards the righteous community. It was, however, in regard to the destiny of the individual that apocalyptic rendered its chief service. Though the individual might perish amid the disorders of this world, he would not fail, apocalyptic taught, to attain through resurrection the recompense that was his due in the Messianic kingdom or in heaven itself. Apocalyptic thus forms the indispensable preparation for the religion of the New Testament.

iii. *Form of Apocalyptic.*—The form of apocalyptic is a literary form; for we cannot suppose that the writers experienced the voluminous and detailed visions we find in their books. On the other hand the reality of the visions is to some extent guaranteed by the writer's intense earnestness and by his manifest belief in the divine origin of his message. But the difficulty of regarding the visions as actual experiences, or as in any sense actual, is intensified, when full account is taken of the artifices of the writer; for the major part of his visions consists of what is to him really past history dressed up in the guise of prediction. Moreover, the writer no doubt intended that his reader should take the accuracy of the prediction (?) already accomplished to be a guarantee for the accuracy of that which was still unrealized. How, then, it may well be asked, can this be consistent with reality of visionary experience? Are we not here obliged to assume that the visions are a literary invention and nothing more?

However we may explain the inconsistency, we are precluded by the moral earnestness of the writer from assuming the visions to be pure inventions. But the inconsistency has in part been explained by Gunkel, who has rightly emphasized that the writer did not freely invent his materials but derived them in the main from tradition, as he held that these mysterious traditions of his people were, if rightly expounded, forecasts of the time to come. Furthermore, the visionary who is found at most periods of great spiritual excitement was forced by the prejudice of his time, which refused to acknowledge any inspiration in the present, to ascribe his visionary experiences and reinterpretations of the mysterious traditions of his people to some heroic figure of the past. Moreover, there will always be a difficulty in determining what belongs to his actual vision and what to the literary skill or free invention of the author, seeing that the visionary must be dependent on memory and past experience for the forms and much of the matter of the actual vision.

iv. *Apocalyptic as distinguished from Prophecy.*—We have already dwelt on certain notable differences between apocalyptic and prophecy; but there are certain others that call for attention.

(*a*) *In the Nature of its Message.*—The message of the prophets was primarily a preaching of repentance and righteousness if the nation would escape judgment; the message of the apocalyptic writers was of patience and trust for that deliverance and reward were sure to come.

(*b*) *By its dualistic Theology.*—Prophecy believes that this world is God's world and that in this world His goodness and truth will yet be vindicated. Hence the prophet prophesies of a definite future arising out of and organically connected with the present. The apocalyptic writer on the other hand despairs of the present, and directs his hopes absolutely to the future, to a new world standing in essential opposition to the present. (*Non fecit Altissimus unum saeculum sed duo*, 4 Ezra vii. 50.) Here we have essentially a dualistic principle, which, though it can largely be accounted for by the interaction of certain inner tendencies and outward sorrowful experience on the part of Judaism, may ultimately be derived from Mazdean influences. This principle, which shows itself clearly at first in the conception that the various nations are under angelic rulers, who are in a greater or less degree in rebellion against God, as in Daniel and

Enoch, grows in strength with each succeeding age, till at last Satan is conceived as "the ruler of this world" (John xii. 31) or "the god of this age" (2 Cor. iv. 4). Under the guidance of such a principle the writer naturally expected the world's culmination in evil to be the immediate precursor of God's intervention on behalf of the righteous, and every fresh growth in evil to be an additional sign that the time was at hand. The natural concomitant in conduct of such a belief is an uncompromising asceticism. He that would live to the next world must shun this. Visions are vouchsafed only to those who to prayer have added fasting.

(*c*) *By pseudonymous Authorship.*—We have already touched on this characteristic of apocalyptic. The prophet stood in direct relations with his people; his prophecy was first spoken and afterwards written. The apocalyptic writer could obtain no hearing from his contemporaries, who held that, though God spoke in the past, "there was no more any prophet." This pessimism and want of faith limited and defined the form in which religious enthusiasm should manifest itself, and prescribed as a condition of successful effort the adoption of pseudonymous authorship. The apocalyptic writer, therefore, professedly addressed his book to future generations. Generally directions as to the hiding and sealing of the book (Dan. xii. 4, 9; 1 Enoch i. 4; Ass. Mos. i. 16-18) were given in the text in order to explain its publication so long after the date of its professed period. Moreover, there was a sense in which such books were not wholly pseudonymous. Their writers were students of ancient prophecy and apocalyptical tradition, and, though they might recast and reinterpret them, they could not regard them as their own inventions. Each fresh apocalypse would in the eyes of its writer be in some degree but a fresh edition of the traditions naturally attaching themselves to great names in Israel's past, and thus the books named respectively Enoch, Noah, Ezra would to some slight extent be not pseudonymous.

(*d*) *By its comprehensive and deterministic Conception of History.*—Apocalyptic took an indefinitely wider view of the world's history than prophecy. Thus, whereas prophecy had to deal with temporary reverses at the hands of some heathen power, apocalyptic arose at a time when Israel had been subject for generations to the sway of one or other of the great world-powers. Hence to harmonize such difficulties with belief in God's righteousness, it had to take account of the rôle of such empires in the counsels of God, the rise, duration and downfall of each in turn, till finally the lordship of the world passed into the hands of Israel, or the final judgment arrived. These events belonged in the main to the past, but the writer represented them as still in the future, arranged under certain artificial categories of time definitely determined from the beginning in the counsels of God and revealed by Him to His servants the prophets. Determinism thus became a leading characteristic of Jewish apocalyptic, and its conception of history became severely mechanical.

II. Old Testament Apocalyptic

i. Canonical:—

Isaiah xxiv.—xxvii.; xxxiii.; xxxiv.–xxxv.
(Jeremiah xxxiii. 14-26?)
Ezekiel ii. 8; xxxviii.–xxxix.
Joel iii. 9-17.
Zech. xii.–xiv.
Daniel.

We cannot enter here into a discussion of the above passages and books.[1] All are probably pseudepigraphic except the passages from Ezekiel and Joel. Of the remaining passages and books Daniel belongs unquestionably to the Maccabean period, and the rest possibly to the same period. Isaiah xxxiii. was probably written about 163 B.C. (Duhm and Marti); Zech. xii.–xiv. about 160 B.C., Isaiah xxiv.–xxvii. about 128 B.C., and xxxiv.–xxxv. sometime in the reign of John Hyrcanus. Jeremiah xxxiii. 14–26 is assigned by Marti to Maccabean times, but this is highly questionable.

[1] See the separate headings for the various apocalyptic books mentioned in this article.

ii. Extra-canonical:—

(a) *Palestinian*:—

(200–100 B.C.)
Book of Noah.
1 Enoch vi.–xxxvi.; lxxii.–xc.
Testaments of the XII. Patriarchs.

(100 B.C. to 1 B.C.)
1 Enoch i.–v.; xxxvii.–lxxi.; xci.–civ.
Testaments of the XII. Patriarchs, *i.e.* T. Lev. x., xiv.–xvi., T. Jud. xxi. 6–xxiii, T. Zeb. ix., T. Dan. v. 6, 7.
Psalms of Solomon.

(A.D. 1–100 and later.)
Assumption of Moses.
Apocalypse of Baruch.
4 Ezra.
Greek Apocalypse of Baruch.
Apocalypse of Zephaniah.
Apocalypse of Abraham.
Prayer of Joseph.
Book of Eldad and Modad.
Apocalypse of Elijah.

(b) *Hellenistic*:—
2 Enoch.
Oracles of Hystaspes.
Testament of Job.
Testaments of the III. Patriarchs.
Sibylline Oracles (excluding Christian portions).

Book of Noah.— Though this book has not come down to us independently, it has in large measure been incorporated in the Ethiopic Book of Enoch, and can in part be reconstructed from it. The Book of Noah is mentioned in Jubilees x. 13, xxi. 10. Chapters lx., lxv.–lxix. 25 of the Ethiopic Enoch are without question derived from it. Thus lx. 1 runs: "In the year 500, in the seventh month . . . in the life of Enoch." Here the editor simply changed the name Noah in the context before him into Enoch, for the statement is based on Gen. v. 32, and Enoch lived only 365 years. Chapters vi.–xi. are clearly from the same source; for they make no reference to Enoch, but bring forward Noah (x. 1) and treat of the sin of the angels that led to the flood, and of their temporal and eternal punishment. This section is compounded of the Semjaza and Azazel myths, and in its present composite form is already presupposed by 1 Enoch lxxxviii.–xc. Hence these chapters are earlier than 166 B.C. Chapters cvi.–cvii. of the same book are probably from the same source; likewise liv. 7–lv. 2, and Jubilees vii. 20-39, x. 1-15. In the former passage of Jubilees the subject-matter leads to this identification, as well as the fact that Noah is represented as speaking in the first person, although throughout Jubilees it is the angel that speaks. Possibly Eth. En. xli. 3-8, xliii.-xliv., lix. are from the same work. The book may have opened with Eth. En. cvi.–cvii. On these chapters may have followed Eth. En. vi.–xi., lxv.–lxix. 25, lx., xli. 3-8, xliii.–xliv., liv. 7–lv. 2; Jubilees vii. 26-39, x. 1-15.

The Hebrew Book of Noah, a later work, is printed in Jellinek's *Bet ha-Midrasch*, iii. 155-156, and translated into German in Rönsch, *Das Buch der Jubiläen*, 385-387. It is based on the part of the above Book of Noah which is preserved in the *Book of Jubilees*. The portion of this Hebrew work which is derived from the older work is reprinted in Charles's *Ethiopic Version of the Hebrew Book of Jubilees*, p. 179.

1 Enoch, or the Ethiopic Book of Enoch.— This is the most important of all the apocryphal writings for the history of religious thought. Like the Pentateuch, the Psalms, the Megilloth and the Pirke Aboth, this work was divided into five parts, which, as we shall notice presently, spring from five different sources. Originally written partly in Aramaic (*i.e.* vi.–xxxvi.) and partly in Hebrew (i.–vi., xxxvii.–cviii.), it was translated into Greek, and from Greek into Ethiopic and possibly Latin. Only one-fifth of the Greek version in two forms survives. The various elements of the book were written by different authors at different dates. vi.–xxxvi. was written before 166 B.C., lxxii.–lxxxii. before the *Book of Jubilees*, *i.e.* before 120 B.C. or thereabouts, lxxxiii.–xc. about 166 B.C., i.–v., xci.–civ. before 95 B.C., and xxxvii.–lxxi. before 64 B.C. There are many interpolations drawn mainly from the Book of Noah.

Testaments of the XII. Patriarchs.—This book, in some respects

the most important of Old Testament apocryphs, has only recently come into its own. Till a few years ago, owing to Christian interpolations, it was taken to be a Christian apocryph, written originally in Greek in the 2nd century A.D. Now it is acknowledged by Christian and Jewish scholars alike to have been written in Hebrew in the 2nd century B.C. From Hebrew it was translated into Greek and from Greek into Armenian and Slavonic. The versions have come down in their entirety, and small portions of the Hebrew text have been recovered from later Jewish writings. The Testaments were written about the same date as the *Book of Jubilees*. These two books form the only Apology in Jewish literature for the religious and civil hegemony of the Maccabees from the Pharisaic standpoint. To the Jewish interpolation of the 1st century B.C. (about 60–40), *i.e.* T. Lev. x., xiv.–xvi.; T. Jud. xxii.–xxiii., &c., a large interest attaches; for these, like 1 Enoch xci.–civ. and the Psalms of Solomon, constitute an unmeasured attack on every office—prophetic, priestly and kingly—administered by the Maccabees. The ethical character of the book is of the highest type, and its profound influence on the writers of the New Testament is yet to be appreciated. (See TESTAMENTS OF THE XII. PATRIARCHS.)

Psalms of Solomon.—These psalms, in all eighteen, enjoyed but small consideration in early times, for only six direct references to them are found in early literature. Their ascription to Solomon is due solely to the copyists or translators, for no such claim is made in any of the psalms. On the whole, Ryle and James are no doubt right in assigning 70–40 B.C. as the limits within which the psalms were written. The authors were Pharisees. They divide their countrymen into two classes—"the righteous," ii. 38-39, iii. 3-5, 7, 8, &c., and "the sinners," ii. 38, iii. 13, iv. 9, &c.; "the saints," iii. 10, &c., and "the transgressors," iv. 11, &c. The former are the Pharisees; the latter the Sadducees. They protest against the Asmonaean house for usurping the throne of David, and laying violent hands on the high priesthood (xvii. 5, 6, 8), and proclaim the coming of the Messiah, the Son of David, who is to set all things right and establish the supremacy of Israel. Pss. xvii.–xviii. and i.–xvi. cannot be assigned to the same authorship. The hopes of the Messiah are confined to the former, and a somewhat different eschatology underlies the two works. Since the Psalms were written in Hebrew, and intended for public worship in the synagogues, it is most probable that they were composed in Palestine. (See SOLOMON, THE PSALMS OF.)

The Assumption of Moses.—This book was lost for many centuries till a large fragment of it was discovered and published by Ceriani in 1861 (*Monumenta Sacra*, I. i. 55-64) from a palimpsest of the 6th century. Very little was known about the contents of this book prior to this discovery. The present book is possibly the long-lost Διαθήκη Μωυσέως mentioned in some ancient lists, for it never speaks of the assumption of Moses, but always of his natural death. About a half of the original Testament is preserved in the Latin version. The latter half probably dealt with questions about the creation. With this "Testament" the "Assumption," to which almost all the patristic references and that of Jude are made, was subsequently edited. The book was written between 4 B.C. and A.D. 7. As for the author, he was no Essene, for he recognizes animal sacrifices and cherishes the Messianic hope; he was not a Sadducee, for he looks forward to the establishment of the Messianic kingdom (x.); nor a Zealot, for the quietistic ideal is upheld (ix.), and the kingdom is established by God Himself (x.). He is therefore a Chasid of the ancient type, and glorifies the ideals which were cherished by the old Pharisaic party, but which were now being fast disowned in favour of a more active rôle in the political life of the nation. He pours his most scathing invectives on the Sadducees, who are described in vii. in terms that recall the anti-Sadducean Psalms of Solomon. His object, therefore, is to protest against the growing secularization of the Pharisaic party through its adoption of popular Messianic beliefs and political ideals. (See also MOSES, ASSUMPTION OF.)

Apocalypse of Baruch—The Syriac.—This apocalypse has survived only in the Syriac version. The Syriac is a translation from the Greek, and the Greek in turn from the Hebrew. The book treats of the Messiah and the Messianic kingdom, the woes of Israel in the past and the destruction of Jerusalem in the present, as well as of theological questions relating to original sin, free will, works, &c. The views expressed on several of these subjects are often conflicting. We must, therefore, assume a number of independent sources put together by an editor or else that the book is on the whole the work of one author who made use of independent writings but failed to blend them into one harmonious whole. In its present form the book was written soon after A.D. 70. For fuller treatment see BARUCH.

4 Ezra.—This apocryph is variously named. In the first Arabic and Ethiopic versions it is called 1 Ezra; in some Latin MSS. and in the English authorized version it is 2 Ezra, and in the Armenian 3 Ezra. With the majority of the Latin MSS. we designate the book 4 Ezra. In its fullest form this apocryph consists of sixteen chapters, but i.–ii. and xv.–xvi. are of different authorship from each other and from the main work iii.–xiv. The book was written originally in Hebrew. There are Latin, Syriac, Ethiopic, Arabic (two), and Armenian versions. The Greek version is lost. This apocalypse is of very great importance, on account of its very full treatment of the theological questions rife in the latter half of the 1st century of the Christian era. The book, even if written by one author, was based on a variety of already existing works. It springs from the same school of thought as the *Apocalypse of Baruch*, and its affinities with the latter are so numerous and profound that scholars have not yet come to any consensus as to the relative priority of either. In its present form it was composed A.D. 80–100. For fuller treatment see EZRA.

Apocalypse of Baruch—The Greek.—This work is referred to by Origen (*de Princip.* II. iii. 6): "Denique etiam Baruch prophetae librum in assertionis hujus testimonium vocant, quod ibi de septem mundis vel caelis evidentius indicatur." This book survives in two forms in Slavonic and Greek. The former was translated by Bonwetsch in 1896, in the *Nachrichten von der königl. Ges. der Wiss. zu Gött.* pp. 91-101; the latter by James in 1897 in *Anecdota*, ii. 84-94, with an elaborate introduction (pp. li.-lxxi.). The Slavonic is only of secondary value, as it is merely an abbreviated form of the Greek. Even the Greek cannot claim to be the original work, but only to be a recension of it; for, whereas Origen states that this apocalypse contained an account of the seven heavens, the existing Greek work describes only five, and the Slavonic only two. As the original work presupposes 2 Enoch and the Syriac *Apocalypse of Baruch* and was known to Origen, it was written between A.D. 80 and 200, and nearer the earlier date than the later, as it would otherwise be hard to understand how it came to circulate among Christians. The superscription shows points of connexion with the *Rest of the Words of Baruch*, but little weight can be attached to the fact, since titles and superscriptions were so frequently transformed and expanded in ancient times. As James and Kohler have pointed out, part of section 4 on the Vine is a Christian addition. A German translation of the Greek appears in Kautzsch's *Apok. u. Pseud.* ii. 448-457, and a strong article by Kohler on the Jewish authorship of the book in the *Jewish Encyclopedia*, ii. 549-551. (See BARUCH.)

Apocalypse of Abraham.—This book is found only in the Slavonic (edited by Bonwetsch, *Studien zur Geschichte d. Theologie und Kirche*, 1897), a translation from the Greek. It is of Jewish origin, but in part worked over by a Christian reviser. The first part treats of Abraham's conversion, and the second forms an apocalyptic expansion of Gen. xv. This book was possibly known to the author of the *Clem. Recognitions*, i. 32, a passage, however, which may refer to Jubilees. It is most probably distinct from the Ἀποκάλυψις Ἀβραάμ used by the gnostic Sethites (Epiphanius, *Haer.* xxxix. 5), which was very heretical. On the other hand, it is probably identical with the apocryphal book Ἀβραάμ mentioned in the Stichometry of Nicephorus, and the Synopsis Athanasii, together with the Apocalypses of Enoch, &c.

Lost Apocalypses: Prayer of Joseph.—The *Prayer of Joseph* is quoted by Origen [*In Joann.* II. xxv. (Lommatzsch, i. 147, 148); *in Gen.* III. ix. (Lommatzsch, viii. 30-31)]. The fragments in Origen represent Jacob as speaking and claiming to be "the first servant in God's presence," "the first-begotten of every creature animated by God," and declaring that the angel who wrestled with Jacob (and was identified by Christians with Christ) was only eighth in rank. The work was obviously anti-Christian. (See Schürer[3], iii. 265-266.)

Book of Eldad and Modad.—This book was written in the name of the two prophets mentioned in Num. xi. 26-29. It consisted, according to the Targ. Jon. on Num. xi. 26-29, mainly of prophecies on Magog's last attack on Israel. The Shepherd of Hermas quotes it *Vis.* ii. 3. (See Marshall in Hastings' *Bible Dictionary*, i. 677.)

Apocalypse of Elijah.—This apocalypse is mentioned in two of the lists of books. Origen, Ambrosiaster, and Euthalius ascribe to it 1 Cor. ii. 9. If they are right, the apocalypse is pre-Pauline. The peculiar form in which 1 Cor. ii. 9 appears in Clemens Alex. *Protrept.* x. 94, and the *Const. Apost.* vii. 32, shows that both have the same source, probably this apocalypse. Epiphanius (*Haer.* xlii., ed. Oehler, vol. ii. 678) ascribes to this work Eph. v. 14. Isr. Lévi (*Revue des études juives*, 1880, i. 108 sqq.) argues for the existence of a Hebrew apocalypse of Elijah from two Talmudic passages. A late work of this name has been published by Jellinek, *Bet ha-Midrasch*, 1855, iii. 65-68, and Buttenwieser in 1897. Zahn, *Gesch. des N. T. Kanons*, ii. 801-810, assigns this apocalypse to the 2nd century A.D. (See Schürer[3], iii. 267-271.)

Apocalypse of Zephaniah.—Apart from two of the lists this work is known to us in its original form only through a citation in Clem. Alex. *Strom.* v. 11, 77. A Christian revision of it is probably preserved in the two dialects of Coptic. Of these the Akhmim text is the original of the Sahidic. These texts and their translations have been edited by Steindorff, *Die Apokalypse des Elias, eine unbekannte Apokalypse und Bruchstücke der Sophonias-Apokalypse* (1899). As Schürer (*Theol. Literaturzeitung*, 1899, No. I. 4-8) has shown, these fragments belong most probably to the Zephaniah apocalypse. They give descriptions of heaven and hell, and predictions of the Antichrist. In their present form these Christianized fragments are not earlier than the 3rd century. (See Schürer, *Gesch. des jüd. Volkes*[3], iii. 271-273.)

2 Enoch, or the *Slavonic Enoch*, or the *Book of the Secrets of Enoch.*—This new fragment of the Enochic literature was recently brought to light through five MSS. discovered in Russia and Servia. The book in its present form was written before A.D. 70 in Greek by an orthodox Hellenistic Jew, who lived in Egypt. For a fuller account see ENOCH.

Oracles of Hystaspes.—See under *N. T. Apocalypses*, below.

Testament of Job.— This book was first printed from one MS. by Mai, *Script. Vet. Nov. Coll.* (1833), VII. i. 180, and translated into French in Migne's *Dict. des Apocryphes*, ii. 403. An excellent edition from two MSS. is given by M. R. James, *Apocrypha Anecdota*, ii. pp. lxxii.-cii., 104-137, who holds that the book in its present form was written by a Christian Jew in Egypt on the basis of a Hebrew Midrash on Job in the 2nd or 3rd century A.D. Kohler (*Kohut Memorial Volume*, 1897, pp. 264-338) has given good grounds for regarding the whole work, with the exception of some interpolations, as "one of the most remarkable productions of the pre-Christian era, explicable only when viewed in the light of Hasidean practice." See *Jewish Encycl.* vii. 200-202.

Testaments of the III. Patriarchs.—For an account of these three Testaments (referred to in the *Apost. Const.* vi. 16), the first of which only is preserved in the Greek and is assigned by James to the 2nd century A.D., see that scholar's "Testament of Abraham," *Texts and Studies*, ii. 2 (1892), which appears in two recensions from six and three MSS. respectively, and Vassiliev's *Anecdota Graeco-Byzantina* (1893), pp. 292-308, from one MS. already used by James. This work was written in Egypt, according to James, and survives also in Slavonic, Rumanian, Ethiopic, and Arabic versions. It deals with Abraham's reluctance to die and the means by which his death was brought about. James holds that this book is referred to by Origen (*Hom. in Luc.* xxxv.), but this is denied by Schürer, who also questions its Jewish origin. With the exception of chaps. x.-xi., it is really a legend and not an apocalypse. An English translation of James's texts will be found in the *Ante-Nicene Christian Library* (Clark, 1897), pp. 185-201. The Testaments of Isaac and Jacob are still preserved in Arabic and Ethiopic (see James, *op. cit.* 140-161). See TESTAMENTS OF THE III. PATRIARCHS.

Sibylline Oracles.—Of the books which have come down to us the main part is Jewish, and was written at various dates. iii. 97-829, iv.-v. are decidedly of Jewish authorship, and probably xi.-xii., xiv. and parts of i.-ii. The oldest portions are in iii., and belong to the 2nd century B.C.

III. NEW TESTAMENT APOCALYPTIC

When we pass from Jewish literature to that of the New Testament, we enter into a new and larger atmosphere at once recalling and transcending what had been best in the prophetic periods of the past. Again the heavens had opened and the divine teaching come to mankind, no longer merely in books bearing the names of ancient patriarchs, but on the lips of living men, who had taken courage to appear in person as God's messengers before His people. But though Christianity was in spirit the descendant of ancient Jewish prophecy, it was no less truly the child of that Judaism which had expressed its highest aspirations and ideals in pseudepigraphic and apocalyptic literature. Hence we shall not be surprised to find that the two tendencies are fully represented in primitive Christianity, and, still more strange as it may appear, that New Testament apocalyptic found a more ready hearing amid the stress and storm of the 1st century than the prophetic side of Christianity, and that the type of the forerunner on the side of its declared asceticism appealed more readily to primitive Christianity than that of Him who came "eating and drinking," declaring both worlds good and both God's.

Early Christianity had thus naturally a special fondness for this class of literature. It was Christianity that preserved Jewish apocalyptic, when it was abandoned by Judaism as it sank into Rabbinism, and gave it a Christian character either by a forcible exegesis or by a systematic process of interpolation. Moreover, it cultivated this form of literature and made it the vehicle of its own ideas. Though apocalyptic served its purpose in the opening centuries of the Christian era, it must be confessed that in *many* of its aspects its office is transitory, as they belong not to the essence of Christian thought. When once it had taught men that the next world was God's world, though it did so at the cost of relinquishing the present to Satan, it had achieved its real task, and the time had come for it to quit the stage of history, when Christianity appeared as the heir of this true spiritual achievement. But Christianity was no less assuredly the heir of ancient prophecy, and thus as spiritual representative of what was true in prophecy and apocalyptic; its essential teaching was as that of its Founder that both worlds were of God and that both should be made God's.

(i.) Canonical:—
- Apocalypse in Mark xiii. (Matthew xxiv., Luke xxi.).
- 2 Thessalonians ii.
- Revelation.

(ii.) Extra-Canonical:—
- Apocalypse of Peter.
- Testament of Hezekiah.
- Testament of Abraham.
- Oracles of Hystaspes.
- Vision of Isaiah.
- Shepherd of Hermas.
- 5 Ezra.
- 6 Ezra.
- Christian Sibyllines.
- Apocalypses of Paul, Thomas and Stephen.
- Apocalypses of Esdras, Paul, John, Peter, The Virgin, Sedrach, Daniel.
- Revelations of Bartholomew.
- Questions of Bartholomew.

Apocalypse in Mark xiii.—According to the teaching of the Gospels the second advent was to take the world by surprise. Only one passage (Mark xiii. = Matt. xxiv. = Luke xxi.) conflicts with this view, and is therefore suspicious. This represents the second advent as heralded by a succession of signs which are unmistakable precursors of its appearance, such as wars, earthquakes, famines, the destruction of Jerusalem and the like. Our suspicion is justified by a further examination of Mark xiii. For the words "let him that *readeth* understand" (ver. 14) indicate that the prediction referred to appeared first not in a spoken address but in a written form, as was characteristic of apocalypses. Again, in ver. 30, it is declared that this generation shall not pass away until all these things be fulfilled, whereas in 32 we have an undoubted declaration of Christ "Of that day or of that hour knoweth no one, not even the angels in heaven, neither the Son, but the Father." On these and other grounds verses 7, 8, 14-20, 24-27, 30, 31 should be removed from their present context. Taken together they constitute a Christian adaptation of an originally Jewish work, written A.D. 67–68, during the troubles preceding the fall of Jerusalem. The apocalypse consists of three Acts: Act i. consisting of verses 7, 8, enumerating the woes heralding the parusia, Act ii. describing the actual tribulation, and Act iii. the parusia itself. (See Wendt, *Lehre Jesu*, i. 12-21; Charles, *Eschatology*, 325 sqq.; H. S. Holtzmann, *N. T. Theol.* 1-325 sqq. with literature there given.)

2 Thessalonians ii.—The earliest form of Pauline eschatology is essentially Jewish. He starts from the fundamental thought of Jewish apocalyptic that the end of the world will be brought about by the direct intervention of God when evil has reached its climax. The manifestation of evil culminates in the Antichrist whose parusia (2 Thess. ii. 9) is the Satanic counterfeit of that of the true Messiah. But the climax of evil is the immediate herald of its destruction; for thereupon Christ will descend from heaven and destroy the Antichrist (ii. 8). Nowhere in his later epistles does this forecast of the future reappear. Rather under the influence of the great formative Christian conceptions he parted gradually with the eschatology he had inherited from Judaism, and entered on a progressive development, in the course of which the heterogeneous elements were for the most part silently dropped.

Revelation.—Since this book is discussed separately we shall content ourselves here with indicating a few of the conclusions now generally accepted. The apocalypse was written about A.D. 96. Its object, like other Jewish apocalypses, was to encourage faith under persecution; its burden is not a call to repentance but a promise of deliverance. It is derived from one author, who has made free use of a variety of elements, some of which are Jewish and consort but ill with their new context. The question of the pseudonymity of the book is still an open one.

Apocalypse of Peter.—Till 1892 only some five or more fragments of this book were known to exist. These are preserved in Clem. Alex. and in Macarius Magnes (see Hilgenfeld, *N.T. extra Can.* iv. 74 sqq.; Zahn, *Gesch. Kanons*, ii. 818-819). It is mentioned in the Muratorian Canon, and according to Eusebius (*H.E.* vi. 14. 1) was commented on by Clement of Alexandria. In the fragment found at Akhmim there is a prediction of the last things, and a vision of the abode and blessedness of the righteous, and of the abode and torments of the wicked.

Testament of Hezekiah.—This writing is fragmentary, and has been preserved merely as a constituent of the Ascension of Isaiah. To it belongs iii. 13b-iv. 18 of that book. It is found under the above name, *Διαθήκη Ἐζεκίου*, only in Cedrenus i. 120-121, who quotes partially iv. 12. 14 and refers to iv. 15-18. For a full account see ISAIAH, ASCENSION OF.

Testament of Abraham.—This work in two recensions was first published by James, *Texts and Studies*, ii. 2. Its editor is of opinion that it was written by a Jewish Christian in Egypt in the 2nd century A.D., but that it embodies legends of an earlier date, and that it received its present form in the 9th or 10th century. It treats of Michael being sent to announce to Abraham his death: of the tree speaking with a human voice (iii.), Michael's sojourn with Abraham (iv.-v.) and Sarah's recognition of him as one of the three angels, Abraham's refusal to die (vii.), and the vision of judgment (x.-xx.).

Oracles of Hystaspes.—This eschatological work (*Χρήσεις Ὑστάσπου*: so named by the anonymous 5th-century writer in Buresch, *Klaros*, 1889, p. 95) is mentioned in conjunction with the Sibyllines by Justin (*Apol.* i. 20), Clement of Alexandria (*Strom.* vi. 5), and Lactantius (*Inst.* VII. xv. 19; xviii. 2-3). According to Lactantius, it prophesied the overthrow of Rome and the advent of Zeus to help the godly and destroy the wicked, but omitted all reference to the sending of the Son of God. According to Justin, it prophesied the destruction of the world by fire. According to the *Apocryph of Paul*, cited by Clement, Hystaspes foretold the conflict of the Messiah with many kings and His advent. Finally, an unknown 5th-century writer (see Buresch, *Klaros*, 1889, pp. 87-126) says that the *Oracles of Hystaspes* dealt with the incarnation of the Saviour. The work referred to in the last two writers has Christian elements, which were absent from it in Lactantius's copy. The lost oracles were therefore in all probability originally Jewish, and subsequently re-edited by a Christian.

Vision of Isaiah.—This writing has been preserved in its entirety in the *Ascension of Isaiah*, of which it constitutes chaps. vi.-xi. Before its incorporation in the latter work it circulated independently in Greek. There are independent versions of these chapters in Latin and Slavonic. (See ISAIAH, ASCENSION OF.)

Shepherd of Hermas.—In the latter half of the 2nd century this book enjoyed a respect bordering on that paid to the writings of the New Testament. Irenaeus, Clement of Alexandria and Origen quote it as Scripture, though in Africa it was not held in such high consideration, as Tertullian speaks slightingly of it. The writer belongs really to the prophetic and not to the apocalyptic school. His book is divided into three parts containing visions, commands, similitudes. In incidental allusions he lets us know that he had been engaged in trade, that his wife was a termagant, and that his children were ill brought up. Various views have been held as to the identity of the author. Thus some have made him out to be the Hermas to whom salutation is sent at the end of the Epistle to the Romans, others that he was the brother of Pius, bishop of Rome in the middle of the 2nd century, and others that he was a contemporary of Clement, bishop of Rome at the close of the 1st century. Zahn fixes the date at 97, Salmon a few years later, Lipsius 142. The literature of this book (see HERMAS, SHEPHERD OF) is very extensive. Among the chief editions are those of Zahn, *Der Hirt des Hermas* (1868); Gebhardt and Harnack, *Patres Apostolici* (1877, with full bibliographical material); Funk, *Patres Apost.* (1878). Further see Harnack, *Gesch. d. altchristl. Literatur*, i. 49-58; II. i. 257-267, 437 f.

5 Ezra.—This book, which constitutes in the later MSS. the first two chapters to 4 Ezra, falls obviously into two parts. The first (i. 5–ii. 9) contains a strong attack on the Jews whom it regards as the people of God; the second (ii. 10-47) addresses itself to the Christians as God's people and promises them the heavenly kingdom. It is not improbable that these chapters are based on an earlier Jewish writing. In its present form it may have been written before A.D. 200, though James and other scholars assign it to the 3rd century. Its tone is strongly anti-Jewish. The style is very vigorous and the materials of a strongly apocalyptic character. See Hilgenfeld, *Messias Judaeorum* (1869); James in Bensly's edition of 4 Ezra, pp. xxxviii.-lxxx.; Weinel in Hennecke's *N.T. Apokryphen*, 331-336.

6 Ezra.—This work consists of chapters xv.-xvi. of 4 Ezra. It may have been written as an appendix to 4 Ezra, as it has no proper introduction. Its contents relate to the destruction of the world through war and natural catastrophes—for the heathen a source of menace and fear, but for the persecuted people of God one of admonition and comfort. There is nothing specifically Christian in the book, which represents a persecution which extends over the whole eastern part of the Empire. Moreover, the idiom is particularly Semitic. Thus we have xv. 8 *nec*

sustinebo in his quae inique exercent, that is ב אוי: in 9 *vindicans vindicabo*: in 22 *non parcet dextera mea super peccatores* = φείσεται . . . ἐπὶ = ע . . . חמל. In verses 9, 19 the manifest corruptions may be explicable from a Semitic background. There are other Hebraisms in the text. It is true that these might have been due to the writer's borrowings from earlier Greek works ultimately of Hebrew origin. The date of the book is also quite uncertain, though several scholars have ascribed it to the 3rd century.

Christian Sibyllines.—Critics are still at variance as to the extent of the Christian Sibyllines. It is practically agreed that vi.-viii. are of Christian origin. As for i.-ii., xi.-xiv. most writers are in favour of Christian authorship; but not so Geffcken (ed. *Sibyll.*, 1902), who strongly insists on the Jewish origin of large sections of these books.

Apocalypses of Paul, Thomas and Stephen.—These are mentioned in the Gelasian decree. The first may possibly be the Ἀναβατικὸν Παύλου mentioned by Epiphanius (*Haer.* xxxviii. 2) as current among the Cainites. It is not to be confounded with the apocalypse mentioned two sections later.

Apocalypse of Esdras.—This Greek production resembles the more ancient fourth book of Esdras in some respects. The prophet is perplexed about the mysteries of life, and questions God respecting them. The punishment of the wicked especially occupies his thoughts. Since they have sinned in consequence of Adam's fall, their fate is considered worse than that of the irrational creation. The description of the tortures suffered in the infernal regions is tolerably minute. At last the prophet consents to give up his spirit to God, who has prepared for him a crown of immortality. The book is a poor imitation of the ancient Jewish one. It may belong, however, to the 2nd or 3rd centuric of the Christian era. See Tischendorf, *Apocalypses Apocryphae*, pp. 24-33.

Apocalypse of Paul.—This work (referred to by Augustine, *Tractat. in Joan.* 98) contains a description of the things which the apostle saw in heaven and hell. The text, as first published in the original Greek by Tischendorf (*Opacalypses Apocr.* 34-869), consists of fifty-one chapters, but is imperfect. Internal evidence assigns it to the time of Theodosius, *i.e.* about A.D. 388. Where the author lived is uncertain. Dr Perkins found a Syriac MS. of this apocalypse, which he translated into English, and printed in the *Journal of the American Oriental Society*, 1864, vol. viii. This was republished by Tischendorf below the Greek version in the above work. In 1893 the Latin version from one MS. was edited by M. R. James, *Texts and Studies*, ii. 1-42, who shows that the Latin version is the completest of the three, and that the Greek in its present form is abbreviated.

Apocalypse of John (Tischendorf, *Apocalypses Apocr.* 70 sqq.) contains a description of the future state, the general resurrection and judgment, with an account of the punishment of the wicked, as well as the bliss of the righteous. It appears to be the work of a Jewish Christian. The date is late, for the writer speaks of the "venerable and holy images," as well as "the glorious and precious crosses and the sacred things of the churches" (xiv.), which points to the 5th century, when such things were first introduced into churches. It is a feeble imitation of the canonical apocalypse.

Arabic Apocalypse of Peter contains a narrative of events from the foundation of the world till the second advent of Christ. The book is said to have been written by Clement, Peter's disciple. This Arabic work has not been printed, but a summary of the contents is given by Nicoll in his catalogue of the Oriental MSS. belonging to the Bodleian (p. 49, xlviii.). There are eighty-eight chapters. It is a late production; for Ishmaelites are spoken of, the Crusades, and the taking of Jerusalem. See Tischendorf, *Apocalypses Apocr.* pp. xx.-xxiv.

The Apocalypse of the Virgin, containing her descent into hell, is not published entire, but only several portions of it from Greek MSS. in different libraries, by Tischendorf in his *Apocalypses Apocryphae*, pp. 95 sqq.; James, *Texts and Studies*, ii. 3. 109-126.

Apocalypse of Sedrach.—This late apocalypse, which M. R. James assigns to the 10th or 11th century, deals with the subject of intercession for sinners and Sedrach's unwillingness to die. See James, *Texts and Studies*, ii. 3. 127-137.

Apocalypse of Daniel.—See Vassiliev's *Anecdota Graeco-Byzantina* (Moscow, 1893), pp. 38-44; *Uncanonical Books of the Old Testament* (Venice, 1901), pp. 237 sqq., 387 sqq.

The Revelations of Bartholomew.—Dulaurier published from a Parisian Sahidic MS., subjoining a French translation, what is termed a fragment of the apocryphal revelations of St Bartholomew (*Fragment des révélations apocryphes de Saint Barthélemy, &c.*, Paris, 1835), and of the history of the religious communities founded by St Pachomius. After narrating the pardon obtained by Adam, it is said that the Son ascending from Olivet prays the Father on behalf of His apostles; who consequently receive consecration from the Father, together with the Son and Holy Spirit—Peter being made archbishop of the universe. The late date of the production is obvious.

Questions of St Bartholomew.—See Vassiliev, *Anec. Graeco-Byzantina* (1893), pp. 10-22. The introduction, which is wanting in the Greek MS., has been supplied by a Latin translation from the Slavonic version (see pp. vii.-ix.). The book contains disclosures by Christ, the Virgin and Beliar and much of the subject-matter is ancient. (R. H. C.)

APOCATASTASIS, a Greek word, meaning "re-establishment," used as a technical scientific term for a return to a previous position or condition.

APOCRYPHAL LITERATURE. The history of the earlier usage of the term "Apocrypha" (from ἀποκρύπτειν, to hide) is not free from obscurity. We shall therefore enter at once on a short account of the origin of this literature in Judaism, of its adoption by early Christianity, of the various meanings which the term "apocryphal" assumed in the course of its history, and having so done we shall proceed to classify and deal with the books that belong to this literature. The word most generally denotes writings which claimed to be, or were by certain sects regarded as, sacred scriptures although excluded from the canonical scriptures.

Apocrypha in Judaism.—Certain circles in Judaism, as the Essenes in Palestine (Josephus, *B.J.* ii. 8. 7) and the Therapeutae (Philo, *De Vita Contempl.* ii. 475, ed. Mangey) in Egypt possessed a secret literature. But such literature was not confined to the members of these communities, but had been current among the Chasids and their successors the Pharisees.[1] To this literature belong essentially the apocalypses which were published in fast succession from Daniel onwards. These works bore, perforce, the names of ancient Hebrew worthies in order to procure them a hearing among the writers' real contemporaries. To reconcile their late appearance with their claims to primitive antiquity the alleged author is represented as "shutting up and sealing" (Dan. xii. 4, 9) the book, until the time of its fulfilment had arrived; for that it was not designed for his own generation but for far-distant ages (1 Enoch i. 2, cviii. 1.; Ass. Mos. i. 16, 17). It is not improbable that with many Jewish enthusiasts this literature was more highly treasured than the canonical scriptures. Indeed, we have a categorical statement to this effect in 4 Ezra xiv. 44 sqq., which tells how Ezra was inspired to dictate the sacred scriptures which had been destroyed in the overthrow of Jerusalem: "In forty days they wrote ninety-four books: and it came to pass when the forty days were fulfilled that the Highest spake, saying: the first that thou hast written publish openly that the worthy and unworthy may read it; but keep the seventy last that thou mayst deliver them only to such as be wise among the people; for in them is the spring of understanding, the fountain of wisdom and the stream of knowledge." Such esoteric books are apocryphal in the original conception of the term. In due course the Jewish authorities were forced to draw up a canon or book of sacred scriptures, and mark them off from those which claimed to be such without justification.

[1] Judaism was long accustomed to lay claim to an esoteric tradition. Thus though it insisted on the exclusive canonicity of the 24 books, it claimed the possession of an oral law handed down from Moses, and just as the apocryphal books overshadowed in certain instances the canonical scriptures, so often the oral law displaced the written in the regard of Judaism.

The true scriptures, according to the Jewish canon (Yad. iii. 5; Toseph. Yad. ii. 3), were those which defiled the hands of such as touched them. But other scholars, such as Zahn, Schürer, Porter, state that the secret books with which we have been dealing formed a class by themselves and were called "Genuizim" (גנוזים), and that this name and idea passed from Judaism over into the Greek, and that *ἀπόκρυφα βιβλία* is a translation of ספרים גנוזים. But the Hebrew verb does not mean "to hide" but "to store away," and is only used of things in themselves precious. Moreover, the phrase is unknown in Talmudic literature. The derivation of this idea from Judaism has therefore not yet been established. Whether the Jews had any distinct name for these esoteric works we do not know. For writings that stood wholly without the pale of sacred books such as the books of heretics or Samaritans they used the designation Hisonim, Sanh. x. 1 (ספרים חצונים and בספרי המינים). To this class in later times even Sirach was relegated, and indeed all books not included in the canon (Midr. r. Num. 14 and on Koheleth xii. 12; cf. Jer. Sabb. 16).[1] In Aqiba's time Sirach and other apocryphal books were not reckoned among the Ḥiṣonim; for Sirach was largely quoted by rabbis in Palestine till the 3rd century A.D.

Apocrypha in Christianity.—Christianity as it springs from its Founder had no secret or esoteric teaching. It was essentially the revelation or manifestation of the truth of God. But as Christianity took its origin from Judaism, it is not unnatural that a large body of Jewish ideas was incorporated in the system of Christian thought. The bulk of these in due course underwent transformation either complete or partial, but there was always a residuum of incongruous and inconsistent elements existing side by side with the essential truths of Christianity. This was no isolated phenomenon; for in every progressive period of the history of religion we have on the one side the doctrine of God advancing in depth and fulness: on the other we have cosmological, eschatological and other survivals, which, however justifiable in earlier stages, are in unmistakable antagonism with the theistic beliefs of the time. The eschatology of a nation—and the most influential portion of Jewish and Christian apocrypha are eschatological—is always the last part of their religion to experience the transforming power of new ideas and new facts.

Now the current religious literature of Judaism outside the canon was composed of apocryphal books, the bulk of which bore an apocalyptic character, and dealt with the coming of the Messianic kingdom. These naturally became the popular religious books of the rising Jewish-Christian communities, and were held by them in still higher esteem, if possible, than by the Jews. Occasionally these Jewish writings were re-edited or adapted to their new readers by Christian additions, but on the whole it was found sufficient to submit them to a system of reinterpretation in order to make them testify to the truth of Christianity and foreshadow its ultimate destinies. Christianity, moreover, moved by the same apocalyptic tendency as Judaism, gave birth to new Christian apocryphs, though, in the case of most of them, the subject matter was to a large extent traditional and derived from Jewish sources.

Another prolific source of apocryphal gospels, acts and apocalypses was Gnosticism. While the characteristic features of apocalyptic literature were derived from Judaism, those of Gnosticism sprang partly from Greek philosophy, partly from oriental religions. They insisted on an allegorical interpretation of the apostolic writings: they alleged themselves to be the guardians of a secret apostolic tradition and laid claim to prophetic inspiration. With them, as with the bulk of the Christians of the 1st and 2nd centuries, apocryphal books as such were highly esteemed. They were so designated by those who valued them. It was not till later times that the term became one of reproach.

We have remarked above that the Jewish apocrypha—especially the apocalyptic section and the host of Christian apocryphs—became the ordinary religious literature of the early Christians. And this is not strange seeing that of the former such abundant use was made by the writers of the New Testament.[2] Thus Jude quotes the Book of Enoch by name, while undoubted use of this book appears in the four gospels and 1 Peter. The influence of the Testaments of the Twelve Patriarchs is still more apparent in the Pauline Epistles and the Gospels, and the same holds true of Jubilees and the Assumption of Moses, though in a very slight degree. The genuineness and inspiration of Enoch were believed in by the writer of the Ep. of Barnabas, Irenaeus, Tertullian and Clement of Alexandria. But the high position which apocryphal books occupied in the first two centuries was undermined by a variety of influences. All claims to the possession of a secret tradition were denied (Irenaeus ii. 27. 2, iii. 2. 1, 3. 1; Tertullian, *Praescript.* 22-27): true inspiration was limited to the apostolic age, and universal acceptance by the church was required as a proof of apostolic authorship. Under the action of such principles apocryphal books tended to pass into the class of spurious and heretical writings.

The Term "Apocryphal."—Turning now to the consideration of the word "apocryphal" itself, we find that in its earliest use it was applied in a laudatory sense to writings, (1) which were kept secret because they were the vehicles of esoteric knowledge which was too profound or too sacred to be imparted to any save the initiated. Thus it occurs in a magical book of Moses, which has been edited from a Leiden papyrus of the 3rd or 4th century by Dieterich (*Abraxas*, 109). This book, which may be as old as the 1st century, is entitled: "A holy and secret Book of Moses, called eighth, or holy" (*Μωυσέως ἱερὰ βίβλος ἀπόκρυφος ἐπικαλουμένη ὀγδόη ἢ ἁγία*). The disciples of the Gnostic Prodicus boasted (Clem. Alex. *Strom.* i. 15. 69) that they possessed the secret (*ἀποκρύφους*) books of Zoroaster. 4 Ezra is in its author's view a secret work whose value was greater than that of the canonical scriptures (xiv. 44 sqq.) because of its transcendent revelations of the future. It is in a like laudatory meaning that Gregory reckons the New Testament apocalypse as *ἐν ἀποκρύφοις* (*Oratio in suam ordinationem*, iii. 549, ed. Migne: cf. Epiphanius, *Haer.* li. 3). The word enjoyed high consideration among the Gnostics (cf. Acts of Thomas, 10, 27, 44). (2) But the word was applied to writings that were kept from public circulation not because of their transcendent, but of their secondary or questionable value. Thus Origen distinguishes between writings which were read by the churches and apocryphal writings: *γραφῇ μὴ φερομένῃ μὲν ἐν τοῖς κοινοῖς καὶ δεδημοσιευμένοις βιβλίοις εἰκὸς δ' ὅτι ἐν ἀποκρύφοις φερομένῃ* (Origen's *Comm. in Matt.*, x. 18, on Matt. xiii. 57, ed. Lommatzsch iii. 49 sqq.). Cf. *Epist. ad Africam*, ix. (Lommatzsch xvii. 31): Euseb. *H.E.* ii. 23, 25; iii. 3, 6. See Zahn, *Gesch. Kanons*, i. 126 sqq. Thus the meaning of *ἀπόκρυφος* is here practically equivalent to "excluded from the public use of the church," and prepares the way for the third and unfavourable sense of this word. (3) The word came finally to mean what is false, spurious, bad, heretical. If we may trust the text, this meaning appears in Origen (*Prolog. in Cant. Cantic.*, Lommatzsch xiv. 325): "De scripturis his, quae appellantur apocryphae, pro eo quod multa in iis corrupta et contra fidem veram inveniuntur a majoribus tradita non placuit iis dari locum nec admitti ad auctoritatem."

In addition to the above three meanings strange uses of the term appear in the western church. Thus the Gelasian Decree includes the works of Eusebius, Tertullian and Clement of Alexandria, under this designation. Augustine (*De Civ. Dei*, xv. 23) explains it as meaning obscurity of origin, while Jerome (*Prologus Galeatus*) declares that all books outside the Hebrew canon belong to this class of apocrypha. Jerome's practice, however, did not square with his theory. The western church did not accept Jerome's definition of apocrypha, but retained the word in its original meaning, though great confusion prevailed. Thus the degree of estimation in which the apocryphal books have been held in the church has varied much according to place and time. As they stood in the Septuagint or Greek canon, along

[1] See Porter in Hastings' *Bible Dict.* i. 113.

[2] The New Testament shows undoubtedly an acquaintance with several of the apocryphal books. Thus James i. 19 shows dependence on Sirach v. 11, Hebrews i. 3 on Wisdom vii. 26, Romans ix. 21 on Wisdom xv. 7, 2 Cor. v. 1, 4 on Wisdom ix. 15, &c.

with the other books, and with no marks of distinction, they were practically employed by the Greek Fathers in the same way as the other books; hence Origen, Clement and others often cite them as "scripture," "divine scripture," "inspired," and the like. On the other hand, teachers connected with Palestine, and familiar with the Hebrew canon, rigidly exclude all but the books contained there. This view is reflected, for example, in the canon of Melito of Sardis, and in the prefaces and letters of Jerome. Augustine, however (*De Doct. Christ.* ii. 8), attaches himself to the other side. Two well-defined views in this way prevailed, to which was added a third, according to which the books, though not to be put in the same rank as the canonical scriptures of the Hebrew collection, yet were of value for moral uses and to be read in congregations,—and hence they were called "ecclesiastical"—a designation first found in Rufinus (*ob.* 410). Notwithstanding the decisions of some councils held in Africa, which were in favour of the view of Augustine, these diverse opinions regarding the apocryphal books continued to prevail in the church down through the ages till the great dogmatic era of the Reformation. At that epoch the same three opinions were taken up and congealed into dogmas, which may be considered characteristic of the churches adopting them. In 1546 the council of Trent adopted the canon of Augustine, declaring "He is also to be anathema who does not receive these entire books, with all their parts, as they have been accustomed to be read in the Catholic Church, and are found in the ancient editions of the Latin Vulgate, as sacred and canonical." The whole of the books in question, with the exception of 1st and 2nd Esdras, and the Prayer of Manasses, were declared canonical at Trent. On the other hand, the Protestants universally adhered to the opinion that only the books in the Hebrew collection are canonical. Already Wycliffe had declared that "whatever book is in the Old Testament besides these twenty-five (Hebrew) shall be set among the apocrypha, that is, without authority or belief." Yet among the churches of the Reformation a milder and a severer view prevailed regarding the apocrypha. Both in the German and English translations (Luther's, 1537; Coverdale's, 1535, &c.) these books are separated from the others and set by themselves; but while in some confessions, *e.g.* the Westminster, a decided judgment is passed on them, that they are not "to be any otherwise approved or made use of than other human writings," a milder verdict is expressed regarding them in many other quarters, *e.g.* in the "argument" prefixed to them in the Geneva Bible; in the Sixth Article of the Church of England, where it is said that "the other books the church doth read for example of life and instruction of manners," though not to establish doctrine; and elsewhere.

Old Testament Apocryphal Books

We shall now proceed to enumerate the apocryphal books: first the Apocrypha Proper, and next the rest of the Old and New Testament apocryphal literature.

1. *The Apocrypha Proper*, or the apocrypha of the Old Testament as used by English-speaking Protestants, consists of the following books: 1 Esdras, 2 Esdras, Tobit, Judith, Additions to Esther, Wisdom of Solomon, Ecclesiasticus, Baruch, Epistle of Jeremy, Additions to Daniel (Song of the Three Holy Children, History of Susannah, and Bel and the Dragon), Prayer of Manasses, 1 Maccabees, 2 Maccabees. Thus the Apocrypha Proper constitutes the surplusage of the Vulgate or Bible of the Roman Church over the Hebrew Old Testament. Since this surplusage is in turn derived from the Septuagint, from which the old Latin version was translated, it thus follows that the difference between the Protestant and the Roman Catholic Old Testament is, roughly speaking, traceable to the difference between the Palestinian and the Alexandrian canons of the Old Testament. But this is only true with certain reservations; for the Latin Vulgate was revised by Jerome according to the Hebrew, and, where Hebrew originals were wanting, according to the Septuagint. Furthermore, the Vulgate rejects 3 and 4 Maccabees and Psalm cli., which generally appear in the Septuagint, while the Septuagint and Luther's Bible reject 4 Ezra, which is found in the Vulgate and the Apocrypha Proper. Luther's Bible, moreover, rejects also 3 Ezra. It should further be observed that the Vulgate adds the Prayer of Manasses and 3 and 4 Ezra after the New Testament as apocryphal.

It is hardly possible to form any classification which is not open to some objection. In any case the classification must be to some extent provisional, since scholars are still divided as to the original language, date and place of composition of some of the books which must come under our classification.[1] We may, however, discriminate (i.) the Palestinian and (ii.) the Hellenistic literature of the Old Testament, though even this distinction is open to serious objections. The former literature was generally written in Hebrew or Aramaic, and seldom in Greek; the latter naturally in Greek. Next, within these literatures we shall distinguish three or four classes according to the nature of the subject with which they deal. Thus the books of which we have to treat will be classed as: (*a*) Historical, (*b*) Legendary (Haggadic), (*c*) Apocalyptic, (*d*) Didactic or Sapiential.

The Apocrypha Proper then would be classified as follows:—

i. Palestinian Jewish Literature:—

(*a*) *Historical.*	(*c*) *Apocalyptic.*
1 (*i.e.* 3) Ezra.	2 (*i.e.* 4) Ezra (see also under separate article on Apocalyptic Literature.
1 Maccabees.	
(*b*) *Legendary.*	(*d*) *Didactic.*
Book of Baruch (see Baruch).	Sirach (see Ecclesiasticus).
Judith.	Tobit.

ii. Hellenistic Jewish Literature:—

Historical and Legendary.	*Didactic.*
Additions to Daniel (*q.v.*).	Book of Wisdom (see Wisdom, Book of.)
,, ,, Esther (*q.v.*).	
Epistle of Jeremy (*q.v.*).	
2 Maccabees (*q.v.*).	
Prayer of Manasses (see Manasses).	

Since all these books are dealt with in separate articles, they call for no further notice here.

Literature.—Texts:—Holmes and Parsons, *Vet. Test. Graecum cum var. lectionibus* (Oxford, 1798–1827); Swete, *Old Testament in Greek*, i.-iii. (Cambridge, 1887–1894); Fritzsche, *Libri Apocryphi V. T. Graece* (1871). Commentaries:—O. F. Fritzsche and Grimm, *Kurzgef. exeget. Handbuch zu den Apok. des A.T.* (Leipzig, 1851–1860); E. C. Bissell, *Apocrypha of the Old Testament* (Edinburgh, 1880); Zöckler, *Apok. des A.T.* (München, 1891); Wace, *The Apocrypha* ("Speaker's Commentary") (1888). Introduction and General Literature:— E. Schürer[3], *Geschichte des jüd. Volkes*, vol. iii. 135 sqq., and his article on "Apokryphen" in Herzog's *Realencykl.* i. 622-653; Porter in Hastings' *Bible Dic.* i. 111-123.

2 (*a*). *Other Old Testament Apocryphal Literature:*—

(*a*) *Historical.*	(*c*) *Apocalyptic.*
History of Johannes Hyrcanus.	(See separate article.)
(*b*) *Legendary.*	(*d*) *Didactic or Sapiential.*
Book of Jubilees.	Pirke Aboth.
Paralipomena Jeremiae, or the Rest of the Words of Baruch.	
Martyrdom of Isaiah.	
Pseudo-Philo's Liber Antiquitatum.	
Books of Adam.	
Jannes and Jambres.	
Joseph and Asenath.	

(*a*) *Historical.*—The *History of Johannes Hyrcanus* is mentioned in 1 Macc. xvi. 23-24, but no trace has been discovered of its existence elsewhere. It must have early passed out of circulation, as it was unknown to Josephus.

(*b*) *Legendary.*—The *Book of Jubilees* was written in Hebrew by a Pharisee between the year of the accession of Hyrcanus to the high-priesthood in 135 and his breach with the Pharisees some years before his death in 105 B.C. *Jubilees* was translated into Greek and from Greek into Ethiopic and Latin. It is

[1] Thus some of the additions to Daniel and the Prayer of Manasses are most probably derived from a Semitic original written in Palestine, yet in compliance with the prevailing opinion they are classed under Hellenistic Jewish literature. Again, the Slavonic Enoch goes back undoubtedly in parts to a Semitic original, though most of it was written by a Greek Jew in Egypt.

preserved in its entirety only in Ethiopic. *Jubilees* is the most advanced pre-Christian representative of the midrashic tendency, which was already at work in the Old Testament 1 and 2 Chronicles. As the chronicler rewrote the history of Israel and Judah from the basis of the Priests' Code, so our author re-edited from the Pharisaic standpoint of his time the book of Genesis and the early chapters of Exodus. His work constitutes an enlarged targum on these books, and its object is to prove the everlasting validity of the law, which, though revealed in time, was superior to time. Writing in the palmiest days of the Maccabean dominion, he looked for the immediate advent of the Messianic kingdom. This kingdom was to be ruled over by a Messiah sprung not from Judah but from Levi, that is, from the reigning Maccabean family. This kingdom was to be gradually realized on earth, the transformation of physical nature going hand in hand with the ethical transformation of man. (For a fuller account see JUBILEES, BOOK OF.)

Paralipomena Jeremiae, or the *Rest of the Words of Baruch.*—This book has been preserved in Greek, Ethiopic, Armenian and Slavonic. The Greek was first printed at Venice in 1609, and next by Ceriani in 1868 under the title *Paralipomena Jeremiae*. It bears the same name in the Armenian, but in Ethiopic it is known by the second title. (See under BARUCH.)

Martyrdom of Isaiah.—This Jewish work has been in part preserved in the *Ascension of Isaiah*. To it belong i. 1, 2^a, 6^b-13^a; ii. 1-8, 10–iii. 12; v. 1^c-14 of that book. It is of Jewish origin, and recounts the martyrdom of Isaiah at the hands of Manasseh. (See ISAIAH, ASCENSION OF.)

Pseudo-Philo's Liber Antiquitatum Biblicarum.—Though the Latin version of this book was thrice printed in the 16th century (in 1527, 1550 and 1599), it was practically unknown to modern scholars till it was recognized by Conybeare and discussed by Cohn in the *Jewish Quarterly Review*, 1898, pp. 279-332. It is an Haggadic revision of the Biblical history from Adam to the death of Saul. Its chronology agrees frequently with the LXX. against that of the Massoretic text, though conversely in a few cases. The Latin is undoubtedly translated from the Greek. Greek words are frequently transliterated. While the LXX. is occasionally followed in its translation of Biblical passages, in others the Massoretic is followed against the LXX., and in one or two passages the text presupposes a text different from both. On many grounds Cohn infers a Hebrew original. The eschatology is similar to that taught in the similitudes of the Book of Enoch. In fact, Eth. En. li. 1 is reproduced in this connexion. Prayers of the departed are said to be valueless. The book was written after A.D. 70; for, as Cohn has shown, the exact date of the fall of Herod's temple is predicted.

Life of Adam and Eve.—Writings dealing with this subject are extant in Greek, Latin, Slavonic, Syriac, Armenian and Arabic. They go back undoubtedly to a Jewish basis, but in some of the forms in which they appear at present they are christianized throughout. The oldest and for the most part Jewish portion of this literature is preserved to us in Greek, Armenian, Latin and Slavonic. (i.) The Greek Διήγησις περὶ Ἀδὰμ καὶ Εὔας (published under the misleading title Ἀποκάλυψις Μωυσέως in Tischendorf's *Apocalypses Apocryphae*, 1866) deals with the Fall and the death of Adam and Eve. Ceriani edited this text from a Milan MS. (*Monumenta Sacra et Profana*, v. 1). This work is found also in Armenian, and has been published by the Mechitharist community in Venice in their *Collection of Uncanonical Writings of the Old Testament*, and translated by Conybeare (*Jewish Quarterly Review*, vii. 216 sqq., 1895), and by Issaverdens in 1901. (ii.) The *Vita Adae et Evae* is closely related and in part identical with (i.). It was printed by W. Meyer in *Abh. d. Münch. Akad.*, Philos.-philol. Cl. xiv., 1878. (iii.) The Slavonic Adam book was published by Jajić along with a Latin translation (*Denkschr. d. Wien. Akad. d. Wiss.* xlii., 1893). This version agrees for the most part with (i.). It has, moreover, a section, §§ 28-39, which though not found in (i.) is found in (ii.). Before we discuss these three documents we shall mention other members of this literature, which, though derivable ultimately from Jewish sources, are Christian in their present form. (iv.) The *Book of Adam and Eve*, also called the *Conflict of Adam and Eve with Satan*, translated from the Ethiopic (1882) by Malan. This was first translated by Dillmann (*Das christl. Adambuch des Morgenlandes*, 1853), and the Ethiopic book first edited by Trump (*Abh. d. Münch. Akad.* xv., 1879–1881). (v.) A Syriac work entitled *Die Schatzhöhle* translated by Bezold from three Syriac MSS. in 1883 and subsequently edited in Syriac in 1888. This work has close affinities to (iv.), but is said by Dillmann to be more original. (vi.) Armenian books on the *Death of Adam* (*Uncanonical Writings of O.T.* pp. 84 sqq., 1901, translated from the Armenian), *Creation and Transgression of Adam* (*op. cit.* 39 sqq.), *Expulsion of Adam from Paradise* (*op. cit.* 47 sqq.), *Penitence of Adam and Eve* (*op. cit.* 71 sqq.) are mainly later writings from Christian hands.

Returning to the question of the Jewish origin of i., ii., iii., we have already observed that these spring from a common original. As to the language of this original, scholars are divided. The evidence, however, seems to be strongly in favour of Hebrew. How otherwise are we to explain such Hebraisms (or Syriacisms) as ἐνῷ ῥέει τὸ ἔλαιον ἐξ αὐτοῦ (§ 9), οὗ εἶπεν . . . μὴ φαγεῖν ἀπ' αὐτοῦ (§ 21). For others see §§ 23, 33. Moreover, as Fuchs has pointed out, in the words ἔσῃ ἐν ματαίοις addressed to Eve (§ 25) there is a corruption of חבלים into חבלים. Thus the words were: "Thou shalt have pangs." In fact, Hebraisms abound throughout this book. (See Fuchs, *Apok. u. Pseud. d. A.T.* ii. 511; *Jewish Encyc.* i. 179 sq.)

Jannes and Jambres.—These two men are referred to in 2 Tim. iii. 8 as the Egyptian magicians who withstood Moses. The book which treats of them is mentioned by Origen (*ad Matt.* xxiii. 37 and xxvii. 9 [*Jannes et Mambres Liber*]), and in the Gelasian Decree as the *Paenitentia Jamnis et Mambre*. The names in Greek are generally Ἰαννῆς καὶ Ἰαμβρῆς (=יגים וימברים) as in the Targ.-Jon. on Exod. i. 15; vii. 11. In the Talmud they appear as יוחני ובמברא. Since the western text of 2 Tim. iii. 8 has Μαμβρῆς, Westcott and Hort infer that this form was derived from a Palestinian source. These names were known not only to Jewish but also to heathen writers, such as Pliny and Apuleius. The book, therefore, may go back to pre-Christian times. (See Schürer[3] iii. 292-294; *Ency. Biblica*, ii. 2327-2329.)

Joseph and Asenath.—The statement in Gen. xli. 45, 50 that Joseph married the daughter of a heathen priest naturally gave offence to later Judaism, and gave rise to the fiction that Asenath was really the daughter of Shechem and Dinah, and only the foster-daughter of Potipherah (*Targ.-Jon.* on Gen. xli. 45; Tractat. *Sopherim*, xxi. 9; *Jalkut Shimoni*, c. 134. See Oppenheim, *Fabula Josephi et Asenethae*, 1886, pp. 2-4). Origen also was acquainted with some form of the legend (*Selecta in Genesin*, ad Gen. xli. 45, ed. Lommatzsch, viii. 89-90). The Christian legend, which is no doubt in the main based on the Jewish, is found in Greek, Syriac, Armenian, Slavonic and Medieval Latin. Since it is not earlier than the 3rd or 4th century, it will be sufficient here to refer to Smith's *Dict. of Christ. Biog.* i. 176-177; Hastings' *Bible Dict.* i. 162-163; Schürer, iii. 289-291.

(*d*) *Didactic or Sapiential.*—The *Pirke Aboth*, a collection of sayings of the Jewish Fathers, are preserved in the 9th Tractate of the Fourth Order of the Mishnah. They are attributed to some sixty Jewish teachers, belonging for the most part to the years A.D. 70–170, though a few of them are of a much earlier date. The book holds the same place in rabbinical literature as the Book of Proverbs in the Bible. The sayings are often admirable. Thus in iv. 1-4, "Who is wise? He that learns from every man. . . . Who is mighty? He that subdues his nature. . . . Who is rich? He that is contented with his lot. . . . Who is honoured? He that honours mankind." (See further PIRKE ABOTH.)

2 (*b*). *New Testament Apocryphal Literature:*—

(*a*) *Gospels*:—
Uncanonical sayings of the Lord in Christian and Jewish writings.
Gospel according to the Egyptians.
,, ,, ,, Hebrews.
Protevangel of James.

Gospel of Nicodemus.
" " Peter.
" " Thomas.
" " the Twelve.
Gnostic gospels of Andrew, Apelles, Barnabas, Bartholomew, Basilides, Cerinthus and some seventeen others.

(*b*) *Acts and Teachings of the Apostles*:—
Acts of Andrew and later forms of these Acts.
" John.
" Paul.
" Peter.
Preaching of Peter.
Acts of Thomas.
Teaching of the Twelve Apostles.
Apostolic constitutions.

(*c*) *Epistles*:—
The Abgar Epistles.
Epistle of Barnabas.
" " Clement.
" Clement's " 2nd Epistle of the Corinthians.
" Epistles on Virginity.
" " to James.
Epistles of Ignatius.
Epistle of Polycarp.
Pauline Epp. to the Laodiceans and Alexandrians.
3 Pauline Ep. to the Corinthians.

(*d*) *Apocalypses*: see under APOCALYPTIC LITERATURE.

(*a*) GOSPELS.—*Uncanonical Sayings of the Lord in Christian and Jewish Sources.*—Under the head of canonical sayings not found in the Gospels only one is found, *i.e.* that in Acts xx. 35. Of the rest the uncanonical sayings have been collected by Preuschen (*Reste der ausserkanonischen Evangelien*, 1901, pp. 44-47). A different collection will be found in Hennecke, *NTliche Apok.* 9-11. The same subject is dealt with in the elaborate volumes of Resch (*Aussercanonische Parallelltexte zu den Evangelien*, vols. i.-iii., 1893–1895).

To this section belongs also the *Fayum Gospel Fragment* and the *Logia* published by Grenfell and Hunt.[1] The former contains two sayings of Christ and one of Peter, such as we find in the canonical gospels, Matt. xxvi. 31-34, Mark xiv. 27-30. The papyrus, which is of the 3rd century, was discovered by Bickell among the Rainer collection, who characterized it (*Z. f. kath. Theol.*, 1885, pp. 498-504) as a fragment of one of the primitive gospels mentioned in Luke i. 1. On the other hand, it has been contended that it is merely a fragment of an early patristic homily. (See Zahn, *Gesch. Kanons*, ii. 780–790; Harnack, *Texte und Untersuchungen*, v. 4; Preuschen, *op. cit.* p. 19.) The *Logia* (*q.v.*) is the name given to the sayings contained in a papyrus leaf, by its discoverers Grenfell and Hunt. They think the papyrus was probably written about A.D. 200. According to Harnack, it is an extract from the *Gospel of the Egyptians*. All the passages referring to Jesus in the Talmud are given by Laible, *Jesus Christus im Talmud*, with an appendix, " Die talmudischen Texte," by G. Dalman (2nd ed. 1901). The first edition of this work was translated into English by A. W. Streane (*Jesus Christ in the Talmud*, 1893). In Hennecke's *NTliche Apok. Handbuch* (pp. 47-71) there is a valuable study of this question by A. Meyer, entitled *Jesus, Jesu Jünger und das Evangelium im Talmud und verwandten jüdischen Schriften*, to which also a good bibliography of the subject is prefixed.

Gospel according to the Egyptians.—This gospel is first mentioned by Clem. Alex. (*Strom.* iii. 6. 45; 9. 63, 66; 13. 92), subsequently by Origen (*Hom. in Luc.* i.) and Epiphanius (*Haer.* lxii. 2), and a fragment is preserved in the so-called 2 Clem. Rom. xii. 2. It circulated among various heretical circles; amongst the Encratites (Clem. *Strom.* iii. 9), the Naassenes (Hippolyt. *Philos.* v. 7), and the Sabellians (Epiph. *Haer.* lxii. 2). Only three or four fragments survive; see Lipsius (Smith and Wace, *Dict. of Christ. Biog.* ii. 712, 713); Zahn, *Gesch. Kanons*, ii. 628-642; Preuschen, *Reste d. ausserkanonischen Evangelien*, 1901, p. 2, which show that it was a product of pantheistic Gnosticism. With this pantheistic Gnosticism is associated a severe asceticism. The distinctions of sex are one day to come to an end; the prohibition of marriage follows naturally on this view. Hence Christ is represented as coming to destroy the work of the female (Clem. Alex. *Strom.* iii. 9. 63). Lipsius and Zahn assign it to the middle of the 2nd century. It may be earlier.

Protevangel of James.—This title was first given in the 16th century to a writing which is referred to as *The Book of James* (ἡ βίβλος Ἰακώβου) by Origen (tom. xi. *in Matt.*). Its author designates it as Ἱστορία. For various other designations see Tischendorf, *Evang. Apocr.*[2] 1 seq. The narrative extends from the Conception of the Virgin to the Death of Zacharias. Lipsius shows that in the present form of the book there is side by side a strange " admixture of intimate knowledge and gross ignorance of Jewish thought and custom," and that accordingly we must " distinguish between an original Jewish Christian writing and a Gnostic recast of it." The former was known to Justin (*Dial.* 78, 101) and Clem. Alex. (*Strom.* vii. 16), and belongs at latest to the earliest years of the 2nd century. The Gnostic recast Lipsius dates about the middle of the 3rd century. From these two works arose independently the *Protevangel* in its present form and the Latin pseudo-Matthaeus (*Evangelium pseudo-Matthaei*). The *Evangelium de Nativitate Mariae* is a redaction of the latter. (See Lipsius in Smith's *Dict. of Christ. Biog.* ii. 701-703.) But if we except the Zachariah and John group of legends, it is not necessary to assume the Gnostic recast of this work in the 3rd century as is done by Lipsius. The author had at his disposal two distinct groups of legends about Mary. One of these groups is certainly of non-Jewish origin, as it conceives Mary as living in the temple somewhat after the manner of a vestal virgin or a priestess of Isis. The other group is more in accord with the orthodox gospels. The book appears to have been written in Egypt, and in the early years of the 2nd century. For, since Origen states that many appealed to it in support of the view that the brothers of Jesus were sons of Joseph by a former marriage, the book must have been current about A.D. 200. From Origen we may ascend to Clem. Alex. who (*Strom.* vi. 93) shows acquaintance with one of the chief doctrines of the book—the perpetual virginity of Mary. Finally, as Justin's statements as to the birth of Jesus in a cave and Mary's descent from David show in all probability his acquaintance with the book, it may with good grounds be assigned to the first decade of the 2nd century. (So Zahn, *Gesch. Kanons*, i. 485, 499, 502, 504, 539; ii. 774-780.) For the Greek text see Tischendorf, *Evang. Apocr.*[2] 1-50; B. P. Grenfell, *An Alexandrian erotic Fragment and other Papyri*, 1896, pp. 13-17: for the Syriac, Wright, *Contributions to Apocryphal Literature of the N.T.*, 1865, pp. 3-7; A. S. Lewis, *Studia Sinaitica*, xi. pp. 1-22. See literature generally in Hennecke, *NTliche Apok. Handbuch*, 106 *seq.*

Gospel of Nicodemus.—This title is first met with in the 13th century. It is used to designate an apocryphal writing entitled in the older MSS. *ὑπομνήματα τοῦ Κυρίου ἡμῶν Ἰησοῦ Χριστοῦ πραχθέντα ἐπὶ Ποντίου Πιλάτου*: also " Gesta Salvatoris Domini . . . inventa Theodosio magno imperatore in Ierusalem in praetorio Pontii Pilati in codicibus publicis." See Tischendorf, *Evang. Apocr.*[2] pp. 333-335. This work gives an account of the Passion (i.–xi.), the Resurrection (xii.–xvi.), and the *Descensus ad Inferos* (xvii.–xxvii.). Chapters i.–xvi. are extant in the Greek, Coptic, and two Armenian versions. The two Latin versions and a Byzantine recension of the Greek contain i.–xxvii. (see Tischendorf, *Evangelia Apocrypha*[2], pp. 210-458). All known texts go back to A. D. 425, if one may trust the reference to Theodosius. But this was only a revision, for as early as 376 Epiphanius (*Haer.* i. 1.) presupposes the existence of a like text. In 325 Eusebius (*H.E.* ii. 2) was acquainted only with the heathen *Acts of Pilate*, and knew nothing of a Christian work. Tischendorf and Hofmann, however, find evidence of its existence in Justin's reference to the Ἄκτα Πιλάτου (*Apol.* i. 35, 48), and in Tertullian's mention of the *Acta Pilati* (*Apol.* 21), and on this evidence attribute our texts to the first half of the 2nd century. But these references have been denied by Scholten, Lipsius, and Lightfoot. Recently Schubert has sought to derive the elements

[1] These editors have discovered (1907) a gospel fragment of the 2nd century which represents a dialogue between our Lord and a chief priest—a Pharisee.

which are found in the Petrine Gospel, but not in the canonical gospels, from the original *Acta Pilati*, while Zahn exactly reverses the relation of these two works. Rendel Harris (1899) advocated the view that the Gospel of Nicodemus, as we possess it, is merely a prose version of the Gospel of Nicodemus written originally in Homeric centones as early as the 2nd century. Lipsius and Dobschütz relegate the book to the 4th century. The question is not settled yet (see Lipsius in Smith's *Dict. of Christ. Biography*, ii. 708-709, and Dobschütz in Hastings' *Bible Dictionary*, iii. 544-547).

Gospel according to the Hebrews.—This gospel was cited by Ignatius (*Ad Smyrnaeos*, iii.) according to Jerome (*Viris illus.* 16, and *in Jes.* lib. xviii.), but this is declared to be untrustworthy by Zahn, *op. cit.* i. 921; ii. 701, 702. It was written in Aramaic in Hebrew letters, according to Jerome (*Adv. Pelag.* iii. 2), and translated by him into Greek and Latin. Both these translations are lost. A collection of the Greek and Latin fragments that have survived, mainly in Origen and Jerome, will be found in Hilgenfeld's *NT extra Canonem receptum*, Nicholson's *Gospel according to the Hebrews* (1879), Westcott's *Introd. to the Gospels*, and Zahn's *Gesch. des NTlichen Kanons*, ii. 642-723; Preuschen, *op. cit.* 3-8. This gospel was regarded by many in the first centuries as the Hebrew original of the canonical Matthew (Jerome, *in Matt.* xii. 13; *Adv. Pelag.* iii. 1). With the canonical gospel it agrees in some of its sayings; in others it is independent. It circulated among the Nazarenes in Syria, and was composed, according to Zahn (*op. cit.* ii. 722), between the years 135 and 150. Jerome identifies it with the *Gospel of the Twelve* (*Adv. Pelag.* iii. 2), and states that it was used by the Ebionites (*Comm. in Matt.* xii. 13). Zahn (*op. cit.* ii. 662, 724) contests both these statements. The former he traces to a mistaken interpretation of Origen (*Hom. I. in Luc.*). Lipsius, on the other hand, accepts the statements of Jerome (Smith and Wace, *Dict. of Christian Biography*, ii. 709-712), and is of opinion that this gospel, in the form in which it was known to Epiphanius, Jerome and Origen, was "a recast of an older original," which, written originally in Aramaic, was nearly related to the Logia used by St Matthew and the Ebionitic writing used by St Luke, "which itself was only a later redaction of the Logia."

According to the most recent investigations we may conclude that the Gospel according to the Hebrews was current among the Nazarenes and Ebionites as early as 100–125, since Ignatius was familiar with the phrase "I am no bodiless demon"—a phrase which, according to Jerome (*Comm. in Is.* xviii.), belonged to this Gospel.

The name "Gospel according to the Hebrews" cannot have been original; for if it had been so named because of its general use among the Hebrews, yet the Hebrews themselves would not have used this designation. It may have been known simply as "the Gospel." The language was Western Aramaic, the mother tongue of Jesus and his apostles. Two forms of Western Aramaic survive: the Jerusalem form of the dialect, in the Aramaic portions of Daniel and Ezra; and the Galilean, in isolated expressions in the Talmud (3rd century), and in a fragmentary 5th century translation of the Bible. The quotations from the Old Testament are made from the Massoretic text.

This gospel must have been translated at an early date into Greek, as Clement and Origen cite it as generally accessible, and Eusebius recounts that many reckoned it among the received books. The gospel is synoptic in character and is closely related to Matthew, though in the Resurrection accounts it has affinities with Luke. Like Mark it seems to have had no history of the birth of Christ, and to have begun with the baptism. (For the literature see Hennecke, *NTliche Apok. Handbuch*, 21-23.)

Gospel of Peter.—Before 1892 we had some knowlege of this gospel. Thus Serapion, bishop of Antioch (A.D. 190–203) found it in use in the church of Rhossus in Cilicia, and condemned it as Docetic (Eusebius, *H.E.* vi. 12). Again, Origen (*In Matt.* tom. xvii. 10) says that it represented the brethren of Christ as his half-brothers. In 1885 a long fragment was discovered at Akhmim, and published by Bouriant in 1892, and subsequently by Lods, Robinson, Harnack, Zahn, Schubert, Swete.

Gospel of Thomas.—This gospel professes to give an account of our Lord's boyhood. It appears in two recensions. The more complete recension bears the title Θωμᾶ Ἰσραηλίτου Φιλοσόφου ῥητὰ εἰς τὰ παιδικὰ τοῦ Κυρίου, and treats of the period from the 7th to the 12th year (Tischendorf, *Evangelia Apocrypha*², 1876, 140-157). The more fragmentary recension gives the history of the childhood from the 5th to the 8th year, and is entitled Σύγγραμμα τοῦ ἁγίου ἀποστόλου Θωμᾶ περὶ τῆς παιδικῆς ἀναστροφῆς τοῦ Κυρίου (Tischendorf, *op. cit.* pp. 158-163). Two Latin translations have been published in this work by the same scholar—one on pp. 164-180, the other under the wrong title, *Pseudo-Matthaei Evangelium*, on pp. 93-112. A Syriac version, with an English translation, was published by Wright in 1875. This gospel was originally still more Docetic than it now is, according to Lipsius. Its present form is due to an orthodox revision which discarded, so far as possible, all Gnostic traces. Lipsius (Smith's *Dict. of Christ. Biog.* ii. 703) assigns it to the latter half of the 2nd century, but Zahn (*Gesch. Kan.* ii. 771), on good grounds, to the earlier half. The latter scholar shows that probably it was used by Justin (*Dial.* 88). At all events it circulated among the Marcosians (Irenaeus, *Haer.* i. 20) and the Naasenes (Hippolytus, *Refut.* v. 7), and subsequently among the Manichaeans, and is frequently quoted from Origen downwards (*Hom. I. in Luc.*). If the stichometry of Nicephorus is right, the existing form of the book is merely fragmentary compared with its original compass. For literature see Hennecke, *NTliche Apokryphen Handbuch*, 132 seq.

Gospel of the Twelve.—This gospel, which Origen knew (*Hom. I. in Luc.*), is not to be identified with the *Gospel according to the Hebrews* (see above), with Lipsius and others, who have sought to reconstruct the original gospel from the surviving fragments of these two distinct works. The only surviving fragments of the *Gospel of the Twelve* have been preserved by Epiphanius (*Haer.* xxx. 13-16, 22: see Preuschen, *op. cit.* 9-11). It began with an account of the baptism. It was used by the Ebionites, and was written, according to Zahn (*op. cit.* ii. 742), about A.D. 170.

OTHER GOSPELS MAINLY GNOSTIC AND ALMOST ALL LOST.—*Gospel of Andrew.*—This is condemned in the Gelasian Decree, and is probably the gospel mentioned by Innocent (1 Ep. iii. 7) and Augustine (*Contra advers. Leg. et Proph.* i. 20).

Gospel of Apelles.—Mentioned by Jerome in his *Prooem. ad Matt.*

Gospel of Barnabas.—Condemned in the Gelasian Decree (see under BARNABAS *ad fin.*).

Gospel of Bartholomew.—Mentioned by Jerome in his *Prooem. ad Matt.* and condemned in the Gelasian Decree.

Gospel of Basilides.—Mentioned by Origen (*Tract. 26 in Matt.* xxxiii. 34, and in his *Prooem. in Luc.*); by Jerome in his *Prooem. in Matt.* (See Harnack i. 161; ii. 536-537; Zahn, *Gesch. Kanons*, i. 763-774.)

Gospel of Cerinthus.—Mentioned by Epiphanius (*Haer.* li. 7).

Gospel of the Ebionites.—A fragmentary edition of the canonical Matthew according to Epiphanius (*Haer.* xxx. 13), used by the Ebionites and called by them the Hebrew Gospel.

Gospel of Eve.—A quotation from this gospel is given by Epiphanius (*Haer.* xxvi. 2, 3). It is possible that this is the Gospel of Perfection (Εὐαγγέλιον τελειώσεως) which he touches upon in xxvi. 2. The quotation shows that this gospel was the expression of complete pantheism.

Gospel of James the Less.—Condemned in the Gelasian Decree.

Wisdom of Jesus Christ.—This third work contained in the Coptic MS. referred to under *Gospel of Mary* gives cosmological disclosures and is presumably of Valentinian origin.

Apocryph of John.—This book, which is found in the Coptic MS. referred to under *Gospel of Mary* and contains cosmological disclosures of Christ, is said to have formed the source of Irenaeus' account of the Gnostics of Barbelus (i. 29-31). Thus this work would have been written before 170.

Gospel of Judas Iscariot.—References to this gospel as in use among the Cainites are made by Irenaeus (i. 31. 1); Epiphanius (xxxviii. 1. 3).

Gospel, The Living (*Evangelium Vivum*).—This was a gospel of the Manichaeans. See Epiphanius, *Haer.* lxvi. 2; Photius, *Contra Manich.* i.

Gospel of Marcion.—On this important gospel see Zahn, *Gesch. Kanons*, i. 585-718.

Descent of Mary (Γέννα Μαρίας).—This book was an anti-Jewish legend representing Zacharias as having been put to death by the Jews because he had seen the God of the Jews in the form of an ass in the temple (Epiphanius, *Haer.* xxvi. 12).

Questions of Mary (*Great and Little*).—Epiphanius (*Haer.* xxvi. 8) gives some excerpts from this revolting work.

Gospel of Mary.—This gospel is found in a Coptic MS. of the 5th century. According to Schmidt's short account, *Sitzungsberichte d. preuss. Akad. d. Wiss. zu. Berlin* (1896), pp. 839 sqq., this gospel gives disclosures on the nature of matter (ὕλη) and the progress of the Gnostic soul through the seven planets.

Gospel of Matthias.—Though this gospel is attested by Origen (*Hom. in Luc.* i.), Eusebius, *H.E.* iii. 25. 6, and the List of Sixty Books, not a shred of it has been preserved, unless with Zahn ii. 751 sqq. we are to identify it with the *Traditions of Matthias*, from which Clement has drawn some quotations.

Gospel of Perfection (*Evangelium perfectionis*).—Used by the followers of Basilides and other Gnostics. See Epiphanius, *Haer.* xxvi. 2.

Gospel of Philip.—This gospel described the progress of a soul through the next world. It is of a strongly Encratite character and dates from the 2nd century. A fragment is preserved in Epiphanius, *Haer.* xxvi. 13. In Preuschen, *Reste*, p. 13, the quotation breaks off too soon. See Zahn ii. 761-768.

Gospel of Thaddaeus.—Condemned by the Gelasian Decree.

Gospel of Thomas.—Of this gospel only one fragment has been preserved in Hippolytus, *Philos.* v. 7, pp. 140 seq. See Zahn, *op. cit.* i. 746 seq.; ii. 768-773; Harnack ii. 593-595.

Gospel of Truth.—This gospel is mentioned by Irenaeus i. 11. 9, and was used by the Valentinians. See Zahn i. 748 sqq.

(*b*) Acts and Teachings of the Apostles.—*Acts of Andrew.*—These Acts, which are of a strongly Encratite character, have come down to us in a fragmentary condition. They belong to the earliest ages, for they are mentioned by Eusebius, *H.E.* iii. 25; Epiphanius, *Haer.* xlvii. 1; lxi. 1; lxiii. 2; Philaster, *Haer.* lxviii., as current among the Manichaeans and heretics. They are attributed to Leucius, a Docetic writer, by Augustine (*c. Felic. Manich.* ii. 6) and Euodius (*De Fide c. Manich.* 38). Euodius in the passage just referred to preserves two small fragments of the original Acts. On internal grounds the section recounting Andrew's imprisonment (Bonnet, *Acta Apostolorum Apocrypha*, ii. 38-45) is also probably a constituent of the original work. As regards the martyrdom, owing to the confusion introduced by the multitudinous Catholic revisions of this section of the Acts, it is practically impossible to restore its original form. For a complete discussion of the various documents see Lipsius, *Apokryphen Apostelgeschichte*, i. 543-622; also James in Hastings' *Bible Dict.* i. 92-93; Hennecke, *NT. Apokryphen, in loc.* The best texts are given in Bonnet's *Acta Apostolorum Apocrypha*, 1898, II. i. 1-127. These contain also the *Acts of Andrew and Matthew* (or Matthias) in which Matthew (or Matthias) is represented as a captive in the country of the anthropophagi. Christ takes Andrew and his disciples with Him, and effects the rescue of Matthew. The legend is found also in Ethiopic, Syriac and Anglo-Saxon. Also the *Acts of Peter and Andrew*, which among other incidents recount the miracle of a camel passing through the eye of a needle. This work is preserved partly in Greek, but in its entirety in Slavonic.

Acts of John.—Clement of Alexandria in his *Hypotyposes* on 1 John i. 1 seems to refer to chapters xciii. (or lxxxix.) of these Acts. Eusebius (*H.E.* iii. 25. 6), Epiphanius (*Haer.* xlvii. 1) and other ancient writers assign them to the authorship of Leucius Charinus. It is generally admitted that they were written in the 2nd century. The text has been edited most completely by Bonnet, *Acta Apostol. Apocr.*, 1898, 151-216. The contents might be summarized with Hennecke as follows:—Arrival and first sojourn of the apostle in Ephesus (xviii.-lv.); return to Ephesus and second sojourn (history of Drusiana, lviii.-lxxxvi.); account of the crucifixion of Jesus and His apparent death (lxxxvii.-cv.); the death of John (cvi.-cxv.). There are manifest gaps in the narrative, a fact which we would infer from the extent assigned to it (*i.e.* 2500 stichoi) by Nicephorus. According to this authority one-third of the text is now lost. Many chapters are lost at the beginning; there is a gap in chapter xxxvii., also before lviii., not to mention others. The encratite tendency in these Acts is not so strongly developed as in those of Andrew and Thomas. James (*Anecdota*, ii. 1-25) has given strong grounds for regarding the Acts of John and Peter as derived from one and the same author, but there are like affinities existing between the Acts of Peter and those of Paul. For a discussion of this work see Zahn, *Gesch. Kanons*, ii. 856-865; Lipsius, *Apok. Apostelgesch.* i. 348-542; Hennecke, *NT. Apokryphen*, 423-432. For bibliography, Hennecke, *NT. Apok. Handbuch*, 492 sq.

Acts of Paul.—The discovery of the Coptic translation of these Acts in 1897, and its publication by C. Schmidt (*Acta Pauli aus der Heidelberger koptischen Papyrushandschrift herausgegeben*, Leipzig, 1894), have confirmed what had been previously only a hypothesis that the Acts of Thecla had formed a part of the larger Acts of Paul. The Acts therefore embrace now the following elements:—(*a*) Two quotations given by Origen in his *Princip.* i. 2. 3 and his comment on John xx. 12. From the latter it follows that in the Acts of Paul the death of Peter was recounted. (*b*) *Apocryphal 3rd Epistle of Paul to the Corinthians* and *Epistle from the Corinthians to Paul.* These two letters are connected by a short account which is intended to give the historical situation. Paul is in prison on account of Stratonice, the wife of Apollophanes. The Greek and Latin versions of these letters have for the most part disappeared, but they have been preserved in Syriac, and through Syriac they obtained for the time being a place in the Armenian Bible immediately after 2 Corinthians. Aphraates cites two passages from 3 Corinthians as words of the apostle, and Ephraem expounded them in his commentary on the Pauline Epistles. They must therefore have been regarded as canonical in the first half of the 4th century. From the Syriac Bible they made their way into the Armenian and maintained their place without opposition to the 7th century. On the Latin text see Carrière and Berger, *Correspondance apocr. de S. P. et des Corinthiens*, 1891. For a translation of Ephraem's commentary see Zahn ii. 592-611 and Vetter, *Der Apocr. 3. Korinthien*, 70 sqq., 1894. The Coptic version (C. Schmidt, *Acta Pauli*, pp. 74-82), which is here imperfect, is clearly from a Greek original, while the Latin and Armenian are from the Syriac. (*c*) *The Acts of Paul and Thecla.* These were written, according to Tertullian (*De Baptismo*, 17) by a presbyter of Asia, who was deposed from his office on account of his forgery. This, the earliest of Christian romances (probably before A.D. 150), recounts the adventures and sufferings of a virgin, Thecla of Iconium. Lipsius discovers Gnostic traits in the story, but these are denied by Zahn (*Gesch. Kanons*, ii. 902). See Lipsius, *op. cit.* ii. 424-467; Zahn (*op. cit.* ii. 892-910). The best text is that of Lipsius, *Acta Apostol. Apocr.*, 1891, i. 235-272. There are Syriac, Arabic, Ethiopic and Slavonic versions. As we have seen above, these Acts are now recognized as belonging originally to the Acts of Paul. They were, however, published separately long before the Gelasian Decree (496). Jerome also was acquainted with them as an independent work. Thecla was most probably a real personage, around whom a legend had already gathered in the 2nd century. Of this legend the author of the Acts of Paul made use, and introduced into it certain historical and geographical facts. (*d*) The healing of Hermocrates of dropsy in Myra. Through a comparison of the Coptic version with the Pseudo-Cyprian writing "Caena," Rolffs (Hennecke, *NT. Apok.* 361) concludes that this incident formed originally a constituent of our book. (*e*) The strife with beasts at Ephesus. This event is mentioned by Nicephorus Callistus (*H.E.* ii. 25) as recounted in the περίοδοι of Paul. The identity of this work with the Acts of Paul is confirmed by a remark of Hippolytus in his commentary on Daniel iii. 29. 4,

ed. Bonwetsch 176 (so Rolffs). (*f*) Martyrdom of Paul. The death of Paul by the sentence of Nero at Rome forms the close of the Acts of Paul. The text is in the utmost confusion. It is best given by Lipsius, *Acta Apostol. Apocr.* i. 104-117.

Notwithstanding all the care that has been taken in collecting the fragments of these Acts, only about 900 stichoi out of the 3600 assigned to them in the Stichometry of Nicephorus have as yet been recovered.

The author was, according to Tertullian (*De Baptism.* 17), a presbyter in Asia, who out of honour to Paul wrote the Acts, forging at the same time 3 Corinthians. Thus the work was composed before 190, and, since it most probably uses the martyrdom of Polycarp, after 155. The object of the writer is to embody in St Paul the model ideal of the popular Christianity of the 2nd century. His main emphasis is laid on chastity and the resurrection of the flesh. The tone of the work is Catholic and anti-Gnostic. For the bibliography of the subject see Hennecke, *N.T. Apok.* 358–360.

Acts of Peter.—These acts are first mentioned by Eusebius (*H.E.* iii. 3) by name, and first referred to by the African poet Commodian about A.D. 250. Harnack, who was the first to show that these Acts were Catholic in character and not Gnostic as had previously been alleged, assigns their composition to this period mainly on the ground that Hippolytus was not acquainted with them; but even were this assumption true, it would not prove the non-existence of the Acts in question. According to Photius, moreover, the Acts of Peter also were composed by this same Leucius Charinus, who, according to Zahn (*Gesch. Kanons*, ii. 864), wrote about 160 (*op. cit.* p. 848). Schmidt and Ficker, however, maintain that the Acts were written about 200 and in Asia Minor. These Acts, which Ficker holds were written as a continuation and completion of the canonical Acts of the Apostles, deal with Peter's victorious conflict with Simon Magus, and his subsequent martyrdom at Rome under Nero. It is difficult to determine the relation of the so-called Latin *Actus Vercellenses* (which there are good grounds for assuming were originally called the Πράξεις Πέτρου) with the Acts of John and Paul. Schmidt thinks that the author of the former made use of the latter, James that the Acts of Peter and of John were by one and the same author, but Ficker is of opinion that their affinities can be explained by their derivation from the same ecclesiastical atmosphere and school of theological thought. No less close affinities exist between our Acts and the Acts of Thomas, Andrew and Philip. In the case of the Acts of Thomas the problem is complicated, sometimes the Acts of Peter seem dependent on the Acts of Thomas, and sometimes the converse.

For the relation of the *Actus Vercellenses* to the "Martyrdom of the holy apostles Peter and Paul" (*Acta Apostol. Apocr.* i. 118-177) and to the "Acts of the holy apostles Peter and Paul" (*Acta Apostol. Apocr.* i. 178-234) see Lipsius ii. 1. 84 sqq. The "Acts of Xanthippe and Polyxena," first edited by James (*Texts and Studies*, ii. 3. 1893), and assigned by him to the middle of the 3rd century, as well as the "Acts of the Disputation of Archelaus, bishop of Mesopotamia, and the Heresiarch Manes" ("Acta Disputationis Archelai Episcopi Mesopotamiae et Manetis Haeresiarchae," in Routh's *Reliquiae Sacrae*[2], v. 36-206), have borrowed largely from our work.

The text of the *Actus Vercellenses* is edited by Lipsius, *Acta Apostol. Apocr.* i. 45-79. An independent Latin translation of the "Martyrdom of Peter" is published by Lipsius (*op. cit.* i. 1-22), *Martyrium beati Petri Apostoli a Lino episcopo conscriptum.* On the Coptic fragment, which Schmidt maintains is an original constituent of these Acts, see that writer's work: *Die alten Petrusakten im Zusammenhang der apokryphen Apostelliteratur nebst einem neuentdeckten Fragment*, and *Texte und Untersuch.* N.F. ix. 1 (1903). For the literature see Hennecke, *Neutestamentliche Apokryphen Handbuch*, 395 sqq.

Preaching of Peter.—This book (Πέτρου κήρυγμα) gave the substance of a series of discourses spoken by one person in the name of the apostles. Clement of Alexandria quotes it several times as a genuine record of Peter's teaching. Heracleon had previously used it (see Origen, *In Evang. Johann.* t. xiii. 17). It is spoken unfavourably of by Origen (*De Prin.* Præf. 8). It was probably in the hands of Justin and Aristides. Hence Zahn gives its date as 90–100 at latest; Dobschütz, as 100–110; and Harnack, as 110–130. The extant fragments contain sayings of Jesus, and warnings against Judaism and Polytheism. They have been edited by Hilgenfeld: *Nov. Test. extra Can.*, 1884, iv. 51-65, and by von Dobschütz, *Das Kerygma Petri*, 1893. Salmon (*Dict. Christ. Biog.* iv. 329-330) thinks that this work is part of a larger work, *A Preaching of Peter and a Preaching of Paul*, implied in a statement of Lactantius (*Inst. Div.* iv. 21); but this view is contested by Zahn, see *Gesch. Kanons*, ii. 820-834, particularly pp. 827-828; Chase, in Hastings' *Bible Dict.* iv. 776.

Acts of Thomas.—This is one of the earliest and most famous of the Gnostic Acts. It has been but slightly tampered with by orthodox hands. These Acts were used by the Encratites (Epiphanius, *Haer.* xlvii. 1), the Manichaeans (Augustine, *Contra Faust.* xxii. 79), the Apostolici (Epiphanius lxi. 1) and Priscillianists. The work is divided into thirteen Acts, to which the Martyrdom of Thomas attaches as the fourteenth. It was originally written in Syriac, as Burkitt (*Journ. of Theol. Studies*, i. 278 sqq.) has finally proved, though Macke and Nöldeke had previously advanced grounds for this view. The Greek and Latin texts were edited by Bonnet in 1883 and again in 1903, ii. 2; the Greek also by James, *Apoc. Anec.* ii. 28-45, and the Syriac by Wright (*Apocr. Acts of the Gospels*, 1871, i. 172-333). Photius ascribes their composition to Leucius Charinus—therefore to the 2nd century, but Lipsius assigns it to the early decades of the 3rd. (See Lipsius, *Apokryphen Apostelgeschichten*, i. 225-347; Hennecke, *N.T. Apokryphen*, 473-480.)

Teaching of the Twelve Apostles (Didachē).—This important work was discovered by Philotheos Bryennios in Constantinople and published in 1883. Since that date it has been frequently edited. The bibliography can be found in Schaff's and in Harnack's editions. The book divides itself into three parts. The first (i.-vi.) contains a body of ethical instruction which is founded on a Jewish and probably pre-Christian document, which forms the basis also of the *Epistle of Barnabas*. The second part consists of vii.-xv., and treats of church ritual and discipline; and the third part is eschatological and deals with the second Advent. The book is variously dated by different scholars: Zahn assigns it to the years A.D. 80–120; Harnack to 120–165; Lightfoot and Funk to 80–100; Salmon to 120. (See Salmon in *Dict. of Christ. Biog.* iv. 806-815, also article Didachē.)

Apostolical Constitutions.—For the various collections of these ecclesiastical regulations—the Syriac *Didascalia*, *Ecclesiastical Canons of the Holy Apostles*, &c.—see separate article.

(*c*) Epistles.—*The Abgar Epistles.*—These epistles are found in Eusebius (*H.E.* i. 3), who translated them from the Syriac. They are two in number, and purport to be a petition of Abgar Uchomo, king of Edessa, to Christ to visit Edessa, and Christ's answer, promising after his ascension to send one of his disciples, who should "cure thee of thy disease, and give eternal life and peace to thee and all thy people." Lipsius thinks that these letters were manufactured about the year 200. (See *Dict. Christ. Biog.* iv. 878-881, with the literature there mentioned.) The above correspondence, which appears also in Syriac, is inwoven with the legend of Addai or Thaddaeus. The best critical edition of the Greek text will be found in Lipsius, *Acta Apostolorum Apocrypha*, 1891, pp. 279-283. (See also Abgar.)

Epistle of Barnabas.—The special object of this epistle was to guard its readers against the danger of relapsing into Judaism. The date is placed by some scholars as early as 70–79, by others as late as the early years of the emperor Hadrian, 117. The text has been edited by Hilgenfeld in 1877, Gebhardt and Harnack in 1878, and Funk in 1887 and 1901. In these works will be found full bibliographies. (See further Barnabas.)

Epistle of Clement.—The object of this epistle is the restoration of harmony to the church of Corinth, which had been vexed by internal discussions. The epistle may be safely ascribed to the years 95–96. The writer was in all probability the bishop of Rome of that name. He is named an apostle and his work was reckoned as canonical by Clement of Alexandria (*Strom.* iv. 17. 105), and as late as the time of Eusebius (*H.E.* iii. 16) it was still read in some of the churches. Critical editions have been published by Gebhardt and Harnack, *Patr. Apost. Op.*, 1876,

and in the smaller form in 1900, Lightfoot[2], 1890, Funk[2], 1901. The Syriac version has been edited by Kennet, *Epp. of St Clement to the Corinthians in Syriac*, 1899, and the Old Latin version by Morin, *S. Clementis Romani ad Corinthios epistulae versio Latina antiquissima*, 1894.

"Clement's" 2nd Ep. to the Corinthians.—This so-called letter of Clement is not mentioned by any writer before Eusebius (*H.E.* iii. 38. 4). It is not a letter but really a homily written in Rome about the middle of the 2nd century. The writer is a Gentile. Some of his citations are derived from the Gospel to the Egyptians.

Clement's Epistles on Virginity.—These two letters are preserved only in Syriac which is a translation from the Greek. They are first referred to by Epiphanius and next by Jerome. Critics have assigned them to the middle of the 2nd century. They have been edited by Beelen, Louvain, 1856.

Clement's Epistles to James.—On these two letters which are found in the Clementine Homilies, see Smith's *Dict. of Christian Biography*, i. 559, 570, and Lehmann's monograph, *Die Clementischen Schriften*, Gotha, 1867, in which references will be found to other sources of information.

Epistles of Ignatius.—There are two collections of letters bearing the name of Ignatius, who was martyred between 105 and 117. The first consists of seven letters addressed by Ignatius to the Ephesians, Magnesians, Trallians, Romans, Philadelphians, Smyrnaeans and to Polycarp. The second collection consists of the preceding extensively interpolated, and six others of Mary to Ignatius, of Ignatius to Mary, to the Tarsians, Antiochians, Philippians and Hero, a deacon of Antioch. The latter collection is a pseudepigraph written in the 4th century or the beginning of the 5th. The authenticity of the first collection also has been denied, but the evidence appears to be against this contention. The literature is overwhelming in its extent. See Zahn, *Patr. Apost. Op.*, 1876; Funk[2], *Die apostol. Väter*, 1901; Lightfoot[2], *Apostolic Fathers*, 1889.

Epistle of Polycarp.—The genuineness of this epistle stands or falls with that of the Ignatian epistles. See article in Smith's *Dictionary of Christian Biography*, iv. 423-431; Lightfoot, *Apostolic Fathers*, i. 629-702; also POLYCARP.

Pauline Epistles to the Laodiceans and the Alexandrians.—The first of these is found only in Latin. This, according to Lightfoot (see *Colossians*[8], 272-298) and Zahn, is a translation from the Greek. Such an epistle is mentioned in the Muratorian canon. See Zahn, *op. cit.* ii. 566-585. The Epistle to the Alexandrians is mentioned only in the Muratorian canon (see Zahn ii. 586-592).

For the *Third Epistle of Paul to the Corinthians*, and *Epistle from the Corinthians to Paul*, see under "Acts of Paul" above. (R. H. C.)

APODICTIC (Gr. *ἀποδεικτικός*, capable of demonstration), a logical term, applied to judgments which are necessarily true, as of mathematical conclusions. The term in Aristotelian logic is opposed to dialectic, as scientific proof to probable reasoning. Kant contrasts apodictical with problematic and assertorical judgments.

APOLDA, a town of Germany, in the grand-duchy of Saxe-Weimar, near the river Ilm, 9 m. E. by N. from Weimar, on the main line of railway from Berlin via Halle, to Frankfort-on-Main. Pop. (1900) 20,352. It has few notable public buildings, but possesses three churches and monuments to the emperor Frederick III. and to Christian Zimmermann (1759–1842), who, by introducing the hosiery and cloth manufacture, made Apolda one of the most important places in Germany in these branches of industry. It has also extensive dyeworks, bell foundries, and manufactures of steam engines, boilers and bicycles.

APOLLINARIS, "the Younger" (d. A.D. 390), bishop of Laodicea in Syria. He collaborated with his father Apollinaris the Elder in reproducing the Old Testament in the form of Homeric and Pindaric poetry, and the New after the fashion of Platonic dialogues, when the emperor Julian had forbidden Christians to teach the classics. He is best known, however, as a warm opponent of Arianism, whose eagerness to emphasize the deity of Christ and the unity of His person led him so far as a denial of the existence of a rational human soul (*νοῦς*) in Christ's human nature, this being replaced in Him by a prevailing principle of holiness, to wit the Logos, so that His body was a glorified and spiritualized form of humanity. Over against this the orthodox or Catholic position maintained that Christ assumed human nature in its entirety including the *νοῦς*, for only so could He be example and redeemer. It was held that the system of Apollinaris was really Docetism (see DOCETAE), that if the Godhood without constraint swayed the manhood there was no possibility of real human probation or of real advance in Christ's manhood. The position was accordingly condemned by several synods and in particular by that of Constantinople (A.D. 381). This did not prevent its having a considerable following, which after Apollinaris's death divided into two sects, the more conservative taking its name (Vitalians) from Vitalis, bishop of Antioch, the other (Polemeans) adding the further assertion that the two natures were so blended that even the body of Christ was a fit object of adoration. The whole Apollinarian type of thought persisted in what was later the Monophysite (*q.v.*) school.

Although Apollinaris was a prolific writer, scarcely anything has survived under his own name. But a number of his writings are concealed under the names of orthodox Fathers, *e.g.* *ἡ κατὰ μέρος πίστις*, long ascribed to Gregory Thaumaturgus. These have been collected and edited by Hans Lietzmann.

He must be distinguished from the bishop of Hierapolis who bore the same name, and who wrote one of the early Christian "Apologies" (*c.* 170). See A. Harnack, *History of Dogma*, vols. iii. and iv. *passim*; R. L. Ottley, *The Doctrine of the Incarnation*; G. Voisin, *L'Apollinarisme* (Louvain, 1901); H. Lietzmann, *Apollinaris von Laodicea und seine Schule* (Tübingen, 1905).

APOLLINARIS, SULPICIUS, a learned grammarian of Carthage, who flourished in the 2nd century A.D. He taught Pertinax—himself a teacher of grammar before he was emperor, —and Aulus Gellius, who speaks of him in the highest terms (iv. 17). He is the reputed author of the metrical arguments to the *Aeneid* and to the plays of Terence and (probably) Plautus (J. W. Beck, *De Sulpicio Apollinari*, 1884).

APOLLINARIS SIDONIUS, CAIUS SOLLIUS (*c.* 430–487 or 488), Christian writer and bishop, was born in Lyons about A.D. 430. Belonging to a noble family, he was educated under the best masters, and particularly excelled in poetry and polite literature. He married (about 452) Papianilla, the daughter of Avitus, who was consul and afterwards emperor. But Majorianus, in the year 457, having deprived Avitus of the empire and taken the city of Lyons, Apollinaris fell into the hands of the enemy. The reputation of his learning led Majorianus to treat him with the greatest respect. In return Apollinaris composed a panegyric in his honour (as he had previously done for Avitus), which won for him a statue at Rome and the title of count. In 467 the emperor Anthemius rewarded him for the panegyric which he had written in honour of him by raising him to the post of prefect of Rome, and afterwards to the dignity of a patrician and senator. In 472, more for his political than for his theological abilities, he was chosen to succeed Eparchius in the bishopric of Arverna (Clermont). On the capture of that city by the Goths in 474 he was imprisoned, as he had taken an active part in its defence; but he was afterwards restored by Euric, king of the Goths, and continued to govern his bishopric as before. He died in A.D. 487 or 488. His extant works are his *Panegyrics* on different emperors (in which he draws largely upon Statius, Ausonius and Claudian); and nine books of *Letters* and *Poems*, whose chief value consists in the light they shed on the political and literary history of the 5th century. The *Letters*, which are very stilted, also reveal Apollinaris as a man of genial temper, fond of good living and of pleasure. The best edition is that in the *Monumenta Germaniae Historica* (Berlin, 1887), which gives a survey of the manuscripts.

Apollinaris Sidonius (the names are commonly inverted by the French) is the subject of numerous monographs, historical and literary. See, for bibliography, A. Molinier, *Sources de l'histoire de France*, no. 136 (vol. i.). S. Dill, *Roman Society in the Fifth Century*, and T. Hodgkin, *Italy and her Invaders* (vol. vii.), contain interesting sections on Apollinaris. See also Teuffel and Ebert's histories of Latin literature.

APOLLO (Gr. Ἀπόλλων, Ἀπέλλων), in Greek mythology, one of the most important and many-sided of the Olympian divinities. No satisfactory etymology of the name has been given, the least improbable perhaps being that which connects it with the Doric ἀπέλλα ("assembly"),[1] so that Apollo would be the god of political life (for other suggested derivations, ancient and modern, see C. Wernicke in Pauly-Wissowa's *Realencyclopädie*). The derivation of all the functions assigned to him from the idea of a single original light- or sun-god, worked out in his *Lexikon der Mythologie* by Roscher, who regards it as "one of the most certain facts in mythology," has not found general acceptance, although no doubt some features of his character can be readily explained on this assumption.

In the legend, as set forth in the Homeric hymn to Apollo and the ode of Callimachus to Delos, Apollo is the son of Zeus and Leto. The latter, pursued by the jealous Hera, after long wandering found shelter in Delos (originally Asteria), where she bore a son, Apollo, under a palm-tree at the foot of Mount Cynthus. Before this, Delos—like Rhodes, the centre of the worship of the sun-god Helios, with whom Apollo was wrongly identified in later times—had been a barren, floating rock, but now became stationary, being fastened down by chains to the bottom of the sea. Apollo was born on the 7th day (ἑβδομαγενής) of the month Thargelion according to Delian, of the month Bysios according to Delphian, tradition. The 7th and 20th, the days of the new and full moon, were ever afterwards held sacred to him. In Homer Apollo appears only as the god of prophecy, the sender of plagues, and sometimes as a warrior, but elsewhere as exercising the most varied functions. He is the god of agriculture, specially connected with Aristaeus (*q.v.*), which, originally a mere epithet, became an independent personality (see, however, Farnell, *Cults of the Greek States*, iv. 123). This side of his character is clearly expressed in the titles *Sitalcas* ("protector of corn"); *Erythibius* ("preventer of blight"); *Parnopius* ("destroyer of locusts"); *Smintheus* ("destroyer of mice"), in which, however, some modern inquirers see a totemistic significance (*e.g.* A. Lang, "Apollo and the Mouse," in *Custom and Myth*, p. 101; against this, W. W. Fowler, in *Classical Review*, November 1892); *Erithius* ("god of reapers"); and *Pasparius* ("god of meal"). He is further the god of vegetation generally—*Nomios*, "god of pastures" (explained, however, by Cicero, as "god of law"), *Hersos*, "sender of the fertilizing dew." Valleys and groves are under his protection, unless the epithets *Napaeus* and *Hylates* belong to a more primitive aspect of the god as supporting himself by the chase, and roaming the glades and forests in pursuit of prey. Certain trees and plants, especially the laurel, were sacred to him. As the god of agriculture and vegetation he is naturally connected with the course of the year and the arrangement of the seasons, so important in farming operations, and becomes the orderer of time (*Horomedon*, "ruler of the seasons"), and frequently appears on monuments in company with the Horae.

Apollo is also the protector of cattle and herds, hence *Poimnius* ("god of flocks"), *Tragius* ("of goats"), *Kereatas* ("of horned animals"). *Carneius* (probably "horned") is considered by some to be a pre-Dorian god of cattle, also connected with harvest operations, whose cult was grafted on to that of Apollo; by others, to have been originally an epithet of Apollo, afterwards detached as a separate personality (Farnell, *Cults*, iv. p. 131). The epithet *Maleatas*, which, as the quantity of the first vowel (ă) shows,[2] cannot mean god of "sheep" or "the apple-tree," is probably a local adjective derived from Malea (perhaps Cape Malea), and may refer to an originally distinct personality, subsequently merged in that of Apollo (see below). Apollo himself is spoken of as a keeper of flocks, and the legends of his service as a herdsman with Laomedon and Admetus point in the same direction. Here probably also is to be referred the epithet *Lyceius*, which, formerly connected with λυκ- ("shine") and used to support the conception of Apollo as a light-god, is now generally referred to λύκος ("wolf") and explained as he who keeps away the wolves from the flock (cf. λυκόεργος, λυκοκτόνος). In accordance with this, the epithet λυκηγενής will not mean "born of" or "begetting light," but rather "born from the she-wolf," in which form Leto herself was said to have been conducted by wolves to Delos. The consecration of the wolf to Apollo is probably the relic of an ancient totemistic religion (Farnell, *Cults*, i. 41; W. Robertson Smith, *Religion of the Semites*, new ed., 1894, p. 226).

With the care of the fruits of the earth and the lower animals is associated that of the highest animal, man, especially the youth on his passage to manhood. As such Apollo is κουροτρόφος ("rearer of boys") and patron of the palaestra. In many places gymnastic contests form a feature of his festivals, and he himself is proficient in athletic exercises (ἐναγώνιος). Thus he was supposed to be the first victor at the Olympic games; he overcomes Hermes in the foot-race, and Ares in boxing.

The transition is easy to Apollo as a warlike god; in fact, the earlier legends represent him as engaged in strife with Python, Tityus, the Cyclopes and the Aloidae. He is *Boëdromios* ("the helper"), *Eleleus* ("god of the war-cry"), and the Paean was said to have been originally a song of triumph composed by him after his victory over Python. In Homer he frequently appears on the field, like Ares and Athene, bearing the aegis to frighten the foe. This aspect is confirmed by the epithets *Argyrotoxos* ("god of the silver bow"), *Hecatebolos* ("the shooter from afar"), *Chrysaoros* ("wearer of the golden sword"), and his statues are often equipped with the accoutrements of war.[3]

The fame of the Pythian oracle at Delphi, connected with the slaying of Python by the god immediately after his birth, gave especial prominence to the idea of Apollo as a god of prophecy. Python, always represented in the form of a snake, sometimes nameless, is the symbol of the old chthonian divinity whose home was the place of "enquiry" (πυθέσθαι). When Apollo Delphinius with his worshippers from Crete took possession of the earth-oracle Python, he received in consequence the name Pythius. That Python was no fearful monster, symbolizing the darkness of winter which is scattered by the advent of spring, is shown by the fact that Apollo was considered to have been guilty of murder in slaying it, and compelled to wander for a term of years and expiate his crime by servitude and purification. Possibly at Delphi and other places there was an old serpent-worship ousted by that of Apollo, which may account for expiation for the slaying of Python being considered necessary. In the solar explanation, the serpent is the darkness driven away by the rays of the sun. (On the Delphian cult of Apollo and its political significance, see Amphictyony, Delphi, Oracle; and Farnell, *Cults*, iv. pp. 179-218.) Oracular responses were also given at Claros near Colophon in Ionia by means of the water of a spring which inspired those who drank of it; at Patara in Lycia; and at Didyma near Miletus through the priestly family of the Branchidae. Apollo's oracles, which he did not deliver on his own initiative but as the mouthpiece of Zeus, were infallible, but the human mind was not always able to grasp their meaning; hence he is called *Loxias* ("crooked," "ambiguous"). To certain favoured mortals he communicated the gift of prophecy (Cassandra, the Cumaean sibyl, Helenus, Melampus and Epimenides). Although his favourite method was by word of mouth, yet signs were sometimes used; thus Calchas interpreted the flight of birds; burning offerings, sacrificial barley, the arrow of the god, dreams and the lot, all played their part in communicating the will of the gods.

Closely connected with the god of oracles was the god of the healing art, the oracle being frequently consulted in cases of sickness. These two functions are indicated by the titles *Iatromantis* ("physician and seer") and *Oulios*, probably meaning "health-giving" (so Suidas) rather than "destructive." This side of Apollo's character does not appear in Homer, where Paeon is mentioned as the physician of the gods. Here again, as in the case of Aristaeus and Carneius, the question arises

[1] Hesychius; who also gives the explanation σηκός ("fold"), in which case Apollo would be the god of flocks and herds.

[2] The authority for the quantity is Isyllus.

[3] Hence some have derived "Apollo" from ἀπολλύναι, "to destroy."

whether Paean (or Paeon) was originally an epithet of Apollo, subsequently developed into an independent personality, or an independent deity merged in the later arrival (Farnell, *Cults*, iv. p. 234). According to Wilamowitz-Möllendorff in his edition of Isyllus, the epithet Maleatas alluded to above is also connected with the functions of the healing god, imported into Athens in the 4th century B.C. with other well-known health divinities. In this connexion, it is said to mean the "gentle one," who gave his name to the rock Malion or Maleas (O. Gruppe, *Griechische Mythologie*, ii. 1442) on the Gortynian coast. Apollo is further supposed to be the father of Asclepius (Aesculapius), whose ritual is closely modelled upon his. The healing god could also prevent disease and misfortune of all kinds: hence he is ἀλεξίκακος ("averter of evil") and ἀποτρόπαιος. Further, he is able to purify the guilty and to cleanse from sin (here some refer the epithet ἰατρόμαντις, in the sense of "physician of the soul"). Such a task can be fitly undertaken by Apollo, since he himself underwent purification after slaying Python. According to the Delphic legend, this took place in the laurel grove of Tempe, and after nine years of penance the god returned, as was represented in the festival called Stepterion or Septerion (see A. Mommsen, *Delphika*, 1878). Thus the old law of blood for blood, which only perpetuated the crime from generation to generation, gave way to the milder idea of the expiatory power of atonement for murder (cf. the court called τὸ ἐπὶ Δελφινίῳ at Athens, which retained jurisdiction in cases where justifiable homicide was pleaded).

The same element of enthusiasm that affects the priestess of the oracle at Delphi produces song and music. The close connexion between prophecy and song is indicated in Homer (*Odyssey*, viii. 488), where Odysseus suggests that the lay of the fall of Troy by Demodocus was inspired by Apollo or the Muse. The metrical form of the oracular responses at Delphi, the important part played by the paean and the Pythian nomos in his ritual, contributed to make Apollo a god of song and music, friend and leader of the Muses (μουσαγέτης). He plays the lyre at the banquets of the gods, and causes Marsyas to be flayed alive because he had boasted of his superior skill in playing the flute, and the ears of Midas to grow long because he had declared in favour of Pan, who contended that the flute was a better instrument than Apollo's favourite, the lyre.

A less important aspect of Apollo is that of a marine deity, due to the spread of his cult to the Greek colonies and islands. As such, his commonest name is *Delphinius*, the "dolphin god," in whose honour the festival Delphinia was celebrated in Attica. This cult probably originated in Crete, whence the god in the form of a dolphin led his Cretan worshippers to the Delphian shore, where he bade them erect an altar in his honour. He is *Epibaterius* and *Apobaterius* ("embarker" and "disembarker"), *Nasiotas* ("the islander"), *Euryalus* ("god of the broad sea"). Like Poseidon, he looks forth over his watery kingdom from lofty cliffs and promontories (ἀκταῖος, and perhaps ἀκρίτας).

These maritime cults of Apollo are probably due to his importance as the god of colonization, who accompanied emigrants on their voyage. As such he is ἀγήτωρ ("leader"), οἰκίστης ("founder"), δωματίτης ("god of the home"). As *Agyieus* ("god of streets and ways"), in the form of a stone pillar with painted head, placed before the doors of houses, he let in the good and kept out the evil (see Farnell, *Cults*, iv. p. 150, who takes Agyieus to mean "leader"); on the epithet *Prostaterius*, he who "stands before the house," hence "protector," see G. M. Hirst in *Journal of Hellenic Studies*, xxii. (1902). Lastly, as the originator and protector of civil order, Apollo was regarded as the founder of cities and legislation. Thus, at Athens, Apollo *Patroös* was known as the protector of the Ionians, and the Spartans referred the institutions of Lycurgus to the Delphic oracle.

It has been mentioned above that W. H. Roscher, in the article "Apollo" in his *Lexikon der Mythologie*, derives all the aspects and functions of Apollo from the conception of an original light- and sun-god. The chief objections to this are the following. It cannot be shown that on *Greek* soil Apollo originally had the meaning of a sun-god; in Homer, Aeschylus and Plato, the sun-god Helios is distinctly separated from Phoebus Apollo; the constant epithet Φοῖβος, usually explained as the brightness of the sun, may equally well refer to his physical beauty or moral purity; λυκηγενής has already been noticed. It is not until the beginning of the 5th century B.C. that the identification makes its appearance. The first literary evidence is a fragment of Euripides (*Phaëthon*), in which it is especially characterized as an innovation. The idea was taken up by the Stoics, and in the Roman period generally accepted. But the fact of the gradual development of Apollo as a god of light and heaven, and his identification with foreign sun-gods, is no proof of an original Greek solar conception of him. Apollo-Helios must be regarded as "a late by-product of Greek religion" (Farnell, *Cults*, iv. p. 136; Wernicke in Pauly-Wissowa's *Realencyclopädie*). For the manner in which the solar theory is developed, reference must be made to Roscher's article, but one legend may here be mentioned, since it helps to trace the spread of the cult of the god. It was said that Apollo soon after his birth spent a year amongst the Hyperboreans, who dwelt in a land of perpetual sunshine, before his return to Delphi. This return is explained as the second birth of the god and his victory over the powers of winter; the name Hyperboreans is explained as the "dwellers beyond the north wind." This interpretation is now, however, generally rejected in favour of that of H. L. Ahrens,—that Hyperborei is identical with the Perphereës ("the carriers"), who are described as the servants of Apollo, carriers of cereal offerings from one community to another (Herodotus iv. 33). This would point to the fact that certain settlements of Apolline worship along the northernmost border of Greece (Illyria, Thrace, Macedonia) were in the habit of sending offerings to the god to a centre of his worship farther south (probably Delphi), advancing by the route from Tempe through Thessaly, Pherae and Doris to Delphi; while others adopted the route through Illyria, Epirus, Dodona, the Malian gulf, Carystus in Euboea, and Tenos to Delos (Farnell, *Cults*, iv. p. 100).

The most usual attributes of Apollo were the lyre and the bow; the tripod especially was dedicated to him as the god of prophecy. Among plants, the bay, used in expiatory sacrifices and also for making the crown of victory at the Pythian games, and the palm-tree, under which he was born in Delos, were sacred to him; among animals and birds, the wolf, the roe, the swan, the hawk, the raven, the crow, the snake, the mouse, the grasshopper and the griffin, a mixture of the eagle and the lion evidently of Eastern origin. The swan and grasshopper symbolize music and song; the hawk, raven, crow and snake have reference to his functions as the god of prophecy.

The chief festivals held in honour of Apollo were the Carneia, Daphnephoria, Delia, Hyacinthia, Pyanepsia, Pythia and Thargelia (see separate articles).

Among the Romans the worship of Apollo was adopted from the Greeks. There is a tradition that the Delphian oracle was consulted as early as the period of the kings during the reign of Tarquinius Superbus, and in 430 a temple was dedicated to Apollo on the occasion of a pestilence, and during the Second Punic War (in 212) the *Ludi Apollinares* were instituted in his honour. But it was in the time of Augustus, who considered himself under the special protection of Apollo and was even said to be his son, that his worship developed and he became one of the chief gods of Rome. After the battle of Actium, Augustus enlarged his old temple, dedicated a portion of the spoil to him, and instituted quinquennial games in his honour. He also erected a new temple on the Palatine hill and transferred the secular games, for which Horace composed his *Carmen Saeculare*, to Apollo and Diana.

Apollo was represented more frequently than any other deity in ancient art. As Apollo Agyieus he was shown by a simple conic pillar; the Apollo of Amyclae was a pillar of bronze surmounted by a helmeted head, with extended arms carrying lance and bow. There were also rude idols of him in wood (*xoana*), in which the human form was scarcely recognizable. In the 6th century, his statues of stone were naked, stiff and rigid in attitude, shoulders square, limbs strong and broad, hair falling

down the back. In the riper period of art the type is softer, and Apollo appears in a form which seeks to combine manhood and eternal youth. His long hair is usually tied in a large knot above his forehead. The most famous statue of him is the Apollo Belvidere in the Vatican (found at Frascati, 1455), an imitation belonging to the early imperial period of a bronze statue representing him, with aegis in his left hand, driving back the Gauls from his temple at Delphi (279 B.C.), or, according to another view, fighting with the Pythian dragon. In the Apollo Citharoedus or Musagetes in the Vatican, he is crowned with laurel and wears the long, flowing robe of the Ionic bard, and his form is almost feminine in its fulness; in a statue at Rome of the older and more vigorous type he is naked and holds a lyre in his left hand; his right arm rests upon his head, and a griffin is seated at his side. The Apollo Sauroctonus (after Praxiteles), copied in bronze at the Villa Albani in Rome and in marble at Paris, is a naked, youthful, almost boyish figure, leaning against a tree, waiting to strike a lizard climbing up the trunk. The gigantic statue of Helios (the sun-god), "the colossus of Rhodes," by Chares of Lindus, celebrated as one of the seven wonders of the world, is unknown to us. Bas-reliefs and painted vases reproduce the contests of Apollo with Tityus, Marsyas, and Heracles, the slaughter of the daughters of Niobe, and other incidents in his life.

AUTHORITIES.—F. L. W. Schwartz, *De antiquissima Apollinis Natura* (Berlin, 1843); J. A. Schönborn, *Über das Wesen Apollons* (Berlin, 1854); A. Milchhöfer, *Über den attischen Apollon* (Munich, 1873); T. Schreiber, *Apollon Pythoktonos* (Leipzig, 1879); W. H. Roscher, *Studien zur vergleichenden Mythologie der Griechen und Römer*, i. (Leipzig, 1873); R. Hecker, *De Apollinis apud Romanos Cultu* (Leipzig, 1879); G. Colin, *Le Culte d'Apollon pythien à Athènes* (1905); L. Dyer, *The Gods in Greece* (1891); articles in Pauly-Wissowa's *Realencyclopädie*, W. H. Roscher's *Lexikon der Mythologie*, and Daremberg and Saglio's *Dictionnaire des antiquités*; L. Preller, *Griechische und römische Mythologie* (4th ed. by C. Robert); J. Marquardt, *Römische Staatsverwaltung*, iii.; G. Wissowa *Religion und Kultus der Römer* (1902); D. Bassi, *Saggio di Bibliografia mitologica*, i. *Apollo* (1896); L. Farnell, *Cults of the Greek States*, iv. (1907); O. Gruppe, *Griechische Mythologie und Religionsgeschichte*, ii. (1906). In the article GREEK ART, fig. 9 represents a bearded Apollo, playing on the lyre, in a chariot drawn by winged horses; fig. 55 (pl. ii.) Apollo of the Belvidere; fig. 76 (pl. v.) a nude and roughly executed colossal figure of the god. (J. H. F.)

APOLLODORUS, an Athenian painter, who flourished at the end of the 5th century B.C. He is said to have introduced great improvements in perspective and chiaroscuro. What these were it is impossible to say: perspective cannot have been in his day at an advanced stage. Among his works were an Odysseus, a priest in prayer, and an Ajax struck by lightning.

APOLLODORUS, an Athenian grammarian, pupil of Aristarchus and Panaetius the Stoic, who lived about 140 B.C. He was a prolific and versatile writer. There is extant under his name a treatise on the gods and the heroic age, entitled Βιβλιοθήκη, a valuable authority on ancient mythology. Modern critics are of opinion that, if genuine, it is an abridgment of a larger work by him (Περὶ θεῶν).

Edition, with commentary, by Heyne (1803); text by Wagner (1894) (*Mythographi Graeci*, vol. i. Teubner series). Amongst other works by him of which only fragments remain, collected in Müller, *Fragmenta Historicorum Graecorum*, may be mentioned: Χρονικά, a universal history from the fall of Troy to 144 B.C.; Περιήγησις, a gazetteer written in iambics; Περὶ Νεῶν, a work on the Homeric catalogue of ships; and a work on etymology (Ἐτυμολογίαι).

APOLLODORUS, of Carystus in Euboea, one of the most important writers of the New Attic comedy, who flourished at Athens between 300 and 260 B.C. He is to be distinguished from an older Apollodorus of Gela (342–290), also a writer of comedy, a contemporary of Menander. He wrote 47 comedies and obtained the prize five times. Terence borrowed his *Hecyra* and *Phormio* from the Ἑκυρά and Ἐπιδικαζόμενος of Apollodorus.

Fragments in Koch, *Comicorum Atticorum Fragmenta*, ii. (1884); see also Meineke, *Historia Critica Comicorum Graecorum* (1839).

APOLLODORUS, of Damascus, a famous Greek architect, who flourished during the 2nd century A.D. He was a favourite of Trajan, for whom he constructed the stone bridge over the Danube (A.D. 104–105). He also planned a gymnasium, a college, public baths, the Odeum and the Forum Trajanum, within the city of Rome; and the triumphal arches at Beneventum and Ancona. The Trajan column in the centre of the Forum is celebrated as being the first triumphal monument of the kind. On the accession of Hadrian, whom he had offended by ridiculing his performances as architect and artist, Apollodorus was banished, and, shortly afterwards, being charged with imaginary crimes, put to death (Dio Cassius lxix. 4). He also wrote a treatise on *Siege Engines* (Πολιορκητικά), which was dedicated to Hadrian.

APOLLONIA, the name of more than thirty cities of antiquity. The most important are the following: (1) An Illyrian city (known as Apollonia κατ' Ἐπίδαμνον or πρὸς Ἐπιδάμνῳ) on the right bank of the Aous, founded by the Corinthians and Corcyraeans. It soon became a place of increasing commercial prosperity, as the most convenient link between Brundusium and northern Greece, and as one of the starting-points of the Via Egnatia. It was an important military post in the wars against Philip and during the civil wars of Pompey and Caesar, and towards the close of the Roman republic acquired fame as a seat of literature and philosophy. Here Augustus was being educated when the death of Caesar called him to Rome. It seems to have sunk with the rise of Aulon, and few remains of its ruins are to be found. The monastery of Pollina stands on a hill which probably is part of the site of the old city. (2) A Thracian city on the Black Sea (afterwards Sozopolis, and now Sizeboli), colonized by the Milesians, and famous for its colossal statue of Apollo by Calamis, which Lucullus removed to Rome.

APOLLONIUS, surnamed ὁ δύσκολος ("the Surly or Crabbed"), a celebrated grammarian of Alexandria, who lived in the reigns of Hadrian and Antoninus Pius. He spent the greater part of his life in his native city, where he died; he is also said to have visited Rome and attracted the attention of Antoninus. He was the founder of scientific grammar and is styled by Priscian *grammaticorum princeps*. Four of his works are extant: *On Syntax*, ed. Bekker, 1817; and three smaller treatises, on *Pronouns*, *Conjunctions* and *Adverbs*, ed. Schneider, 1878.

Grammatici Graeci, i. in Teubner series; Egger, *Apollonius Dyscole* (1854).

APOLLONIUS, surnamed ὁ μαλακός ("the Effeminate"), a Greek rhetorician of Alabanda in Caria, who flourished about 120 B.C. After studying under Menecles, chief of the Asiatic school of oratory, he settled in Rhodes, where he taught rhetoric, among his pupils being Mark Antony.

APOLLONIUS, surnamed "the Sophist," of Alexandria, a famous grammarian, who probably lived towards the end of the 1st century A.D. He was the author of a Homeric lexicon (Λέξεις Ὁμηρικαί), the only work of the kind we possess. His chief authorities were Aristarchus and Apion's Homeric glossary.

Edition by Villoison (1773), I. Bekker (1833); Leyde, *De Apollonii Sophistae Lexico Homerico* (1885); E. W. B. Nicholson on a newly discovered fragment in *Classical Review* (Nov. 1897).

APOLLONIUS MOLON (sometimes called simply MOLON), a Greek rhetorician, who flourished about 70 B.C. He was a native of Alabanda, a pupil of Menecles, and settled at Rhodes. He twice visited Rome as an ambassador from Rhodes, and Cicero and Caesar took lessons from him. He endeavoured to moderate the florid Asiatic style and cultivated an "Atticizing" tendency. He wrote on Homer, and, according to Josephus, violently attacked the Jews.

See C. Müller, *Fragmenta Historicorum Graecorum*, iii.; E. Schürer, *History of the Jewish People*, iii. (Eng. tr. 1886).

APOLLONIUS OF PERGA [PERGAEUS], Greek geometer of the Alexandrian school, was probably born some twenty-five years later than Archimedes, *i.e.* about 262 B.C. He flourished in the reigns of Ptolemy Euergetes and Ptolemy Philopator (247–205 B.C.). His treatise on *Conics* gained him the title of The Great Geometer, and is that by which his fame has been transmitted to modern times. All his numerous other treatises have perished, save one, and we have only their titles handed down, with general indications of their contents, by later writers, especially Pappus. After the *Conics* in eight Books had been written in a first edition, Apollonius brought out a second edition, considerably revised as regards Books i.-ii., at the instance of one Eudemus of Pergamum;

the first three books were sent to Eudemus at intervals, as revised, and the later books were dedicated (after Eudemus' death) to King Attalus I. (241–197 B.C.). Only four Books have survived in Greek; three more are extant in Arabic; the eighth has never been found. Although a fragment has been found of a Latin translation from the Arabic made in the 13th century, it was not until 1661 that a Latin translation of Books v.-vii. was available. This was made by Giovanni Alfonso Borelli and Abraham Ecchellensis from the free version in Arabic made in 983 by Abu 'l-Fath of Ispahan and preserved in a Florence MS. But the best Arabic translation is that made as regards Books i.-iv. by Hilāl ibn Abī Hilāl (d. about 883), and as regards Books v.-vii. by Tobit ben Korra (836–901). Halley used for his translation an Oxford MS. of this translation of Books v.-vii., but the best MS. (Bodl. 943) he only referred to in order to correct his translation, and it is still unpublished except for a fragment of Book v. published by L. Nix with German translation (Drugulin, Leipzig, 1889). Halley added in his edition (1710) a restoration of Book viii., in which he was guided by the fact that Pappus gives lemmas "to the seventh and eighth books" under that one heading, as well as by the statement of Apollonius himself that the use of the seventh book was illustrated by the problems solved in the eighth.

The degree of originality of the *Conics* can best be judged from Apollonius' own prefaces. Books i.-iv. form an "elementary introduction," *i.e.* contain the essential principles; the rest are specialized investigations in particular directions. For Books i.-iv. he claims only that the generation of the curves and their fundamental properties in Book i. are worked out more fully and generally than they were in earlier treatises, and that a number of theorems in Book iii. and the greater part of Book iv. are new. That he made the fullest use of his predecessors' works, such as Euclid's four Books on Conics, is clear from his allusions to Euclid, Conon and Nicoteles. The generality of treatment is indeed remarkable; he gives as the fundamental property of all the conics the equivalent of the Cartesian equation referred to *oblique* axes (consisting of a diameter and the tangent at its extremity) obtained by cutting an oblique circular cone in any manner, and the axes appear only as a particular case after he has shown that the property of the conic can be expressed in the same form with reference to any new diameter and the tangent at its extremity. It is clearly the form of the fundamental property (expressed in the terminology of the "application of areas") which led him to call the curves for the first time by the names *parabola*, *ellipse*, *hyperbola*. Books v.-vii. are clearly original. Apollonius' genius takes its highest flight in Book v., where he treats of normals as minimum and maximum straight lines drawn from given points to the curve (independently of tangent properties), discusses how many normals can be drawn from particular points, finds their feet by construction, and gives propositions determining the centre of curvature at any point and leading at once to the Cartesian equation of the evolute of any conic.

The other treatises of Apollonius mentioned by Pappus are —1st, Λόγου ἀποτομή, *Cutting off a Ratio*; 2nd, Χωρίου ἀποτομή, *Cutting off an Area*; 3rd, Διωρισμένη τομή, *Determinate Section*; 4th, Ἐπαφαί, *Tangencies*; 5th, Νεύσεις, *Inclinations*; 6th, Τόποι ἐπίπεδοι, *Plane Loci*. Each of these was divided into two books, and, with the *Data*, the *Porisms* and *Surface-Loci* of Euclid and the *Conics* of Apollonius were, according to Pappus, included in the body of the ancient analysis.

1st. *De Rationis Sectione* had for its subject the resolution of the following problem: Given two straight lines and a point in each, to draw through a third given point a straight line cutting the two fixed lines, so that the parts intercepted between the given points in them and the points of intersection with this third line may have a given ratio.

2nd. *De Spatii Sectione* discussed the similar problem which requires the rectangle contained by the two intercepts to be equal to a given rectangle.

An Arabic version of the first was found towards the end of the 17th century in the Bodleian library by Dr Edward Bernard, who began a translation of it; Halley finished it and published it along with a restoration of the second treatise in 1706.

3rd. *De Sectione Determinata* resolved the problem: Given two, three or four points on a straight line, to find another point on it such that its distances from the given points satisfy the condition that the square on one or the rectangle contained by two has to the square on the remaining one or the rectangle contained by the remaining two, or to the rectangle contained by the remaining one and another given straight line, a given ratio. Several restorations of the solution have been attempted, one by W. Snellius (Leiden, 1698), another by Alex. Anderson of Aberdeen, in the supplement to his *Apollonius Redivivus* (Paris, 1612), but by far the best is by Robert Simson, *Opera quaedam reliqua* (Glasgow, 1776).

4th. *De Tactionibus* embraced the following general problem: Given three things (points, straight lines or circles) in position, to describe a circle passing through the given points, and touching the given straight lines or circles. The most difficult case, and the most interesting from its historical associations, is when the three given things are circles. This problem, which is sometimes known as the Apollonian Problem, was proposed by Vieta in the 16th century to Adrianus Romanus, who gave a solution by means of a hyperbola. Vieta thereupon proposed a simpler construction, and restored the whole treatise of Apollonius in a small work, which he entitled *Apollonius Gallus* (Paris, 1600). A very full and interesting historical account of the problem is given in the preface to a small work of J. W. Camerer, entitled *Apollonii Pergaei quae supersunt, ac maxime Lemmata Pappi in hos Libros, cum Observationibus, &c.* (Gothae, 1795, 8vo).

5th. *De Inclinationibus* had for its object to insert a straight line of a given length, tending towards a given point, between two given (straight or circular) lines. Restorations have been given by Marino Ghetaldi, by Hugo d'Omerique (*Geometrical Analysis*, Cadiz, 1698), and (the best) by Samuel Horsley (1770).

6th. *De Locis Planis* is a collection of propositions relating to loci which are either straight lines or circles. Pappus gives somewhat full particulars of the propositions, and restorations were attempted by P. Fermat (*Œuvres*, i., 1891, pp. 3-51), F. Schooten (Leiden, 1656) and, most successfully of all, by R. Simson (Glasgow, 1749).

Other works of Apollonius are referred to by ancient writers, viz. (1) Περὶ τοῦ πυρίου, *On the Burning-Glass*, where the focal properties of the parabola probably found a place; (2) Περὶ τοῦ κοχλίου, *On the Cylindrical Helix* (mentioned by Proclus); (3) a comparison of the dodecahedron and the icosahedron inscribed in the same sphere; (4) Ἡ καθόλου πραγματεία, perhaps a work on the general principles of mathematics in which were included Apollonius' criticisms and suggestions for the improvement of Euclid's *Elements*; (5) Ὠκυτόκιον (quick bringing-to-birth), in which, according to Eutocius, he showed how to find closer limits for the value of π than the $3\frac{1}{7}$ and $3\frac{10}{71}$ of Archimedes; (6) an arithmetical work (as to which see PAPPUS) on a system of expressing large numbers in language closer to that of common life than that of Archimedes' *Sand-reckoner*, and showing how to multiply such large numbers; (7) a great extension of the theory of irrationals expounded in Euclid, Book x., from binomial to multinomial and from *ordered* to *unordered* irrationals (see extracts from Pappus' comm. on Eucl. x., preserved in Arabic and published by Woepcke, 1856). Lastly, in astronomy he is credited by Ptolemy with an explanation of the motion of the planets by a system of epicycles; he also made researches in the lunar theory, for which he is said to have been called Epsilon (ε).

The best editions of the works of Apollonius are the following: (1) *Apollonii Pergaei Conicorum libri quatuor, ex versione Frederici Commandini* (Bononiae, 1566), fol.; (2) *Apollonii Pergaei Conicorum libri octo, et Sereni Antissensis de Sectione Cylindri et Coni libri duo* (Oxoniae, 1710), fol. (this is the monumental edition of Edmund Halley); (3) the edition of the first four books of the Conics given in 1675 by Barrow; (4) *Apollonii Pergaei de Sectione Rationis libri duo: Accedunt ejusdem de Sectione Spatii libri duo Restituti: Praemittitur, &c., Opera et Studio Edmundi Halley* (Oxoniae, 1706), 4to; (5) a German translation of the *Conics* by H. Balsam (Berlin, 1861); (6) the definitive Greek text of Heiberg (*Apollonii Pergaei quae Graece*

exstant Opera, Leipzig, 1891–1893); (7) T. L. Heath, *Apollonius, Treatise on Conic Sections* (Cambridge, 1896); see also H. G. Zeuthen, *Die Lehre von den Kegelschnitten im Altertum* (Copenhagen, 1886 and 1902). (T. L. H.)

APOLLONIUS OF RHODES (RHODIUS), a Greek epic poet and grammarian, of Alexandria, who flourished under the Ptolemies Philopator and Epiphanes (222–181 B.C.). He was the pupil of Callimachus, with whom he subsequently quarrelled. In his youth he composed the work for which he is known—*Argonautica*, an epic in four books on the legend of the Argonauts. When he read it at Alexandria, it was rejected through the influence of Callimachus and his party. Disgusted with his failure, Apollonius withdrew to Rhodes, where he was very successful as a rhetorician, and a revised edition of his epic was well received. In recognition of his talents the Rhodians bestowed the freedom of their city upon him—the origin of his surname. Returning to Alexandria, he again recited his poem, this time with general applause. In 196, Ptolemy Epiphanes appointed him librarian of the Museum, which office he probably held until his death. As to the *Argonautica*, Longinus' (*De Sublim.* p. 54, 19) and Quintilian's (*Instit.* x. 1, 54) verdict of mediocrity seems hardly deserved; although it lacks the naturalness of Homer, it possesses a certain simplicity and contains some beautiful passages. There is a valuable collection of scholia. The work, highly esteemed by the Romans, was imitated by Virgil (*Aeneid*, iv.), Varro Atacinus, and Valerius Flaccus. Marianus (about A.D. 500) paraphrased it in iambic trimeters. Apollonius also wrote epigrams; grammatical and critical works; and Κτίσεις (the foundations of cities).

Editio Princeps (Florence, 1496); Merkel-Keil (with scholia, 1854); Seaton (1900). English translations: Verse, by Greene (1780); Fawkes (1780); Preston (1811); Way (1901); Prose by Coleridge (1889); see also Couat, *La Poésie alexandrine*; Susemihl, *Geschichte der griech. Lit. in der alexandrinischen Zeit.*

APOLLONIUS OF TRALLES (in Caria), a Greek sculptor, who flourished in the 2nd century B.C. With his brother Tauriscus, he executed the marble group known as the Farnese Bull, representing Zethus and Amphion tying the revengeful Dirce to the tail of a wild bull.

See GREEK ART, pl. i. fig. 51.

APOLLONIUS OF TYANA, a Greek philosopher of the Neo-Pythagorean school, born a few years before the Christian era. He studied at Tarsus and in the temple of Asclepius at Aegae, where he devoted himself to the doctrines of Pythagoras and adopted the ascetic habit of life in its fullest sense. He travelled through Asia and visited Nineveh, Babylon and India, imbibing the oriental mysticism of magi, Brahmans and gymnosophists. The narrative of his travels given by his disciple Damis and reproduced by Philostratus is so full of the miraculous that many have regarded him as an imaginary character. On his return to Europe he was saluted as a magician, and received the greatest reverence from priests and people generally. He himself claimed only the power of foreseeing the future; yet in Rome it was said that he raised from death the body of a noble lady. In the halo of his mysterious power he passed through Greece, Italy and Spain. It was said that he was accused of treason both by Nero and by Domitian, but escaped by miraculous means. Finally he set up a school at Ephesus, where he died, apparently at the age of a hundred years. Philostratus keeps up the mystery of his hero's life by saying, " Concerning the manner of his death, *if he did die*, the accounts are various." The work of Philostratus composed at the instance of Julia, wife of Severus, is generally regarded as a religious work of fiction. It contains a number of obviously fictitious stories, through which, however, it is not impossible to discern the general character of the man. In the 3rd century, Hierocles (*q.v.*) endeavoured to prove that the doctrines and the life of Apollonius were more valuable than those of Christ, and, in modern times, Voltaire and Charles Blount (1654–1693), the English freethinker, have adopted a similar standpoint. Apart from this extravagant eulogy, it is absurd to regard Apollonius merely as a vulgar charlatan and miracle-monger. If we cut away the mass of mere fiction which Philostratus accumulated, we have left a highly imaginative, earnest reformer who laboured to infuse into the flaccid dialectic of paganism a saner spirit of practical morality.

See L. Dyer, *Studies of the Gods in Greece* (New York, 1891); A. Chassang, *Le Merveilleux dans l'antiquité* (1882); D. M. Tredwell, *Sketch of the Life of Apollonius of Tyana* (New York, 1886); F. C. Baur, *Apollonius von Tyana und Christus*, ed. Ed. Zeller (Leipzig, 1876,—an attempt to show that Philostratus's story is merely a pagan counterblast to the New Testament history); J. Jessen, *Apollonius v. Tyana und sein Biograph Philostratos* (Hamburg, 1885); J. Göttsching, *Apollonius von Tyana* (Berlin, 1889); J. A. Froude, *Short Studies*, vol. iv.; G. R. S. Mead, *Apollonius of Tyana* (London, 1901); B. L. Gildersleeve, *Essays and Studies* (New York, 1890); Philostratus's *Life of Apollonius* (Eng. trans. New York, 1905); O. de B. Priaulx, *The Indian Travels of Apollonius* (1873); F. W. G. Campbell, *Apoll. of Tyana* (1908); see also NEO-PYTHAGOREANISM.

APOLLONIUS OF TYRE, a medieval tale supposed to be derived from a lost Greek original. The earliest mention of the story is in the *Carmina* (Bk. vi. 8, ll. 5-6) of Venantius Fortunatus, in the second half of the 6th century, and the romance may well date from three centuries earlier. It bears a marked resemblance to the *Antheia and Habrokomes* of Xenophon of Ephesus. The story relates that King Antiochus, maintaining incestuous relations with his daughter, kept off her suitors by asking them a riddle, which they must solve on pain of losing their heads. Apollonius of Tyre solved the riddle, which had to do with Antiochus's secret. He returned to Tyre, and, to escape the king's vengeance, set sail in search of a place of refuge. In Cyrene he married the daughter of King Archistrates, and presently, on receiving news of the death of Antiochus, departed to take possession of the kingdom of Antioch, of which he was, for no clear reason, the heir. On the voyage his wife died, or rather seemed to die, in giving birth to a daughter, and the sailors demanded that she should be thrown overboard. Apollonius left his daughter, named Tarsia, at Tarsus in the care of guardians who proved false to their trust. Father, mother, and daughter were only reunited after fourteen years' separation and many vicissitudes. The earliest Latin MS. of this tale, preserved at Florence, dates from the 9th or 10th century. The pagan features of the supposed original are by no means all destroyed. The ceremonies observed by Tarsia at her nurse's grave, and the preparations for the burning of the body of Apollonius's wife, are purely pagan. The riddles which Tarsia propounds to her father are obviously interpolated. They are taken from the *Enigmata* of Caelius Firmianus Symposius. The many inconsistencies of the story seem to be best explained by the supposition (E. Rohde, *Der griechische Roman*, 2nd ed., 1900, pp. 435 *et seq.*) that the Antiochus story was originally entirely separate from the story of Apollonius's wanderings, and was clumsily tacked on by the Latin author. The romance kept its form through a vast number of medieval re-arrangements, and there is little change in its outlines as set forth in the Shakespearian play of *Pericles*.

The Latin tale is preserved in about 100 MSS., and was printed by M. Velser (Augsburg, 1595), by J. Lapaume in *Script. Erot.* (Didot, Paris, 1856), and by A. Riese in the *Bibl. Teubneriana* (1871, new ed. 1893). The most widespread versions in the middle ages were those of Godfrey of Viterbo in his *Pantheon* (1185), where it is related as authentic history, and in the *Gesta Romanorum* (cap. 153), which formed the basis of the German folk-tale by H. Steinhöwel (Augsburg, 1471), the Dutch version (Delft, 1493), the French in *Le Violier des histoires romaines* (Paris, 1521), the English, by Laurence Twine (London, 1576, new ed. 1607), also of the Scandinavian, Czech, and Hungarian tales.

In England a translation was made as early as the 11th century (ed. B. Thorpe, 1834, and J. Zupitza in *Archiv für neuere Sprachen*, 1896); there is a Middle English metrical version (J. O. Halliwell, *A New Boke about Shakespeare*, 1850), by a poet who says he was vicar of Wimborne; John Gower uses the tale as an example of the seventh deadly sin in the eighth book of his *Confessio Amantis*; Robert Copland translated a prose romance of *Kynge Apollyne of Thyre* (Wynkyn de Worde, 1510) from the French; *Pericles* was entered at Stationers' Hall in 1607, and was followed in the next year by George Wilkins's novel, *The Painfull Adventures of Pericles, Prynce of Tyre* (ed. Tycho Mommsen, Oldenburg, 1857), and George Lillo drew his play *Marina* (1738) from the piece associated with Shakespeare; *Orendel*, by a Middle High German minnesinger, contains some of the episodes of *Apollonius*; Heinrich von Neustadt wrote a poem of 20,000 lines on *Apollonius von Tyrland* (*c.* 1400); the story was well known in Spanish, *Libre de Apolonio* (verse, *c.* 1200), and in J. de Timoneda's *Patrañuelo* (1576); in French much

of it was embodied in *Jourdain de Blaives* (13th cent.), and it also appears in Italian and medieval Greek. See A. H. Smyth, *Shakespeare's Pericles and Apollonius of Tyre* (Philadelphia, 1898); Elimar Klebs, *Die Erzählung von A. aus Tyrus* (Berlin, 1899); S. Singer, *Apollonius von Tyrus* (Halle, 1895).

APOLLOS ('Απολλώς; contracted from Apollonius), an Alexandrine Jew who after Paul's first visit to Corinth worked there in a similar way (1 Cor. iii. 6). He was with Paul at a later date in Ephesus (1 Cor. xvi. 12). In 1 Cor. i. 10-12 we read of four parties in the Corinthian church, of which two attached themselves to Paul and Apollos respectively, using their names, though the "division" can hardly have been due to conflicting doctrines. (See PAUL.) From Acts xviii. 24-28 we learn that he spoke and taught with power and success. He may have captivated his hearers by teaching "wisdom," as P. W. Schmiedel suggests, in the allegorical style of Philo, and he was evidently a man of unusual magnetic force. There seems to be some contradiction between Acts xviii. 25 *a b* and Acts xviii. 25 *c*, 26 *b c*; and it has been suggested that these latter passages are subsequent accretions. Since Apollos was a Christian and "taught exactly," he could hardly have been acquainted only with John's baptism or have required to be taught Christianity more thoroughly by Aquila and Priscilla. Martin Luther regarded Apollos as the author of the Epistle to the Hebrews, and many scholars since have shared his view.

Jerome says that Apollos was so dissatisfied with the division at Corinth, that he retired into Crete with Zenas, a doctor of the law; and that the schism having been healed by Paul's letter to the Corinthians, Apollos returned to the city, and became its bishop. Less probable traditions assign to him the bishopric of Duras, or of Iconium in Phrygia, or of Caesarea.

See the articles in the *Encyclopaedia Biblica*; Herzog-Hauck, *Realencyklopädie*; *The Jewish Encyclopaedia*; Hastings' *Dictionary of the Bible*; and cf. Weizsäcker, *Das apostolische Zeitalter*; A. C. McGiffert, *History of Christianity in the Apostolic Age*.

APOLLYON, the "foul fiend" who assaulted Christian on his pilgrimage through the Valley of Humiliation in John Bunyan's great allegory. The name (Gr. 'Απολλύων), which means "destroyer" (ἀπολλύειν, to destroy), is taken from Rev. ix. 11, where it represents the Hebrew word *Abaddon* (lit. "place of destruction," but here personified). The identification with the Asmodeus (*q.v.*) of Tobit iii. 8 is erroneous.

APOLOGETICS, in theology, the systematic statement of the grounds which Christians allege for belief in (at least) a *supernatural revelation* and a *divine redemption* (cf. *e.g.* Heb. i. 1-3). The majority of apologists in the past have further believed in an *infallible Bible*; but they admit this position can only be reached at a late stage in the argument. We should note, however, that even a liberal orthodoxy, while saying nothing about infallibility, is pledged to the *essential* authority of the Bible; it cannot *e.g.* simply ignore the Old Testament with F. E. D. Schleiermacher. Catholic apologetics must further give a central position to *Church* authority, which Roman Catholics explicitly define as infallible; but this position too is debated in a late section of their system. On the other hand, there may be a Christianity which seeks to extricate the "spiritual" from the "supernatural" (Arnold Toynbee, characterizing T.H.Green). It would only lead to confusion, however, if we called this method "apologetic." Any *single* effort in apologetics may be termed "an apology." More elaborate contrasts have been proposed between the two words, but are of little practical importance.

I. *The Word itself.*—In Greek, ἀπολογία is the defendant's reply (personally, not through a lawyer) to the speech for the prosecution—κατηγορία. Sometimes defendants' speeches passed into literature, *e.g.* Plato's splendid version of the *Apology* of Socrates. Thus, in view of persecution or slander, the Christian church naturally produced literary "Apologies." The word has never quite lost this connotation of standing on the defensive and rebutting criticism; *e.g.* Anselm's *Apologia contra insipientem Gaunilonem* (*c.* 1100); or the Lutheran *Apology for the Augsburg Confession* (1531); or J. H. Newman's *Apologia pro vita sua* (1864); or A. B. Bruce's *Apologetics; or Christianity Defensively Stated* (1892). Of course, defence easily passes into counter-attack, as when early apologists denounce Greek and Roman religion. Yet the purpose may be defence even then. And there is perhaps a reason of a deeper kind for holding Apologetics to the defensive. Christianity is a prophetic religion. Now a prophet does not argue; he declares what he feels to be God's will. For himself, he rests, like the mystic, upon an immediate vision of truth; but he differs from most mystics in having a message for others; and—again unlike most mystics—he addresses the hearer's *conscience*, which we might call (in one sense) the mystic element in every man—or better, perhaps, the prophetic. Can the positive grounds for a prophet's message be analysed and stated in terms of argument? If so, apologetics is literally a science, and it is pedantry to claim the defensive and pretend to throw the *onus probandi* upon objectors. But, if not, then apologetics is a mere auxiliary, and is only "a science" in so far as it presents a *conscious* and *systematic* plea. Bruce's title, and his programme of "succouring distressed faith," imply the latter alternative; the moral appeal of Christianity, primary and essential; its confirmation by argument, secondary. The view has its difficulties; but it is highly suggestive.

The word ἀπολογία is used by Origen (*Contra Cel.* ii. 65, v. 19) of the general Christian defence. But the introduction of the adjective "apologetic" and of the substantive "apologetics" is recent. They are serviceable as bracketing together (1) Natural Theology or Theism, (2) Christian Evidences—chiefly "miracles" and "prophecy"; or, on a more modern view, chiefly the character and personality of Christ. The lower usage of Apology (as expression of regret for a fault) has tipped many a sarcasm besides George III.'s on the occasion of Bishop Watson's book, "I did not know that the Bible needed an apology!"

II. *Apologetics in the Bible.*—The Old Testament does not argue in support of its beliefs, unless when (chiefly in parts of the Wisdom literature) it seeks to rebut moral difficulties (cf. T. K. Cheyne, *Job and Solomon*; A. S. Peake, *Problem of Suffering in the Old Testament*, 1904). The New Testament reflects chiefly controversy with Jews. Great emphasis is laid upon alleged fulfilments—striking or fanciful, but very generally striking to that age—of Old Testament prophecy (Matt. especially; rather differently Ep. to Heb.). The miracles of Jesus are also canvassed. Jews do not deny their wonderful character, but attribute them to black art (Mark iii. 22 &c., &c.). On the other hand, Christians and Jews are pretty well agreed on natural theology; so the New Testament tends to take its theism for granted. However, Rom. i. 20 has had great influence on Christian theology (*e.g.* Thomas Aquinas) in leading it to base theism upon reason or argument. One apologetic contention, aimed at Gentile readers, is found among the motives of Acts. Christianity is not a lawless but an excellent law-abiding faith. So (it is alleged) rulers, both Jewish and Gentile, have often admitted (xviii. 14; xix. 37; xxiii. 9; xxvi. 32).

III. *Early Christian.*—When we leave the New Testament, apologetics becomes conspicuous until the political triumph of Christianity, and even somewhat later. The atmosphere is no longer Jewish but fully Greek. True there are, as always, Jewish controversialists. Justin Martyr writes a *Dialogue with Trypho*; Origen deals with many anti-Christian arguments borrowed by Celsus from a certain nameless Jew. Yet Greece was the sovereign power in all the world of ancient culture. And so Christianity was necessarily Hellenized, necessarily philosophized. One result was to bring natural theology into the forefront. A pure morality, belief in one God, hopes extending beyond death—these appealed to the age; the Church taught them as philosophically true *and* divinely revealed. But, further still, philosophy offered a vehicle which could be applied to the contents of Christianity. The Platonic or eclectic theism, which adopted the conception of the Logos, made a place for Christ in terms of philosophy within the Godhead. (John i. 1 may or may not be affected by Philo; it is almost or quite solitary in the N.T.) Similarly, the immortality of the soul may be maintained on Platonic or quasi-Platonic lines, as by St Athanasius (*Contra Gentes*, § 33)—a writer who repeatedly quotes the Alexandrian Book of Wisdom, in which Platonism and the Old Testament had already joined partnership. This

phase of Platonism, however, was much more slowly adopted. The earlier apologists dispute the natural immortality of the soul; Athanasius himself, in *De Incarnatione Dei*, §§ 4, 5, tones down the teaching of *Wisdom*; and the somewhat eccentric writer Arnobius, a layman—from Justin Martyr downwards apologetics has always been largely in the hands of laymen—stands for what has recently been called "conditional immortality"—eternal life for the righteous, the children of God, alone.

Allied with this more empiricist stand-point is the assertion that Greek philosophy borrowed from Moses; but in studying the Fathers we constantly find that groundless assertion uttered in the same breath with the dominant Idealist view, according to which Greek philosophy was due to incomplete revelation from the divine Logos.

On purely defensive lines, early apologists rebut charges of cannibalism and sexual promiscuity; the Christians had to meet in secret, and the gossip of a rotten age drew malignant conclusions. They make counter attacks on polytheism as a folly and on the shamefulness of obscene myths. Here they are in line with non-Christian writers or culture-mockers like Lucian of Samosata; or graver spirits like Porphyry, who champions Neo-Platonism as a rival to Christianity, and does pioneer work in criticism by attacks on some of the Old Testament books. Turning to Christian evidence proper, we are struck with the continued prominence of the argument from prophecy. The Old Testament was an immense religious asset to the early church. Their enemies had nothing like it; and—the N.T. canon being as yet but half formed—the Old Testament was pushed into notice by dwelling on this imperfect "argument," which grew more extravagant as the partial control exercised by Jewish learning disappeared. An argument from miracles is also urged, though with more reserve. Formally, every one in that age admitted the supernatural. The question was, whose supernatural? And how far did it carry you? Miracle could not be to a 3rd century writer what it was to W. Paley—a conclusive and well-nigh solitary proof. Other apologies are by Aristides (recently recovered in translation), Athenagoras ("elegant"), Eusebius of Caesarea, Cyril of Alexandria; in Latin by Minucius Felix, Tertullian (a masculine spirit and phrase-coiner like T. Carlyle, if bitterer still), Lactantius Firmianus, &c., &c.[1]

As Christianity wins the day, a new objection is raised to it. The age is full of troubles; Christianity is ruining the empire! Besides notices elsewhere, we find the charge specially dealt with by St Augustine and his friends. Paulus Orosius argues that the world has always been a vale of tears. Salvian contends that not the acceptance of Christianity, but the sins of the people are bringing trouble upon them; and he gives ugly evidence of the continued prevalence of vice. Most impressive of all was Augustine's own contribution in *The City of God*. Powers created by worldliness and sin are crumbling, as they well may; "the city of God remaineth!" Whether he meant it so or not, the saint's argument became a programme and an apologia for the imperializing of the Western Church under the leadership of Rome during the middle ages.

IV. *Middle Ages.*—From the point of view of apologetics, we may mass together the long stretch of history which covers the period between the disappearance and the re-appearance of free discussion. When emperors became converts, the church, so lately a victim and a pleader for liberty, readily learned to persecute. Under such conditions there is little scope for apologetics. Force kills argument and drives doubt below the smooth surface of a nominal conformity. But there were two influences beyond the bounds or beyond the power of the christianized empire. The Jew remained, as always, stubbornly unconvinced, and, as often, fond of slanders. Many of the principal medieval attempts in apologetics are directed chiefly against him, *e.g.* the *Pugio Fidei* of Raymond Martini (*c.* 1280), which became one of Pascal's sources (see V. below), or Peter Abelard's *Dialogus inter Judaeum Philosophum et Christianum*. And the Moslem came on the scenes bringing, as a gift for Christendom, fuller knowledge of classical, especially Aristotelian, texts. The Jews, less bitterly opposed to Mahommedanism than the Christians were, caught fire more rapidly, and in some cases served as an intermediate link or channel of communication. These two religions anticipated the discussion of the problem of faith and reason in the Christian church. According to the great Avicenna and Maimonides, faith and the highest reason are sure to coincide (see ARABIAN PHILOSOPHY). According to Ghazali, in his *Destruction of Philosophers*, the various schools of philosophy cancel each other; reason is bankrupt; faith is everything. (So nearly Jehuda Halevi.) According to Averroes, reason suffices, and faith, with (what he considers) its dreams of immortality and the like, is useful only for the ignorant masses. Christian theology, however, strikes out a line of its own. Moslems and Jews were applying Aristotelian philosophy to rigorously monotheistic faiths; Christianity had been encouraged by Platonism in teaching a trinity of divine persons, and Platonism of a certain order long dominated the middle ages as part of the Augustinian tradition. In sympathy with this Platonism, the medieval church began by assuming the entire mutual harmony of faith and reason. Such is the teaching, along different lines, alike of St Anselm and of Abelard. But, when increased knowledge of Aristotle's texts (and of the commentaries) led to the victory of a supposed Aristotelianism over a supposed Platonism, Albertus Magnus, and his still more distinguished pupil Thomas Aquinas, mark certain doctrines as belonging to faith but not to reason. They adhere to the general position with exceptions (in the case of what had been considered Platonic doctrines). From the point of view of philosophy, this was a compromise. Faith and reason partly agree, partly diverge. The tendency of the later middle ages is to add to the number of the doctrines with which philosophy cannot deal. Thomas's great rival, Duns Scotus, does this to a large extent, at times affirming "two truths." The latter position, ascribed by the schoolmen to the Averroists, becomes dominant among the later Nominalists, William of Occam and his disciples, who withdraw *all* doctrines of faith from the sphere of reason. This was a second and a more audacious compromise. It is not exactly an attempt to base Christian faith on rational scepticism. It is a consistent policy of harbouring inconsistencies in the same mind. A statement may be true in philosophy and false in theology, or vice versa. To the standpoint of Aquinas, however, the Church of Rome (at least in regard to the basis of doctrine) has more and more returned. The councils of Trent and of the Vatican mark the Two Truths hypothesis as heretical, when they affirm that there *is* a natural knowledge of God and natural certainty of immortality. Along with this affirmation, the Church of Rome (if less decisively) has adopted the limitations of the Thomist theory by the condemnation of "Ontologism"; certain mysterious doctrines are beyond reason. This cautious compromise sanctioned by the Church does not represent the *extremest* reaction against nominalism. Even in the nominalistic epoch we have Raymond of Sabunde's *Natural Theology* (according to the article in Herzog-Hauck, not the title of the oldest Paris MS., but found in later MSS. and almost all the printed editions) or *Liber Creaturarum* (*c.* 1435). The book is not what moderns (schooled unconsciously in post-Reformation developments of Thomist ideas) expect under the name of natural theology. It is an attempt once more to demonstrate *all* scholastic dogmas out of the book of creation or on principles of natural reason. At many points it follows Anselm closely, and, of course, very often "makes light work" of its task.

The Thomist compromise—or even the more sceptical view of "two truths"—has the merit of giving filling *of a kind* to the formula "supernatural revelation"—mysteries inaccessible to reason, beyond discovery and beyond comprehension. According to earlier views—repeatedly revived in Protestantism—revelation is just philosophy over again. Can the choice be

[1] While these writings are of great historical value, they do not, of course, represent the Christian argument as conceived to-day. The Church of Rome prefers medieval or modern statements of its position; Protestantism can use only modern statements.

fairly stated? If revelation is thought of as God's personal word, and redemption as his personal deed, is it reasonable to view them either as open to a sort of scientific prediction or as capricious and unintelligible? Even in the middle ages there were not wanting those—the St Victors, Bonaventura—who sought to vindicate mystical if not moral redemption as the central thought of Christianity.

V. *Earlier Modern Period.*—It will be seen that apologetics by no means reissued unchanged from the long period of authority. The compromise of Aquinas, though not unchallenged, holds the field and that even with Protestants. G. W. Leibnitz devotes an introductory chapter in his *Théodicée*, 1710 (as against Pierre Bayle), to faith and reason. He is a good enough Lutheran to quote as a "mystery" the Eucharist no less than the Trinity, while he insists that truths *above* are not *against* reason. Stated thus baldly, has the distinction any meaning? The more celebrated and central thesis of the book—this finite universe, the best of all such that are possible—also restates positions of Augustine and Aquinas.

Before modern philosophy began its career, there was a great revival of ancient philosophy at the Renaissance; sometimes anti-Christian, sometimes pro-Christian. The latter furnishes apologies by Marsilio Ficino, Agostino Steuco, J. L. Vives.

Early in the modern period occurs the great name of Blaise Pascal (1623–1662). A staunch Roman Catholic, but belonging to a school of Augustinian enthusiasts (the Jansenists), whom the Church put down as heretics, he stands pretty much apart from the general currents. His *Pensées*, published posthumously, seems to have been meant for a systematic treatise, but it has come to us in fragments. Once again, a lay apologist! A layman's work may have the advantage of originality or the drawback of imperfect knowledge. Pascal's work exhibits both characters. It has the originality of rare genius, but it borrows its material (as industrious editors have shown) from very few sources—the *Pugio Fidei*, M. de Montaigne, P. Charron. Ideas as well as learning are largely Montaigne's. The latter's cheerful man-of-the-world scepticism is transfigured in Pascal to a deep distrust of human reason, in part, perhaps, from anti-Protestant motives. But this attitude, while not without parallels both earlier (Ghazali, Jehuda Halevi) and later (H. L. Mansel), has peculiarities in Pascal. It is *fallen* man whom he pursues with his fierce scorn; his view of man's nature—intellect as well as character—is to be read in the light of his unflinching Augustinianism. Again, Pascal, unlike most apologists, belongs to the small company of saintly souls. This philosophical sceptic is full of humble joy in salvation, of deep love for the Saviour.

Another French Roman Catholic apologist, P. D. Huet (1630–1721)—within the conditions of his age a prodigy of learning (in apologetics see his *Demonstratio Evangelica*)—is not uninfluenced by Pascal (*Traité de la faiblesse de l'esprit humaine*).

As we might expect, Protestant lands are more busily occupied with apologetics. Intolerant reliance upon *force* presents greater difficulties to them; soon it grows quite obsolete. Benedict Spinoza, the eminent Jewish pantheist (1632–1677), to whom miracle is impossible, revelation a phrase, and who renews pioneer work in Old Testament criticism, finds at least a fair measure of liberty and comfort in Holland (his birth-land). Bayle, the historical sceptic, lectured and published his learned *Dictionnaire* (1696) at Rotterdam. From Holland, earlier, had proceeded an apologetic work by a man of European fame. Hugo Grotius's *De Veritate Christianae Religionis* (1627) is partly the medieval tradition:—Oppose Mahommedans and Jews! It is partly practical:—Arm Christian sailors against religious danger! But in its cool spirit it forecasts the coming age, whose master is John Locke. His *Reasonableness of Christianity* (1695) is the thesis of "a whole century" of theologians. And his *Essay on the Human Understanding* (1690) is almost a Bible to men of education during the same period; its lightest word treasured. Locke does not break with the compromise of Aquinas. But he transfers attention from *contents* to *proof*. Reason proves that a revelation has been made—and then submits. Leibnitz has to supplement rather than correct Locke on this point.

In such an atmosphere, deism readily uttered its protest against mysterious revelation. Deism is, in fact, the Thomist natural theology (more clearly distinguished from dogmatic theology than in the middle ages, alike by Protestants and by the post-Tridentine Church of Rome) now dissolving partnership with dogmatic and starting in business for itself. Or it is the doctrine of unfallen man's "natural state"—a doctrine intensified in Protestantism—separating itself from the theologians' grave doctrine of sin. If Socinianism had challenged natural theology—Christ, according to it, was the prophet who first revealed the way to eternal life—it had glorified the natural powers of man; and the learning of the Arminian divines (friends of Grotius and Locke) had helped to modernize Christian apologetics upon rational lines. Deism now taught that reason, or "the light of nature," was all-sufficient.

Not to dwell upon earlier continental "Deists" (mentioned by Viret as quoted first in Bayle's *Dictionary* and again in the introduction to Leland's *View of the Deistical Writers*), Lord Herbert of Cherbury (*De Veritate*, 1624; *De Religione Gentilium*, 1645?—according to J. G. Walch's *Bibliotheca Theologica* (1757) not published complete until 1663) was universally understood as hinting conclusions hostile to Christianity (cf. also T. Hobbes, *Leviathan*, 1651, ch. xxxi.; Spinoza, *Tractatus Theologico-Politicus*, 1670, ch. xiv.). Professedly, Herbert's contention merely is that non-Christians feeling after the "supreme God" and the law of righteousness must have a chance of salvation. Herbert was also epoch-making for the whole 18th century in teaching that *priests* had *corrupted* this primitive faith. During the 18th century deism spread widely, though its leaders were "irrepressible men like Toland, men of mediocre culture and ability like Anthony Collins, vulgar men like Chubb, irritated and disagreeable men like Matthew Tindal, who conformed that he might enjoy his Oxford fellowship and wrote anonymously that he might relieve his conscience" (A. M. Fairbairn). More distinguished sympathizers are Edward Gibbon, who has the deistic spirit, and David Hume, the historian and philosophical sceptic, who has at least the letter of the deistic creed (*Dialogues Concerning Natural Religion*), and who uses Pascal's appeal to "faith" in a spirit of mockery (*Essay on Miracles*). In France the new school found powerful speaking-trumpets, especially Voltaire, the idol of his age—a great denier and scoffer, but always sincerely a believer in the God of reason—and the deeper but wilder spirit of J. J. Rousseau. Others in France developed still more startling conclusions from Locke's principles, E. B. Condillac's sensationalism—Locke's philosophy purged of its more ideal if less logical elements—leading on to materialism in J. O. de la Mettrie; and at least one of the Encyclopedists (P. H. von Holbach) capped materialism with confessed atheism.

In Germany the parallel movement of "illumination" (H. S. Reimarus; J. S. Semler, pioneer in N.T. criticism; and a layman, the great Lessing) took the form of "rationalism" within the church—interpreting Bible texts by main force in a way which the age thought "enlightened" (H. E. G. Paulus, 1761–1851, &c.).

Among the innumerable English anti-deistic writers (see W. Law, *The Case of Reason*; R. Bentley, or "Phileleutherus Lipsiensis"; &c., &c.), three are of chief importance. Nathaniel Lardner (Arian, 1684–1768) stands in the front rank of the scholarship of his time, and uses his vast knowledge to maintain the genuineness of all books of the New Testament and the perfect accuracy of its history. Joseph Butler, a very original, careful and honest thinker, lifts controversy with deists from details to principles in his *Analogy of Religion both Natural and Revealed to the Constitution and Course of Nature* (1736). This title introduces us to a new conception. Deists and orthodox in those days agreed in recognizing not merely natural theology but natural religion—"essential religion," Butler more than once styles it; the expression shows how near he stood intellectually to those he criticized. But morally he stood aloof. In part i.—on Natural Religion—he defends a moral or punishing Deity against the sentimental softness of the age. The God of Nature, whom deists confess, does punish in time, if they will

but look at the facts; why not in eternity? "Morality," as others have confessed, is "the nature of things"! Not the Being of God is discussed—Butler will not waste words on triflers (as he thinks them) who deny that—but God's character. Unfortunately (perhaps) Butler prefers to argue on *admitted principles*; holds much of his own moral belief in reserve; tries to reduce everything to a question of *probable fact*. If this hampers him in part i., the situation appears still worse in part ii., which is directly occupied with the defence of Christianity. Butler says nothing about incomprehensible mysteries, and protests that reason is the only ground we have to proceed upon. But by treating the atonement simply as revealed (and unexplained) matter of fact—in spite of some partial analogies in human experience, a thing essentially anomalous—Butler repeats, and applies to the *moral* contents of Christianity, what Aquinas said of its speculative doctrines. (Whether one calls the unknowable a revealed mystery or an unexplained and inexplicable fact makes little difference.) William Paley (1743–1805) borrows from many writers; he borrows Lardner's learning and Butler's "particular evidence for Christianity," viz. miracles, prophecy and "history"; and he states his points with perfect clearness. No man ever filled a typical position more exactly than Paley. Eighteenth-century ethics—Hedonism, with a theological background. Empiricist Natural Theology—the argument from Design. Christian Evidences—the strong probability of the resurrection of Christ and the consequent authority of his teaching. *Horae Paulinae*—mutual confirmations of *Acts* and Epistles; better, though one-sided. When such exclusively "external" arguments are urged, the contents of Christianity go for next to nothing.

VI. *Later Modern Period.*—Towards the end of the 18th century a new epoch of reconstruction begins in the thought and life of civilization. The leader in speculative philosophy is Immanuel Kant, though he includes many agnostic elements, and draws the inference (which some things in the letter of Butler might seem to warrant) that the essence of Christianity is an ethical theism. While he thus created a new and more ethical "rationalism," Kant's many-sided influence, alike in philosophy and in theology, worked to further issues. He (and other Germans, but not G. W. F. Hegel) was represented in England in a fragmentary way by S. T. Coleridge (1772–1834), probably the most typical figure of his period—another layman. His general thought was that "rationalism" represents an uprising of the lower reason or "understanding" against the higher or true "reason." The mysteries of theology are its best part—not alien to reason but of its substance, the "logos." This is to upset the compromise of Aquinas and go back to a Christian platonism. Of course the difficulty revives again: If a philosophy, why supernaturally revealed? Thomas Arnold, criticizing Edward Hawkins, appeals rather to the atonement as deeper neglected truth. So in Scotland, Thomas Erskine and Thomas Chalmers—the latter in contradiction to his earlier position—hold that the doctrine of salvation, when translated into experience, furnishes "internal evidence"—a somewhat broader use of the phrase than when it applies merely to evidence of date or authorship drawn from the contents of a book. This gives a new and moral filling to the conception of "supernatural revelation." The attempt to work out either of the reactions against Thomism in new theological systems is pretty much confined to Germany. Hegel's theological followers, of every shade and party, represent the first, and Schleiermacher's the second. Schleiermacher rejects natural religion in favour of the positive religions, while the school of A. Ritschl and W. Herrmann reject natural theology outright in favour of revelation—a striking external parallel to early Socinianism. British and American divines, on the other hand, are slow to suspect that a new apologetic principle may mean a new system of apologetics, to say nothing of a new dogmatic. Among the evangelicals, for the most part, natural theology, far from being rejected, is not even modified, and certain doctrines continue to be described as incomprehensible mysteries. No Protestant, of course, can agree with Roman Catholic theology that (supernatural) faith is an obedient assent to church authority and the mysteries it dictates. To Protestantism, faith is personal trust. But the principle is hardly ever carried out to the end. Mysterious doctrines are ascribed by Protestants to *scripture*; so half of revelation is regarded as matter for blind assent, if another half is luminous in experience. The movement of German philosophy which led from Kant to Hegel has indeed found powerful British champions (T. H. Green, J. and E. Caird, &c.), but less churchly than Coleridge (or F. D. Maurice or B. F. Westcott), though churchly again in J. R. Illingworth and other contributors to *Lux Mundi* (1890). Before this wave of thought, H. L. Mansel tried (1858) to play Pascal's game on Kantian principles, developing the sceptical side of Kant's many-faceted mind. But as he protested against relying on the human conscience—the one element of positive conviction spared by Kant—his ingenuity found few admirers except H. Spencer, who claims him as justifying anti-Christian agnosticism. Butler's tradition was more directly continued by J. H. Newman—with modifications on becoming a Roman Catholic in the light of the church's decision in favour of Thomism. A. M. Fairbairn (*Catholicism, Roman and Anglican*, ch. v., and elsewhere) and E. A. Abbott (*Philomythus*, and elsewhere) suspect Newman of a sceptical leaven and extend the criticism to Butler's doctrine of "probability." Yet it seems plain that any theology, maintaining redemption as historical fact (and not merely ideal), must attach religious importance to conclusions which are technically probable rather than proven. If we transfer Christian evidence from the "historical" to the "philosophical" with H. Rashdall—we surely cut down Christianity to the limits of theism. And the *inner* mind of Butler has moral anchorage in the *Analogy*, quite as much as in the *Sermons*. It is in part ii. more than in part i. of his masterpiece that the light seems to grow dim. Another of the Oxford converts to Rome, W. G. Ward, made vigorous contributions to natural theology.

VII. *Contents of Modern Apologetics.*—Superficially regarded, philosophy ebbs and flows, whatever progress the debate may reveal to speculative insight. Old positions re-emerge from forgetfulness, and there is always a philosophy to back every "case." More visible dangers arise for the apologist in the region of science, historical or physical. There the progress of truth, within whatever limits, is manifest. *Essays and Reviews* (1860) was a vehement announcement of scientific results—startling English conservatism awake for the first time. And in the scientific region the great apologetic classics, like Butler, are hopelessly out of date. The modern apologist must do ephemeral work—unless it should chance that he proves to be the skirmisher, pioneering for a modified dogmatic. He holds a watching brief. While he must beware of hasty speech, he has often to plead that new knowledge does not really threaten faith; or that it is not genuinely established knowledge at all; or else, that faith has mistaken its own grounds, and will gain strength by concentrating on its true field. The work is not always well done; but the Christian church needs it.

1. *Apologetics and Philosophy.*—The main part of this subject is discussed under THEISM. Some notes may be added on special points. (*a*) Freewill is generally assumed on the Christian side (R.C. Church; Scottish philosophy; H. Lotze; J. Martineau; W. G. Ward. Not in a libertarian sense; Leibnitz. New and obscure issues raised by Kant). But there is no continuous tradition or steady trend of discussion. (*b*) Personal immortality is affirmed as philosophically certain by the Church of Rome and many Protestant writers. Others teach "conditional immortality." Others base the hope on belief in the resurrection of Christ. (*c*) Theodicy—the tradition of Leibnitz is preserved (on libertarian lines) by Martineau (*A Study of Religion*, 1883). See also F. R. Tennant's *Origin and Propagation of Sin* (1902)—sin a "bye-product" of a generally good evolution. Others find in the gospel of redemption the true theodicy. (*d*) The problem of Christian apologetic has been simplified in the past by the prevalence of the Christian ethics and temper even among many non-Christians (*e.g.* J. S. Mill). But hereafter it may not prove possible for the apologist to assume as unchallenged the Christian

moral outlook. Germans have suspected an anti-Christian strain in Goethe; all the world knows of it in E. von Hartmann or F. Nietzsche.

2. *Apologetics and Physical Science.*—(*a*) Copernicanism has won its battles and the Church of Rome would fain have its error forgotten. The admission is now general that the Bible cannot be expected to use the language of scientific astronomy. Still, it is not certain that the shock of Copernicanism on supernatural Christianity is exhausted. (*b*) Geology has also won its battles, and few now try to harmonize it with Genesis. (*c*) Evolution came down from the clouds when C. Darwin and A. R. Wallace succeeded in displacing the naïf conception of special creation by belief in the origin of species out of other species through a process of natural law. This gave immense vogue to wider and vaguer theories of evolutionary process, notably to H. Spencer's grandiose cosmic formula in terms of mechanism. Here the apologist has more to say. The special Darwinian hypothesis—natural "selection"—may or may not be true; it was at least a fruitful suggestion. If true, it need not be exhaustive. Again, evolution itself need not apply everywhere. We are offered a philosophical rather than a scientific speculation when E. Caird (*Evolution of Religion*, 1893) tries to vindicate Christianity as the highest working of nature—true just *because* evolved from lower religions. The Christian apologist indeed may himself seek, following John Fiske, to philosophize evolution as a restatement of natural theology—"one God, one law, one element and one far-off divine event"—and as at least pointing *towards* personal immortality. But if evolution is to be the whole truth regarding Christianity, we should have to surrender both *supernatural revelation* and *divine redemption*. And these, it may be strongly urged, contain the magic of Christianity. Losing them it might sink into a lifeless theory.

As far as pure science goes, the inference from science in favour of materialism has visibly lost much of its plausibility, and Protestant apologists would probably be prepared to accept in advance all verified discoveries as belonging to a different region from that of faith. Roman Catholic apologetic prefers to negotiate in detail.

3. *Apologetics and History.*—History brings us nearer the heart of the Christian position. (*a*) Old Testament criticism won startling victories towards the end of the 19th century. It blots out much supposed knowledge, but throws a vivid and interesting light on the reconstrued process of history. Most Protestants accept the general scheme of criticism; those who hang back make not a few concessions (*e.g.* J. Orr, *Problem of the O.T.*, 1906). The Roman Catholic Church again prefers an attitude of reserve. (*b*) New Testament criticism raises even more delicate issues. Positively it may be affirmed that the recovered figure of the historical Jesus is the greatest asset in the possession of modern Christian theology and apologetics. The "Lives" of Christ, Roman Catholic and Protestant, "critical" (D. F. Strauss, A. Renan, &c., &c.) and "believing," imply this at least. Negatively, "unchallenged historical certainties" are becoming few in number, or are disappearing altogether, through the industry of modern minds. True, the Tübingen criticism of F. C. Baur and his school—important as the first scientific attempt to conceive New Testament conditions and literature as a whole—has been abandoned. (A. Ritschl's *Entstehung der alt-katholischen Kirche*, 2nd edition, 1857, was an especially telling reply.) The synoptic gospels are now treated with considerable respect. It is no longer suggested in responsible quarters that they are party documents sacrificing truth to "tendency." But not all quarters are responsible; and in the effort to grasp scientifically, *i.e.* accurately, the amazing facts of Christ and primitive Christianity, every imaginable hypothesis is canvassed. Even the Roman Catholic Church produced the Abbé Loisy (though he undertakes to play off church certainties against historical uncertainties). Hitherto at least the fourth gospel has been the touchstone. The authorship of the epistles is in many cases a matter of subordinate importance; at least for Protestants or for those surrendering Bible infallibility, which Rome can hardly do. (*c*) New Testament history. The apologist must maintain (1) that Jesus of Nazareth is a real historical figure—a point well-nigh overlooked by Strauss, and denied by some modern advocates of a mythical theory; (2) that Jesus is knowable (not one "of whom we really know very little"—B. Jowett) in his teaching, example, character, historical personality; and that he is full of moral splendour. On the other hand, faith has no special interest in claiming that we can compose a biographical study of the development of Jesus. Certainly no early writer thought of providing material for such use. It is a common opinion in Germany that our material is in fact too scanty or too self-contradictory. Yet the fascination of the subject will always revive the attempt. If it succeeds, there will be a new line of communication along which that great personality will tell on men's minds and hearts. If it fails—there are other channels; character can be known and trusted even when we are baffled by a thing necessarily so full of mystery as the development of a personality. Notably, the manifest *non-consciousness of personal guilt* in Jesus suggests to us his sinlessness. (3) Apologists maintain that Jesus "claimed" Messiahship. There are speculative constructions of gospel history which eliminate that claim; and no doubt apologetics could—with more or less difficulty—restate its position in a changed form if the paradox of to-day became accepted as historical fact to-morrow. The central apologetic thesis is the *uniqueness* of the "only-begotten"; it is here that "the supernatural" passes into the substance of Christian faith. But most probably the description of Jesus as thus unique will continue to be associated with the allegation—He told us so; he claimed Messiahship and "died for the claim." (See preface to 5th ed. of *Ecce Homo*.) Nor did so superhuman a claim crush him, or deprive his soul of its balance. He imparted to the title a grander significance out of the riches of his personality. (4) In the light of this the "argument from prophecy" is reconstructed. It ceases to lay much stress upon coincidences between Old Testament predictions or "types" and events in Christ's career. It becomes the assertion; historically, providentially, the expectation of a *unique religious figure* arose—"the" Messiah; and Jesus gave himself to be thought of as that great figure. (5) It is also claimed as certain that Jesus had marvellous powers of healing. More reserve is being shown towards the other or "nature" miracles. These latter, it may be remarked, are more unambiguously supernatural. But, if Jesus really cured leprosy or really restored the dead to life, we have miracle plainly enough in the region of healing. (6) For Jesus' own resurrection several lines of evidence are alleged. (i.) All who believe that in any sense Christ rose again insist upon the impression which his personality made during life. It was *he* whose resurrection seemed credible! Some practically stop here; the apologist proceeds. (ii.) There is the report of the empty grave; historically, not easily waved aside. (iii.) We have New Testament reports of appearances of the risen Jesus; subjective? the mere clothing of the impression made by his personality during life? or objective? "telegrams" from heaven (Th. Keim)—"Veridical Hallucinations"? or something even more, throwing a ray of light perhaps on the state and powers of the happy dead? (iv.) There is the immense influence of Jesus Christ in history, *associated with belief in him* as the risen Son of God.

In view of the claims of Jesus, different possibilities arise. (i.) The evangelists impute to him a higher claim than he made. This may be called the rationalistic solution; with sympathy in Christ's ethical teaching, there is relief at minimizing his great claim. So, brilliantly, Wellhausen's Gospel commentaries and Introduction. (Mark fairly historical; other gospels' fuller account of Christ's teaching and claims unreliable.) (ii.) The claim was fraudulent (Reimarus; Renan, ed. 1; popular anti-Christian agitation). This is a counsel of despair. (iii.) He was an enthusiastic dreamer, expecting the world's end. This the apologist will recognize as the most plausible hostile alternative. He may feel bound to admit an element of illusion in Christ's vision of the future; but he will contend that the apocalyptic form did not destroy the spiritual content of Christ's revelations—nay, that it was itself the

vehicle of great truths. So he will argue as the essence of the matter that (iv.) he who has occupied Christ's place in history, and won such reverence from the purest souls, was what he claimed to be, and that his many-sidedness comes to focus and harmony when we recognize him as the Christ of God and the Saviour of the world.

To a less extent, similar problems and alternatives arise in regard to the church:—Catholicism a compromise between Jewish Christianity and Pauline or Gentile Christianity (F. C. Baur, &c.); Catholicism the Hellenizing of Christianity (A. Ritschl, A. Harnack); the Catholic church for good and evil the creation of St Paul (P. Wernle, H. Weinel); the church supernaturally guided (R.C. apologetic; in a modified degree High Church apologetic); essential—not necessarily exclusive—truth of Paulinism, essential error in first principles of Catholicism (Protestant apologetic).

LITERATURE.—Omitting the Christian fathers as remote from the present day, we recognize as works of genius Pascal's *Pensées* and Butler's *Analogy*, to which we might add J. R. Seeley's *Ecce Homo* (1865). The philosophical, Platonist, or Idealist line of Christian defence is represented among recent writers by J. R. Illingworth [Anglican], in *Personality, Human and Divine* (1894), *Divine Immanence* (1898), *Reason and Revelation* (1902), who at times seems rather to presuppose the Thomist compromise, and A. M. Fairbairn [Congregationalist], in *Place of Christ in Modern Theology* (1893), *Philosophy of the Christian Religion* (1902). The appeal to ethical or Christian experience—" internal evidence "—is found especially in E. A. Abbott [Christianity supernatural and divine, but not miraculous], *Through Nature to Christ* (1877), *The Kernel and the Husk* (1886), *The Spirit on the Waters* (1897), &c., or A. B. Bruce, *Chief End of Revelation* (1881), *The Miraculous Element in the Gospels* (1886), *Apologetics* (1892), and other works; Bruce's posthumous article, " Jesus " in *Encyc. Bib.*, was understood by some as exchanging Christian orthodoxy for bare theism, but probably its tone of aloofness is due to the attempt to keep well within the limits of what the author considered pure scientific history. Scholarly and apologetic discussion on the gospels and life of Jesus is further represented by the writings of W. Sanday or (earlier) of J. B. Lightfoot. Much American work of merit on the character of Christ is headed by W. E. Channing, and by H. Bushnell (in *Nature and the Supernatural*). For defence of Christ's resurrection, reference may be made to H. Latham's *The Risen Lord* and R. Mackintosh's *First Primer of Apologetics*. For modification in light of recent scholarship of argument from prophecy, to Riehm's *Messianic Prophecy*, Stanton's *Jewish and Christian Messiah*, and Woods's *Hope of Israel*. Roman Catholic apologetics—of necessity, Thomist—is well represented by Professor Schanz of Tübingen. The whole Ritschl movement is apologetic in spirit; best English account in A. E. Garvie's *Ritschlian Theology* (1899). See also the chief church histories or histories of doctrine (Harnack; Loofs; Hagenbach; Shedd); A. S. Farrar's *Critical History of Free* (*i.e.* anti-Christian) *Thought* (Bampton Lectures, 1862); R. C. Trench's Introduction to *Notes on the Miracles*, and F. W. Macran's *English Apologetic Theology* (1905). For the 18th century, G. V. Lechler's *Geschichte des englischen Deismus* (1841); Mark Pattison in *Essays and Reviews* (1860); Leslie Stephen's *English Thought in 18th Century* (agnostic); John Hunt, *Religious Thought in England* (3 vols., 1870–1873).

(R. MA.)

APOLOGUE (from the Gr. ἀπόλογος, a statement or account), a short fable or allegorical story, meant to serve as a pleasant vehicle for some moral doctrine or to convey some useful lesson. One of the best known is that of Jotham in the Book of Judges (ix. 7-15); others are " The City Rat and Field Rat," by Horace, " The Belly and its Members," by the patrician Menenius Agrippa in the second book of Livy, and perhaps most famous of all, those of Aesop. The term is applied more particularly to a story in which the actors or speakers are taken from the brute creation or inanimate nature. An apologue is distinguished from a fable in that there is always some moral sense present, which there need not be in a fable. It is generally dramatic, and has been defined as " a satire in action." It differs from a parable in several respects. A parable is equally an ingenious tale intended to correct manners, but it can be *true*, while an apologue, with its introduction of animals and plants, to which it lends our ideas and language and emotions, is necessarily devoid of real truth, and even of all probability. The parable reaches heights to which the apologue cannot aspire, for the points in which brutes and inanimate nature present analogies to man are principally those of his lower nature, and the lessons taught by the apologue seldom therefore reach beyond prudential morality, whereas the parable aims at representing the relations between man and God. It finds its framework in the world of nature as it actually is, and not in any grotesque parody of it, and it exhibits real and not fanciful analogies. The apologue seizes on that which man has in common with creatures below him, and the parable on that which he has in common with God. Still, in spite of the difference of moral level, Martin Luther thought so highly of apologues as counsellors of virtue that he edited and revised Aesop and wrote a characteristic preface to the volume. The origin of the apologue is extremely ancient and comes from the East, which is the natural fatherland of everything connected with allegory, metaphor and imagination. Veiled truth was often necessary in the East, particularly with the slaves, who dared not reveal their minds too openly. It is noteworthy that the two fathers of apologue in the West were slaves, namely Aesop and Phaedrus. La Fontaine in France; Gay and Dodsley in England; Gellert, Lessing and Hagedorn in Germany; Tomas de Iriarte in Spain, and Krilov in Russia, are leading modern writers of apologues. Length is not an essential matter in the definition of an apologue. Those of La Fontaine are often very short, as, for example, " Le Coque et la Perle." On the other hand, in the romances of Reynard the Fox we have medieval apologues arranged in cycles, and attaining epical dimensions. An Italian fabulist, Corti, is said to have developed an apologue of " The Talking Animals " to the bulk of twenty-six cantos. La Motte, writing at a time when this species of literature was universally admired, attributes its popularity to the fact that it *ménage et flatte l'amour-propre* by inculcating virtue in an amusing manner without seeming to dictate or insist. This was the ordinary 18th-century view of the matter, but Rousseau contested the educational value of instruction given in this indirect form.

A work by P. Soullé, *La Fontaine et ses devanciers* (1866), is a history of the apologue from the earliest times until its final triumph in France.

APOLOGY (from Gr. ἀπολογία, defence), in its usual sense, an expression of regret for something which has been wrongfully said or done; a withdrawal or retraction of some charge or imputation which is false. In an action for libel, the fact that an apology has been promptly and fully made is a plea in mitigation of damages. The apology should have the same form of publicity as the original charge. If made publicly, the proper form is an advertisement in a newspaper; if made within the hearing of a few only, a letter of apology, which may be read to those who have heard what was said, should be sufficient. By the English Libel Act 1843, s. 2, it was enacted that in an action for libel contained in a newspaper it is a defence for the defendant to plead that the libel was inserted without actual malice and without gross negligence, and that before the commencement of the action and at the earliest opportunity afterwards he inserted in the newspaper a full apology for the libel, or, where the newspaper in which the libel appeared was published at intervals exceeding one week, he offered to publish the apology in any newspaper selected by the plaintiff. The apology must be full and must be printed in as conspicuous a place and manner as the libel was.

The word " apology " or " apologia " is also used in the sense of defence or vindication, the only meaning of the Greek ἀπολογία, especially of the defence of a doctrine or system, or of religious or other beliefs, &c., *e.g.* Justin Martyr's *Apology* or J. H. Newman's *Apologia pro vita sua*. (See APOLOGETICS.)

APONEUROSIS (Gr. ἀπό, away, and νεῦρον, a sinew), in anatomy, a membrane separating muscles from each other.

APOPHTHEGM (from the Gr. ἀπόφθεγμα), a short and pointed utterance. The usual spelling up to Johnson's day was *apothegm*, which Webster and Worcester still prefer; it indicates the pronunciation—*i.e.* " apothem "—better than the other, which, however, is more usual in England and follows the derivation. Such sententious remarks as " Knowledge is Power " are apophthegms. They become " proverbs " by age and acceptance. Plutarch made a famous collection in his *Apophthegmata Laconica*.

APOPHYGE (Gr. ἀποφυγή, a flying off), in architecture, the lowest part of the shaft of an Ionic or Corinthian column, or the highest member of its base if the column be considered as a whole. The apophyge is the inverted cavetto or concave sweep, on the upper edge of which the diminishing shaft rests.

APOPHYLLITE, a mineral often classed with the zeolites, since it behaves like these when heated before the blowpipe and has the same mode of occurrence; it differs, however, from the zeolites proper in containing no aluminium. It is a hydrous potassium and calcium silicate, $H_7KCa_4(SiO_3)_8+4\frac{1}{2}H_2O$. A small amount of fluorine is often present, and it is one of the few minerals in which ammonium has been detected. The temperature at which the water is expelled is higher than is usually the case with zeolites; none is given off below 200°, and only about half at 250°; this is slowly reabsorbed again from moist air, and is therefore regarded as water of crystallization, the remainder being water of constitution. When heated before the blowpipe, the mineral exfoliates, owing to loss of water, and on this account was named apophyllite by R. J. Haüy in 1806, from the Greek ἀπό, from, and φύλλον, a leaf.

Apophyllite always occurs as distinct crystals, which belong to the tetragonal system. The form is either a square prism terminated by the basal planes (fig. 2), or an acute pyramid (fig. 1). A prominent feature of the mineral is its perfect basal cleavage, on which the lustre is markedly pearly, presenting, in white crystals, somewhat the appearance of the eye of a fish after boiling, hence the old name fish-eye-stone or ichthyophthalmite for the mineral. On other surfaces the lustre is vitreous. The crystals are usually transparent and colourless, sometimes with a greenish or rose-red tint. Opaque white crystals of cubic habit have been called albine; xylochlore is an olive-green variety. The hardness is 4½, and the specific gravity 2·35.

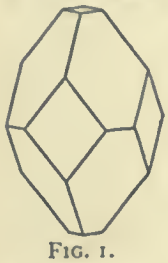


FIG. 1.

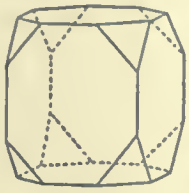


FIG. 2.

The optical characters of the mineral are of special interest, and have been much studied. The sign of the double refraction may be either positive or negative, and some crystals are divided into optically biaxial sectors. The variety known as leucocyclite shows, when examined in convergent polarized light, a peculiar interference figure, the rings being alternately white and violet-black and not coloured as in a normal figure seen in white light.

Apophyllite is a mineral of secondary origin, commonly occurring, in association with other zeolites, in amygdaloidal cavities in basalt and melaphyre. Magnificent groups of greenish and colourless tabular crystals, the crystals several inches across, were found, with flesh-red stilbite, in the Deccan traps of the Western Ghâts, near Bombay, during the construction of the Great Indian Peninsular railway. Groups of crystals of a beautiful pink colour have been found in the silver veins of Andreasberg in the Harz and of Guanaxuato in Mexico. Crystals of recent formation have been detected in the Roman remains at the hot springs of Plombières in France. (L. J. S.)

APOPHYSIS (Gr. ἀπόφυσις, offshoot), a bony protuberance, in human physiology; also a botanical term for the swelling of the spore-case in certain mosses.

APOPLEXY (Gr. ἀποπληξία, from ἀποπλήσσειν, to strike down, to stun), the term employed by Galen to designate the "sudden loss of feeling and movement of the whole body, with the exception of respiration," to which, after the time of Harvey, was added "and with the exception of the circulation." Although the term is occasionally employed in medicine with other significations, yet in its general acceptation apoplexy may be defined as a sudden loss of consciousness, of sensibility, and of movement without any *essential* modification of the respiratory and circulatory functions occasioned by some brain disease. It was discovered that the majority of the cases of apoplexy were due to cerebral haemorrhage, and what looked like cerebral haemorrhage, red softening; and the idea for a long time prevailed that apoplexy and cerebral haemorrhage could be employed as synonymous terms, and that an individual who, in popular parlance, "had an apoplectic stroke," had necessarily suffered from haemorrhage into his brain. A small haemorrhage may not, however, cause an apoplectic fit, nor is an apoplectic fit always caused by haemorrhage; it may be due to sudden blocking of a large vessel by a clot from a distant part (embolism), or by a sudden clotting of the blood in the vessel itself (thrombosis). Owing to the prevailing idea in former times that cerebral haemorrhage and apoplexy were synonymous terms, the word apoplexy was applied to haemorrhage into other organs than the brain; thus the terms pulmonary apoplexy, retinal apoplexy and splenic apoplexy were used.

The term "apoplexy" is now used in clinical medicine to denote that form of coma or deep state of unconsciousness which is due to sudden disturbance of the cerebral circulation occasioned by a local cause within the cranial cavity, as distinct from the loss of consciousness due to sudden failure of the heart's action (syncope) or the coma of narcotic or alcoholic poisoning, of *status epilepticus*, of uraemia or of head injury.

The sudden coma of sunstroke and heat-stroke might be included, although owing to the suddenness with which a person may be struck down, the term *heat apoplexy* is frequently used, and, from an etymological point of view, quite justifiably. The older writers use the term *simple apoplexy* for a sudden attack which could not be explained by any visible disease. Again, *congestive apoplexy* was applied to those cases of coma where, at the autopsy, nothing was found to account for the coma and death except engorgement of the vessels of the brain and its membranes. In senile dementia and in general paralysis the brain is shrunken and the convolutions atrophied, the increased space in the ventricles and between the convolutions being filled up with the cerebro-spinal fluid. In these diseases apoplectic states may arise, terminating fatally; the excess of fluid found in such cases was formerly thought to be the cause of the symptoms, consequently the condition was called *serous apoplexy*. Such terms are no longer used, owing to the better knowledge of the pathology of brain disease.

Having thus narrowed down the application of the term "apoplexy," we are in a position to consider its chief features, and the mechanism by which it is produced. Apoplexy may be rapidly fatal, but it is very seldom *instantly* fatal. The onset is usually sudden, and sometimes the individual may be struck down in an instant, senseless and motionless, "warranting those epithets, which the ancients applied to the victims of this disease, of *attoniti* and *siderati*, as if they were thunder-stricken or planet-struck" (Sir Thomas Watson). The attack, however, may be less sudden and, not infrequently, attended by a convulsion; while occasionally, in the condition termed *ingravescent apoplexy*, the coma is gradual in its onset, occupying hours in its development. Although unexpected, various warning symptoms, sometimes slight, sometimes pronounced, occur in the majority of cases. Such are, fulness in the head, headache, giddiness, noises in the ears, mental confusion, slight lapses of consciousness, numbness or tingling in the limbs. A characteristic apoplectic attack presents the following phenomena: the individual falls down suddenly and lies without sense or motion, except that his pulse keeps beating and his breathing continues. He appears to be in a deep sleep, from which he cannot be roused; the breathing is laboured and stertorous, and is accompanied with puffing out of the cheeks; the pulse may be beating more strongly than natural, and the face is often flushed and turgid. The reflexes are abolished. Although apoplexy may occur without paralysis, and paralysis without apoplexy, the two, owning the same cause, very frequently co-exist, or happen in immediate sequence and connexion; consequently there is in most cases definite evidence of paralysis affecting usually one side of the body in addition to the coma. Thus the pupils are unequal; there may be asymmetry of the face, or the limbs may be more rigid or flaccid on one side than on the other. These signs of localized disease enable a distinction to be made from the coma

of narcotic poisoning and alcoholic intoxication. It must be borne in mind that a person smelling strongly of liquor and found lying in the street in a comatose state may be suffering from apoplexy, and the error of sending a dying man to a police cell may be avoided by this knowledge.

If the fit is only moderately severe, the reflexes soon return, and the patient may in a few hours show indications of returning consciousness by making some movements or opening his eyes when spoken to, although later it may be found that he is unable to speak, or may be paralysed or mentally afflicted (see PARALYSIS). In severe cases the coma deepens and the patient dies, usually from interference with the breathing, or, less commonly, from arrest of the heart's action.

The mechanism by which apoplexy is produced has been a matter of much dispute; the condition was formerly ascribed to the pressure exerted by the clot on the rest of the brain, but there is no increase of intracranial pressure in an apoplectic fit occurring as a result of the sudden closure of a large vessel by embolism or thrombosis. Suddenness of the lesion appears to be, then, the essential element common to all cases of apoplexy from organic brain disease. It is the sudden shock to the delicate mechanism that produces the unconsciousness; but seeing that the coma is usually deeper and more prolonged in cerebral haemorrhage than when occasioned by vascular occlusion, and that an ingravescent apoplexy coma gradually develops and deepens as the amount of haemorrhage increases, we may presume that increase of intracranial pressure does play an important part in the degree and intensity of the coma caused by the rupture of a vessel. Apoplexy seldom occurs under forty years of age, but owing to the fact that disease of the cerebral vessels may exist at any age, from causes which are fully explained in the article NEUROPATHOLOGY, no period of life is exempt; consequently cases of true apoplexy are not wanting even in very young children. Recognizing that there are two causes of apoplexy in advanced life, viz. (1) sudden rupture of a diseased vessel usually associated with high arterial pressure, enlarged, powerfully acting heart and chronic renal disease, and (2) the sudden clotting of blood in a large diseased vessel favoured by a low arterial pressure due to a weak-acting heart, it is obvious that the character of the pulse forms a good guide to the diagnosis of the cause, the prevention and warding off of an attack, and the treatment of such should it occur.

Anything which tends directly or indirectly to increase arterial pressure within the cerebral blood-vessels may bring on an attack of cerebral haemorrhage; and although the identification of an apoplectic habit of body with a stout build, a short neck and florid complexion is now generally discredited, it being admitted that apoplexy occurs as frequently in thin and spare persons who present no such peculiarity of conformation, yet a plethoric habit of body, occasioned by immoderate eating or drinking associated with the gouty diathesis, leads to a general arterio-sclerosis and high arterial pressure. All conditions which can give rise to a local intracranial or a general bodily increase of the arterial pressure, *i.e.* severe exertion of body and mind, violent emotions, much stooping, overheated rooms, exposure to the sun, sudden shocks to the body, constipation and straining at stool, may, by suddenly increasing the strain on the wall of a diseased vessel, lead to its rupture.

The outlook of apoplexy is generally unfavourable in cases where the coma is profound; death may take place at different intervals after the onset. If the patient, after recovering from the initial coma, suffers with continual headache and lapses into a drowsy state, the result is likely to be serious; for such a condition probably indicates that an inflammatory change has taken place about the clot or in the area of softening.

Treatment.—The patient should be placed in the recumbent position with the head and shoulders slightly raised. He should be moved as little as possible from the place where the attack occurred. The medical man who is summoned will probably give the following directions: an ice-bag to be applied to the head; a few grains of calomel or a drop of croton oil in butter to be placed on the tongue, or an enema of castor oil to be administered. He may find it necessary to draw off the water with a catheter. The practice of blood-letting, once so common in this disease, is seldom resorted to, although in some cases, where there is very high arterial tension and a general state of plethora, it might be beneficial. Depletives are not employed where there is evidence of failure of the heart's action; indeed the cautious administration of stimulants may be necessary, either subcutaneously or by the mouth (if there exist a power of swallowing), together with warm applications to the surface of the body; a water-bed may be required, and careful nursing is essential to prevent complications, especially the formation of bedsores. (F. W. Mo.)

APOROSE (from Gr. ἀ, without, and πόρος, passage), a biological term meaning imperforate, or not porous: there is a group of corals called *Aporosa*.

APOSIOPESIS (the Greek for "becoming silent"), a rhetorical device by which the speaker or writer stops short and leaves something unexpressed, but yet obvious, to be supplied by the imagination. The classical example is the threat, "*Quos ego*——!" of Neptune (in Virgil, *Aen.* i. 135).

APOSTASY (ἀπόστασις, in classical Greek a defection or revolt from a military commander), a term generally employed to describe a complete renunciation of the Christian faith, or even an exchange of one form of it for another, especially if the motive be unworthy. In the first centuries of the Christian era, apostasy was most commonly induced by persecution, and was indicated by some outward act, such as offering incense to a heathen deity or blaspheming the name of Christ.[1] In the Roman Catholic Church the word is also applied to the renunciation of monastic vows (*apostasis a monachatu*), and to the abandonment of the clerical profession for the life of the world (*apostasis a clericatu*). Such defection was formerly often punished severely.

APOSTIL, or APOSTILLE (possibly connected with Lat. *appositum*, placed near), a marginal note made by a commentator.

APOSTLE (ἀπόστολος, one sent forth on a mission, an envoy, as in Is. xviii. 2; Symmachus, ἀποστέλλειν ἀποστόλους; Aquila, πρεσβευτάς), a technical term used in the New Testament and in Christian literature generally for a special envoy of Jesus Christ. How far it had any similar use in Judaism in Christ's day is uncertain; but in the 4th century A.D., at any rate, it denoted responsible envoys from the central Jewish authority, especially for the collection of religious funds. In its first and simplest Christian form, the idea is present already in Mark iii. 14 f., where from the general circle of his disciples Jesus "made twelve ('whom he also named apostles,' Luke vi. 13, but doubtful in Mark), that they should be with him, and that he might from time to time send them forth (ἵνα ἀποστέλλῃ) to preach and to have authority to cast out demons." Later on (vi. 6 ff.), in connexion with systematic preaching among the villages of Galilee, Jesus begins actually to "send forth" the twelve, two by two; and on their return from this mission (vi. 30) they are for the first time described as "apostles" or missionary envoys. Matthew (x. 1 ff.) blends the calling of the twelve with their actual sending forth, while Luke (vi. 13) makes Jesus himself call them "apostles" (for Luke's usage cf. xi. 49, "prophets and apostles," where Matthew, xxiii. 34, has "prophets and wise men and scribes"). But it is doubtful whether Jesus ever used the term for the Twelve, in relation to their temporary missions, any more than for the "seventy others" whom he "sent forth" later (Luke x. 1). Even the Fourth Gospel never so describes them. It simply has "a servant is not greater than his lord, neither an apostle (envoy) greater than he that sent him" (xiii. 16); and applies the idea of "mission" alike to Jesus (cf. Heb. iii. 1, "Jesus, the apostle . . . of our profession") and to his disciples, generally, as represented by the Twelve (xvii. 18, with 3, 6 ff.). But while ideally all Christ's disciples were "sent" with the Father's Name in charge, there were different degrees in which this

[1] The readmission of such apostates to the church was a matter that occasioned serious controversy. The emperor Julian's "Apostasy" is discussed under JULIAN.

applied in practice; and so we find "apostle" used in several senses, once it emerges as a technical term.

1. In the Apostolic age itself, "apostle" often denotes simply an "envoy," commissioned by Jesus Christ to be a primary witness and preacher of the Messianic Kingdom. This wide sense was shown by Lightfoot (in his commentary on *Galatians*, 1865) to exist in the New Testament, *e.g.* in 1 Cor. xii. 28 f., Eph. iv. 11, Rom. xvi. 7; and his view has since been emphasized[1] by the discovery of the *Teaching of the Twelve Apostles* (see DIDACHÈ), with its itinerant order of "apostles," who, together with "prophets" (cf. Eph. ii. 20, iii. 5) and "teachers," constituted a *charismatic* and seemingly unordained ministry of the Word, in some part of the Church (in Syria?) during the early sub-apostolic age. Paul is our earliest witness, as just cited; also in 1 Cor. xv. 5 ff., where he seems to quote the language of Palestinian tradition, in saying that Christ "appeared to Cephas; then to the Twelve; then . . . to James; then to the apostles one and all (*τοῖς ἀποστόλοις πᾶσιν*); and last of all . . . to me also." The appearance to "*all* the Apostles" must refer to the final commission given by the risen Christ to certain assembled disciples (Acts i. 6 ff., cf. Luke xxiv. 33), including not only the Twelve and the Lord's brethren (i. 13 f.), but also some at least of the Seventy. Of this wider circle of witnesses, taken from among personal disciples during Jesus's earthly ministry, we get a further glimpse in the election of one from their number to fill Judas's place among the Twelve (i. 21 ff.), as the primary official witnesses of Messiah and his resurrection. Many of the 120 then present (Acts i. 15), and not only the two set forward for final choice, must have been personal disciples, who by the recent commission had been made "apostles." Among such we may perhaps name Judas Barsabbas and Silas (Acts xv. 22, cf. i. 23), if not also Barnabas (1 Cor. ix. 6) and Andronicus and Junia (Rom. xvi. 7).

So far, then, we gather that the original Palestinian type of apostleship meant simply (*a*) personal mission from the risen Christ (cf. 1 Cor. ix. 1), following on (*b*) some preliminary intercourse with Jesus in his earthly ministry. It was pre-eminence in the latter qualification that gave the Twelve their special status among apostles (Acts i. 26, ii. 14, vi. 2; in Acts generally they are simply "the apostles"). Conversely, it was Paul's lack in this respect which lay at the root of his difficulties as an apostle.

It is possible, though not certain, that even those Judaizing missionaries at Corinth whom Paul styles "false-apostles" or, ironically, "the superlative apostles" (2 Cor. xi. 5, 13; xii. 11), rested part of their claim to superiority over Paul on (*b*), possibly even as having done service to Christ when on earth (2 Cor. xi. 18, 23). There is no sign in 2 Cor. that they laid claim to (*a*). If this be so, they were "Christ's apostles" only indirectly, "through men" (as some had alleged touching Paul, cf. Gal. i. 1), i.e. as sent forth on mission work by certain Jerusalem leaders with letters of introduction (2 Cor. iii. 1; E. von Dobschütz, *Probleme der apost. Zeitalters*, p. 106).

2. *The Twelve.*—When Jesus selected an inner circle of disciples for continuous training by personal intercourse, his choice of "twelve" had direct reference to the tribes of Israel (Matt. xix. 28; Luke xxii. 30). This gave them a symbolic or representative character as a closed body (cf. Rev. xxi. 14), marking them off as the primary religious authority (cf. Acts ii. 42, "the apostles' teaching") among the "disciples" or "brethren," when these began to assume the form of a community or church. The relationship which other "apostles" had enjoyed with the Master had been uncertain; *they* had been his recognized intimates, and that as a body. Naturally, then, they took the lead, collectively—in form at least, though really the initiative lay with one or two of their own number, Peter in particular. The process of practical differentiation from their fellow-apostles was furthered by the concentration of the Twelve, or at least of its most marked representatives, in Jerusalem, for a considerable period (Acts viii. 1, cf. xii. 1 ff.; an early tradition specifies twelve years). Other apostles soon went forth on their mission to "the cities of Israel" (cf. Acts ix. 31), and so exercised but little influence on the central policy of the Church. Hence their shadowy existence in the New Testament, though the actual wording of Matt. x. 5-42, read in the light of the *Didachè*, may help us to conceive their work in its main features.

3. "*Pillar*" *Apostles.*—But in fact differentiation between apostles existed among the Twelve also. There were "pillars," like Peter and John (and his brother James until his death), who really determined matters of grave moment, as in the conference with Paul in Gal. ii. 9—a conference which laid the basis of the latter's status as an apostle even in the eyes of Jewish Christians. Such pre-eminence was but the sequel of personal distinctions visible even in the preparatory days of discipleship, and it warns us against viewing the primitive facts touching apostles in the official light of later times.

Consciousness of such personal pre-eminence has left its marks on the lists of the Twelve in the New Testament. Thus (1) Peter, James, John, Andrew, always appear as the first four, though the order varies, Mark representing relative prominence during Christ's ministry, and Acts actual influence in the Apostolic Church (cf. Luke viii. 51, ix. 28). (2) The others also stand in groups of four, the first name in each being constant, while the order of the rest varies.

The same lesson emerges when we note that one such apostolic "pillar" stood outside the Twelve altogether, viz. James, the Lord's brother (Gal. ii. 9, cf. i. 19); and further, that "the Lord's brethren" seem to have ranked above "apostles" generally, being named between them and Peter in 1 Cor. ix. 5. That is, they too were apostles with the addition of a certain personal distinction.

4. *Paul, the "Apostle of the Gentiles."*—So far apostles are only of the Palestinian type, taken from among actual hearers of the Messiah and with a mission primarily to Jews—apostles "of the circumcision" (Gal. ii. 7-9). Now, however, emerges a new apostleship, that to the Gentiles; and with the change of mission goes also some change in the type of missionary or apostle. Of this type Paul was the first, and he remained its primary, and in some senses its only, example. Though he could claim, on occasion, to satisfy the old test of having seen the risen Lord (1 Cor. ix. 1, cf. xv. 8), he himself laid stress not on this, but on the revelation within his own soul of Jesus as God's Son, and of the Gospel latent therein (Gal. i. 16). This was his divine call as "apostle of the Gentiles" (Rom. xi. 13); here lay both his qualification and his credentials, once the fruits of the divine inworking were manifest in the success of his missionary work (Gal. ii. 8 f.; 1 Cor. xi. 1 f.; 2 Cor. iii. 2 f., xii. 12). But this new criterion of apostleship was capable of wider application, one dispensing altogether with vision of the risen Lord—which could not even in Paul's case be proved so fully as in the case of the original apostles—but appealing to the "signs of an apostle" (1 Cor. ix. 2; 2 Cor. xii. 12), the tokens of spiritual gift visible in work done, and particularly in the planting of the Gospel in fresh fields (2 Cor. x. 14-18). It may be in this wide *charismatic* sense that Paul uses the term in 1 Cor. xii. 28 f., Eph. ii. 20, iii. 5, iv. 11, and especially in Rom. xvi. 7, "men of mark among the apostles" (cf. 2 Cor. xi. 13, "pseudo-apostles" masquerading as "apostles of Christ," and perhaps 1 Thess. ii. 6, of himself and Silas). That he used it in senses differing with the context is proved by 1 Cor. xv. 9, where he styles himself "the least of apostles," although in other connexions he claims the very highest rank, co-ordinate even with the Twelve as a body (Gal. ii. 7 ff.), in virtue of his distinctive Gospel.

This point of view was not widely shared even in circles appreciative of his actual work. To most he seemed but a fruitful worker within lines determined by "the twelve apostles of the Lamb" as a body (Rev. xxi. 14). So we read of "the plant (Church) which the twelve apostles of the Beloved shall plant" (*Ascension of Isaiah*, iv. 3); "those who preached the Gospel to us (especially Gentiles) . . . unto whom He gave authority over the Gospel, being twelve for a witness to the tribes" (Barn. viii. 3, cf. v. 9); and the going forth of the

[1] By analogy, that is; for the wider sense of "apostle" in the Apostolic age need not be identical with a sub-apostolic use of the term (see below, 4 *fin.*).

Twelve, after twelve years, beyond Palestine "into the world," to give it a chance to hear (*Preaching of Peter*, in Clem. Alex. *Strom.* vi. 5. 43; 6. 48). Later on, however, his own claim told on the Church's mind, when his epistles were read in church as a collection styled simply "the Apostle."

As the primary medium of the Gentile Gospel (Gal. i. 16, cf. i. 8, ii. 2) Paul had no peers as an "apostle of the Gentiles" (Rom. xi. 13, cf. xv. 15-20, and see 1 Cor. xv. 8, "last of all to me"), unless it were Barnabas who shares with him the title "apostle" in Acts xiv. 4, 14—possibly with reference to the special "work" on which they had recently been "sent forth by the Spirit" (xiii. 2, 4). Yet such as shared the spiritual gift (*charisma*) of missionary power in sufficient degree, were in fact apostles of Christ in the Spirit (1 Cor. xii. 28, 11). Such a secondary type of apostolate—answering to "apostolic missionaries" of later times (cf. the use of ἱεραπόστολος in this sense by the Orthodox Eastern Church to-day)—would help to account for the apostolic claims of the missionaries censured in Rev. ii. 2, as also for the "apostles" of the second generation implied in the *Didachē*.

In the *sub-apostolic age*, however, the class of "missionaries" enjoying a *charisma* such as was conceived to convey apostolic commission through the Spirit, soon became distinguished from "apostles" (cf. Hermas, *Sim.* ix. 15. 4, "the apostles and teachers of the message of the Son of God," so 25. 2; in 17. 1 the apostles are reckoned as twelve), as the title became more and more confined by usage to the original apostles, particularly the Twelve as a body (*e.g.* *Ascension of Isaiah* and the *Preaching of Peter*), or to them and Paul (*e.g.* in Clement and Ignatius), and as reverence for these latter grew in connexion with their story in the Gospels and in Acts.[1] Thus Eusebius describes as "evangelists" (cf. Philip the Evangelist in Acts xxi. 8, also Eph. iv. 11, 2 Tim. iv. 5) those who "occupied the first rank in the succession to the Apostles" in missionary work (*Hist. Eccl.* iii. 37, cf. v. 10). Yet the wider sense of "apostle" did not at once die out even in the third and fourth generations. It lingered on as applied to the Seventy[2]—by Irenaeus, Tertullian, Clement and Origen—and even to Clement of Rome, by Clem. Alex. (? as a "fellow-worker" of Paul, Phil. iv. 3); while the adjective "apostolic" was applied to men like Polycarp (in his contemporary *Acts of Martyrdom*) and the Phrygian, Alexander, martyred at Lyons in A.D. 177 (Eus. v. 1), who was "not without share of apostolic *charisma*."

The *authority* attaching to apostles was essentially spiritual in character and in the conditions of its exercise. Anything like autocracy among his followers was alien to Jesus's own teaching (Matt. xxiii. 6-11). All Christians were "brethren," and the basis of pre-eminence among them was relative ability for service. But the personal relation of the original Palestinian apostles to Jesus himself as Master gave them a unique fitness as authorized witnesses, from which flowed naturally, by sheer spiritual influence, such special forms of authority as they came gradually to exercise in the early Church. "There is no trace in Scripture of a formal commission of authority for government from Christ Himself" (Hort, *Chr. Eccl.* p. 84) given to apostles, save as representing the brethren in their collective action. Even the "resolutions" (δόγματα) of the Jerusalem conference were not set forth by the apostles present simply in their own name, nor as *ipso facto* binding on the conscience of the Antiochene Church. They expressed "a claim to deference rather than a right to be obeyed" (Hort, *op. cit.* 81-85). Such was the kind of authority attaching to apostles, whether collectively or individually. It was not a fixed notion, but varied in quantity and quality with the growing maturity of converts. This is how Paul, from whom we gather most on the point, conceives the matter. The exercise of his spiritual authority is not absolute, lest he "lord it over their faith"; consent of conscience or of "faith" is ever requisite (2 Cor. i. 24; cf. Rom. xiv. 23). But the principle was elastic in application, and would take more patriarchal forms in Palestine than in the Greek world. The case was essentially the same as on the various mission-fields to-day, where the position of the "missionary" is at first one of great spiritual initiative and authority, limited only by his own sense of the fitness of things, in the light of local usages. So the notion of formal or constitutional authority attaching to the apostolate, in its various senses, is an anachronism for the apostolic age. The tendency, however, was for their authority to be conceived more and more on formal lines, and, particularly after their deaths, as absolute.

The authority attaching to apostles as writers, which led gradually to the formation of a New Testament Canon—"the Apostles" side by side with "the Books" of the Old Testament (so 2 Clement xiv., *c.* A.D. 120–140)—is a subject by itself (see BIBLE).

This change of conception helped to further the notion of a certain devolution of apostolic powers to successors constituted by act of ordination. The earliest idea of an *apostolical succession* meant simply the re-emergence in others of the apostolic spirit of missionary enthusiasm. "The first rank in the succession of the apostles" consisted of men eminent as disciples of theirs, and so fitted to continue their labours (Euseb. iii. 37); and even under Commodus (A.D. 180–193) there were "evangelists of the word" possessed of "inspired zeal to emulate apostles" (v. 10). Such were perhaps the "apostles" of the *Didachē*. Of the notion of apostolic succession in ministerial grace conferred by ordination, there is little or no trace before Irenaeus. The famous passage in Clement of Rome (xliv. 2) refers simply to the succession of one set of men to another in an office of apostolic institution. The grace that makes Polycarp "an apostolic and prophetic teacher" (*Mart. Polyc.* 16) is peculiar to him personally. But Irenaeus holds, apparently on *a priori* grounds, that "elders" who stand in orderly succession to the apostolic founders of the true tradition in the churches, have, "along with the succession of oversight," also an "assured gift of (insight into) truth" by the Father's good pleasure ("cum episcopatus successione charisma veritatis certum secundum placitum Patris acceperunt"), in contrast to heretics who wilfully stand outside this approved line of transmission (*adv. Haer.* iv. 26. 2). So far, indeed, the succession is not limited to the monarchical episcopate as distinct from the presbyteral order to which it belonged (cf. "presbyterii ordo, principalis consessio" in the same context, and see iii. 14. 2), though the bishops of apostolic churches, as capable of being traced individually (iii. 3. 1), are specially appealed to as witnesses (cf. iv. 33. 8, v. 19. 2)—as earlier by Hegesippus (Euseb. iv. 22). Nor is there mention of sacerdotal grace attaching to the succession in apostolic truth.[3] But once the idea of supernatural grace going along with office as such (of which we have already a trace in the Ignatian bishop, though without the notion of actual apostolic succession) arose in connexion with *successio ab apostolis*, the full development of the doctrine was but a matter of time.[4]

LITERATURE.—In England the modern treatment of the subject dates from J. B. Lightfoot's dissertation in his *Commentary on Galatians*, to which Dr F. J. A. Hort's *The Christian Ecclesia* added elements of value; see also T. M. Lindsay, *The Church and the Ministry*, and articles in Hastings' *Dictionary of the Bible* and the *Ency. Biblica*; A. Harnack, *Die Lehre der Apostel*, pp. 93 ff., and

[1] The tendency is already visible in the Lucan writings. An analogous process is seen in the use of "disciple," applicable in the apostolic age to Christians at large, but in the course of the sub-apostolic age restricted to personal "disciples of the Lord" or to martyrs (Papias in Eus. iii. 39, cf. Ignatius, *Ad Eph.* i. 2).

[2] In the Edessene legend of Abgar, in Eus. i. 12, we read that "Judas, who is also Thomas, sent Thaddaeus as apostle—one of the Seventy," where simply an authoritative envoy of Jesus seems intended. For traces of the wider sense of "apostle" in Gnostic, Marcionite and Montanist circles, see Monnier (as below).

[3] The above is substantially the view taken by J. B. Lightfoot in his essay on "The Christian Ministry" (*Comm. on Philippians*, 6th ed., pp. 239, 252 f.), and by T. M. Lindsay, *The Church and the Ministry* (1902), pp. 224-228, 278 ff. Even C. Gore, *The Church and the Ministry* (1889), pp. 119 ff., while inferring a sacerdotal element in Irenaeus's conception of the episcopate, says: "But it is mainly as preserving the catholic traditions that Irenaeus regards the apostolic succession" (p. 120).

[4] See Lightfoot's essay for Cyprian's contribution, as also for that of the Clementines, which fix on the twofold position of James at Jerusalem, as apostle and bishop, as bearing on apostolic succession in the episcopate.

Dogmengeschichte (3rd ed.), I. 153 ff.; E. Haupt, *Zum Verständnis d. Apostolats in NT.* (Halle, 1896); and especially H. Monnier, *La Notion de l'apostolat, des origines à Irénée* (Paris, 1903). The later legends and their sources are examined by T. Schermann, *Propheten- und Apostellegenden* (Leipzig, 1907). (J. V. B.)

APOSTLE SPOONS, a set of spoons, usually of silver or silver gilt, with the handles terminating in figures of the apostles, each bearing their distinctive emblem. They were common baptismal gifts during the 15th and 16th centuries, but were dying out by 1666. Often single spoons were given, bearing the figure of the patron or name saint of the child. Sets of the twelve apostles are not common, and complete sets of thirteen, with the figure of our Lord on a larger spoon, are still rarer. The Goldsmiths' Company in London has one such set, all by the same maker and bearing the hall-mark of 1626, and a set of thirteen was sold at Christie's in 1904 for £4900.

See William Hone, *The Everyday Book* and *Table Book* (1831); and W. J. Cripps, *Old English Plate* (9th ed., 1906).

APOSTOLICAL CONSTITUTIONS (Διαταγαὶ *or* Διατάξεις τῶν ἁγίων ἀποστόλων διὰ Κλήμεντος τοῦ Ῥωμαίων ἐπισκόπου τε καὶ πολίτου. Καθολικὴ διδασκαλία), a collection of ecclesiastical regulations in eight books, the last of which concludes with the eighty-five *Canons of the Holy Apostles*. By their title the Constitutions profess to have been drawn up by the apostles, and to have been transmitted to the Church by Clement of Rome; sometimes the alleged authors are represented as speaking jointly, sometimes singly. From the first they have been very variously estimated; the *Canons*, as a rule, more highly than the rest of the work. For example, the Trullan Council of Constantinople (*quini-sextum*), A.D. 692, accepts the Canons as genuine by its second canon, but rejects the Constitutions on the ground that spurious matter had been introduced into them by heretics; and whilst the former were henceforward used freely in the East, only a few portions of the latter found their way into the Greek and oriental law-books. Again, Dionysius Exiguus (*c.* A.D. 500) translated fifty of the Canons into Latin,[1] although under the title *Canones qui dicuntur Apostolorum*, and thus they passed into other Western collections; whilst the Constitutions as a whole remained unknown in the West until they were published in 1563 by the Jesuit Turrianus. At first received with enthusiasm, their authenticity soon came to be impugned; and their true significance was largely lost sight of as it began to be realized that they were not what they claimed to be. Vain attempts were still made to rehabilitate them, and they were, in general, more highly estimated in England than elsewhere. The most extravagant estimate of all was that of Whiston, who calls them "the most sacred standard of Christianity, equal in authority to the Gospels themselves, and superior in authority to the epistles of single apostles, some parts of them being our Saviour's own original laws delivered to the apostles, and the other parts the public acts of the apostles" (Historical preface to *Primitive Christianity Revived*, pp. 85-86). Others, however, realized their composite character from the first, and by degrees some of the component documents became known. Bishop Pearson was able to say that "the eight books of the Apostolic Constitutions have been after Epiphanius's time compiled and patched together out of the *didascaliae* or doctrines which went under the names of the holy apostles and their disciples or successors" (*Vind. Ign.* i. cap. 5); whilst a greater scholar still, Archbishop Usher, had already gone much further, and concluded, forestalling the results of modern critical methods, that their compiler was none other than the compiler of the spurious Ignatian epistles (*Epp. Polyc. et Ign.* p. lxiii. f., Oxon. 1644). The Apostolical Constitutions, then, are spurious, and they are one of a long series of documents of like character. But we have not really gauged their significance by saying that they are spurious. They are the last stage and climax of a gradual process of compilation and crystallization, so to speak, of unwritten church custom; and a short account of this process will show their real importance and value.

[1] Why he did not go on to give the remaining thirty-five is not clear; they belong to the same date as, and are not inferior to, the first fifty.

These documents are the outcome of a tendency which is found in every society, religious or secular, at some point in its history. The society begins by living in accordance with its fundamental principles. By degrees these translate themselves into appropriate action. Difficulties are faced and solved as they arise; and when similar circumstances recur they will tend to be met in the same way. Thus there grows up by degrees a body of what may be called customary law. Plainly, there is no particular point of time at which this customary law can be said to have begun. To all appearance it is there from the first in solution and gradually crystallizes out; and yet it is being continually modified as time goes on. Moreover, the time comes when the attempt is made, either by private individuals or by the society itself, to put this "customary law" into writing. Now when this is done, two tendencies will at once show themselves. (*a*) This "customary law" will at once become more definite: the very fact of putting it into writing will involve an effort after logical completeness. There will be a tendency on the part of the writer to fill up gaps; to state local customs as if they obtained universally; to introduce his personal equation, and to add to that which is the custom that which, in his opinion, *ought* to be. (*b*) There will be a strong tendency to fortify that which has been written with great names, especially in days when there is no very clear notion of literary property. This is done, not always with any deliberate consciousness of fraud (although it must be clearly recognized that truth is not one of the "natural virtues," and that the sense of the obligations of truthfulness was far from strong), but rather to emphasize the importance of what was written, and the fact that it was no new invention of the writer's. In a non-literary age fame gathers about great names; and that which, *ex hypothesi*, has gone on since the beginning of things is naturally attributed to the founders of the society. Then come interpolations to make this ascription more probable, and the prefixing of a title, then or subsequently, which states it as a fact. This is precisely the way in which the Apostolical Constitutions and other kindred documents have come into being. They are attempts, made in various places and at different times, to put into writing the order and discipline and character of the Church; in part for private instruction and edification, but in part also with a view to actual use; frequently even with an actual reference to particular circumstances. In this lies their importance, to a degree which is only just being adequately realized. They contain evidence of the utmost value as to the order of the Church in early days; evidence, however, which needs to be sifted with the greatest care, since the personal preferences of the writer and the customs of the local church to which he belongs are continually mixed up with things which have a wider prevalence. It is only by careful investigation, by the method of comparisons, that these elements can be disentangled; but as the number of documents of this class known to us is continually increasing, their value increases even more than proportionately. And whilst their local and fugitive character must be fully recognized and allowed for, is it unjustifiable to set them aside or leave them out of account as heretical, and therefore negligible.

Origin and real nature.

It will be sufficient here to mention shortly the chief collections of this kind which came into existence during the first four centuries; generally as the work of private individuals, and having, at any rate, no more than a local authority of some kind. (*a*) The earliest known to us is the *Didachē* or *Teaching of the Twelve Apostles*, itself compiled from earlier materials, and dating from about 120 (see DIDACHĒ). (*b*) *The Apostolic Church Order* (*apostolische Kirchenordnung* of German writers); *Ecclesiastical Canons of the Holy Apostles* of one MS.; *Sententiae Apostolorum* of Pitra: of about 300, and emanating probably from Asia Minor. Its earlier part, cc. 1-14, depends upon the *Didachē*, and the rest of it is a book of discipline in which Harnack has attempted to distinguish two older fragments of church law (*Texte u. Unters.* ii. 5). (*c*) The so-called *Canones Hippolyti*, probably Alexandrian or Roman, and of the first half of the 3rd century. It will be observed that these

Other collections.

make no claim to apostolic authorship; but otherwise their origin is like that of the rest, unless indeed, as has been suggested, they represent the work of an actual Roman synod. (*d*) The so-called *Egyptian Church Order*, in Coptic from a Greek pre-Nicene original (*c.* 310). It is part of the Egyptian Heptateuch and contains neither communion nor ordination forms. (*e*) The *Ethiopic Church Order*, perhaps twenty years later than (*d*), and forming part of the *Ethiopic Statutes*. (*f*) The *Verona Latin Fragments*, discovered and published by Hauler, portions of a form akin to (*e*), which may be dated *c.* 340, though possibly earlier. It has a preface which refers to a treatise *Concerning Spiritual Gifts* as having immediately preceded it. (*g*) The recently discovered *Testament of the Lord*, which is somewhat later in date (*c.* 350), and likewise depends upon the *Canones Hippolyti*. (*h*) The so-called *Canons of Basil*. This is an Arabic work perhaps based on a Coptic and ultimately on a Greek original, embodying with modifications large portions of the Canons of Hippolytus. (On the relations between the six last-named, see HIPPOLYTUS, CANONS OF.)

Here also may be noticed the *Didascalia Apostolorum*, originally written in Greek, but known through a Syriac version and a fragmentary Latin one published by Hauler. It is of the middle of the 3rd century—in fact, a passage in the Latin translation seems to give us the date A.D. 254. It emanates from Palestine or Syria, and is independent of the documents already mentioned; and upon it the *Constitutions* themselves very largely depend. It is a mixture of moral and ecclesiastical instruction. The *Sacramentary of Serapion* (*c.* 350), *The Pilgrimage of Etheria* (*Silvia*) (*c.* 385), and *The Catechetical Lectures of Cyril of Jerusalem* (348) are also of value in this connexion. In the (so-called) *Constitutions through Hippolytus* we have possibly a preliminary draft of the famous 8th book of the *Apostolical Constitutions*.[1]

Contents.

The Constitutions themselves fall into three main divisions. (i.) The first of these consists of books i.-vi., and throughout runs parallel to the *Didascalia*. Bickell, indeed, held that this latter was an abbreviated form of books i.-vi.; but it is now agreed on all hands that the Constitutions are based on the *Didascalia* and not vice versa. (ii.) Then follows book vii., the first thirty-one chapters of which are an adaptation of the *Didachē*, whilst the rest contain various liturgical forms of which the origin is still uncertain, though it has been acutely suggested by Achelis, and with great probability, that they originated in the schismatical congregation of Lucian at Antioch. (iii.) Book viii. is more composite, and falls into three parts. The first two chapters, *περὶ χαρισμάτων*, may be based upon a lost work of St Hippolytus, otherwise known only by a reference to it in the preface of the *Verona Latin Fragments*; and an examination shows that this is highly probable. The next section, cc. 3-27, *περὶ χειροτονιῶν*, and cc. 28-46, *περὶ κανόνων*, is twofold, and is evidently that upon which the writer sets most store. The apostles no longer speak jointly, but one by one in an apostolic council, and the section closes with a joint decree of them all. They speak of the ordination of bishops (the so-called Clementine Liturgy is that which is directed to be used at the consecration of a bishop, cc. 5-15), of presbyters, deacons, deaconesses, subdeacons and lectors, and then pass on to confessors, virgins, widows and exorcists; after which follows a series of canons on various subjects, and liturgical formulae. With regard to this section, all that can be said is that it includes materials which are also to be found elsewhere—in the *Egyptian Church Order* and other documents already spoken of—and that the precise relation between them is at present not determined. The third section consists of the Apostolic Canons already referred to, the last and most significant of which places the Constitutions and the two epistles of Clement in the canon of Scripture, and omits the Apocalypse. They are derived in part from the preceding Constitutions, in part from the canons of the councils of Antioch, 341, Nicaea, 325, and possibly Laodicaea, 363.

[1] At a later date various collections were made of the documents above mentioned, or some of them, to serve as law-books in different churches—*e.g.* the Syrian Octateuch, the Egyptian Heptateuch, and the Ethiopic Sīnōdōs. These, however, stand on an entirely different footing, since they are simply collections of existing documents, and no attempt is made to claim apostolic authorship for them.

A comparison of the Constitutions with the material upon which they are based will illustrate the compiler's method. (*a*) To begin with the *Didascalia* already mentioned. It is unmethodical and badly digested, homiletical in style, and abounding in biblical quotations. There is no precise arrangement; but the subjects, following a general introduction, are the bishop and his duties, penance, the administration of the offerings, the settlement of disputes, the divine service, the order of widows, deacons and deaconesses, the poor, behaviour in persecution, and so forth. The compiler of the Constitutions finds here material after his own heart. He is even more discursive and more homiletical in style; he adds fresh citations of the Scriptures, and additional explanations and moral reflexions; and all this with so little judgment that he often leaves confusion worse confounded (*e.g.* in ii. 57, where, upon a symbolical description of the Church as a sheepfold, he has superimposed the further symbolism of a ship). (*b*) Passing on to books vii. and viii., we observe that the compiler's method of necessity changes with his new material. In the former book he still makes large additions and alterations, but there is less scope for his prolixity than before; and in the latter, where he is no longer dealing with generalities, but making actual definitions, the Constitutions of necessity become more precise and statutory in form. Throughout he adopts and adapts the language of his sources as far as possible, "only pruning in the most pressing cases," but towards the end he cannot avoid making larger alterations from time to time. And his alterations throughout are not made aimlessly. Where he finds things which would obviously clash with the customs of his own day, he unhesitatingly modifies them. An account of the Passion, with a curiously perverted chronology, the object of which was to justify the length of the Passion-tide fast, is entirely revised for this reason (v. 14); the direction to observe Easter according to the Jewish computation is changed into the exact contrary for the same reason (v. 17); and where his archetype lapses into speaking of a lull in persecution he naïvely informs us that the Romans have now given up persecuting and have adopted Christianity (vi. 26), forgetting altogether that he is speaking in the character of the apostles. Above all, he both magnifies the office of the Christian ministry as a whole and alters what is said of it in detail (for example, the deaconess loses rank not a little), to make it agree with the circumstances of his day in general, and with his own ideas of fitness in particular. It is here that his evidence is at once most valuable and needs to be used with the greatest care. To give one striking example of the value of these documents. The *Canones Hippolyti* (vi. 43) provide that one who has been a confessor for the faith may be received as a presbyter by virtue of his confessorship and not by the laying on of the bishop's hands; but if he be chosen a bishop, he is to be ordained. This provision passes on into the Egyptian *Ecclesiastical Canons* and other kindred documents, and even into the *Testamentum Domini*. But the corresponding passage in the Apostolical Constitutions (viii. 23) entirely reverses it: "A confessor is not ordained, for he is so by choice and patience, and is worthy of great honour. . . . But if there be occasion, he is to be ordained either a bishop, priest, or deacon. But if any one of the confessors who is not ordained snatches to himself any such dignity upon account of his confession, let the same person be deprived and rejected; for he is not in such an office, since he has denied the constitution of Christ, and is worse than an infidel."

Authorship, place and date.

Who, then, is the author of the Constitutions, and what can be inferred with regard to him? (i.) By separating off the sources which he used from his own additions to them, it at once becomes clear that the latter are the work of one man: the style is unmistakable, and the method of working is the same throughout. The compiler of books i.-vi. is also the compiler of books vii., viii. (ii.) As to his theological position, different views have been held. Funk suggests Apollinarianism, which is the refuge of the destitute; and Achelis inclines in the same direction. But the affinities of the author are quite otherwise, the most pronounced of them being a strong subordinationist tendency, denial of a human

soul to Christ, and the like, which suggest not indeed Arianism but an inclination towards Arianism. Above all, his polemic is directed against the dying heresies of the 3rd century; and he writes with an absence of constraint which is not the language of one who lives amidst violent controversies or who is conscious of being in a minority. All this points to the position of a "conservative" or semi-Arian of the East, one who belongs, perhaps, to the circle of Lucian of Antioch and writes before the time of Julian. It is hard to think of any other time or circumstances in which a man could write like this. (iii.) The indications of *time* have been held to point to a different conclusion. On the one hand, the fact that the attempt to rebuild the temple by Julian in 363 is not mentioned in vi. 24 points to an earlier date; and the fact that the κοπιᾶται are not mentioned amongst the church officers points in the same direction, for elsewhere they are first mentioned in a rescript of Constantius in A.D. 357. On the other hand, in the cycle of feasts occur the names of several which are probably of later date—*e.g.* Christmas and St Stephen, which were introduced at Antioch *c.* A.D. 378 and 379 respectively. Again, Epiphanius (*c.* A.D. 374) appears to be unacquainted with it; he still quotes from the *Didascalia*, and elaborately explains it away where it is contrary to the usages of his own day. But as regards the former point, it is possible that the Apostolical Constitutions constantly gave rise to these festivals; or, on the other hand, that the two passages were subsequently introduced either by the writer himself or by some other hand, when the last book of the Constitutions was being used as a law-book. And as regards the latter, the fact that Epiphanius does not use the Constitutions is no proof that they had not yet been compiled. (iv.) As to the region of composition there is no real doubt. It was clearly the East, Syria or Palestine. Many indications are against the latter, and Syria is strongly suggested by the use of the Syro-Macedonian calendar. Moreover, the writer represents the Roman Clement as the channel of communication between the apostles and the Church. This fact both supplies him with the name by which he is commonly known, Pseudo-Clement, and also furnishes corroboration of his Syrian birth; since the other spurious writings bearing the name of Clement, the *Homilies* and *Recognitions*, are likewise of Syrian origin. Moreover, the spurious Ignatian epistles, which are also Syrian, depend throughout upon the Constitutions. (v.) But this is not all. It was long ago noticed that Pseudo-Clement bears a very close resemblance to Pseudo-Ignatius, the interpolator of the Ignatian Epistles in the longer Greek recension. Usher, as we have seen, identified them, and modern criticism accepts this identification as a fact (Lagarde, Harnack, Funk, Brightman). Lightfoot, indeed, still hesitated (*Ap. Fathers*, II. i. 266 n.) on the ground that Pseudo-Ignatius occasionally misunderstands the Constitutions, that the two writings give the Roman succession differently, and that Pseudo-Clement shows no knowledge of the Christological controversies of Nicaea. But as regards the first of these, it is rather a case of condensed citation than of misinterpretation; the second is explained by the writer's carelessness as shown in other passages, and all are solved if a considerable interval of time elapsed between the compilation of the Constitutions and the spurious Ignatian epistles.

It seems clear then that the compiler was a Syrian, and that he also wrote the spurious Ignatian epistles; he was likewise probably a semi-Arian of the school of Lucian of Antioch. His date is given by Harnack as A.D. 340–360, with a leaning to 340–343; by Lightfoot as the latter half of the 4th century; by Brightman, 370–380; by Maclean, 375; and by Funk as the beginning of the 5th century.

AUTHORITIES.—W. Ueltzen, *Constitutiones Apostolicae* (Schwerin, 1853); P. A. de Lagarde, *Didascalia Apostolorum Syriace* (Leipz., 1854); *Constitutiones Apostolorum* (Leipz. and Lond., 1862); M. D. Gibson, *Didascalia Apost. Syriace*, with Eng. trans. (*Horae Semiticae*, i. and ii., Cambridge, 1903); J. B. Pitra, *Juris Ecclesiastici Graecorum Historia et Monumenta*, i. (Rome, 1864); Hauler, *Didascaliae Apostolorum Fragmenta Ueronensia Latina* (Leipzig, 1900); Bickell, *Geschichte des Kirchenrechts*, i. (Giessen, 1843); F. X. Funk, *Die apostolischen Konstitutionen* (Rottenb., 1891); A. Harnack, *Geschichte d. altchristl. Litteratur*, i. 515 ff. (Leipz., 1893); F. E. Brightman, *Liturgies Eastern and Western*, I. xvii. ff. (Oxford, 1896); H. Achelis, in Hauck's *Realencyklopädie*, i. 734 f., art. "Apostolische Konstitutionen und Kanones" (Leipz., 1896); A. S. Maclean, *Recent Discoveries illustrating Early Christian Worship* (Lond., 1904); J. Wordsworth, *The Ministry of Grace*, pp. 18 ff; J. P. Arendzen, "The Apostolic Church Order" (Syriac Text, Eng. trans. and notes) in *Journ. of Theol. Studies*, iii. 59. Trans. of *Apost. Constitutions*, book viii., in Ante-Nicene Christian Library. (W. E. Co.)

APOSTOLIC CANONS, a collection of eighty-five rules for the regulation of clerical life, appended to the eighth book of the *Apostolical Constitutions* (*q.v.*). They are couched in brief legislative form though on no definite plan, and deal with the vexed questions of ecclesiastical discipline as they were raised towards the end of the 4th century. At least half of the canons are derived from earlier constitutions, and probably not many of them are the actual productions of the compiler, whose aim was to gloss over the real nature of the *Constitutions*, and secure their incorporation with the Epistles of Clement in the New Testament of his day. The *Codex Alexandrinus* does indeed append the Clementine Epistles to its text of the New Testament. The Canons may be a little later in date than the preceding *Constitutions*, but they are evidently from the same Syrian theological circle.

APOSTOLIC FATHERS, a term used to distinguish those early Christian writers who were believed to have been the personal associates of the original Apostles. While the title "Fathers" was given from at least the beginning of the 4th century to church writers of former days, as being the parents of Christian belief and thought for later times, the expression "Apostolic Fathers" dates only from the latter part of the 17th century. The idea of recognizing these "Fathers" as a special group exists already in the title "Patres aevi apostolici, sive SS. Patrum qui temporibus apostolicis floruerunt . . . opera," under which in 1672 J. B. Cotelier published at Paris the writings current under the names of Barnabas, Clement of Rome, Hermas, Ignatius and Polycarp. But the name itself is due to their next editor, Thomas Ittig (1643–1710), in his *Bibliotheca Patrum Apostolicorum* (1699), who, however, included under this title only Clement, Ignatius and Polycarp. Here already appears the doubt as to how many writers can claim the title, a doubt which has continued ever since, and makes the contents of the "Apostolic Fathers" differ so much from editor to editor. Thus the Oratorian Andrea Gallandi (1709–1779), in re-issuing Cotelier's collection in his *Bibliotheca Veterum Patrum* (1765–1781), included the fragments of Papias and the Epistle to Diognetus, to which recent editors have added the citations from the "Elders" of Papias's day found in Irenaeus and, since 1883, the *Didachē*.

The degree of historic claim which these various writings have to rank as the works[1] of Apostolic Fathers varies greatly on any definition of "apostolic." Originally the epithet was meant to be taken strictly, viz. as denoting those whom history could show to have been personally connected, or at least coeval, with one or more apostles; and an effort was made, as by Cotelier, to distinguish the writings rightly and wrongly assigned to such. Thus editions tended to vary with the historical views of editors. But the convenience of the category "Apostolic Fathers" to express not only those who might possibly have had some sort of direct contact with apostles—such as "Barnabas," Clement, Ignatius, Papias, Polycarp—but also those who seemed specially to preserve the pure tradition of apostolic doctrine during the sub-apostolic age, has led to its general use in a wide and vague sense.

Conventionally, then, the title denotes the group of writings which, whether in date or in internal character, are regarded as belonging to the main stream of the Church's teaching during the period between the Apostles and the Apologists (*i.e.* to *c.* A.D. 140). Or to put it more exactly, the "Apostolic Fathers" represent, chronologically in the main and still more from the religious and theological standpoint, the momentous process of

[1] Cotelier included the Acts of Martyrdom of Clement, Ignatius and Polycarp; and those of Ignatius and Polycarp are still often printed by editors.

transition from the type of teaching in the New Testament to that which meets us in the early Catholic Fathers, from the last quarter of the 2nd century onwards. The Apologists no doubt show us certain fresh factors entering into this development; but on the whole the Apostolic Fathers by themselves go a long way to explain the transition in question, so far as knowledge of this *saeculum obscurum* is within our reach at all. It is true that they do not include the whole even of the ecclesiastical literature of the sub-apostolic age, not to mention what remains of Gnostic and other minority types. The *Preaching* and *Apocalypse* of Peter, for instance, are quite typical of the same period, and help us to read between the lines of the Apostolic Fathers. Yet they do not really add much to what is there already, and they have the drawbacks of pseudonymity; they lack concrete and personal qualities; they are general expressions of tendencies which we cannot well locate or measure, save by means of the Apostolic Fathers themselves or of their earliest Catholic successors.

(A) In *external features* the group is far from homogeneous, a fact which has led to their being disintegrated as a group in certain histories of early Christian literature (*e.g.* those of Harnack and Krüger), and classed each under its own literary type—so sacrificing to outer form, which is quite secondary in primitive Christian writings, the more significant fact of religious affinity. Its original members, those still best entitled to their name in any strict sense, are epistles, and in this respect also most akin to Apostolic writings. Indeed Ignatius takes pleasure in saluting his readers "after the apostolic stamp" (*ad Trall.* inscr.), while yet disclaiming all desire to emulate the apostolic manner in other respects, being fully conscious of the gulf between himself and apostles like Peter and Paul in claim to authority (*ib.* iii. 3, *ad Rom.* iv. 3). The like holds of Polycarp, who, in explaining that he writes to exhort the Philippians only at their own request, adds, "for neither am I, nor is any other like me, able to follow the wisdom of the blessed and glorious Paul" (iii. 2). Clement's epistle, indeed, conforms more to the elaborate and treatise-like form of the Epistle to the Hebrews, on which it draws so largely; and the same is true of "Barnabas." But one and all are influenced by study of apostolic epistles, and witness to the impression which these produced on the men of the next generation. Unconsciously, too, they correspond to the apostolic type of writing in another respect, viz. their occasional and practical character. They are evoked by pressing needs of the hour among some definite body of Christians and not by any literary motive.[1] This is a universal trait of primitive Christian writings; so that to speak of primitive Christian "literature" at all is hardly accurate, and tends to an artificial handling of their contents. These sub-apostolic epistles are veritable "human documents," with the personal note running through them. They are after all personal expressions of Christianity, in which are discernible also specific types of local tradition. To such spontaneous actuality a large part of their interest and value is due.

Nor is this pre-literary and vital quality really absent even from the writing which is least entitled to a place among "Apostolic Fathers," the Epistle to Diognetus. This beautiful picture of the Christian life as a realized ideal, and of Christians as "the soul" of the world, owes its inclusion to a double error: first, to the accidental attachment at the end of another fragment (§ 11), which opens with the writer's claim to stand forth as a teacher as being "a disciple of apostles"; and next, to mistaken exegesis of this phrase as implying personal relations with apostles, rather than knowledge of their teaching, written or oral. Whether in form addressed to Diognetus, the tutor of Marcus Aurelius, as a typical cultured observer of Christianity, or to some other eminent person of the same name in the locality of its origin, or, as seems more likely, to cultured Greeks generally, personified under the significant name "Diognetus" ("Heaven-born," cf. Acts xvii. 28 along with § iii. 4)—the epistle is in any case an "open letter" of an essentially literary type. Further, its opening seems modelled on the lines of the preface to Luke's Gospel, to which, along with *Acts*, it may owe something of its very conception as a reasoned appeal to the lover of truth. But while literary in form and conception, its appeal is in spirit so personal a testimony to what the Gospel has done for the writer and his fellow Christians, that it is akin to the piety of the Apostolic Fathers as a group. It is true that it has marked affinities, *e.g.* in its natural theology, with the earliest Apologists, Aristides and Justin, even as it is itself in substance an apology addressed not to the State, but to thoughtful public opinion. But this only means that we cannot draw a hard and fast line between groups of early Christian writings at a time when practical religious interests overshadowed all others.

If thus related to the Apologists of the middle of the 2nd century, the Epistle to Diognetus has also points of contact with one of the most practical and least literary writings found among our Apostolic Fathers, viz. the homily originally known as the Second Epistle of Clement (for this ascription, as for other details, see CLEMENTINE LITERATURE). The recovery of its concluding sections in the same MS. which brought the *Didachē* to light, proves beyond question that we have here the earliest extant sermon preached before a Christian congregation, about A.D. 120–140 (so J. B. Lightfoot). Its opening section, recalling to its hearers the passing of the mists of idolatry before the revelation in Jesus Christ, is markedly similar in tone and tenor to passages in the Epistle to Diognetus. Far closer, however, are the affinities between the homily and the *Shepherd of Hermas*, "the first Christian allegory," which as a literary whole dates from about A.D. 140, but probably represents a more or less prolonged prophetic activity on the part of its author, the brother of Pius, the Roman bishop of his day (*c.* 139–154). In both the primary theme is repentance, as called for by serious sins, after baptism has placed the Christian on his new and higher level of responsibility. Thus both are hortatory writings, the one argumentative in form, the other prophetic, after the manner of later Old Testament prophets whose messages came in visions and similitudes. This prophetic and apocalyptic note, which characterizes Hermas among the Apostolic Fathers (though there are traces of it also in the *Didachē* and in Ignatius, *ad Eph.* xx.), is a genuinely primitive trait and goes far to explain the vogue which the *Shepherd* enjoyed in the generations immediately succeeding, as also the influence of its disciplinary policy, which is its prophetic "burden" (see HERMAS, SHEPHERD OF).

We come finally to the anonymous *Teaching of the Twelve Apostles* and Papias's *Exposition of Oracles of the Lord*, so far as this is known to us. The former, besides embodying catechetical instruction in Christian conduct (the "Two Ways"), which goes back in substance to the early apostolic age and is embodied also in "Barnabas," depicts in outline the fundamental usages of church life as practised in some conservative region (probably within Syria) about the last quarter of the 1st century and perhaps even later. The whole is put forth as substantially the apostolic teaching (*Didachē*) on the subjects in question. This is probably a *bona fide* claim. It expresses the feeling common to the Apostolic Fathers and general in the sub-apostolic age, at any rate in regions where apostles had once laboured, that local tradition, as held by the recognized church leaders, did but continue apostolic doctrine and practice. Into later developments of this feeling an increasing element of illusion entered, and all other written embodiments of it known to us take the form of literary fictions, more or less bold. It is in contrast to these that the *Didachē* is justly felt to be genuinely primitive and of a piece with the Apostolic Fathers. Thus while its form would by analogy tend *per se* to awaken suspicion, its contents remove this feeling; and we may even infer from this surviving early formulation of local ecclesiastical tradition, that others of somewhat similar character came into being in the sub-apostolic age, but failed to survive save as embodied in later local teaching, oral or written, very much as if the *Didachē* had perished and its literary offspring alone remained (see DIDACHĒ).

As regards Papias's *Exposition*, which Lightfoot describes

[1] See G. A. Deissmann, *Bible Studies*, pp. 1-60, for this distinction between the genuine "letter" and the literary "epistle," as applied to the New Testament in particular.

as "among the earliest forerunners of commentaries, partly explanatory, partly illustrative, on portions of the New Testament," we need here only remark that, whatever its exact form may have been—as to which the extant fragments still leave room for doubt—it was in conception expository of the historic meaning of Christ's more ambiguous Sayings, viewed in the light of definitely ascertained apostolic traditions bearing on the subject. The like is true also of the fragments of the Elders preserved in Irenaeus (so far as these do not really come from Papias). Both bodies of exposition represent the traditional principle at work in the sub-apostolic age, making for the preservation in relative purity, over against merely subjective interpretations—those of the Gnostics in particular—of the historic or original sense of Christ's teaching, just as Ignatius stood for the historicity of the facts of His earthly career in their plain, natural sense.

(B) Here the question of external form passes readily over into that of the *internal character and spirit*. Indeed much has already been said or suggested bearing on these. The relation of these writers to the apostolic teaching generally has become pretty evident. It is one of absolute loyalty and deference, as to the teaching of inspiration. They are conscious, as are we in reading them, that they are not moving on the same level of insight as the Apostles; they are sub-apostolic in that sense also. Hence there appear constant traces of study of the Apostolic writings, so far as these were accessible in the locality of each writer at his date of writing (for the details of this subject, and its bearing on the history of the Canonical Scriptures of the New Testament, see *The New Testament in the Apostolic Fathers*, Oxford, 1905). As Lightfoot points out (*Apostolic Fathers*, pt. i. vol. i. p. 7), however, personality, with its variety of temperament and emphasis, largely colours the Apostolic Fathers, especially the primary group. Clement has all the Roman feeling for duly constituted order and discipline; Ignatius has the Syrian or semi-oriental passion of devotion, showing itself at once in his mystic love for his Lord and his over-strained yearning to become His very "disciple" by drinking the like cup of martyrdom; Polycarp is, above all things, steady in his allegiance to what had first won his conscience and heart, and his "passive and receptive character" comes out in the contents of his epistle. Of the rest, whose personalities are less known to us, Papias shares Polycarp's qualities and their limitations, the anonymous homilist and Hermas are marked by intense moral earnestness, while the writer to Diognetus joins to this a profound religious insight. These personal traits determine by selective affinity, working under conditions given by the special local type of tradition and piety, the elements in the Apostolic writings which each was able to assimilate and express—though we must allow also for variety in the occasions of writing. Thus one New Testament type is echoed in one and another in another; or it may be several in turn. The latter is the case in Clement, Ignatius and Polycarp; perhaps also in "Barnabas." In Hermas there is special affinity to the language and thought of the epistle of James, and in the homilist to those of Paul. Yet their very use of the same terms or ideas makes us the more aware of "a marked contrast to the depth and clearness of conception with which the several Apostolic writers place before us different aspects of the Gospel" (Lightfoot). While Apostolic phrases are used, the sense behind them is often different and less evangelic. They have not caught the Apostolic meaning, because they have not penetrated to the full religious experience which gave to the words, often words with long and varied history both in the Septuagint and in ordinary Greek usage, their specific meaning to each apostle and especially to Paul. This phenomenon was noted particularly by E. Reuss, in his *Histoire de la théologie chrétienne au siècle apostolique* (3rd ed., 1864). Take for instance Clement. Lightfoot, indeed, dwells on the all-round "comprehensiveness" with which Clement, as the mouthpiece of the early Roman Church, utters in succession phrases or ideas borrowed impartially from Peter and Paul and James and the Epistle to Hebrews. He admits, however, that such mere co-ordination of the language of Paul and James, for instance, as appears in his twice bracketing "faith and hospitality" as grounds of acceptance with God (the cases are those of Abraham and Rahab, in chs. x. and xii.), is "from a strictly dogmatic point of view" his weakness. But the weakness is more than a dogmatic one; it is one of religious experience, as the source of spiritual insight. It is not merely that "there is no *dogmatic system* in Clement" or in any other of the Apostolic Fathers; that may favour, not hinder, religious insight. There is a want of depth in Christian experience, in the power of realizing relative spiritual values in the light of the master principle involved in the distinctively Christian consciousness, such as could raise Clement above a verbal eclecticism, rather than comprehensiveness, in the use of Apostolic language. As R. W. Dale remarks, in a note on Reuss's too severe words (Eng. trans. ii. 295): "The vital force of the Apostolic convictions gave to Apostolic thought a certain organic and consistent form." It is lack of this organic quality in the thought, not only of Clement but also of the Apostolic Fathers generally—with the possible exception of Ignatius, who seems to share the Apostolic experience more fully than any other, to which Reuss rightly directs attention. In virtue of this defect, due largely to the failure to enter into the Apostolic experience of mystic union with Christ, he can rightly speak of "an immense retrogression" in theology visible "at the end of the century, and in circles where it might have been least expected" (ii. p. 294, cf. 541).

In fact the perspective of the Gospel was seriously changed and its most distinctive features obscured. This was specially the case with the experimental doctrines of grace. Here the central glory of the Cross as "the power of God unto salvation" suffered some eclipse, although the passion of Christ was felt to be a transcendent act of Divine Grace in one way or another. But even more serious was the loss of an adequate sense of the contrast between "grace" and "works" as conditions of salvation. There was little or no sense of the danger of the *legal principle*, as related to human egoism and the instinct to seek salvation as a reward for merit. The passages in which these things are laid bare by Paul's remorseless analysis of his own experience "under Law" seem to have made practically no impression on the Apostolic Fathers as a whole. Gentile Christians had not felt the fang of the Law as the ex-Pharisee had occasion to feel it. Even if first trained in the Hellenistic synagogues of the Dispersion, as was often the case, they apprehended the Law on its more helpful and less exacting side, and had not been brought "by the Law to die unto the Law," that they might "live unto God." The result was too great a continuity between their religious conceptions before and after embracing the Gospel. Thus the latter seemed to them simply to bring forgiveness of past sins for Christ's sake, and then an enhanced moral responsibility to the New Law revealed in Him. Hence a new sort of legalism, known to recent writers as Moralism, underlies much of the piety of the Apostolic Fathers, though Ignatius is quite free from it, while Polycarp and "Barnabas" are less under its influence than are the *Didachē*, Clement, the Homilist and Hermas. It conceives salvation as a "wages" (*μισθός*) to be earned or forfeited; and regards certain good works, such as prayer, fasting, alms—especially the last—as efficacious to cancel sins. The reality of this tendency, particularly at Rome, betrays itself in Hermas, who teaches the supererogatory merit of alms gained by the self-denial of fasting (*Sim.* v. 3. 3 ff.). Marcion's reaction, too, against the Judaic temper in the Church as a whole, in the interests of an extravagant Paulinism, while it suggests that Paul's doctrines of grace generally were inadequately realized in the sub-apostolic age, points also to the prevalence of such moralism in particular.

(C) In attempting a final estimate of the value of the Apostolic Fathers for the historian to-day, we may sum up under these heads: ecclesiastical, theological, religious. (*a*) As a mine of materials for reconstructing the history of Church institutions, they are invaluable, and that largely in virtue of their spontaneous and "esoteric" character, with no view to the public generally or to posterity. (*b*) Theologically, as a stage in the

history of Christian doctrine, their value is as great negatively as positively. Impressive as is their witness to the persistence of the Apostolic teaching in its essential features, amidst all personal and local variations, perhaps the most striking thing about these writings is the degree in which they fail to appreciate certain elements of the Apostolic teaching as embodied in the New Testament, and those its higher and more distinctively Christian elements.[1] This negative aspect has a twofold bearing. Firstly, it suggests the supernormal level to which the Apostolic consciousness was raised at a bound by the direct influence of the Founder of Christianity, and justifies the marking-off of the Apostolic writings as a Canon, or body of Christian classics of unique religious authority. To this principle Marcion's Pauline Canon is a witness, though in too one-sided a spirit. Secondly, it means that the actual development of ecclesiastical doctrine began, not from the Apostolic consciousness itself, but from a far lower level, that of the inadequate consciousness of the sub-apostolic Church, even when face to face with their written words. This theological " retrogression " is of much significance for the history of dogma. (*c*) On the other hand, there is great religious and moral continuity, beneath even theological discontinuity, in the life working below all conscious apprehension of the deeper ideas involved (E. von Dobschütz, *Christian Life in the Primitive Church*, 1905). There is continuity in character; the Apostolic Fathers strike us as truly good men, with a goodness raised to a new type and power. This is what the Gospel of Christ aims chiefly at producing as its proper fruit; and the Apostolic Fathers would have desired no better record than that they were themselves genuine " epistles of Christ."

LITERATURE.—This is too large to indicate even in outline, but is given fully in the chief modern editions, viz. of Gebhardt, Harnack and Zahn jointly (1875–1877), J. B. Lightfoot (1885–1890) and F. X. Funk (1901); also in O. Bardenhewer, *Gesch. der altkirchlichen Litteratur* (1902), Band i., and in *Neutestamentliche Apokryphen*, with *Handbuch* thereto, edited by E. Hennecke (Tübingen, 1904). The fullest discussion in English of the teaching of Barnabas, Clement, Ignatius and Polycarp is by J. Donaldson, *The Apostolical Fathers* (1874), which, however, suffers from the imperfect state of the texts when he wrote. The most useful edition for ready reference, containing critical texts (up to date) and good translations, is Lightfoot's one-volume edition, *The Apostolic Fathers* (London, 1891). (J. V. B.)

APOSTOLICI, APOSTOLIC BRETHREN, or APOSTLES, the names given to various Christian heretics, whose common doctrinal feature was an ascetic rigidity of morals, which made them reject property and marriage. The earliest Apostolici appeared in Phrygia, Cilicia, Pisidia and Pamphylia towards the end of the 2nd century or the beginning of the 3rd. According to the information given by Epiphanius (*Haer.* 61) about the doctrines of these heretics, it is evident that they were connected with the Encratites and the Tatianians. They condemned individual property, hence the name sometimes given to them of *Apotactites* or *Renuntiatores*. They preserved an absolute chastity and abstained from wine and meat. They refused to admit into their sect those Christians whom the fear of martyrdom had once restored to paganism. As late as the 4th century St Basil (*Can.* 1 and 47) knew some Apostolici. After that period they disappeared, either becoming completely extinct, or being confounded with other sects (see St Augustine, *Haer.* 40; John of Damascus, *Haer.* 61).

Failing a more exact designation, the name of Apostolici has been given to certain groups of Latin heretics of the 12th century. It is the second of the two sects of Cologne (the first being composed very probably of Cathari) that is referred to in the letter addressed in 1146 by Everwin, provost of Steinfeld, to St Bernard (Mabillon, *Vet. Anal.* iii. 452). They condemned marriage (save, perhaps, first marriages), the eating of meat, baptism of children, veneration of saints, fasting, prayers for the dead and belief in purgatory, denied transubstantiation, declared the Catholic priesthood worthless, and considered the whole church of their time corrupted by the " negotia saecularia " which absorbed all its zeal (cf. St Bernard, *Serm.* 65 and 66 *in Canlic.*). They do not seem to have been known as Apostles or Apostolici: St Bernard, in fact, asks his hearers: " Quo nomine istos titulove censebis?" (*Serm.* 66 *in Cantic.*). Under this designation, too, are included the heretics of Périgueux in France, alluded to in the letter of a certain monk Heribert (Mabillon, *Vet. Anal.* iii. 467). Heribert says merely: " Se dicunt apostolicam vitam ducere." It is possible that they were Henricians (see HENRY OF LAUSANNE). During his mission in the south-east of France in 1146–1147 St Bernard still met disciples of Henry of Lausanne in the environs of Périgueux. The heretics of whom Heribert speaks condemned riches, denied the value of the sacraments and of good works, ate no meat, drank no wine and rejected the veneration of images. Their leader, named Pons, gathered round him nobles, priests, monks and nuns.

In the second half of the 13th century appeared in Italy the *Order of the Apostles* or *Apostle Brethren* (see especially the *Chron.* of Fra Salimbene). This was a product of the mystic fermentation which proceeded from exalted Franciscanism and from Joachimism (see FRATICELLI and JOACHIM). It presents great analogies with groups of the same character, *e.g.* Sachets, Bizocchi, Flagellants, &c. The order of the Apostles was founded about 1260 by a young workman from the environs of Parma, Gerard Segarelli, who had sought admission unsuccessfully to the Franciscan order. To make his life conform to that of Christ, his contemporaries say that he had himself circumcised, wrapped in swaddling clothes and laid in a cradle, and that he then, clad in a white robe and bare-footed, walked through the streets of Parma crying " Penitenz agite!" (" Poenitentiam agite!"). He was soon followed by a throng of men and women, peasants and mechanics. All had to live in absolute poverty, chastity and idleness. They begged, and preached penitence. Opizo, bishop of Parma, protected them until they caused trouble in his diocese. Their diffusion into several countries of Christendom disturbed Pope Honorius IV., who in 1286 ordered them to adhere to an already recognized rule. On their refusal, the pope condemned them to banishment and Opizo imprisoned Segarelli. The councils of Würzburg (1287) and Chichester (1289) took measures against the Apostles of Germany and England. But in 1291 the sect reappeared, sensibly increased, and Pope Nicholas IV. published anew the bull of Honorius IV. From that day the Apostles, regarded as rebels, were persecuted pitilessly. Four were burned in 1294, and Segarelli, as a relapsed heretic, went to the stake at Parma in 1300.

They had had close relations with the dissident Franciscans, but the Spirituals often disavowed them, especially when the sect, which in Segarelli's time had had no very precise doctrinal character, became with Dolcino frankly heterodox. Dolcino of Novara was brought up at Vercelli, and had been an Apostle since 1291. Thrice he fell into the hands of the Inquisition, and thrice recanted. But immediately after Segarelli's death he wrote an epistle, soon followed by a second, in which he declared that the third Joachimite age began with Segarelli and that Frederick of Sicily was the expected conqueror (*Hist. Dulcini* and *Addit. ad Hist. Dulcini* in Muratori, *Scriptores*, vol. ix.). He gave himself out as an angel sent from God to elucidate the prophecies. Soon he founded an *Apostolic congregation* at whose head he placed himself. Under him were his four lieutenants, his " mystic sister," Margherita di Franck, and 4000 disciples. He taught almost the same principles of devotion as Segarelli, but the Messianic character which he attributed to himself, the announcement of a communistic millennial kingdom, and, besides, an aggressive anti-sacerdotalism, gave to Dolcino's sect a clearly marked character, analogous only to the theocratic community of the Anabaptists of Münster in the 16th century. On the 5th of June 1305 Pope Clement V., recognizing the impotence of the ordinary methods of repression, issued bulls for preaching a crusade against the Dolcinists. But four crusades, directed by the bishop of Vercelli, were required to reduce the little army of the heresiarch, entrenched in the mountains in the neighbourhood of Vercelli. Not till the 23rd

[1] One result is their inability to form a true theory of Judaism and of the Old Testament in relation to the Gospel, a matter of great moment for them and for their successors.

of March 1307 were the sectaries definitively overcome. The Catholic crusaders seized Dolcino in his entrenchments on Mount Rubello, and the pope at once announced the happy event to King Philip the Fair. At Vercelli Dolcino suffered a horrible punishment. He was torn in pieces with red-hot pincers—the torture lasting an entire day—while Margherita was burned at a slow fire. Dante mentions Dolcino's name (*Inferno*, c. xxviii.), and his memory is not yet completely effaced in the province of Novara. The Apostles continued their propaganda in Italy, Languedoc, Spain and Germany. In turn they were condemned by the councils of Cologne (1306), Treves (1310) and Spoleto (1311). The inquisitor of Languedoc, Bernard Gui, persecuted them unremittingly (see Gui's *Practica Inquisitionis*). From 1316 to 1322 the condemnations of Apostles increased at Avignon and Toulouse. They disappeared, however, at a comparatively late date from those regions (council of Lavaur, 1368; council of Narbonne, 1374). In Germany two Apostles were burned at Lübeck and Wismar at the beginning of the 15th century (1402–1403) by the inquisitor Eylard.

Several controversialists, including Gotti, Krohn and Stockmann, have mentioned among the innumerable sects that have sprung from Anabaptism a group of individuals whose open-air preaching and rigorous practice of poverty gained them the name of Apostolici. These must be carefully distinguished from the *Apostoolians*, Mennonites of Frisia, who followed the teachings of the pastor Samuel Apostool (1638–beginning of 18th century). In the Mennonite church they represent the rigid, conservative party, as opposed to the Galenists, who inclined towards the Arminian latitudinarianism and admitted into their community all those who led a virtuous life, whatever their doctrinal tendencies. (P. A.)

APOSTOLIC MAJESTY, a title borne by the kings of Hungary. About A.D. 1000 it was conferred by Pope Silvester II. upon St Stephen (975–1038), the first Christian king of Hungary, in return for his zeal in seeking the conversion of the heathen. It was renewed by Pope Clement XIII. in 1758 in favour of the empress Maria Theresa and her descendants. The emperor of Austria bears the title of apostolic king of Hungary.

APOSTOLIUS, MICHAEL (d. *c.* 1480), a Greek theologian and rhetorician of the 15th century. When, in 1453, the Turks conquered Constantinople, his native city, he fled to Italy, and there obtained the protection of Cardinal Bessarion. But engaging in the great dispute that then raged between the upholders of Aristotle and Plato, his zeal for the latter led him to speak so contemptuously of the more popular philosopher and of his defender, Theodorus Gaza, that he fell under the severe displeasure of his patron. He afterwards retired to Crete, where he earned a scanty living by teaching and by copying manuscripts. Many of his copies are still to be found in the libraries of Europe. One of them, the *Icones* of Philostratus at Bologna, bears the inscription: "The king of the poor of this world has written this book for his living." Apostolius died about 1480, leaving two sons, Aristobulus Apostolius and Arsenius. The latter became bishop of Malvasia (Monemvasia) in the Morea.

Of his numerous works a few have been printed: Παροιμίαι (Basel, 1538), now exceedingly rare; a collection of proverbs in Greek, of which a fuller edition appeared at Leiden, "Curante Heinsio," in 1619; "Oratio Panegyrica ad Fredericum III." in Freher's *Scriptores Rerum Germanicarum*, vol. ii. (Frankfort, 1624); Georgii Gemisthi Plethonis et Mich. Apostolii *Orationes funebres duae in quibus de Immortalitate Animae exponitur* (Leipzig, 1793); and a work against the Latin Church and the council of Florence in Le Moine's *Varia Sacra*.

APOSTROPHE (Gr. ἀποστροφή, turning away; the final *e* being sounded), the name given to an exclamatory rhetorical figure of speech, when a speaker or writer breaks off and addresses some one directly in the vocative. The same word (representing, through the French, the Greek ἀπόστροφος προσῳδία, the accent of elision) means also the sign (') for the omission of a letter or letters, *e.g.* in "don't." In physiology, "apostrophe" is used more precisely in connexion with its literal meaning of "turning away," *e.g.* for movement away from the light, in the case of the accumulation of chlorophyll-corpuscles on the cells of leaves.

APOTACTITES, or APOTACTICI (from Gr. ἀποταχτός, set apart), a sect of early Christians, who renounced all their worldly possessions. (See APOSTOLICI *ad init.*)

APOTHECARY (from the Lat. *apothecarius*, a keeper of an *apotheca*, Gr. ἀποθήκη, a store), a word used by Galen to denote the repository where his medicines were kept, now obsolete in its original sense. An apothecary was one who prepared, sold and prescribed drugs, but the preparing and selling of drugs prescribed by others has now passed into the hands of duly qualified and authorized persons termed "chemists and druggists," while the apothecary, by modern legislation, has become a general medical practitioner, and the word itself, when used at all, is applied, more particularly in the United States and in Scotland, to those who in England are called "pharmaceutical chemists." The Apothecaries' Society of London is one of the corporations of that city, and both by royal charters and acts of parliament exercises the power of granting licences to practise medicine. The members of this society do not possess and never have possessed any exclusive power to deal in or sell drugs; and until 1868 any person whatever might open what is called a chemist's shop, and deal in drugs and poisons. In that year, however, the Pharmacy Act was passed, which prohibits any person from engaging in this business without being registered.

From early records we learn that the different branches of the medical profession were not regularly distinguished till the reign of Henry VIII., when separate duties were assigned to them, and peculiar privileges were granted to each. In 1518 the physicians of London were incorporated, and the barber-surgeons in 1540. But, independently of the physicians and the surgeons, there were a great number of irregular practitioners, who were more or less molested by their legitimate rivals, and it became necessary to pass an act in 1543 for their protection and toleration. As many of these practitioners kept shops for the sale of medicines, the term "apothecary" was used to designate their calling.

In April 1606 James I. incorporated the apothecaries as one of the city companies, uniting them with the grocers. On their charter being renewed in 1617 they were formed into a separate corporation, under the title of the "Apothecaries of the City of London." These apothecaries appear to have prescribed medicines in addition to dispensing them, and to have claimed an ancient right of acting in this double capacity; and it may be mentioned that Henry VIII., after the grant of the charter to the College of Physicians, appointed an apothecary to the Princess Mary, who was delicate and unhealthy, at a salary of 40 marks a year, "*pro meliore cura et consideratione sanitatis suae.*" During the 17th century, however, there arose a warm contest between the physicians and the apothecaries,—the former accusing the latter of usurping their province, and the latter continuing and justifying the usurpation until the dispute was finally set at rest by a judgment of the House of Lords in 1703 (*Rose* v. *College of Physicians*, 5 Bro. P. C. 553), when it was decided that the duty of the apothecary consisted not only in compounding and dispensing, but also in directing and ordering the remedies employed in the treatment of disease. In 1722 an act was obtained empowering the Apothecaries' Company to visit the shops of all apothecaries practising in London, and to destroy such drugs as they found unfit for use. In 1748 great additional powers were given to the company by an act authorizing them to appoint a board of ten examiners, without whose licence no person should be allowed to dispense medicines in London, or within a circuit of 7 m. round it. In 1815, however, an act of parliament was passed which gave the Apothecaries' Society a new position, empowering a board, consisting of twelve of their members, to examine and license all apothecaries throughout England and Wales. It also enacted that, from the 1st of August of that year, no persons except those who were so licensed should have the right to act as apothecaries, and it gave the society the power of prosecuting those who practised

without such licence. But the act expressly exempted from prosecution all persons who were then in actual practice, and it distinctly excluded from its operation all persons pursuing the calling of chemists and druggists. It was also provided that the act should in no way interfere with the rights or privileges of the English universities, or of the English College of Surgeons or the College of Physicians; and indeed a clause imposed severe penalties on any apothecaries who should refuse to compound and dispense medicines on the order of a physician, legally qualified to act as such. It is therefore clear that the act contemplated the creation of a class of practitioners who, while having the right to practise medicine, should assist and co-operate with the physicians and surgeons.

Before this act came into operation the education of the medical practitioners of England and Wales was entirely optional on their own part, and although many of them possessed degrees or licences from the universities or colleges, the greater number possessed no such qualification, and many of them were wholly illiterate and uneducated. The court of examiners of the Apothecaries' Society, being empowered to enforce the acquisition of a sufficient medical education upon its future licentiates, specified from time to time the courses of lectures or terms of hospital practice to be attended by medical students before their examination, and in the progress of years regular schools of medicine were organized throughout England.

As it was found that, notwithstanding the stringent regulations as to medical acquirements, the candidates were in many instances deficient in preliminary education, the court of examiners instituted, about the year 1850, a preliminary examination in arts as a necessary and indispensable prerequisite to the medical curriculum, and this provision has been so expanded that, at the present day, all medical students in the United Kingdom are compelled to pass a preliminary examination in arts, unless they hold a university degree. An act of parliament, passed in 1858, and known as the Medical Act, made very little alteration in the powers exercised by the Apothecaries' Society, and indeed it confirmed and in some degree amplified them, for whereas by the act of 1815, the licentiates of the society were authorized to practise as such only in England and Wales, the new measure gave them the same right in Scotland and Ireland. The Medical Act 1886 extended the qualifications necessary for registration under the medical acts, by making it necessary to pass a qualifying examination in medicine, surgery and midwifery. (See MEDICAL EDUCATION.)

An act, passed in 1874, related exclusively to the Apothecaries' Society, and is termed the Apothecaries' Act Amendment Act. By this measure some provisions of the act of 1815, which had become obsolete or unsuitable, were repealed, and powers were given to the society to unite or co-operate with other medical licensing bodies in granting licences to practise. The act of 1815 had made it compulsory on all candidates for a licence to have served an apprenticeship of five years to an apothecary, and although by the interpretation of the court of examiners of the society this term really included the whole period of medical study, yet the regulation was felt as a grievance by many members of the medical profession. It was accordingly repealed, and no apprenticeship is now necessary. The restriction of the choice of examiners to the members of the society was also repealed, and the society was given the power (which it did not before possess) to strike off from the list of its licentiates the names of disreputable persons. The act of 1874 also specified that the society was not deprived of any right or obligation they may have to admit women to examination, and to enter their names on the list of licentiates if they acquit themselves satisfactorily.

The Apothecaries' Society is governed by a master, two wardens and twenty-two assistants. The members are divided into three grades, yeomanry or freemen, the livery, and the court. Women are not, however, admitted to the freedom. The hall of the society, situated in Water Lane, London, and covering about three-quarters of an acre, was acquired in 1633. It was destroyed by the great fire, but was rebuilt about ten years later and enlarged in 1786. This is the only property possessed by the society. In 1673, the society established a botanic and physic garden at Chelsea, and in 1722 Sir Hans Sloane, who had become the ground owner, gave it to the society on the condition of presenting annually to the Royal Society fifty dried specimens of plants till the number should reach 2000. This condition was fulfilled in 1774. Owing to the heavy cost of maintenance and other reasons, the "physic garden" was handed over in 1902, with the consent of the Charity Commissioners, to a committee of management, to be maintained in the interests of botanical study and research.

See C. R. B. Barrett, *The History of the Society of Apothecaries of London* (1905).

APOTHEOSIS (Gr. ἀποθεοῦν, to make a god, to deify), literally deification. The term properly implies a clear polytheistic conception of gods in contrast with men, while it recognizes that some men cross the dividing line. It is characteristic of polytheism to blur that line in several ways. Thus the ancient Greek religion was especially disposed to belief in heroes and demigods. Founders of cities, and even of colonies, received worship; the former are, generally speaking, mythical personages and, in strictness, heroes. But the worship after death of historical persons, such as Lycurgus, or worship of the living as true deities, *e.g.* Lysander and Philip II. of Macedon, occurred sporadically even before Alexander's conquests brought Greek life into contact with oriental traditions. It was inevitable, too, that ancient monarchies should enlist polytheistic conceptions of divine or half-divine men in support of the dynasties; "*Seu deos regesve canit deorum Sanguinem*," Horace (*Odes*, iv. 2, ll. 12, 13) writes of Pindar; though the reference is to myths, yet the phrase is significant. In the East all such traits are exaggerated, a result perhaps rather of the statecraft than of the religions of Egypt and Persia. Whatever part vanity or the flattery of courtiers may have played with others, or with Alexander, it is significant that the dynasties of Alexander's various successors all claim divine honours of some sort (see PTOLEMIES, SELEUCID DYNASTY, &c.). Theocritus (*Idyll* 17) hails Ptolemy Philadelphus as a demigod, and speaks of his father as seated among the gods along with Alexander. Ancestor worship, or reverence for the dead, was a third factor. It may work even in Cicero's determination that his daughter should enjoy "ἀποθέωσις"—as he writes to Atticus—or receive the "honour" of *consecratio* (fragment of his *De Consolatione*). Lastly, we need not speak of mere sycophancy. Yet it was common; Verres was worshipped before he was impeached!

The Romans had, up to the end of the Republic, accepted only one official apotheosis; the god Quirinus, whatever his original meaning, having been identified with Romulus. But the emperor Augustus carried on the tradition of ancient statecraft by having Julius Caesar recognized as a god (*divus Julius*), the first of a new class of deities proper (*divi*). The tradition was steadily followed and was extended to some ladies of the imperial family and even to imperial favourites. Worship of an emperor during his lifetime, except as the worship of his *genius*, was, save in the cases of Caligula and Domitian, confined to the provinces. Apotheosis after his death, being in the hands of the senate, did not at once cease, even when Christianity was officially adopted. The Latin term is *consecratio*, which of course has a variety of senses, including simple burial. (Inscription in G. Boissier, *La Religion romaine*; Renier, *Inscriptions d'Algiers*, 2510.) The Greek term Apotheosis, probably a coinage of the Hellenistic epoch, becomes more nearly technical for the deification of dead emperors. But it is still used simply for the erection of tombs (clearly so in some Greek inscriptions, *Corpus Inscript. Graec.* 2831, 2832, quoted in Pauly-Wissowa, *s.v. Apotheosis*). Possibly there is a trace of ancestor worship even here; but the two usages have diverged. The squib of the philosopher Seneca on the memory of Claudius (d. A.D. 54), *Apocolocyntosis* ("pumpkinification"), is evidence that, as early as Seneca's lifetime, apotheosis was in use for the recognition of a departed emperor as a god. It also indicates how much contempt might be associated with this pretended worship. The people, says

Suetonius (*Jul. Caes.* c. 88), fully believed in the divinity of Julius Caesar, hinting at the same time that this was by no means the case with the majority of the apotheoses subsequently decreed by the senate. Yet we learn from Capitolinus that Marcus Aurelius was still worshipped as a household divinity in the time of Diocletian, and was believed to impart revelations in dreams (*Vit. M. Ant.* c. 18). Antinous, the favourite of Hadrian, was adored in Egypt a century after his death (Origen, *Contra Celsum*, iii. 36), though, according to Boissier, his worship never had official sanction. The ceremonies attendant on an imperial apotheosis are very fully described by Herodianus (bk. iv. c. 2) on occasion of the obsequies of Severus, which he appears to have witnessed. The most significant was the liberation, at the moment of kindling the funeral pyre, of an eagle which was supposed to bear the emperor's soul to heaven. Sharp-sighted persons had actually beheld the ascension of Augustus (Suet. *August.* c. 100), and of Drusilla, sister of Caligula. Representations of apotheoses occur on several works of art; the most important are the apotheosis of Homer on a relief in the Townley collection of the British Museum, that of Titus on the arch of Titus, and that of Augustus on a magnificent cameo in the Louvre.

In China at the present day many Taoist gods are (or are given out as) men deified for service to the state. This again may be statecraft. In India, the (still unexplained) rise of the doctrine of transmigration hindered belief. Apotheosis can mean nothing to those who hold that a man may be reborn as a god, but still needs redemption, and that men on earth may win redemption, if they are brave enough. Curiously, Buddhism itself is ruled by the ghost or shadowy remainder of belief in transmigration—Karma.

Apotheosis may also be used in wider senses. (*a*) Some (*e.g.* Herbert Spencer) hold that most gods are deified men, and most myths historical traditions which have been grotesquely distorted. This theory is known as Euhemerism (see EUHEMERUS). It is needless to say that the attitude of those holding the Euhemerist theory is at the farthest pole from belief in apotheosis. According to the latter, some men may become gods. According to the former, all gods are but men; or, some men have been erroneously supposed to become gods. The Euhemerist theory mainly appeals to ancestor worship — a fact of undoubted importance in the history of religion, especially in China and in ancient Rome. In India, too, a dead person treated with funeral honours becomes a guardian spirit—if neglected, a tormenting demon. But whether the great gods of polytheism were really transfigured ancestors is very doubtful. (*b*) Again, there is a tendency to offer something like worship to the founders of religions. Thus more than human honour is paid to Zoroaster and Buddha and even to the founders of systems not strictly religious, *e.g.* to Confucius and Auguste Comte. It is noticeable that this kind of worship is not accorded in rigidly monotheistic systems, *e.g.* to Moses and Mahomet. Nor is it accurate to speak of apotheosis in cases where the founder is in his lifetime regarded as the incarnation of a god (cf. Ali among Shi'ite Mahommedans; the Bâb in Babism; the Druse Hakim). Most Christians on this ground repudiate the application of the term to the worship of Jesus Christ. Curiously, *Apotheosis* is used by the Latin Christian poet, Prudentius (*c.* 400), as the title of a poem defending orthodox views on the person of Christ and other points of doctrine—the affectation of a decadent age. (*c*) The worship paid to Saints, in those Christian churches which admit it, is formally distinguished as *dulia* (δουλεία) from true worship or *latria* λατρεία). Even the Virgin Mary, though she is styled Mother of God and Queen of Heaven, receives only *dulia* or at most *hyperdulia*.

(R. G.; R. MA.)

APPALACHIAN MOUNTAINS, the general name given to a vast system of elevations in North America, partly in Canada, but mostly in the United States, extending as a zone, from 100 to 300 m. wide, from Newfoundland, Gaspé Peninsula and New Brunswick, 1500 m. south-westward to central Alabama. The whole system may be divided into three great sections: the *Northern*, from Newfoundland to the Hudson river; the *Central*, from the Hudson Valley to that of New river (Great Kanawha), in Virginia and West Virginia; and the *Southern*, from New river onwards. The northern section includes the Shickshock Mountains and Notre Dame Range in Quebec, scattered elevations in Maine, the White Mountains and the Green Mountains; the central comprises, besides various minor groups, the Valley Ridges between the Front of the Allegheny Plateau and the Great Appalachian Valley, the New York-New Jersey Highlands and a large portion of the Blue Ridge; and the southern consists of the prolongation of the Blue Ridge, the Unaka Range, and the Valley Ridges adjoining the Cumberland Plateau, with some lesser ranges.

The Chief Summits.—The Appalachian belt includes, with the ranges enumerated above, the plateaus sloping southward to the Atlantic Ocean in New England, and south-eastward to the border of the coastal plain through the central and southern Atlantic states; and on the north-west, the Allegheny and Cumberland plateaus declining toward the Great Lakes and the interior plains. A remarkable feature of the belt is the longitudinal chain of broad valleys—the Great Appalachian Valley—which, in the southerly sections divides the mountain system into two subequal portions, but in the northernmost lies west of all the ranges possessing typical Appalachian features, and separates them from the Adirondack group. The mountain system has no axis of dominating altitudes, but in every portion the summits rise to rather uniform heights, and, especially in the central section, the various ridges and intermontane valleys have the same trend as the system itself. None of the summits reaches the region of perpetual snow. Mountains of the Long Range in Newfoundland reach heights of nearly 2000 ft. In the Shickshocks the higher summits rise to about 4000 ft. elevation. In Maine four peaks exceed 3000 ft., including Katahdin (5200 ft.), Mount Washington, in the White Mountains (6279 ft.), Adams (5805), Jefferson (5725), Clay (5554), Monroe (5390), Madison (5380), Lafayette (5269); and a number of summits rise above 4000 ft. In the Green Mountains the highest point, Mansfield, is 4364 ft.; Lincoln (4078), Killington (4241), Camel Hump (4088); and a number of other heights exceed 3000 ft. The Catskills are not properly included in the system. The Blue Ridge, rising in southern Pennsylvania and there known as South Mountain, attains in that state elevations of about 2000 ft.; southward to the Potomac its altitudes diminish, but 30 m. beyond again reach 2000 ft. In the Virginia Blue Ridge the following are the highest peaks east of New river: Mount Weather (about 1850 ft.), Mary's Rock (3523), Peaks of Otter (4001 and 3875), Stony Man (4031), Hawks Bill (4066). In Pennsylvania the summits of the Valley Ridges rise generally to about 2000 ft., and in Maryland Eagle Rock and Dans Rock are conspicuous points reaching 3162 ft. and 2882 ft. above the sea. On the same side of the Great Valley, south of the Potomac, are the Pinnacle (3007 ft.) and Pidgeon Roost (3400 ft.). In the southern section of the Blue Ridge are Grandfather Mountain (5964 ft.), with three other summits above 5000, and a dozen more above 4000. The Unaka Ranges (including the Black and Smoky Mountains) have eighteen peaks higher than 5000 ft., and eight surpassing 6000 ft. In the Black Mountains, Mitchell (the culminating point of the whole system) attains an altitude of 6711 ft., Balsam Cone, 6645, Black Brothers, 6690, and 6620, and Hallback, 6403. In the Smoky Mountains we have Clingman's Peak (6611), Guyot (6636), Alexander (6447), Leconte (6612), Curtis (6588), with several others above 6000 and many higher than 5000.

In spite of the existence of the Great Appalachian Valley, the master streams are transverse to the axis of the system. The main watershed follows a tortuous course which crosses the mountainous belt just north of New river in Virginia; south of this the rivers head in the Blue Ridge, cross the higher Unakas, receive important tributaries from the Great Valley, and traversing the Cumberland Plateau in spreading gorges, escape by way of the Cumberland and Tennessee rivers to the Ohio and Mississippi, and thus to the Gulf of Mexico; in the central section the rivers, rising in or beyond the Valley Ridges, flow through

great gorges (water gaps) to the Great Valley, and by south-easterly courses across the Blue Ridge to tidal estuaries penetrating the coastal plain; in the northern section the water-parting lies on the inland side of the mountainous belt, the main lines of drainage running from north to south.

Geology.—The rocks of the Appalachian belt fall naturally into two divisions; ancient (pre-Cambrian) crystallines, including marbles, schists, gneisses, granites and other massive igneous rocks, and a great succession of Paleozoic sediments. The crystallines are confined to the portion of the belt east of the Great Valley where Paleozoic rocks are always highly metamorphosed and occur for the most part in limited patches, excepting in New England and Canada, where they assume greater areal importance, and are besides very generally intruded by granites. The Paleozoic sediments, ranging in age from Cambrian to Permian, occupy the Great Valley, the Valley Ridges and the plateaus still farther west. They are rarely metamorphosed to the point of recrystallization, though locally shales are altered to roofing slates, sandstones are indurated, limestones slightly marblized, and coals, originally bituminous, are changed to anthracite in northern Pennsylvania, and to graphite in Rhode Island. Igneous intrusions consist only of unimportant dikes of trap. The most striking and uniformly characteristic geologic feature of the mountains is their internal structure, consisting of innumerable parallel, long and narrow folds, always closely appressed in the eastern part of any cross-section (Piedmont Plateau to Great Valley), less so along a central zone (Great Valley and Valley Ridges), and increasingly open on the west (Allegheny and Cumberland Plateaus). Asymmetry of the folds is a marked characteristic in the zones of closer folding, the anticlines having long gently inclined easterly limbs, and short, steep and even overturned limbs upon the west. The effect of such folds is often exaggerated by thrusts, and faulting of this sort is prominent in the southern section, where the existence of over-thrusts measured by several miles has been established.

What may be termed the ancestral Appalachian system was formed during the post-carboniferous revolution, though certain of its elements had been previously outlined, and perhaps at different dates. Folding of the rocks resulted from the operation of great compressive forces acting tangentially to the figure of the earth. Extensive and deep-seated crumpling was necessarily accompanied by vertical uplift throughout the zone affected, but once at least since their birth the mountains have been worn down to a lowland, and the mountains of to-day are the combined product of subsequent uplift of a different sort, and dissection by erosion. Produced by long-continued subaerial decay and erosion, in later Cretaceous times this lowland extended from the Atlantic Ocean well toward the interior of North America; since then the whole continent has been generally elevated, and by successive steps the Appalachian belt has been raised to form a wide but relatively low arch. The crosswise courses of the greater rivers result from the rivers being older than the mountains, which indeed have been produced by circumdenudation. The master streams of the present have inherited their channels from the drainage systems of the Cretaceous lowland, and though raised athwart the courses of the lowland trunk streams the great arch was developed so slowly that these channels could be maintained through *pari passu* deepening. Former tributaries have given place to others developed with reference to the distribution of more or less easily eroded strata, the present longitudinal valleys being determined by the out-crop of soft shales or soluble limestones, and the parallel ridges upheld by hard sandstones or schists. Parallelism of mountain ridges and intervening valleys is thus attributable to the folding of the rocks, but the origin of the interior structure of the mountains is to be kept distinct from the origin of the mountains as features of topography.

Flora and Fauna.—Much of the region is covered with forest yielding quantities of valuable timber, especially in Canada and northern New England. The most valuable trees for lumber are spruce, white pine, hemlock, cedar, white birch, ash, maple and basswood; all excepting pine and hemlock and poplar in addition are ground into wood pulp for the manufacture of paper. In the central and southern parts of the belt oak and hickory constitute valuable hard woods, and certain varieties of the former furnish quantities of tan bark. The tulip tree produces a good clear lumber known as white wood or poplar, and is also a source of pulp. In the south both white and yellow pine abounds. Many flowering and fruit-bearing shrubs of the heath family add to the beauty of the mountainous districts, rhododendron and kalmia often forming impenetrable thickets. Bears, mountain lions (pumas), wild cats (lynx) and wolves haunt the more remote fastnesses of the mountains; foxes abound; deer are found in many districts and moose in the north.

Influence on History.—For a century the Appalachians were a barrier to the westward expansion of the English colonies; the continuity of the system, the bewildering multiplicity of its succeeding ridges, the tortuous courses and roughness of its transverse passes, a heavy forest and dense undergrowth all conspired to hold the settlers on the seaward-sloping plateaus and coastal plains. Only by way of the Hudson and Mohawk valleys, and round about the southern termination of the system were there easy routes to the interior of the country, and these were long closed by hostile aborigines and jealous French or Spanish colonists. In eastern Pennsylvania the Great Valley was accessible by reason of a broad gateway between the end of South Mountain and the Highlands, and here in the Lebanon Valley settled German Moravians, whose descendants even now retain the peculiar patois known as "Pennsylvania Dutch." These were late comers to the New World forced to the frontier to find unclaimed lands. With their followers of both German and Scotch-Irish origin, they worked their way southward and soon occupied all of the Virginia Valley and the upper reaches of the Great Valley tributaries of the Tennessee. By 1755 the obstacle to westward expansion had been thus reduced by half; outposts of the English colonists had penetrated the Allegheny and Cumberland plateaus, threatening French monopoly in the transmontane region, and a conflict became inevitable. Making common cause against the French to determine the control of the Ohio valley, the unsuspected strength of the colonists was revealed, and the successful ending of the French and Indian War extended England's territory to the Mississippi. To this strength the geographic isolation enforced by the Appalachian mountains had been a prime contributor. The confinement of the colonies between an ocean and a mountain wall led to the fullest occupation of the coastal border of the continent, which was possible under existing conditions of agriculture, conducing to a community of purpose, a political and commercial solidarity, which would not otherwise have been developed. As early as 1700 it was possible to ride from Portland, Maine, to southern Virginia, sleeping each night at some considerable village. In contrast to this complete industrial occupation, the French territory was held by a small and very scattered population, its extent and openness adding materially to the difficulties of a disputed tenure. Bearing the brunt of this contest as they did, the colonies were undergoing preparation for the subsequent struggle with the home government. Unsupported by shipping, the American armies fought toward the sea with the mountains at their back protecting them against Indians leagued with the British. The few settlements beyond the Great Valley were free for self-defence because debarred from general participation in the conflict by reason of their position.

See the separate articles on the states, and also the following references:—Topographic maps and Geologic Folios of the United States Geological Survey; Bailey Willis, "The Northern Appalachians," and C. W. Hayes, "The Southern Appalachians," both in *National Geographic Monographs*, vol. i.; and chaps. iii., iv. and v. of Miss E. C. Semple's *American History and its Geographic Conditions* (Boston, 1903). (A. C. Sp.)

APPANAGE, or APANAGE (a French word from the late Lat. *apanagium*, formed from *apanare, i.e. panem porrigere*, to give bread, *i. e.* sustenance), in its original sense, the means of subsistence given by parents to their younger children as distinct

from the rights secured to the eldest born by the custom of primogeniture. In its modern usage it is practically confined to the money endowment given to the younger children of reigning or mediatized houses in Germany and Austria, which reverts to the state or to the head of the family on the extinction of the line of the original grantee. In English history the system of appanages never played any great part, and the term is now properly applied only to the appanages of the crown: the duchy of Cornwall, assigned to the king's eldest son at birth, or on his father's accession to the crown, and the duchy of Lancaster. In the history of France, however, the appanage was a very important factor. The word denotes in very early French law the portion of lands or money given by fathers and mothers to their sons or daughters on marriage, and usually connotes a renunciation by the latter of any future inheritance; or it may denote the portion given by the eldest son to his brothers and sisters when he was sole inheritor. The word *apanage* is still employed in this sense in French official texts of some *Customs*; but it was in old public law that it received its definite meaning and importance. Under the kings of the third dynasty, the division of the kingdom among the sons of the dead monarch which had characterized the Merovingian and Carolingian dynasties, ceased. The eldest son alone succeeded to the crown; but at the same time a custom was established by which the king made territorial provision suitable to their rank for his other children or for his brothers and sisters; custom forbade their being left landless. Lands and lordships thus bestowed constituted the appanages, which interfered so greatly with the formation of ancient France. While the persevering policy of the Capets, which aimed at reuniting the great fiefs, duchies, countships, baronies, &c., to the domain of the crown, gradually reconstructed for their benefit a territorial sovereignty over France, the institution of the appanage periodically subtracted large portions from it. Louis XI., in particular, had to struggle against the appanaged nobles. The old law, however, never abolished this institution. The edict of Moulins (1566) maintained it, as one of the exceptions to the inalienability of the crown-lands; only it was then decided that daughters of France should be appanaged in money, or that if, in default of coin, lands were assigned to them, these lands should be redeemable by the crown in perpetuity. The efforts of the kings to minimize this evil, and of the old jurisprudence to deal with the matter, resulted in two expedients: (1) the reversion of the appanage to the crown was secured as far as possible, being declared inalienable and transmissible only to male descendants in the male line of the person appanaged; (2) originally the person appanaged had possessed all the rights of a duke or count—that is to say, in the middle ages nearly all the attributes of sovereignty; the more important of these attributes were now gradually reserved to the monarch, including public authority over the inhabitants of the appanage in all essential matters. However, it is evident from the letters of appanage, dated April 1771, in favour of the count of Provence, how many functions of public authority an appanaged person still held. The Constituent Assembly, by the law dated the 22nd of November 1790, decided that in future there should be no appanages in real estate, and that younger sons of monarchs, married and over twenty-five years of age, should be provided for by yearly grants (*rentes apanagères*) from the public funds. The laws of the 13th of August and the 21st of December 1790 revoked all the existing appanages, except those of the Luxembourg Palace and the Palais Royal. To each person hitherto appanaged an annual income of one million *livres* was assigned, and two millions for the brothers of the king. All this came to an end with the monarchy. Napoleon, by the *sénatus-consulte* of the 30th of January 1810, resolved to create appanages for the emperor's princely descendants, such appanages to consist for the most part of lands on French soil. The fall of the empire again annulled this enactment. The last appanage known in France was that enjoyed by the house of Orleans. Having been re-established, or recognized as still existing, by the Restoration, it was formally confirmed by the law of the 15th of January 1825. On the accession of Louis Philippe it was united to the national property by the law of the 2nd of March 1832.

For appanages in ancient law see the *Essai sur les apanages ou mémoires historiques de leur établissement*, attributed to Du Vaucel, about 1780. (J. P. E.)

APPAREL (from O. Fr. *aparail*, *apareiller*, mod. *appareil*, from Low Lat. *adpariculare*, to make fit or equal), equipment, outfit, things furnished for the proper performance of anything, now chiefly used of dress. The word is also applied to the "orphreys," *i.e.* embroidered strips or borders, on ecclesiastical vestments.

APPARITIONS. An apparition, strictly speaking, is merely an appearance (Lat. *apparere*, to appear), the result of perception exercised on any stimulus of any of the senses. But in ordinary usage the word apparition denotes a perception (generally through the sense of sight) which cannot, as a rule, be shown to be occasioned by an object in external nature. We say "as a rule" because many so-called apparitions are merely illusions, *i.e.* misconstructions of the perceptive processes, as when a person in a bad light sees a number of small children leading a horse, and finds, on nearer approach, that he sees two men carrying bee-hives suspended from a pole. Again, Sir Walter Scott's vision of Byron, then lately dead, proved to be a misconstruction of certain plaids and cloaks hanging in the hall at Abbotsford, or so Sir Walter declared. Had he not discovered the physical basis of this illusion (which, while it lasted, was an apparition, technically speaking), he and others might have thought that it was an apparition in the popular sense of the word, a ghost. In popular phraseology a ghost is understood to be a phantasm produced in some way by the spirit of a dead person, the impression being usually visual, though the ghost, or apparition, may also affect the sense of hearing (by words, knocks, whistles, groans and so forth), or the sense of touch, or of weight, as in the case of the "incubus." In ordinary speech an apparition of a person not known to the percipient to be dead is called a wraith, in the Highland phrase, a spirit of the living. The terms *ghost* and *wraith* involve the hypothesis that the false perceptions are caused by spirits, a survival of the archaic animistic hypothesis (see Animism), an hypothesis as difficult to prove as to disprove. Apparitions, of course, are not confined to anthropomorphic phantasms; we hear of phantom coaches (sometimes seen, but more frequently heard), of phantom dogs, cats, horses, cattle, deer, and even of phantom houses.

Whatever may be the causes of these and other false perceptions,—most curious when the impression is shared by several witnesses,—they may best be considered under the head of hallucination (*q.v.*). Hallucinations may be pathological, *i.e.* the result of morbid conditions of brain or nerve, of disease, of fever, of insanity, of alcoholism, of the abuse of drugs. Again, they may be the result of dissociation, or may occur in the borderland of sleep or waking, and in this case they partake of the hallucinatory nature of dreams (*q.v.*). Again, hallucinations may, once or twice in a lifetime, come into the experience of the sane, the healthy, and, as far as any tests can be applied, of the wide-awake. In such instances the apparition (whether it take the form of a visual phantasm, of a recognized voice, of a touch, or what not) may be coincidental or non-coincidental. The phantasm is called coincidental if it represents a known and distant person who is later found to have been dying or in some other crisis at the moment of the percipient's experience. When the false perception coincides with nothing of the sort, it is styled non-coincidental. Coincidental apparitions have been explained by the theory of telepathy (*q.v.*), one mind or brain impressing another in some unknown way so as to beget an hallucinatory apparition or phantasm. On the evidence, so far as it has been collected and analysed, it seems that the mind which, on the hypothesis, begets the hallucinations, usually does so without *conscious* effort (see Subliminal Self). There are, however, a few cases in which the experiment of begetting, in another, an hallucination from a distance, is said to have been experimentally and consciously made, with success.

If the telepathic theory of coincidental hallucinations be accepted, we have still to account for the much more common

non-coincidental apparitions of the living who do not happen to be in any particular crisis. In these instances it cannot be demonstrated that telepathy has *not* been at work, as when a person is seen at a place which he thought of visiting, but did not visit. F. W. Myers even upheld a theory of psychorhagy, holding that the spirits of some persons have a way of manifesting themselves at a distance by a psychic invasion. This involves, as he remarked, paleolithic psychology, and the old savage doctrine of animism, rather than telepathy (see Myers, *Human Personality*). Of belief in coincidental hallucinations or wraiths among savages, records are scanty; the belief, however, is found among Maoris and Fuegians (see Lang, *Making of Religions*). The perception of apparitions of distant but actual scenes and occurrences is usually called clairvoyance (*q.v.*). The belief is also familiar under the name of second sight(see SECOND SIGHT), a term of Scots usage, though the belief in it, and the facts if accepted, are of world-wide diffusion. The apparitions may either represent actual persons and places, or may be symbolical, taking the form of phantasmic lights, coffins, skeletons, shrouds and so forth. Again, the appearances may either represent things, persons and occurrences of the past (see RETROCOGNITION), or of the present (clairvoyance), or of the future (see PREMONITION). When the apparitions produce themselves in given rooms, houses or localities, and are exhibited to various persons at various times, the locality is popularly said to be haunted by spirits, that is, of the dead, on the animistic hypothesis (see HAUNTINGS). Like the other alleged facts, these are of world-wide diffusion, or the belief in them is world-wide, and peculiar to no race, age, or period of culture. A haunted place is a centre of permanent possibilities of hallucinations, or is believed to be so. A distinct species of hauntings are those in which unexplained sounds and movements of objects, apparently untouched, occur. The German term *Poltergeist* (*q.v.*) has been given to the supposed cause of these occurrences where the cause is not ascertained to be sportive imposture. In the performances of modern spiritualists the Poltergeist appears, as it were, to be domesticated, and to come at the call of the medium.

An intermittent kind of ominous haunting attached, not to places, but to families, is that of the banshee (Celtic) or family death omen, such as the white bird of the Oxenhams, the Airlie drummer, the spectral rider of Clan Gilzean, the rappings of the Woodde family. These apparitions, with fairies and *djinns* (the Arab form of fairy), haunt the borderland between folk-lore and psychical research.

So far we have been concerned with spontaneous apparitions, or with the belief in them. Among induced apparitions may be reckoned the materialized forms of spiritual *séances*, which have a material basis of veils, false moustaches, wigs and the *corpus vile* of the medium. It is also possible that mere expectancy and suggestion induce hallucinatory perceptions among the members of the circle. That apparitions of a sort can be induced by hypnotic and posthypnotic suggestion is certain enough (see HYPNOTISM). Savages produce apparitions in similar ways by suggestion, accompanied by dances, fumigations, darkness, fasting, drugs, and whatever can affect the imaginations of the onlookers (see MAGIC). Both in savage and civilized life, some persons can provoke themselves into beholding apparitions usually fantastic, but occasionally coincidental, by sedulously staring into any clear deep water, a fragment of rock crystal, a piece of polished basalt or obsidian, a mirror, a ring, a sword blade, or a glass of sherry (see CRYSTAL GAZING). Indeed any object, a wall, the palm of the hand,the shoulder-blade-bone of a sheep, may be, and has been used to this end (see DIVINATION).

Almost all known apparitions may accommodate themselves to one or other of the categories given, whether they be pathological, coincidental or spontaneous, induced, permanently localized, or sporadic.

See generally, SPIRITUALISM and PSYCHICAL RESEARCH. (A. L.)

APPARITOR, or APPARATOR (Latin for a servant of a public official, from *apparere*, to attend in public), an attendant who executed the orders of a Roman magistrate; hence a beadle in a university, a pursuivant or herald; particularly, in English ecclesiastical courts, the official who serves the processes of the court and causes defendants to appear by summons.

APPEAL, in law. In the old English common law the term "appeal" was used to describe a process peculiar to English criminal procedure. It was a right of prosecution possessed as a personal privilege by a party individually aggrieved by a felony, a privilege of which the crown could not directly or indirectly deprive him, since he could use it alike when the prisoner was tried and acquitted, and when he was convicted and pardoned. It was chiefly known in practice as the privilege of the nearest relation of a murdered person. When in 1729 (after Colonel Oglethorpe's inquiry and report on the London prisons) Bambridge and other gaolers were indicted for their treatment of prisoners, but were acquitted for deficiency of evidence, appeals for murder were freely brought by relatives of deceased prisoners. In the case of Slaughterford (1708) the accused was charged with murdering a woman whom he had seduced; the evidence was very imperfect, and he was acquitted on indictment. But public indignation being aroused by the atrocities alleged to have been perpetrated, an appeal was brought, and on conviction he was hanged, as his execution was a privilege belonging to the prosecutor, of which the crown could not deprive him by a pardon. In 1818 an appeal was ingeniously met by an offer of battle, since if the appellee were an able-bodied man he had the choice between combat or a jury (see WAGER). This neutralizing of one obsolete and barbarous process by another called the attention of the legislature to the subject, and appeal in criminal cases, along with trial by battle, was abolished in 1819. The history of this appeal is fully dealt with in Pollock and Maitland, *History of English Law*, 1898.

In its usual modern sense the term appeal is applied to the proceeding by which the decision of a court of justice is brought for review before another tribunal of higher authority. In Roman jurisprudence it was used in this and in other significations; it was sometimes equivalent to prosecution, or the calling up of an accused person before a tribunal where the accuser appealed to the protection of the magistrate against injustice or oppression. The derivation from *appellare* ("call") suggests that its earliest meaning was an urgent outcry or prayer against injustice. During the republic the magistrate was generally supreme within his sphere, and those who felt themselves outraged by injustice threw themselves on popular protection by *provocatio*, instead of looking to redress from a higher official authority. Under the empire different grades of jurisdiction were established, and the ultimate remedy was an appeal to the emperor; thus Paul, when brought before Festus, appealed unto Caesar. Such appeals were, however, not heard by the emperor in person but by a supreme judge representing him. In the *Corpus Juris* the appeal to the emperor is called indiscriminately *appellatio* and *provocatio*. A considerable portion of the 49th book of the *Pandects* is devoted to appeals; but little of the practical operation of the system is to be deduced from the propositions there brought together.

During the middle ages full scope was afforded for appeals from the lower to the higher authorities in the church. In matters ecclesiastical, including those matrimonial, testamentary and other departments, which the church ever tried to bring within the operation of the canon law, there were various grades of appeal, ending with the pope. The claims of the church to engross appeals in matters trenching on the temporal rights of princes led to continual conflicts between church and state, terminated in England at the reformation by the suppression in 1534 of appeals to Rome, which had previously been discouraged by legislation of Edward III. and Richard II.

In temporal, as distinct from spiritual matters, it became customary for ambitious sovereigns to encourage appeals from the courts of the crown vassals to themselves as represented by the supreme judges, and Charlemagne usually enjoys the credit of having set the example of this system of centralization by establishing *missi dominici*. It is not improbable that his claim was suggested or justified by the practice of the Roman empire, to the sovereignty whereof he claimed to be successor.

England.—When the royal authority in England grew strong as against that of the tenants *in capite*, the king's courts in England were more effectively organized, and their net swept wider so as to draw within their cognizance matters previously adjudged in courts baron or courts leet or in the county court, and they acquired authority to supervise and review the decisions of the inferior and local courts, to control and limit their claims to exercise jurisdiction, and to transfer causes from the local to the royal courts. The machinery by which this process was usually effected, under the common law, was not by what is now known as appeal, but by the process of *certiorari* or writs of error or prohibition. Recourse was also had against the decisions of the royal courts by appeal to the great council of the king, or to parliament as a whole. The supremacy of the king's courts over all causes, as well ecclesiastical as civil, has been completely established since the reign of Henry VIII., and they have effectually asserted the power to regulate and keep within their proper jurisdiction all other tribunals within the realm. Since that date the organization of judicial tribunals has gradually been changed and improved with the object (1) of creating a judicial hierarchy independent of executive control; (2) of ensuring that all decisions on questions of law shall be co-ordinated and rendered systematic by correction of the errors and vagaries of subordinate tribunals; and (3) of securing so far as possible uniformity in the judicial interpretation and administration of the law, by creating a supreme appellate tribunal to whose decisions all other tribunals are bound to conform. It would be undesirable to detail at length the history of appellate jurisdiction in England, involving as it would the discussion in great detail of the history and procedure of English law, and it may suffice to indicate the system of appeals as at present organized, beginning with the lowest courts.

Justices of the Peace.—The decisions of justices of the peace sitting as courts of summary jurisdiction are subject to review on questions of law only by the High Court of Justice. This review is in a sense consultative, because it is usually effected by means of a case voluntarily stated by the justices at the request of the aggrieved party, in which are set forth the facts as determined by the justices, the questions of law raised and their decision thereon, as to the correctness whereof the opinion of the High Court is invited. The procedure is equally open in criminal and civil matters brought before the justices. But when the justices decline to state a case for the opinion of the High Court, the latter, if review seems desirable, may order the justices to state a case. And the High Court has also power to control the action of justices by prohibiting them from acting in a case beyond their jurisdiction, ordering them to exercise jurisdiction where they have improperly declined (*mandamus*), or bringing up for review and quashing orders or convictions which they have made in excess of jurisdiction, or in cases in which interested or biassed justices have adjudicated (*certiorari*). None of these regulative processes exactly corresponds to what is popularly known as an appeal, but in effect if not in form an appeal is thus given.

There is also another form of appeal, in the fullest sense of the term, from the decision of justices sitting as a court of summary jurisdiction to the justices of the same county sitting in general or quarter sessions, or in the case of a borough to the recorder as judge of the borough court of quarter sessions. This form of appeal is in every case the creation of statute: and even in text-books it is hardly possible to find a really complete list of the matters in respect of which such appeal lies. But as regards criminal cases there is an approximately general rule, given by § 19 of the Summary Jurisdiction Act 1879, viz. that an appeal to quarter sessions lies from the conviction or order of a court of summary jurisdiction directing imprisonment without the option of a fine as a punishment for an offence, or for failing to do or to abstain from doing any act required to be done or left undone other than an order for the payment of money, or to find sureties or give security or to enter into a recognizance, or a conviction made on a plea of guilty or admission of the truth of the matter of complaint.

As a general rule, subject to particular statutory exceptions, appeals of this kind are by way of rehearing, *i.e.* the actor or prosecutor must before the appellate tribunal call his witnesses and prove his case just as if no previous hearing had taken place before the court appealed from (Pritchard, *Quarter Sessions Practice*, 2nd ed., 461). The only limit is that the appellant must confine himself to the grounds of appeal stated in the notice of appeal given by him.

Justices in Quarter Sessions.—This tribunal has under the commission of the peace and under statute power to refer questions of difficulty arising before it for decision to the High Court. The old mode of exercising this power was by sending on to assizes indictments raising difficult questions which had been presented at quarter sessions. The High Court has *ex officio* power to transfer such indictments where the nature of the case and the demands of justice call for such transfer. The quarter sessions had also power under statute on trying an indictment to refer to the court for crown cases reserved (Crown Cases Act 1848), abolished by the Criminal Appeal Act 1907, questions of law which had arisen at the trial, and in all civil cases the quarter sessions has power of its own volition and subject to no direct compulsion to consult the High Court on legal questions of difficulty which have arisen. Until 1894 this jurisdiction was regarded as consultative only. It was and is exercised by stating the facts, of which the court of quarter sessions is the sole judge, and indicating the questions of law arising on the facts, and the view of quarter sessions thereon, and inviting the opinion of the High Court. Under the Judicature Act 1894 cases stated in this way are now treated as "appeals" in the popular sense.

Inferior Courts of purely Civil Jurisdiction.—An appeal also lies as a general rule to the High Court from the judgment of a county court or of any inferior tribunal having civil jurisdiction.

(*a*) County Courts. Any party to an action or matter in a county court who is dissatisfied with the determination or direction of the judge in law or equity, or upon the admission or rejection of any evidence, may appeal against the decision in the following cases: (1) if the amount of claim or counter-claim in the proceeding exceeds £20; or (2) in all equity matters or cases in which an injunction has been given; or (3) in actions to recover possession of land where questions of title are involved (County Courts Act 1888, § 120). In the case of a claim below £20 no appeal lies except by the leave of the county court. The old practice of appeal by way of special case as in appeals from justices has been abolished, and the present procedure is by notice of motion (R.S.C. O. LIX. rr. 10-18).

These appeals are heard in the king's bench division, except in the case of appeals from judgments of a county court sitting in the exercise of admiralty jurisdiction, which are heard by two or more judges sitting in the probate, divorce and admiralty division. The chancery division has never sat to hear "appeals" from a county court exercising equity jurisdiction; but at times, by *prohibition* or *certiorari*, has, in effect, reviewed or restrained excess of jurisdiction by county courts in equity matters.

The decision of the High Court on county court appeals is final unless an appeal to the court of appeal is brought by leave of that court or of the High Court (Judicature Act 1894, § 1, sub. sect. 5; Judicature Act 1873, § 45).

(*b*) Other inferior courts of civil jurisdiction. Appeals from the local courts of record which still survive in certain cities, towns and districts are in a somewhat anomalous position. The general rule is that, unless a statute regulates such appeal, it may be brought in the king's bench division of the High Court on notice of motion in any case in which, before the Judicature Acts, the court of king's bench could have reviewed the decision of the inferior court by writ of error. The history of this question is dealt with in *Darlow* v. *Shuttleworth*, 1902, 1 K.B. 721.

In the case of the mayor's court of London, under the local and general statutes regulating that court, the appeal is usually to the king's bench division, but where there is what is termed "error" on the face of the proceedings of the mayor's court,

the appeal lies direct to the court of appeal as successor of the court of exchequer chamber. Appeals from the Liverpool court of passage and from the chancery courts of the duchies of Lancaster and Durham lie by statute direct to the court of appeal.

High Court of Justice.—Until the Supreme Court of Judicature Acts of 1873 and 1875 came into operation, the superior courts in England were imperfectly co-ordinated both as to jurisdiction and appeals. The effect of these acts was to create a Supreme Court of Judicature divided into two main branches, the High Court of Justice, which is an appellate court with respect to the inferior courts already mentioned, and to certain other special courts and persons; and the court of appeal, which is mainly concerned with appeals from the High Court of Justice.

The High Court of Justice acts as an appellate court or court of consultation with reference to courts of summary jurisdiction or quarter sessions and to county courts and other inferior courts of civil jurisdiction in the cases already indicated. The three divisions of the court are somewhat differently placed with reference to appeals.

In the chancery division (made up, in 1908, of six single judge courts) no appeals are heard except from subordinate officials (masters) of the court, or an occasional interference by *certiorari* or *prohibition* with a county court.

In the probate, divorce and admiralty division, besides the supervision which may be exercised by a single judge over the subordinate officers of the court (registrars), divisional courts (of two judges) hear appeals from decisions of the county court in admiralty causes, and appeals from justices in cases between husband and wife under the Summary Jurisdiction (Married Women) Act 1895, as amended by the Licensing Act 1902. In the first of these cases the appeal is on law only as in the case of other county court appeals; in the second, the procedure is by rehearing, or reconsideration of the facts as minuted in the court appealed from, and of the law there applied to these facts.

The bulk of the appellate work of the High Court is conducted in the king's bench division—which, as successor of the old court of king's bench in the duties of *custos morum* of the realm, still retains supervisory power over all inferior courts in all cases in which that supervision has not been transferred to the other divisions of the High Court or to the court of appeal, or to the court of criminal appeal.

The king's bench division exercises appellate jurisdiction in the following cases.

With respect to decisions of justices of the peace sitting at quarter sessions, or as a court of summary jurisdiction, except in the case above stated, the subject matter of appeal is for the most part of a criminal or quasi-criminal character, the civil jurisdiction of justices being comparatively limited. The appeal in such cases is as to matters of law only, the justices' decision on facts not being subject to review.

In the case of the courts above named, the appeal is brought by writ of *certiorari*, where the jurisdiction of quarter sessions to give the judgment challenged is denied *in toto*, or in some cases by writ of *habeas corpus*, where the appellant is in custody under an order of the court appealed from (Judicature Act 1894, § 2). The best example of this is the right of a fugitive criminal committed for extradition to challenge the legality of the decision of the committing magistrate by writ of *habeas corpus*. Save in cases of want of jurisdiction or refusal to exercise it, no appeal lies from quarter sessions except by consent of the court appealed from, which states the facts as ascertained by the inferior court, and invites the review of the superior court upon the questions of law raised by the facts as found.

Decisions of justices sitting in the exercise of summary jurisdiction are subject to review by a special case in which the justices state the facts found by them and their decision on the points of law, and invite the review of the appellate court on these grounds. Such cases for appeal are usually stated by consent of the justices, but in the event of their refusal the appellate court may order that a case shall be stated.

Decisions of justices in the exercise of summary jurisdiction may also be challenged by writ of *certiorari* as having been wholly outside their jurisdiction; and in such proceeding the appellate tribunal may review the evidence taken below so far as to ascertain whether the justices have by an erroneous finding of fact enabled themselves to assume a jurisdiction which upon the true facts they did not possess.

Where the decision appealed from is in a criminal cause or matter the decision of the High Court is final. Where it is in a civil matter a further appeal also lies to the court of appeal by leave of the High Court or of the court of appeal (Judicature Act 1873, § 45).

Appeals in criminal cases tried on indictment, criminal information or coroner's inquisition, stand on a different footing from other appeals.

For many years the question of criminal appeal in general had been a matter of great controversy. As early as 1844 a bill had been unsuccessfully introduced for the purpose of establishing appeal in criminal cases, and from that time up to 1906 nearly thirty bills were brought forward with the same object, but none succeeded in passing. In 1892 the question was referred to the council of judges and favourably reported upon by them. It may be remarked that England was practically the only civilized country in which there was no appeal in criminal cases. It is true there was an appeal on questions of law arising at the trial. But the procedure was intricate and technical, being either (1) by writ of error, issued by the consent of the attorney-general (expressed by his *fiat*), to review errors of law appearing in the record of the trial, or (2) by special case, stated by the judge presiding at the trial, with respect to a question of law raised at the trial. These appeals were heard by the king's bench division. Meanwhile there had been a considerable development of public opinion in favour of the establishment of criminal appeal, a development undoubtedly hastened by the report of a committee of inquiry in the case of Adolf Beck (1904), showing clearly that the home office was not a satisfactory tribunal of final appeal. In 1906 the lord chancellor (Lord Loreburn) introduced another criminal appeal bill, which passed the House of Lords, but was dropped in the House of Commons after a first reading. The next year the act (Criminal Appeal Act 1907), which was ultimately carried, was introduced into the House of Commons. By this act a court is established consisting of the lord chief justice and eight judges of the king's bench division, the jurisdiction of the court for crown cases reserved being transferred to the new court. The court to be duly constituted must consist of not less than three judges and of an uneven number of judges. The court may sit in two or more divisions if the lord chief justice so directs. Its sittings are held in London unless special directions are given by the lord chief justice that it shall sit at some other place. The opinion of the majority of those hearing the case determines any question before the court, and judgment is pronounced by the president (who is the lord chief justice or senior member present), unless in questions of law, when, if it is convenient that separate judgments should be pronounced by the members of the court, they may be so pronounced. The judgment of the court of criminal appeal is final, except where the decision involves a point of law of exceptional public importance, and a certificate must be obtained from the attorney-general to that effect. The court of criminal appeal is a superior court of record. An appeal may be made either against conviction or against sentence. A person convicted on indictment may appeal either on a question of law alone or of fact alone, or on a question of mixed law and fact. On a point of law a prisoner has an unqualified right of appeal, on a question of fact or of mixed law and fact there is a right of appeal only if leave be obtained from the court of criminal appeal or a certificate be granted by the judge who tried the prisoner that it is a fit case for appeal. The court is given a wide discretion as to whether a conviction may be sustained or set aside. The court may allow the appeal if they think that the verdict of the jury should be set aside because it is

unreasonable, or because it cannot be supported having regard to the evidence, or that the judgment should be set aside on the ground of a wrong decision on any point of law, or that on any ground there was a miscarriage of justice. Power is given to the court to dismiss the appeal if they consider that no substantial miscarriage of justice has occurred, even though they are of opinion that the point raised in the appeal might be decided in favour of the appellant. The sentence passed at the trial may be quashed by the appeal court and such other sentence (whether more or less severe) warranted in law by the verdict substituted. Notice of appeal or notice of application for leave to appeal must be given within ten days of the date of conviction; where a conviction involves sentence of death or corporal punishment the sentence must not be executed until after the expiration of ten days, and, if notice of appeal is given, not until after the determination of the appeal or the final dismissal of the application for leave to appeal. The act gives the court power to order any witnesses who would have been compellable witnesses at the trial to attend and be examined before the court, and to receive the evidence, if tendered, of any witness who is a competent but not compellable witness. If any question arises on the appeal involving prolonged examination of documents or accounts or any scientific or local investigation, which the court thinks cannot be conveniently conducted before it, the matter may be referred to a special commissioner appointed by the court, and the court may act on the report of that commissioner if it thinks fit. An appellant is given the right to be present on the hearing of his appeal, if he desires it, except where the appeal is on some ground involving a question of law alone, but rules of court may provide for his presence in such a case, or the court may give him leave. The act requires shorthand notes to be taken of the proceedings at the trial of any person, who, if convicted, would have a right to appeal under the act. Nothing in the act affects the prerogative of mercy, and the home secretary may, if he thinks fit, at any time refer a case to the court of criminal appeal.

The Court of Appeal.—The court of appeal, constituted under the Judicature Acts, is one of the two permanent divisions of the Supreme Court of Judicature. As now constituted the court consists of *ex officio* members and five ordinary members, styled lords justices of appeal. The *ex officio* members are the lord chancellor, every person who has held that office, the lord chief justice, the master of the rolls, and the president of the probate, &c., division.

The ordinary business of the court is carried on by the lords justices under the presidency of the master of the rolls, who in 1881 ceased to be a judge of the High Court (Judicature Act 1881, § 2). The court usually sits in two divisions of three judges, but on occasion a third court can be formed, with the assistance of the other *ex officio* judges, in the absence of the ordinary judges from illness or public engagements, or to deal with arrears of business. The quorum for final appeals is three, for interlocutory appeals two judges.

The court of appeal has succeeded to the appellate authority exercised (1) in the case of equity and bankruptcy matters by the lord chancellor and the lords justices of appeal in chancery (Judicature Act 1873, § 18); (2) in the case of common law matters, by the court of exchequer chamber, as a court of error, and the superior courts of common law sitting to review the decisions of single judges of these courts sitting with or without a jury at first instance in civil actions; (3) in the case of divorce or probate causes by the full court of divorce (Judicature Act 1881, § 9); (4) in the case of admiralty causes by the king in council or the judicial committee of the privy council; (5) in the case of applications for new trials in jury actions by the king's bench division (Judicature Act 1890, § 1).

The court never had jurisdiction to hear an appeal in any criminal cause or matter, but was able to review by writ of error decisions of the king's bench division in such cases, unless the court for crown cases reserved had dealt with the question under the Crown Cases Act 1848. This procedure has been abolished by the Criminal Appeal Act 1907. Instances of procedure by writ of error were rare. Those best worth notice are the cases of the Tichborne claimant on his conviction of perjury, and the case of C. Bradlaugh on the sufficiency of the indictment against him for publishing the *Fruits of Philosophy*.

The appellate jurisdiction of the court as now exercised entitles the court to hear and determine (1) appeals from every judgment or decree of every division of the High Court in all civil cases in which such judgment is not declared final by statute; (2) applications for a new trial in civil cases tried in the king's bench division by judge and jury which, until 1890, were dealt with by two or more judges in that division; (3) appeals in matters of civil practice and procedure from decisions of a single judge in chambers, which, until 1894, were dealt with in a divisional court or by a judge in open court; (4) appeals from the chancery courts of Durham (Palatine Court of Durham Act 1889) and Lancaster (act of 1890, c. 23) and the Liverpool court of passage (*Anderson* v. *Dean*, 1894, 2 Q.B. 222), and on error in a record of the mayor's court of London (*Le Blanche* v. *Heaton Telegram Co.*, 1876, 1 Ex.D. 408); and from county courts under the Agricultural Holdings Acts and Workmen's Compensation Acts; (5) appeals on questions of law from decisions of the railway commissioners in England (Railway and Canal Traffic Act 1888).

The court of appeal also exercises the lunacy jurisdiction of the lord chancellor, but in regard to this the jurisdiction of the court is for the most part original and not appellate.

The jurisdiction of the court of appeal is excluded or limited in the following cases:—(1) judgments of the High Court—(*a*) where its jurisdiction is consultative only; (*b*) where there is an appeal to the High Court from an inferior court of civil jurisdiction; (*c*) where there is an appeal to the High Court from any court of person, unless in cases (*b*) and (*c*) leave be obtained of the court by which the order is made, or of the court of appeal; (2) orders of the High Court in registration and election cases except with the like leave; (3) orders made by consent of parties, or as to costs only which by law are left to the discretion of the court; (4) certain interlocutory orders mentioned in § 1 of the Supreme Court of Judicature (Procedure) Act 1894, except by leave of the judge appealed from or of the court of appeal (5) orders of the admiralty division in cases of prize, the appeal from which lies to His Majesty in Council; (6) where the decision of any court whose jurisdiction was transferred to the High Court is declared by statute to be final; (7) matters which from their nature were not appealable to any court before the Judicature Acts, or in which the court of appeal has no means of enforcing or executing its judgment. For example, it was held in the House of Lords, in *Cox* v. *Hakes*, 1890, 15 A.C. 506, that no appeal lies from the order of a judge discharging a prisoner under a writ of *habeas corpus*. "If," said Lord Herschell, "the contention of the respondent is to prevail, the statute has effected a grave constitutional change"; and later, "if" the High Court "has inherited the combined powers of the courts whose functions were transferred to it, but none of them had any jurisdiction or authority to review a discharge by a competent court under a writ of *habeas corpus*, or to enforce the arrest of one thus freed from custody . . . it seems to me to follow, that however wrong the court of appeal might think a discharge to have been, it would have been powerless to order a rearrest, or at least to enforce such an order."

The procedure of the court of appeal is regulated by the rules of the Supreme Court. A distinction is drawn between appeals from a final judgment or order (which, unless the parties consent to a smaller quorum, must be heard by three judges) and an appeal from an interlocutory order (which may be determined by two judges of the court of appeal).

In the case of appeals from a final or interlocutory "judgment," or from an order, including applications for a new trial, the appeal must be brought within three months from the time when the judgment or order is signed, entered or otherwise perfected, or in the case of refusal of an application from the date of refusal. The appeal is by notice of motion, which,

except in cases of application for a new trial, need not state the grounds of appeal. Fourteen clear days' notice of the motion must be given by the appellant to the other party, the respondent.

In the case of appeals from an interlocutory order, or from a final order, or from an order made in any matter which is not an action, or from an order made in chambers, the appeal must be brought within fourteen days by motion, of which four clear days' notice must be given by the appellant to all parties directly affected by the appeal. Controversies have arisen as to the meaning of the term "interlocutory," which (in the absence of any authoritative definition) the court of appeal settles as they arise. The test most generally accepted is that a judgment or order is final if, as made, it finally disposes of the rights of the parties in a manner equally conclusive between them. The court may by special leave allow appeals of either class to be brought after the time above limited. The respondent may by proper notice bring a cross appeal against any portion of the judgment or order made below with which he is dissatisfied. The court has power to order the appellant to find security for the costs of an appeal, if special circumstances, such as insolvency or poverty or foreign domicile or the like, make the giving of security desirable. The court of appeal "rehears" the case. Under ordinary circumstances it does not permit a new case to be set up inconsistent with the case as presented below; and it is content with the judges' notes, or a transcript of the evidence given below, and with a note or transcript of the judgment appealed from, but has power on special grounds to receive fresh evidence either *viva voce* or on affidavit. The court may call in for its assistance assessors who are experts on the matters of fact or science involved in the appeal, and usually does so in cases arising out of collisions at sea.

The court of appeal may make any order which it deems just as to the costs of the whole or any part of an appeal, except possibly in the case of certain appeals in matters on the crown side of the High Court, as to which some doubt still exists. In practice the costs follow the event, unless the court in a particular case makes an order to the contrary.

A decision of the court of appeal is final in appeals from the High Court in bankruptcy, unless leave be given to appeal to the House of Lords (§ 104, Bankruptcy Act 1883), and in divorce appeals, except where the decision either is upon the grant or refusal of a decree for dissolution or nullity of marriage, or for a declaration of legitimacy, or is upon any question of law on which the court gives leave to appeal (Supreme Court of Judicature Act 1881, § 9); but no further appeal to the House of Lords lies, even with leave of the court of appeal, on appeals from the High Court sitting as a court of appeal from county courts in bankruptcy. With these exceptions there is now a right of appeal from every order of the court of appeal to the House of Lords.

The House of Lords.—The House of Lords has for centuries been the court of last resort, and is still the final court of appeal from the chief courts in the United Kingdom. The origin of the appellate jurisdiction of the House of Lords was undoubtedly of that partly feudal and partly popular character already alluded to, which made the suitor seek from the high court of parliament the justice denied elsewhere in the baronial courts or by the king's judges. The lords exercised the mixed function of jurymen and judges, and, as in judgments on impeachment, might be influenced by private or party considerations, debating and dividing on the question before the House. A revolution was silently accomplished, however, by which the function of reviewing the decisions of the courts fell entirely to the lawyers raised to the peerage, while the unprofessional lords only attended to give the sanction of a quorum to the proceedings, and the House has always had the right to invoke the assistance of the judges of the superior courts to advise on the questions of law raised by an appeal. The letters and memoirs, so late as Queen Anne's reign, show that party or personal influence and persuasion were employed to procure votes on appeals, as they have been in later times on railway or other local bills. The last instance probably in which a strong division of opinion was manifested among the unprofessional lords was the celebrated Douglas cause in 1769, when the House was addressed by the dukes of Newcastle and Bedford, but was led by the authoritative opinion of Lord Mansfield on the effect of the evidence—an opinion which was treated rather as that of a political partisan than of a judge. The case of Daniel O'Connell and others, brought up on writ of error from the queen's bench in Ireland in 1844, may be said to have finally established the precedent that the judgments of the House of Lords were to be given solely by the law lords. On that occasion there was a difference of opinion among the law lords themselves. The judgment of the majority of the House was strongly against the political feeling of the government and of the peers as a body, while the law lords who carried the decision had been appointed by previous governments opposed in politics to the existing cabinet. But all these temptations to a party vote by the unprofessional members were resisted.

By § 20 of the act of 1873, the appellate jurisdiction of the House of Lords (so far as it affects England) was abolished, but this section was repealed by the Appellate Jurisdiction Act 1876. Under that act and an amending act of 1887, the appellate business of the House of Lords is conducted solely by the law lords, though lay peers may still sit (*Bradlaugh* v. *Clarke*, 1882, 8 App. Cas. 354). No appeal may be heard or determined except in the presence of not less than three of the following persons:—(1) the lord chancellor; (2) the lords of appeal, four of whom are appointed under the act from among persons who hold, or have held, high judicial office, or, at the date of appointment, have been in practice for not less than fifteen years as barristers in England or Ireland, or as advocates in Scotland; (3) such peers of parliament as hold, or have held, high judicial office. By "high judicial office" is meant the office of lord chancellor of Great Britain or Ireland, lord of appeal in ordinary, paid judge of the judicial committee or member of that committee, or judge of one of the superior courts of Great Britain or Ireland.

An appeal lies to the House of Lords (1) from any order or judgment of the court of appeal in England except as above stated; (2) from a judgment or order of any court in Scotland or Ireland from which error or an appeal to the House of Lords lay by common law or statute immediately before the 1st of November 1876. No appeals are heard from the decision of courts in criminal cases. The House of Lords has an indirect power by standing orders to admit appeals from Scotland or Ireland which under former law or practice could not be admitted (Appellate Jurisdiction Act 1876, § 12). The procedure on appeals is regulated by standing orders of the House. The proceedings are commenced by petition of appeal, which must be lodged with the clerk of the parliaments within one year from the date of the last judgment it appealed from. Security for costs (£200) must be given by bond or lodgment of the money, unless dispensed with by the House on the ground of poverty (act of 1893). Each party lodges a printed case signed and certified by counsel, containing a resumé of the matters to be discussed and of the contentions for or against the allowance of the appeal. The hearing is before three or more law lords, who may call in nautical assessors in admiralty cases (acts of 1893 and 1894). It is not public in the full sense of the term, as persons not concerned in the appeal can attend only by consent of the House. The House pronounces the judgment which in the opinion of the majority of the law lords should have been pronounced below, and has jurisdiction in the case of all appeals to give or refuse costs to the successful party. The costs of the appeal if given are taxed by the officers of the House. The jurisdiction as to costs does not directly arise under any statute (see *West Ham Guardians* v. *Bethnal Green Churchwardens*, 1896, A.C. 477).

Appeals to the King in Council.—The decisions of ecclesiastical courts when acting within the limits of their jurisdiction, and the decisions of courts in the king's dominions outside the United Kingdom, and of courts in foreign countries set up under the Foreign Jurisdiction Acts, cannot be dealt with by the

House of Lords or any of the ordinary tribunals of any part of the United Kingdom. The power once claimed by the court of king's bench in England to control the courts of Ireland has lapsed, and its power to intervene in colonial cases is limited to the grant of the writ of *habeas corpus* to a possession in which no court exists having power to issue that writ or one of like effect (Habeas Corpus Act 1862). As regards all British possessions, the appeal to the king in council is in its origin and nature like that of the provincials unto Caesar, and flows from the royal prerogative to admit appeals. With the growth of the British empire it has been found necessary to create a comparatively constant and stable tribunal to advise the king in the exercise of this prerogative. For this purpose the judicial committee of the privy council was created in 1833. In 1851, and again in 1870, it was reorganized, and by acts of 1876, 1887 and 1898 it received its present form. The committee consists of the president of the council, and of the following persons, if privy councillors—the lord chancellor and ex-chancellors of Great Britain and of Ireland, the four lords of appeal in ordinary, the lords justices of appeal in England or retired lords justices of appeal in England, and persons who hold or have held the office (*a*) of judge of the High Court of Justice or the court of appeal in England or Ireland, or of the court of session in Scotland; (*b*) any person who is or has been chief justice or a judge of the Supreme Court of Canada or of a superior court of any province of Canada, of any of the Australian states (except Fiji and Papua), or of New Zealand or the Cape of Good Hope or Natal. The number of persons of this class who may be members at once is limited to five (1895, c. 44); (*c*) provision is also made for the payment of two privy councillors who have been judges in India who attend the privy council.

Numerous as are the members of the committee, the quorum is three. One or more of the lords of appeal in ordinary usually attend at every hearing, but the composition of the committee is very fluctuating. Appeals from the British dominions abroad lie in criminal as well as civil matters. The right of appeal is regulated as to most possessions by order in council, and in some cases is limited by imperial or colonial statute. Appeals are on fact as well as on law, but the committee rarely if ever disturbs the concurrent judgments on facts of two colonial courts. In the case of admiralty appeals from colonial or consular courts, naval assessors may be called in. The committee also hears (with the aid of ecclesiastical assessors) appeals from ecclesiastical courts. The judgment of the committee is in the form of a report and advice to the king, which is read by one of the members sitting, and no indication is given as to whether the members present are unanimous. Effect is given to the advice by orders in council dismissing or allowing the appeal, and giving direction as to the payment of costs and as to the further proceedings to be taken in the colonial courts.

The procedure of the committee is on the same lines as that on appeals to the House of Lords; no well-arranged code of practice existed however up to the end of 1908, and new rules were then being proposed on the subject. The appeal is commenced by a petition of appeal, and by the giving of security for costs. In colonial appeals printed cases are lodged containing a summary of the contentions of the parties, and with this a printed copy of the record of the proceedings and documents used in the courts appealed from. The hearing is in the privy council chamber and is not public. When an appeal is called on, the counsel and parties are summoned into the chamber, and when the arguments are concluded they are requested to retire. The appeals to the king in council from colonial states having a federal constitution, like Canada and Australia, stand in an exceptional position. The act creating the Supreme Court of Canada purports to make the decision of that court final. But it is still the practice to admit by special leave a prerogative appeal from the court, and to entertain appeals from courts of the provinces of Canada direct to the king in council, without requiring them to go to the Supreme Court. The constitution of the Australian Commonwealth contemplates (§73) the possibility of restricting appeals to the king in council from the supreme courts of Australia, and sec. 74 forbids appeals to the king in council except by leave of the High Court of Australia from decision of that court on any question however arising as to the limits *inter se* of the constitutional powers of the commonwealth and those of any state or states, or as to the limits *inter se* of the constitutional powers of any two or more states. The exact effect of these enactments and of Australian legislation under § 73 is a matter of controversy.

Scotland.—In Scotland the ordinary appellate tribunal for decisions of inferior courts and of the lords ordinary is the court of session, which for appellate purposes sits in two divisions. Appeals from inferior tribunals in criminal cases go before the judges of the court of session sitting in the High Court of Justiciary. The court of session was in its original constitution a committee of parliament for the performance of its judicial functions, and an appeal to parliament was consequently anomalous. In the reign of Charles II., however, the courts grew so intolerably corrupt that a determined effort was made to have their judgments overturned, by an appeal which was strictly of the old character of a cry for protection against flagrant injustice. It was called a "protest for remeid of law," and was inserted as one of the national claims in the Petition of Right at the revolution. The treaty of union is silent as to appeals, though definitely excluding the right of English courts to interfere with Scottish courts or cases. The House of Lords has since the Union acted without challenge as the final appellate tribunal for Scotland in civil causes; but has always declined jurisdiction in Scottish criminal cases.

Ireland.—The Supreme Court of Judicature (Ireland) Acts have remodelled the courts and appellate system of Ireland on the same lines as those of England. The High Court of Justice in Ireland now consists of two divisions only, the chancery division, which has little or no appellate functions, and the king's bench division, which has for Ireland substantially the same power of reviewing and correcting the decisions of inferior courts as has the corresponding court in England. To this there is one exception, that appeals from a county court in Ireland may be heard on circuit by a single judge of assize. In Ireland there is also a court of appeal, created in 1877, whose jurisdiction and procedure follow the same lines as that of the English court of appeal.

France.—The court of last resort in France for all cases, whether civil or criminal (*en matière criminelle, correctionnelle et de police*), is the *cour de cassation*, which sits in Paris. It is a court of error for the review of all judgments of tribunals of last resort (except *juges de paix* in certain cases), and for the transfer of causes from one court to another when justice so demands, and to determine conflicts of jurisdiction (Law 1 Dec. 1790). Ordinarily it is confined to errors of law and procedure, but where evidence not available below is brought before the court, it may send the case back for retrial or give the appropriate final judgment, as in the case of Dreyfus (1906). It also hears appeals from courts martial.

Next to the *cour de cassation* are the courts of appeal, which have jurisdiction to hear appeals (1) in civil matters from courts of first instance, *juges de paix*, and where the amount in dispute exceeds £60 from commercial courts, *tribunaux de commerce* (Civil Proc. Code, arts. 443-475); (2) in criminal matters from *tribunaux correctionnels* (Com. Proc. Code, arts. 202-235). The appeal is both on fact and on law, and applies to interlocutory or preparatory as well as to final judgments.

Spain.—In Spain the jurisdiction and procedure with reference to appeals is on the same lines as in France. As regards civil matters it is regulated by title 21 of the Civil Procedure Code. The appeal to the supreme court is for the most part on questions of law (*por infraccion de ley o de doctrina*); but the court has also power to review judgments on materials not available at the first hearing (arts. 1796, 1801).

British India.—In British India complete and systematic provision is made for appeals both in civil and in criminal cases by the Procedure Codes (Civil of 1882, with subsequent amendments, and Criminal of 1898), and also to some extent by the

charters of the high courts of Calcutta, Bombay and Madras (see Ilbert, *Government of India*, Oxford, 1898, p. 137). In addition, the decisions of subordinate tribunals may be revised by a superior tribunal *proprio motu*, or reviewed in a proper case by the tribunal which has given them; and provision is made for the consultation of a superior by an inferior tribunal in cases of legal difficulty. The policy of admitting so many appeals has been criticized. But with an enormous population which has no representative institutions it has been deemed wise to provide ample means of correcting judicial errors at the instance not only of the aggrieved person but also at the instance of the supervising judicial authorities, as a means of ensuring regularity and propriety in the conduct of judicial business by subordinate judges in out-of-the-way districts.

Civil Appeals.—(1) Except where otherwise expressly provided by the Civil Procedure Code, or by any other law for the time being in force, an appeal lies from the whole or part of any decree, whether made *ex parte* or *inter partes*, of a court exercising original jurisdiction (Civil Procedure Code, § 540). By "decree" is meant the final expression of an adjudication upon a right claimed or defence set up in a civil court, when such adjudication, so far as regards the court expressing it, decides the suit (§ 2). The appeal is both on facts and on law. The procedure on the appeal is prescribed by c. 41 of the Civil Procedure Code, and the directions of the code deal even with the language of the judgment on appeal and the matters to be stated therein. (2) Decrees passed on an appeal to any court in India subordinate to a High Court are as a general rule subject to appeal to the High Court on the grounds (*a*) that they are contrary to a specified law, or usage having the force of law; (*b*) that they have failed to determine some material issue of law, or usage having the force of law; (*c*) of substantial error or defect in procedure prescribed by the code or other law, which might possibly have produced error or defect in the decision of the case upon the merits (§ 584). The procedure on these appeals is regulated by c. 42 of the Civil Procedure Code. (3) Appeals from orders which do not fall within the definition of decrees are allowed in the cases specified in § 588 of the code. The procedure with respect to these appeals is on the same lines as that on appeals against decrees (§ 590). Provision is made (by c. 44) for allowing appeals *in forma pauperis* after certain preliminary inquiries. In the High Courts appeals lie from the decision of one judge to two or more judges of the High Court, whose decision has effect as a judgment of the full court. Appeals, in civil cases, from the courts of India to the king in council are regulated by c. 45 of the Civil Procedure Code. The appealable amount is for most cases Rs.10,000 or a claim or question as to property of like amount.

Besides the provisions stated as to appeals, Indian courts have power in certain contingencies to review their own decisions (§ 623). An inferior court may also refer cases of difficulty to the High Court on a statement of the facts as found in the referring court and of the opinion thereon of that court (§§ 617-620); and in cases in which no appeal lies to the High Court, that court may call for the record of any case in which the court below appears to have acted without jurisdiction or failed to exercise its jurisdiction, or to have exercised its jurisdiction illegally or with material illegality (§ 622).

Criminal Matters.—Criminal jurisdiction in India is exercised by magistrates of the first, second and third class, by sessions courts, and the high or chief courts of the presidencies or provinces (Criminal Procedure Code of 1898). The higher judges in a district have the power of revising those decisions which are not absolutely summary of the judges of the classes below them in the same district; *i.e.* the sessions judge can revise the decisions of a first-class magistrate, and the High Court those of a sessions judge (§ 435). Inferior tribunals can also refer questions of law to the High Court (§§ 432, 433); and where a sentence of death is passed, or a sessions judge differs from the jury (§ 307), the matter must be referred to the High Court. On matters of reference or revision the parties have no right to be heard.

Provision is also made for appeals by c. 31 of the Code. Appeals from second- or third-class magistrates are dealt with by the district (first-class) magistrate (§ 407). Persons convicted on trial by assistant sessions judges or first-class magistrates, except in cases where the punishment is very small, have an appeal to the sessions judge (§§ 408, 413). A person convicted on trial by the sessions judge has an appeal to the High Court (§ 410), but where he has pleaded guilty the only point on which appeal is open is the legality or extent of sentence (§ 412). Special provision is made as to appeals by persons born in Europe (whether British subjects or not) and Americans (§§ 408, 415, and c. 33).

In criminal cases there is a right of appeal to the king in council in certain cases provided for by the charters of the chartered high courts (see Ilbert, *Government of India*, Oxford, 1898, p. 137).

An appeal also lies in certain cases from the courts of British officers in feudatory states of India to a high court in India, and from the courts of Aden and Zanzibar and British East Africa to the High Court of Bombay. Appeals do not lie from the courts of native states to British courts in India, though in some cases there is an appeal of a political rather than judicial nature from the judicial tribunals of feudatory states; *e.g.* in the case of Kathiawar (*Hemchand Derchand* v. *Azam Sakarlal*; 1906. L.R. A.C. 212).

Canada.—In Canada each province has the regulation of its own courts of justice. In Ontario the judiciary are organized, under the Provincial Judicature Acts, in much the same manner as in England; and the review of decisions of inferior courts (by appeal or other proceedings based on English practice) is in the hands of the High Court of Justice, subject to appeal to the provincial court of appeal. In Quebec the highest court (king's bench), besides its original jurisdiction, has appellate jurisdiction over the superior court (see Quebec Civil Procedure Code, art. 1114 *et seq.*). The jurisdiction is exercised by writ of error or by appeal, according to the nature of the decision appealed from. The judges of the superior court have also, under art. 494, power to review before three judges decisions of a judge of that court or of a circuit court (arts. 494-504). Nova Scotia, New Brunswick, Manitoba and British Columbia have supreme courts with appellate authority over decisions of single judges of the court and over inferior tribunals in the province. Appeals lie from the highest courts of each province, in civil matters, to the Supreme Court of Canada, or to the king in council in cases falling within the orders in council applying to each province, but in criminal matters to the king in council. From the Supreme Court of Canada no appeal lies as of right to the king in council (Dominion Act 1875, 38 Vic. c. 11, § 47), and the royal prerogative of granting special leave to appeal is sparingly exercised. The principles on which the judicial committee acts in advising for or against the grant of special leave in civil cases are stated in *Daily Telegraph Newspaper Co.* v. *M'Laughlin*, 1904, L.R. A.C. 776. It is, however, as before, quite common for appeals to be brought direct to the privy council from the provincial courts without resort to the Dominion court (see Wheeler, *Privy Council Law*, p. 955).

Australia.—Each of the states of the Australian Commonwealth has its own supreme court. The Commonwealth parliament constituted in 1903 a High Court for Australia, which, besides its original federal jurisdiction, is also a court of appeal from the supreme courts of the constitutional states, or from any state court from which an appeal lay to the king in council at the establishment of the Commonwealth. The jurisdiction of the court is defined by the Judiciary Act of 1903, by which it is created. The right of appeal is given both as to criminal and civil matters.

South Africa.—In Cape Colony and Natal the appellate courts are the supreme courts, subject to further appeal in certain cases to the king in council. The superior courts of Cape Colony are empowered to review the proceedings of all inferior courts in the colony and its dependencies in cases where no appeal lies. There was for a time an appeal from the High Court of Orange

River Colony to the supreme court of the Transvaal, and from that court (whether acting for its own colony or on appeal from the Orange Colony), an appeal to the king in council. In other colonies the provisions as to appeal follow more or less closely the lines of English law and procedure as to appeals, and in all cases the ultimate appeal is to the king in council.

United States.—In the American courts the term "appeal" covers (1) a removal of a cause to a higher court for retrial on all the questions of law or fact involved, or (2) taking up points of law only by proceedings in error, for revision by a higher court. Decrees in admiralty, bankruptcy and equity, in the federal courts, are the subjects of an appeal; judgments in actions at law, of a writ of error. On an equity appeal the evidence taken at the original hearing is reported at length to the appellate court, and it has the right to review the conclusions of fact reached by the court below and come to different ones. This, however, is seldom done, the appeal being almost always decided on points of law based upon the conclusions of fact reached in the original hearing. In admiralty appeals the conclusions of fact reached by the trial court are specially set forth, and are final.

"Appeal" in many of the states is the general term for reviewing any judgment of an inferior court on assignments of error. It is also often used to signify a mode of reviewing proceedings of municipal bodies, affecting the interests of particular persons, *e.g.* in matters of licences or assessments.

In criminal prosecutions an appeal, or writ of error on points of law, is almost everywhere allowed by statute to the defendant, and often to the state. (*United States* v. *Sanges*, 144 United States Reports, 310; *State* v. *Lee*, 65 Connecticut Reports, 265.)

By the constitution of the United States the Supreme Court is vested with "appellate jurisdiction, both as to law and fact, with such exceptions, and under such regulations, as the Congress should make." This provision is held not to create but only to authorize the creation of the jurisdiction. In the words of Chancellor Kent, "If congress had not provided any rule to regulate the proceedings in appeal, the court could not exercise an appellate jurisdiction: and, if a rule be provided, the court could not depart from it." In pursuance of this principle, the Supreme Court decided in *Clarke* v. *Bazadone* that a writ of error did not lie to that court from a court of the United States territory north-west of the Ohio, because the act had not authorized an appeal or writ of error from such a court (*Commentaries*, i. 324): The appellate jurisdiction of the court is now regulated by title 13 chap. ii. of the Revised Statutes of the United States (1873), §§ 690-710; and by the acts enumerated at p. 901 of the Revised Statutes, United States, 1873 to 1891. Under these statutes the Supreme Court may entertain appeals from the highest court of a state of the Union, but only (1) where the state court has decided against the validity of a treaty or statute of the United States, or of an authority exercised under the United States; (2) where a state court has affirmed the validity of a statute, or of an authority exercised which has been challenged on the ground of repugnance to the constitution, laws or treaties of the United States; (3) where the state court has decided against the existence of a title, right, privilege, or immunity claimed or set up under the constitution of, or under any statute, treaty, commission or authority of the United States.

The appeal from state courts is by writ of error, *i.e.* on law only; and applies as well in criminal as in civil cases. The Supreme Court will not act unless the federal question was raised in the court below (*Chicago U. S. Mail Co.* v. *McGuire*, 1904, 196, U.S. 128). The circuit court of appeals, established in 1891, deals with appeals from the district and circuit courts of the United States, except where other provision is made, *e.g.* where the jurisdiction of the court appealed from is in question; in prize causes and convictions of capital crimes (U.S. Statutes, 1891, c. 54, § 5); in cases involving the construction or application of the constitution; in cases arising in district or circuit courts involving the constitutional questions already stated as subject of appeal from state courts.

The review by the circuit court of appeals is effected by appeal or by writ of error, and its decision is final, with certain exceptions but with power to certify cases to the Supreme Court for instructions (1891, c. 511, § 6).

The Supreme Court hears appeals from the circuit court of appeals within the limits above stated, and appeals from the circuit and district courts in cases in which an appeal does not lie to the circuit court of appeals, and has power to issue a *certiorari* to transfer a case from the circuit court of Appeals. (W. F. C.)

APPEARANCE (from Lat. *apparere*, to appear), in law, the coming into court of either of the parties to a suit; the formal act by which a defendant submits himself to the jurisdiction of the court. The defendant in an action in the High Court of England enters his appearance to the writ of summons by delivering, either at the central office of the Supreme Court, or a district registry, a written memorandum either giving his solicitor's name or stating that he defends in person. He must also give notice to the plaintiff of his appearance, which ought, according to the time limited by the writ, to be within eight days after service; a defendant may, however, appear any time before judgment. The *Rules of the Supreme Court*, orders xii. and xiii., regulate the procedure with respect to the entering of an appearance, the giving of notice, the limit of time, the setting aside and the general effect of default of appearance. In county courts there is no appearance other than the coming into court of the parties to the suit. In criminal cases the accused appears in person. In civil cases infants appear by their guardians *ad litem*; lunatics by their committee; companies by a solicitor; friendly societies by the trustee or other officer appointed to sue or be sued on behalf thereof.

APPENDICITIS, the modern medical term for inflammation of that part of the intestine which is known as the "appendix." Though not a new disease, there can be no doubt that it is far commoner than it used to be, though the explanation of this increased frequency is not yet forthcoming. Amongst the virulent micro-organisms associated with the disease no one specific germ has hitherto been found. It may be remarked that the theories that influenza, or the use of preserved foods, may be connected with the disease as cause and effect, have supporters. Sometimes the disease is due to the impaction of a pin, shot-corn, tooth-brush bristle, or fish-bone in the appendix, which has set up inflammation and ulceration. In many cases a patch of mortification with perforation of the appendix is caused by the presence of a hard faecal concretion, or "stercolith," which from its size, shape and appearance has been mistaken by a casual observer for a date-stone or cherry-stone.

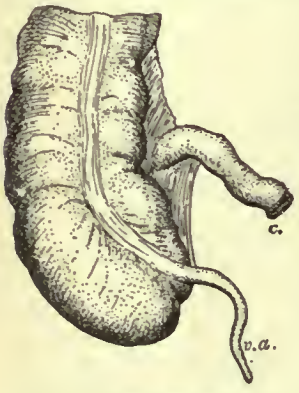
Apart from the fact of the more frequent occurrence of appendicitis, the disease is now better understood and more promptly recognized. It was formerly included under the term "perityphlitis"—that is, inflammation connected with the caecum or *blind* portion of the large intestine. But in the vast majority of cases the inflammation begins in the appendix, not in the intestine proper. It is apt to extend and set up a localized peritonitis, which in the worst cases may become general.

Appendicitis is more often met with in the young than the old, and in boys rather than girls; and in some families there is a strange predisposition towards it. It is often started by a chill, or by over-exertion, and sometimes the attack follows a blow or strain, or some other direct injury, after which the virulent micro-organisms seize on the mucous membrane and involve the appendix in acute inflammation.

The appendix is a narrow tube, about the size of a goose-quill, with an average length of 3 in. It terminates in a blunt point, and from its worm-like shape is called *vermiformis*. It is an appendage of the large intestine, into which it opens, and is regarded as the degenerate relic, surviving in man and other mammals, of an earlier form of intestine. Foreign bodies passing down the intestinal canal may find their way into the appendix and lodge there. Frequently the diseased appendix is found blocked by hard faeces or undigested particles of food, such as nuts, fibrous vegetable matter, and other imperfectly masticated substances; inflammation may occur, however, without the presence of any impacted material. The appendix may be

twisted, bent, or otherwise strangulated, or its orifice may be blocked, so that the tube is distended with mucus which can find no outlet; or ulceration of tuberculous or malignant origin may occur. Inflammation started in the appendix is liable to spread to the peritoneum, and herein lies the gravity of the affection and the indication for treatment. The symptoms vary from "indigestion," and slight pain and sickness, which pass off in a few short days, to an exceedingly violent illness, which may cause death in a few hours. Pain is usually first felt in the belly, low down on the right side or across the region of the navel; sometimes, however, it is diffuse, and at other times it is scarcely complained of. There is some fever, the temperature rising to 101° or 102° F., with nausea, and very likely with vomiting. The abdomen is tender to pressure, and the tenderness may be referred to the spot mentioned above. Some swelling may also be made out in that region. The attack may last for two, three or four days, and then subside. There are, however, other cases less well defined, in which the mischief pursues a latent course, producing little more than a vague abdominal uneasiness, until it suddenly advances into a violent stage. In some chronic cases the trouble continues, on and off, for months or even for years.

On paper it is easy to arrange cases of appendicitis into three classes—catarrhal, ulcerative and mortifying—but in actual practice this is neither desirable nor possible. Such classification is based upon the symptoms, and in appendicitis symptoms may be actually misleading. The three conditions to which the surgeon chiefly looks for guidance are the aspect of the patient, the rate of his pulse and the degree of fever as shown by the thermometer. But in certain cases of appendicitis, though the surgeon knows intuitively, or, at least, suspects, that the general condition is extremely serious, the patient looks fairly well and says that he is not in pain, his pulse-rate being but little quickened and his temperature being but slightly above normal. Nevertheless, when the surgeon has opened the belly in the appendix region, he finds the appendix swollen, perforated and mortified, and lying in a stinking abscess, whilst inflammation has already spread to the neighbouring coils of intestine. Unfortunately, the surgeon can no more tell what he is going to find at his operation in some of these cases than he can foretell the course which any particular case is going to run.



Large Intestine showing Vermiform Appendix (*v.a.*) and Cæcum (*c*).

We may most usefully give here the symptoms as they are likely to be found in an ordinary case of appendicitis, and as they may be observed by one who is not a member of the medical profession, in a way that may prove helpful to him when circumstances have awakened his interest in the disease.

The case taken shall be that of a boy at school, for, as already stated, boys are more prone to the disease than girls. The boy has had, may be, occasional attacks of "indigestion" which have duly passed away under the influence of aperient medicines, and, being heated at play, he has sat down upon the cold ground. Or he has got wet through or over-tired during a long walk or ride. At any rate, his vital powers have been suddenly lowered, and the micro-organisms teeming in his bowel have seized upon the lining membrane of the appendix. He feels out of sorts, and if he manages to eat a meal he very likely vomits it soon after, for the whole nervous system of his abdomen is disturbed by the local inflammation. The act of vomiting gives slight relief, however, and probably he begins to complain of pains in his head as well as in his abdomen, and possibly he has an attack of shivering—the result of disturbance of his general nervous system. By this time he may be attacked with intense pain in the part of his abdomen a little above the middle of the right groin, and at that spot there may be a tenderness, and a feeling of resistance may be made out by the gentle pressure of the finger. In order to relax the pressure upon the tender area he probably lies with his right thigh slightly bent. By this time he may look ill, his face being slightly flushed, or pale and anxious. If the clinical thermometer is placed under his tongue, the index may rise a degree or two, perhaps several degrees, above normal, and his pulse may be quickened to 90 or 100 beats a minute. Perhaps it is a good deal quicker than this. Later, the skin of the lower part of the right side of the abdomen may be flushed or reddened.

This clinical picture leaves no room for doubt. The boy has an attack of acute septic inflammation of his appendix. Let it be that the symptoms have come on quickly, and that the affection is not more than ten or twelve hours old; no one can tell precisely what course the disease is going to run. It may be that with rest in bed, constant fomentations, and absolute starvation, the inflammation will subside; but it is just as likely that in spite of this judicious treatment the symptoms will go from bad to worse, and that a belated operation will fail to rescue the boy from a general peritonitis which may end fatally. But at present, so far as one can tell, the disease is still limited to the appendix. And what, at this moment, is the best line of treatment? Some practitioners would answer—"Let the acute attack settle down,and then, after a week or ten days, when everything is quiet, remove the appendix, for statistics show that when the operation is done in the quiet interval the results are extremely favourable, whilst if it is done in the acute stage the outlook is not so bright." This is quite right. But one cannot be sure that the "quiet interval" will ever arrive. The case in question may be one of those which rapidly go on from bad to worse, and mortification and perforation of the appendix having taken place over some hard faecal concretion, general peritonitis is inevitable, with distension of the bowel and hopeless blood-poisoning. If it were certain that the attack of appendicitis would subside and become quiescent, it would be wise to wait. But it too often happens that the first attack is, indeed, the last. Acute appendicitis is one thing; relapsing appendicitis is another. The latter condition is very manageable.

Inasmuch, then, as it is impossible to know what direction the disease will take, whether to quiescence or to disaster, it is for the greatest good in the greatest number of cases that the inflamed appendix be removed by operation whilst the disease is still limited to the appendix. It is highly probable that if every available hospital surgeon were asked if he had ever had cause to regret having advised early operation in a case of appendicitis the answer would be "No"; on the other hand, every surgeon would be able to recall cases in which delay had been followed by disaster—which an early resort to operation would, in all probability, have prevented.

If the disease is going to assume the severe form, all the symptoms, as a rule, increase in severity. The facial expression becomes more anxious, and the accumulation of gas in the paralysed intestine causes an increase in the abdominal distension, so that the patient lies with his knees drawn up. The vomiting continues. The pulse quickens to 120 or 140 a minute, and the temperature rises, perhaps to 104° F. The swelling and tenderness increase on the right side of the abdomen, and if the abscess does not find escape externally it probably bursts into the general peritoneal cavity, and the patient becomes bathed in profuse sweat, the result of blood-poisoning. Death is likely to follow within two days, the result of blood-poisoning and exhaustion.

Catarrhal and Relapsing Appendicitis.—Some cases of appendicitis run a mild course, giving rise to no worse symptoms, perhaps, than those of "indigestion" and nausea, with a feeling of general discomfort in the abdomen, and, probably, some local tenderness. The attack may be preceded or accompanied by constipation. The administration of a mild aperient or an enema, rest, starvation and fomentation will probably put matters right again—at any rate for a time.

This form of the disease may be due to the presence of "bolted," unchewed or indigestible food in that part of the large intestine into which the appendix opens. And these mild recurrent attacks may sometimes be got rid of altogether by having the teeth put in order, and by inducing the individual to choose his food with discretion, to chew it carefully, to take his meals regularly and to eat slowly.

Obviously, these attacks are very different from those of the acute septic form of the disease described above, though there is no telling that one of them may not develop into the acute form. Some of the mild attacks are due to a kink in the appendix, or to some other condition which temporarily prevents the secretions of the appendix from finding their way into the large intestine. Others of them are caused by a passing catarrhal inflammation of the lining of the appendix and have a distant resemblance to a recurring "sore throat."

After undergoing one or two of these mild attacks the patient would be well advised to have his appendix removed when it has once more got into the "quiet stage." Experience abundantly shows that the operation can then be performed with but slight disturbance of the patient, and with the smallest possible amount of risk. And until his vulnerable appendix has been removed he is never safe.

In the *chronic* form of the disease though the patient is never desperately ill he is never quite well. He has pains and discomfort in the abdomen, with slight tenderness and nausea, with "indigestion," as he may call it. And as one can never tell when the smouldering inflammation may break out into conflagration, he is well advised to submit himself to operation without further delay. To carry about a diseased appendix is to run the constant risk of being laid up at a time most inconvenient, as when travelling or when staying in some place where skilled assistance is far distant or absolutely unobtainable. But having made up his mind that the appendix had better be removed, the patient can choose time, place and surgeon, and, having undergone a week's careful training for the ordeal, can safely count on being back at work again in a month or six weeks' time.

As regards *treatment*, the greatest safety consists in the prompt removal of the inflamed appendix, and statistics show that if the operation can be done in the first or second day of even an acute attack, the result is generally favourable—that is to say, if the appendix can be removed whilst the disease is still shut up within its tissues. But in some cases ulceration and perforation, or mortification, may have taken place over a hard faecal concretion within the first twenty-four or forty-eight hours, and, the septic germs having been let loose, peritonitis may have already set in, and operation may be followed by disappointment. Still, if the case had been left unoperated on, no other result could have been expected. It was not to the operation, but to the intensely acute disease that the calamity must be attributed.

Nature is marvellously clever in some of these cases in shutting off the area of the disease by glueing together the neighbouring coils of intestine, the limited local peritonitis causing the tissues to build themselves into a wall which securely shuts in the abscess cavity. But in other cases she seems helpless, no barrier being formed for limiting the area of disturbance. In such a case it is inevitable that disappointment must result from the surgeon delaying operation in the hope that delimitation might take place. And when at last he makes his incision he sees that the disease has had so long a start that his own chance of success is but a poor one. In a less severe attack, under the influence of rest, starvation and fomentation, and in cases of chronic and of relapsing disease, the surgeon may watch and wait and choose his own time for operating. But when the symptoms are steadily increasing in severity he should urge an immediate incision. When, as often happens, the inflammation begins suddenly and severely, and, under the influence of treatment, steadily quiets down, the surgeon does well to delay operation. But in a fortnight or so, when everything has become once more quiet, he will urge the removal of the appendix, for this one attack is more than likely to be the forerunner of other attacks if the diseased appendix is left.

The most serious cases are those in which the aspect, the pulse, and the temperature of the patient fail to give warning of a very advanced state of disease. Every surgeon of experience has met with cases in which, though there is nothing pointing to the fact that the patient is on the brink of a disaster, the operation has shown that the appendix is mortified, and that it is surrounded with abundant foul matter. It is then that he regrets not having operated a day or two earlier. Consequently it is a good rule to operate in all doubtful cases. In cases in which one happens to know that previous attacks have passed off under palliative treatment, there is no need for immediate operation; the quiet interval may be safely waited for. But in cases in which there is "no history," and in which the surgeon has nothing to guide him, the greatest safety is in prompt operation.

If an attack of acute appendicitis is allowed to take its course unoperated on, abscess forms in the peritoneal cavity in the region of the appendix, but if already inflammation has happily glued the intestines together around that area, the pus is confined within definite limits. But as the abscess increases in size the demand for its evacuation becomes urgent. The pus, under the influence of a natural law, seeks its escape by the path of least resistance; sometimes this is into the intestine, and occasionally into the bladder. The most satisfactory course which it can take is through the wall of the abdomen and out above the right groin. As it is making its way in this direction the skin over that part becomes red, swollen, hot and tender, and the tissues between it and the skin become swollen and brawny. Rarely is *fluctuation* to be made out until the pus has worked its way close to the surface. Later, ulceration takes place in the undermined skin, and the stinking contents of the abscess escape, greatly to the relief of the patient. But long before this could happen the surgeon should have made an incision through the inflamed tissues in order to give nature some greatly needed help. For in many cases she allows the pus blindly to discover that the course of least resistance is not towards the surface of the abdomen but through the inflammatory barrier formed by the adherent coils of bowel, and so into the general peritoneal cavity. This unfortunate issue may give temporary relief to the patient, so that he says that he feels much better, and that his pain has nearly gone. But though his temperature may fall, his pulse is apt to quicken—an ominous coupling of symptoms; the paralysed bowels become further distended, so that the lungs are pressed upon and breathing is embarrassed; hiccough comes on; and whether operation is now resorted to or not, a fatal end is highly probable. In other cases, the escaping pus finds its way up towards the liver and forms an abscess below the base of the lungs.

If operation is performed when appendicitis has run on to the formation of abscess, and the diseased appendix presents itself, it should of course be removed; but if it does not present itself the surgeon should abstain from making a determined search for it, as in so doing he may break down the barrier which nature has provided, and thus himself become the means of spreading a septic peritonitis. Nor should he attempt to make clean the foul abscess cavity. All that he should do is to provide for efficient drainage. A large proportion of these cases do extremely well with incision and drainage, and in the subsequent healing of the cavity the wreckage of the appendix either undergoes disintegration or is rendered harmless for further anxiety.

In some cases, however, the damaged appendix remains as a smouldering ember, ready at any moment to cause further conflagration. This is made manifest by lingering pains, and by tenderness and warnings after the abscess has healed, and the patient will be well advised to have what is left of the appendix removed by operation at a time of quiescence. The operation, however, may turn out to be a very difficult one. Sometimes the wound by which the abscess has been evacuated, by nature or by art, refuses to heal completely, a little discharge of a faecal odour continuing to escape. The small wound leads into a

faecal fistula, and a bent probe passed along it would probably find its way into the bowel. The wound is likely to close of itself in due course; but if after many weeks of disappointment it still continues to discharge, the surgeon may advise an operation for its obliteration.

It occasionally happens that after operation the scar of the wound in the abdominal wall yields under the pressure from within, and a bulging of the intestines beneath the skin occurs. This is called a *ventral hernia*, and if the patient cannot be made comfortable by wearing a truss with a large flat pad, an operation may be deemed advisable.

If, in a case of appendicitis, for one reason or another operation is to be delayed, what treatment should be resorted to? The patient should be put to bed with his knees resting over a pillow, and a large fomentation under oil silk should be laid over the lower part of the abdomen. No food should be given beyond an occasional sip of hot water. Purgatives should not be administered, as this would be to set in movement an inflamed piece of bowel. If the case is not acute, a large enema of soap and water with turpentine may be given, or, possibly, a dose of castor oil by the mouth. As a rule, however, it is unwise to set the bowels in vigorous action until the diseased appendix has been removed. No opium should be given.

Acute intestinal obstruction, cancer of the intestine, inflammation of the ovary, typhoid fever and renal and gallstone colic, are affections which are apt to be mistaken for appendicitis. The first of these resembles it most closely, and diagnosis is sometimes impossible without resort to operation. And it is a fortunate thing that, when error of diagnosis has been made, the operation which was designed for dealing with an inflamed appendix may be directed with equal advantage to the morbid condition which is found on opening the abdomen. In typhoid fever the characteristic temperature, the general condition of the patient, and the presence of delirium are differentiating signs of importance; in renal and gallstone colic the situation and the more paroxysmal character of the pain are usually distinctive. (E. O.*)

APPENDICULATA, a zoological name introduced by E. Ray Lankester (preface to the English edition of C. Gegenbaur's *Comparative Anatomy*), and employed by the same writer in the 9th edition of this encyclopaedia (article "Zoology") to denote the eighth phylum, or major division, of coelomate animals. The animals thus associated, the Rotifera, Chaetopoda and Arthropoda, are composed of a larger or smaller number of hollow rings, each ring possessing typically a pair of hollow lateral appendages, moved by intrinsic muscles and penetrated by blood-spaces.

APPENDINI, FRANCESCO MARIA (1768–1837), Italian historian and philologist, was born at Poirino, near Turin, on the 4th of November 1768. Educated at Rome, he took orders and was sent to Ragusa, where he was appointed professor of rhetoric. When the French seized Ragusa, Napoleon placed Appendini at the head of the Ragusan academy. After the Austrian occupation he was appointed principal of a college at Zara, where he died in 1837. Appendini's chief work was his *Notizie Istorico-critiche sulle Antichità, Storia, e Letteratura dei Ragusei* (1802–1803).

APPENZELL, one of the cantons of north-east Switzerland, entirely surrounded by the canton of St Gall; both were formed out of the dominions of the prince abbots of St Gall, whence the name Appenzell (*abbatis cella*). It is an alpine region, particularly in its south portion, where rises the Alpstein limestone range (culminating in the Säntis, 8216 ft.), though towards the north the surface is composed rather of green hills, separating green hollows in which nestle neat villages and small towns. It is mainly watered by two streams that descend from the Säntis, the Urnäsch joining the Sitter (on which is the capital, Appenzell), which later flows into the Thur. There are light railways from Appenzell to St Gall either (12½ m.) past Gais or (20½ m.) past Herisau, as well as lines from St Gall to Trogen (6 m.) and from Rorschach to Heiden (4¼ m.). Since 1597 it has been divided, for religious reasons, into two half-cantons, which are quite independent of each other, and differ in many points.

The north and west portion or *Ausser Rhoden* has a total area of 93·6 sq. m. (of which 90·6 are classed as "productive"; forests covering 22·5 sq. m. and glaciers ·038 sq. m.), with a population (in 1900) of 55,281, mainly German-speaking, and containing 49,797 Protestants as against 5418 Romanists. Its political capital is Trogen (*q.v.*), though the largest town is Herisau (*q.v.*), while Teufen has 4595 inhabitants, and Heiden (3745 inhabitants) in the north-east corner is the most frequented of the many goats' whey cure resorts for which the entire canton is famous (Urnäsch and Gais are also in Ausser Rhoden). This half-canton is divided into three administrative districts, comprising twenty communes, and is mainly industrial, the manufacture of cotton goods, muslins, and embroidery being very flourishing. It sends one member (elected by the *Landsgemeinde*) to the federal *Ständerath* and three to the federal *Nationalrath* (elected by a direct popular vote).

The south or more mountainous portion of Appenzell forms the half-canton of Appenzell, *Inner Rhoden*. It has a total area of 66·7 sq. m. (of which 62·8 sq. m. are classed as "productive," forests covering 12·8 sq. m. and glaciers ·38 sq. m.), and a total population of 13,499, practically all German-speaking, and all but 833 Romanists. Its political capital is Appenzell (*q.v.*), which is also the largest village, while Weissbad (near it) and Gonten are the best-known goats' whey cure resorts. Embroidery and muslins are made in this half-canton, though wholly at home by the work-people. But it is very largely pastoral, containing 168 mountain pastures or "alps," maintaining each summer 4000 cows, and of an estimated capital value of 2,682,955 francs (the figures for Ausser Rhoden are respectively 100 alps, 2800 cows, and 1,749,900 francs). Inner Rhoden is extremely conservative, and has the reputation of always rejecting any federal *Referendum*. For similar reasons it has preserved many old customs and costumes, those of the women being very elaborate and picturesque, while the herdsmen have retained their festival attire of red waistcoats, embroidered braces and canary-coloured shorts. It sends one member (named by the *Landsgemeinde*) to the federal *Ständerath*, and one also to the federal *Nationalrath*, while it forms but a single administrative district, though divided into six communes.

To the outer world the canton of Appenzell is best known by its institution of *Landsgemeinden*, or primitive democratic assemblies held in the open air, in which every male citizen (not being disqualified) over twenty years of age *must* (under a money penalty) appear personally: each half-canton has such an assembly of its own, that of Inner Rhoden always meeting at Appenzell, and that of Ausser Rhoden in the odd years at Hundwil (near Herisau) and in the even years at Trogen. This institution is of immemorial antiquity, and the meetings in either case are always held on the last Sunday in April. The *Landsgemeinde* is the supreme legislative authority, and elects both the executive (in Inner Rhoden composed of nine members and called *Ständeskommission*, and in Ausser Rhoden of seven members and called *Regierungsrath*) and the president or *Landammann*; in each half-canton there is also a sort of standing committee (composed of the members of the executive and representatives from the communes—in Inner Rhoden one member per 250 or fraction over 125 of the population, and in Ausser Rhoden one member per 1000 of the inhabitants) which prepares business for the *Landsgemeinde* and decides minor matters; in Inner Rhoden it is named the *Grossrath* and in Ausser Rhoden the *Kantonsrath*. As various old-fashioned ceremonies are observed at the meetings and the members each appear with his girded sword, the sight of a meeting of the *Landsgemeinde* is most striking and interesting. The existing constitution of Inner Rhoden dates mainly from 1872, and that of Ausser Rhoden from 1876.

By the middle of the 11th century the abbots of St Gall had established their power in the land later called Appenzell, which, too, became thoroughly teutonized, its early inhabitants having probably been romanized Raetians. But as early as 1377, this portion of the abbots' domains formed an alliance with the Swabian free imperial cities and adopted a constitution of its own. The repeated attempts of the abbots to put down this

independence of their rule were defeated in the battles of Vögelinsegg (1403), north-west of Trogen, and of the Stoss (1405), the pass leading from Gais over to Altstätten in the Rhine valley. In 1411 Appenzell was placed under the "protection" of the Swiss Confederation, of which, in 1452, it became an "allied member," and in 1513 a full member. Religious differences broke up the land after the Reformation into two portions, each called *Rhoden*, a term that in the singular is said to mean a "clearing," and occurs in 1070, long before the final separation. From 1798 to 1803 Appenzell, with the other domains of the abbot of St Gall, was formed into the canton Säntis of the Helvetic Republic, but in 1803, on the creation of the new canton of St Gall, shrank back within its former boundaries. The oldest codes of the laws and customs of the land date from 1409 and 1585, the original MS. of the latter (called the "Silver Book" from its silver clasps) being still used in Inner Rhoden when, at the close of the annual *Landsgemeinde*, the newly elected *Landammann* first takes the oath of office, and the assembled members then take that of obedience to him, in either case with uplifted right hands.

See also *Appenzellische Jahrbücher* (3 series from 1854, Trogen); G. Baumberger, "*Juhu-Juuhu*"—*Appenzellerland und Appenzellerleut*' (Einsiedeln. 1903); J. G. Ebel, *Schilderung d. Gebirgsvölker d. Schweiz*, vol. i. (Leipzig, 1798); W. Kobelt, *Die Alpwirthschaft im Kant. App. Inner Rhoden* (Soleure, 1899); I. B. Richman, *Appenzell* (London, 1895); H. Ryffel, *Die schweiz. Landsgemeinden* (Zürich, 1903); J. J. Tobler and A. Strüby, *Die Alpwirthschaft im Kant. App. Ausser Rhoden* (Soleure, 1900); J. C. Zellweger, *Geschichte d. app. Volkes* (to 1597), 6 vols in 11 parts (Trogen, 1830–1838); J.C. Zellweger, junior, *Der Kant. App.* (Trogen, 1867); A. Tobler, *Das Volkslied im Appenzellerland* (Basel, 1906); J. J. Blumer, *Staats- und Rechtsgeschichte d. schweiz. Demokratien* (3 vols. St Gall, 1850–1859). (W. A. B. C.)

APPENZELL, the political capital of the Inner Rhoden half of the Swiss canton of Appenzell. It is built in a smiling green hollow on the left bank of the Sitter stream, which is formed by the union of several mountain torrents descending from the Säntis. By light railways it is 12½ m. from St Gall past Gais or 20½ m. past Herisau. Its chief streets are paved, but it is rather a large village than a town, though in 1900 it had 4574 inhabitants, practically all German-speaking and Romanists. It has a stately modern parish church (attached to a Gothic choir), a small but very ancient chapel of the abbots of St Gall (whose summer residence was this village), and two Capuchin convents (one for men, founded in 1588, and one for women, founded in 1613). Among the archives, kept in the sacristy of the church, are several banners captured by the Appenzellers in former days, among them one taken in 1406 at Imst, near Lanedeck, with the inscription *Hundert Teufel*, though popularly this number is multiplied a thousandfold. In the principal square the *Landsgemeinde* (or cantonal democratic assembly) is held annually in the open air on the last Sunday in April. The inhabitants are largely employed in the production of embroidery, though also engaged in various pastoral occupations. About 2½ m. by road south-east of Appenzell is Weissbad, a well-known goat's whey cure establishment, while 1½ hours above it is the quaint little chapel of Wildkirchli, built (1648) in a rock cavern, on the way to the Säntis. (W. A. B. C.)

APPERCEPTION (Lat. *ad* and *percipere*, perceive), in psychology, a term used to describe the presentation of an object on which attention is fixed, in relation to the sum of consciousness previous to the presentation and the mind as a whole. The word was first used by Leibnitz, practically in the sense of the modern Attention (*q.v.*), by which an object is apprehended as "not-self" and yet in relation to the self. In Kantian terminology apperception is (1) *transcendental*—the perception of an object as involving the consciousness of the pure self as subject, and (2) *empirical*,—the cognition of the self in its concrete existence. In (1) apperception is almost equivalent to self-consciousness; the existence of the ego may be more or less prominent, but it is always involved. According to J. F. Herbart (*q.v.*) apperception is that process by which an aggregate or "mass" of presentations becomes systematized (*apperceptions-system*) by the accretion of new elements, either sense-given or product of the inner workings of the mind. He thus emphasizes in apperception the connexion with the self as resulting from the sum of antecedent experience. Hence in education the teacher should fully acquaint himself with the mental development of the pupil, in order that he may make full use of what the pupil already knows.

Apperception is thus a general term for all mental processes in which a presentation is brought into connexion with an already existent and systematized mental conception, and thereby is classified, explained or, in a word, understood; *e.g.* a new scientific phenomenon is explained in the light of phenomena already analysed and classified. The whole intelligent life of man is, consciously or unconsciously, a process of apperception, inasmuch as every act of attention involves the appercipient process.

See Karl Lange, *Ueber Apperception* (6th ed. revised, Leipzig, 1899; trans. E. E. Brown, Boston, 1893); G. F. Stout, *Analytic Psychology* (London, 1896), bk. ii. ch. viii., and in general text-books of psychology; also PSYCHOLOGY.

APPERLEY, CHARLES JAMES (1777–1843), English sportsman and sporting writer, better known as "Nimrod," the pseudonym under which he published his works on the chase and the turf, was born at Plasgronow, near Wrexham, in Denbighshire, in 1777. Between the years 1805 and 1820 he devoted himself to fox-hunting. About 1821 he began to contribute to the *Sporting Magazine*, under the pseudonym of "Nimrod," a series of racy articles, which helped to double the circulation of the magazine in a year or two. The proprietor, Mr Pittman, kept for "Nimrod" a stud of hunters, and defrayed all expenses of his tours, besides giving him a handsome salary. The death of Mr Pittman, however, led to a law-suit with the proprietors of the magazine for money advanced, and Apperley, to avoid imprisonment, had to take up his residence near Calais (1830), where he supported himself by his writings. He died in London on the 19th of May 1843. The most important of his works are: *Remarks on the Condition of Hunters, the Choice of Horses*, &c. (1831); *The Chase, the Turf, and the Road* (originally written for the *Quarterly Review*), (1837); *Memoirs of the Life of the Late John Mytton* (1837); *Nimrod's Northern Tour* (1838); *Nimrod Abroad* (1842); *The Horse and the Hound* (a reprint from the seventh edition of the *Encyclopaedia Britannica*) (1842); *Hunting Reminiscences* (1843).

APPERT, BENJAMIN NICOLAS MARIE (1797–1847), French philanthropist, was born in Paris on the 10th of September 1797. While a young man he introduced a system of mutual instruction into the regimental schools of the department of the Nord. The success which it obtained induced him to publish a *Manual* setting forth his system. While engaged in teaching prisoners at Montaigu, he fell under the suspicion of having connived at the escape of two of them, and was thrown into the prison of La Force. On his release he resolved to devote the rest of his life to bettering the condition of those whose lot he had for a time shared, and he travelled much over Europe for the purpose of studying the various systems of prison discipline, and wrote several books on the subject. After the revolution of 1830 he became secretary to Queen Marie Amélie, and organized the measures taken for the relief of the needy. He was decorated with the Legion of Honour in 1835.

His brother, FRANÇOIS APPERT (d. 1840), was the inventor of the method of preserving food by enclosing it in hermetically sealed tins; he left a work entitled *Art de conserver les substances animales et végétables*.

APPIAN (Gr. Ἀππιανός), of Alexandria, Roman historian, flourished during the reigns of Trajan, Hadrian and Antoninus Pius. He tells us that, after having filled the chief offices in his native place, he repaired to Rome, where he practised as an advocate. When advanced in years, he obtained, by the good offices of his friend Fronto, the dignity of imperial procurator—it is supposed in Egypt. His work (Ῥωμαϊκά) in twenty-four books, written in Greek, is rather a number of monographs than a connected history. It gives an account of various peoples and countries from the earliest times down to their incorporation

into the Roman empire. Besides a preface, there are extant eleven complete books and considerable fragments. In spite of its unattractive style, the work is very valuable, especially for the period of the civil wars.

Editio princeps, 1551; Schweighäuser, 1785; Bekker, 1852; Mendelssohn, 1878–1905. English translations: by W. B., 1578 (black letter); J. D[avies], 1679; H. White, 1899 (Bohn's Classical Library); bk. i. ed. by J. L. Strachan-Davidson, 1902.

APPIANI, ANDREA (1754–1817), the best fresco painter of his age, was born at Milan. He was made pensioned artist to the kingdom of Italy by Napoleon, but lost his allowance after the events of 1814 and fell into poverty. Correggio was his model, and his best pieces, which are in the church of Santa Maria presso San Celso and the royal palace at Milan, almost rival those of his great master. He also painted Napoleon and the chief personages of his court. Among the most graceful of his oil-paintings are his "Venus and Love," and "Rinaldo in the Garden of Armida." He is known as "the elder," to distinguish him from his great-nephew Andrea Appiani (1817–1865), an historical painter at Rome. Other painters of the same name were Niccolo Appiani (fl. 1510) and Francesco Appiani (1704–1792).

APPIA, VIA, a high-road leading from Rome to Campania and lower Italy, constructed in 312 B.C. by the censor Appius Claudius Caecus. It originally ran only as far as Capua, but was successively prolonged to Beneventum, Venusia, Tarentum and Brundusium, though at what dates is unknown. Probably it was extended as far as Beneventum not long after the colonization of this town in 268 B.C., and it seems to have reached Venusia before 190 B.C. Horace, in the journey to Brundusium described in *Sat.* i. 5, followed the Via Appia as far as Beneventum, but not beyond.

The original road was no doubt only gravelled (*glarea strata*); in 298 B.C. a footpath was laid *saxo quadrato* from the Porta Capena, by which it left Rome, to the temple of Mars, about 1 m. from the gate. Three years later, however, the whole road was paved with *silex* from the temple to Bovillae, and in 191 B.C. the first mile from the gate to the temple was similarly treated. The distance from Rome to Capua was 132 m. For the first few miles the road is flanked by an uninterrupted series of tombs and other buildings (see L. Canina, *Via Appia*, Rome, 1853). As far as Terracina it ran in an almost entirely straight line, even through the Alban Hills, where the gradients are steep. A remarkably fine embankment belonging to it still exists at Aricia. At Forum Appii it entered the Pomptine Marshes; that this portion (19 m. long, hence called Decennovium) belonged to the original road was proved by the discovery at Ad Medias (Mesa) of a milestone of about 250 B.C. (Ch. Hülsen, in *Römische Milteilungen*, 1889, 83; 1895, 301). A still older road ran along the foot of the Volscian mountains past Cora, Norba and Setia; this served as the post road until the end of the 18th century. At the time of Strabo and Horace, however, it was the practice to travel by canal from Forum Appii to Lucus Feroniae; to Nerva and Trajan were due the paving of the road and the repair of the bridges along this section. Theodoric in A.D. 486 ordered the execution of similar repairs, the success of which is recorded in inscriptions, but in the middle ages it was abandoned and impassable, and was only renewed by Pius VI. The older road crossed the back of the promontory at the foot of which Terracina stands; in imperial times, probably, the rock was cut away perpendicularly for a height of 120 ft. to allow the road to pass. Beyond Fundi it passed through the mountains to Formiae, the engineering of the road being noteworthy; and thence by Minturnae and Sinuessa (towns of the Aurunci which had been conquered in 314 B.C.)[1] to Capua. The remains of the road in this first portion are particularly striking.

Between Capua and Beneventum, a distance of 32 m., the road passed near the defile of Caudium (see CAUDINE FORKS). The modern highroad follows the ancient line, and remains of the latter, with the exception of three well-preserved bridges, which still serve for the modern highroad, are conspicuous by their absence. The portion of the road from Rome to Beneventum is described by Sir R. Colt Hoare, *Classical Tour through Italy*, 57 seq. (London, 1819). He was accompanied on his journey, made in 1789, by the artist Carlo Labruzzi, who executed a series of 226 drawings, the greater part of which have not been published; they are described by T. Ashby in *Mélanges de l'École Française de Rome* (1903), p. 375 seq., and *Atti del Congresso Internazionale per le Scienze Storiche*, vol. v. (Rome, 1904), p. 125 seq.

From Beneventum to Brundusium by the Via Appia, through Venusia and Tarentum, was 202 m. A shorter route, but more fitted for mule traffic, though Horace drove along part of it,[2] ran by Aequum Tuticum, Aecae, Herdoniae, Canusium, Barium, and Gnatia (Strabo vi. 282); it was made into a main road by Trajan, and took the name Via Traiana. The original road, too, adopted in imperial times a more devious but easier route by Aeclanum instead of by Trevicum. This was restored by Hadrian for the 15 m. between Beneventum and Aeclanum. Under Diocletian and Maximian a road (the Via Herculia) was constructed from Aequum Tuticum to Pons Aufidi near Venusia, where it crossed the Via Appia and went on into Lucania, passing through Potentia and Grumentum, and joining the Via Popilia near Nerulum. Though it must have lost much of its importance through the construction of the Via Traiana, the last portion from Tarentum to Brundusium was restored by Constantine about A.D. 315.

The Via Appia was the most famous of Roman roads; Statius, *Silvae*, ii. 2. 12, calls it *longarum regina viarum*. It was administered under the empire by a curator of praetorian rank, as were the other important roads of Italy. A large number of milestones and other inscriptions relating to its repair at various times are known. See Ch. Hülsen in Pauly-Wissowa, *Realencyclopädie*, ii. 238 seq. (Stuttgart, 1896). (T. As.)

APPIN, a coast district of Argyllshire, Scotland, bounded W. by Loch Linnhe, S. by Loch Creran, E. by the districts of Benderloch and Lorne, and N. by Loch Leven. It lies north-east to south-west, and measures 14 m. in length by 7 m. in breadth. The scenery of the coast is extremely beautiful, and inland the country is rugged and mountainous. The principal hills are the double peaks of Ben Vair (3362 ft. and 3284 ft.) and Creag Ghorm (2372 ft.) in the north, and Fraochie (2883 ft.), Meall Ban (2148 ft.) and Ben Mhic na Ceisich (2093 ft.) near the right flank of Glen Creran. The chief streams are the Coe and Laroch, flowing into Loch Leven, the Duror and Salachan flowing into Loch Linnhe, and the Iola and Creran flowing into Loch Creran. The leading industries comprise slate and granite quarries and lead mining. Ballachulish, Duror, Portnacroish, Appin and Port Appin are the principal villages. Ballachulish and Port Appin are ports of call for steamers, and the Caledonian railway company's branch line from Connel Ferry to Ballachulish runs through the coast land and has stations at Creagan, Appin, Duror, Kentallen and Ballachulish Ferry. Appin was the country of a branch of the Stewarts.

APPLAUSE (Lat. *applaudere*, to strike upon, clap), primarily the expression of approval by clapping of hands, &c.; generally any expression of approval. The custom of applauding is doubtless as old and as widespread as humanity, and the variety of its forms is limited only by the capacity for devising means of making a noise. Among civilized nations, however, it has at various times been subject to certain conventions. Thus the Romans had a set ritual of applause for public performances, expressing degrees of approval: snapping the finger and thumb, clapping with the flat or hollow palm, waving the flap of the toga,

[1] It is important to note how the Romans followed up every victory with a road.

[2] From Beneventum he followed the older line of the Via Appia to Trevicum; thence, leaving the main road at Aquilonia, he went to Ausculum ("quod versu dicere non est"), the mod. Ascoli Satriano, by a by-road, for the milestones which have been found there, though they probably belong to the Via Traiana, cannot be in their original position, but must have been transplanted thither (Th. Mommsen in *Corp. Inscrip. Lat.*, ix. 1883, No. 6016)—and on to Herdoniae (why Mommsen says that he left Herdoniae on the left, *op. cit.* p. 592, is not clear), where he joined the line of the later Via Traiana.

for which last the emperor Aurelian substituted a handkerchief (*orarium*), distributed to all Roman citizens (see STOLE). In the theatre, at the close of the play, the chief actor called out "Valete et plaudite!", and the audience, guided by an unofficial choregus, chaunted their applause antiphonally. This was often organized and paid for (Böttiger, *Über das Applaudieren im Theater bei den Alten*, Leipz., 1822). When Christianity became fashionable the customs of the theatre were transferred to the churches. Eusebius (*Hist. Eccl.* vii. 30) says that Paul of Samosata encouraged the congregation to applaud his preaching by waving linen cloths (ὀθόναις), and in the 4th and 5th centuries applause of the rhetoric of popular preachers had become an established custom. Though, however, applause may provide a healthy stimulus, its abuse has led to attempts at abolishing or restricting it even in theatres. The institution of the *claque*, people hired by performers to applaud them, has largely discredited the custom, and indiscriminate applause has been felt as an intolerable interruption to serious performances. The reverential spirit which abolished applause in church has tended to spread to the theatre and the concert-room, largely under the influence of the quasi-religious atmosphere of the Wagner performances at Baireuth. In Germany (*e.g.* the court theatres at Berlin) applause during the performance and "calling before the curtain" have been officially forbidden, but even in Germany this is felt to be in advance of public opinion. (See also ACCLAMATION and CHEERING.)

APPLE (a common Teut. word, A.S. *aepl*, *aeppel*, O.H.G. *aphul*, *aphal*, *apfal*, mod. Ger. *Apfel*), the fruit of *Pyrus Malus*, belonging to the sub-order *Pomaceae*, of the natural order *Rosaceae*. It is one of the most widely cultivated and best-known and appreciated of fruits belonging to temperate climates. In its wild state it is known as the crab-apple, and is found generally distributed throughout Europe and western Asia, growing in as high a latitude as Trondhjem in Norway. The crabs of Siberia belong to different species of *Pyrus*. The apple-tree as cultivated is a moderate-sized tree with spreading branches, ovate, acutely serrated or crenated leaves, and flowers in corymbs. The fruit is too well known to need any description of its external characteristics. The apple is successfully cultivated in higher latitudes than any other fruit tree, growing up to 65° N., but notwithstanding this, its blossoms are more susceptible of injury from frost than the flowers of the peach or apricot. It comes into flower much later than these trees, and so avoids the night frost which would be fatal to its fruit-bearing. The apples which are grown in northern regions are, however, small, hard, and crabbed, the best fruit being produced in hot summer climates, such as Canada and the United States. Besides in Europe and America, the fruit is now cultivated at the Cape of Good Hope, in northern India and China, and in Australia and New Zealand.

Apples have been cultivated in Great Britain probably since the period of the Roman occupation, but the names of many varieties indicate a French or Dutch origin of much later date. In 1688 Ray enumerated seventy-eight varieties in cultivation in the neighbourhood of London, and now it is calculated that about 2000 kinds can be distinguished. According to the purposes for which they are suitable, they can be classed as—1st, dessert; 2nd, culinary; and 3rd, cider apples. The principal dessert apples are the Pippins (*pepins*, seedlings), of which there are numerous varieties. As culinary apples, besides Rennets and other dessert kinds, Codlins and Biffins are cultivated. In England, Herefordshire and Devonshire are famous for the cultivation of apples, and in these counties the manufacture of cider (*q.v.*) is an important industry. Cider is also extensively prepared in Normandy and in Holland. Verjuice is the fermented juice of crab apples.

A large trade in the importation of apples is carried on in Britain, imports coming chiefly from French, Belgian and Dutch growers, and from the United States and British North America. Dried and pressed apples are imported from France for stewing, under the name of Normandy Pippins, and similarly prepared fruits come also from America.

The apple may be propagated by seeds to obtain stocks for grafting, and also for the production of new varieties. The established sorts are usually increased by grafting, the method called whip-grafting being preferred. The stocks should be at least as thick as the finger; and should be headed back to where the graft is to be fixed in January, unless the weather is frosty, but in any case before vegetation becomes active. The scions should be cut about the same time, and laid in firmly in a trench, in contact with the moist soil, until required.

The tree will thrive in any good well-drained soil, the best being a good mellow calcareous loam, while the less iron there is in the subsoil the better. The addition of marl to soils that are not naturally calcareous very much improves them. The trees are liable to canker in undrained soils or those of a hot sandy nature. Where the soil is not naturally rich enough, it should be well manured, but not to the extent of encouraging over-luxuriance. It is better to apply manure in the form of a compost than to use it in a fresh state or unmixed.

To form an orchard, standard trees should be planted at from 25 to 40 ft. between the rows, according to the fertility of the soil and other considerations. The trees should be selected with clean, straight, self-supporting stems, and the head should be shapely and symmetrical, with the main branches well balanced. In order to obtain such a stem, all the leaves on the first shoot from the graft or bud should be encouraged to grow, and in the second season the terminal bud should be allowed to develop a further leading shoot, while the lateral shoots should be allowed to grow, but so that they do not compete with the leader, on which the growth of leaves should be encouraged in order that they may give additional strength to the stem below them. The side shoots should be removed gradually, so that the diminution of foliage in this direction may not exceed the increase made by the new branches and shoots of the upper portion. Dwarf pyramids, which occupy less space than open dwarfs, if not allowed to grow tall, may be planted at from 10 to 12 ft. apart. Dwarf bush trees may be planted from 10 to 15 ft. apart, according to the variety and the soil. Dwarf bushes on the Paradise stock are both ornamental and useful in small gardens, the trees being always conveniently under control. These bush trees, which must be on the proper stock—the French Paradise—may be planted at first 6 ft. apart, with the same distance between the rows, the space being afterwards increased, if desired, to 12 ft. apart, by removing every alternate row.

"Cordons" are trees trained to a single shoot, the laterals of which are kept spurred. They are usually trained horizontally, at about 1½ ft. from the ground, and may consist of one stem or of two, the stems in the latter case being trained in opposite directions. In cold districts the finer sorts of apples may be grown against walls as upright or oblique cordons. From these cordon trees very fine fruit may often be obtained. The apple may also be grown as an espalier tree, a form which does not require much lateral space. The ordinary trained trees for espaliers and walls should be planted 20 ft. apart.

The fruit of the apple is produced on spurs which form on the branchlets of two years old and upwards, and continue fertile for a series of years. The principal pruning should be performed in summer, the young shoots if crowded being thinned out, and the superabundant laterals shortened by breaking them half through. The general winter pruning of the trees may take place any time from the beginning of November to the beginning of March, in open weather. The trees are rather subject to the attacks of the American blight, the white cottony substance found on the bark and developed by an insect (*Eriosoma mali*), somewhat similar to the green-fly of the garden, but not a true aphis. It may be removed by scrubbing with a hard brush, by painting the affected spots with any bland oil, or by washing them with dilute paraffin and soft soap.

The apple-blossom weevil (*Anthonomus pomorum*), a small reddish-brown beetle, often causes serious damage to the flowers. The female bores and lays an egg in the unopened bud, and the maggot feeds on the stamens and pistil. The weevil hibernates in the crannies of the bark or in the soil at the base of the trees,

and bandages of tarred cloth placed round the stem in spring will prevent the female from crawling up.

The codlin moth (*Carpocapsa pomonana*) lays its eggs in May in the calyx of the flowers. The young caterpillar, which is white with black head and neck, gnaws its way through the fruit, and pierces the rind. When nearly full grown it attacks the core, and the fruit soon drops. The insect emerges and spins its cocoon in a crack of the bark.

To check this disease the apples which fall before ripening should be promptly removed. A loosely made hay-band twisted round the stem about a foot from the ground is of use. The grubs will generally choose the bands in which to make their cocoon; at the end of the season the bands are collected and burned.

The following are a few of the most approved varieties of the apple tree, arranged in order of their ripening, with the months in which they are in use:—

Dessert Apples.

White Juneating	July
Early Red Margaret	Aug.
Irish Peach	Aug.
Devonshire Quarrenden	Aug., Sept.
Duchess of Oldenburg	Aug., Sept.
Red Astrachan	Sept.
Kerry Pippin	Sept., Oct.
Peasgood's Nonesuch	Sept.–Nov.
Sam Young	Oct.–Dec.
King of the Pippins	Oct.–Jan.
Cox's Orange Pippin	Oct.–Feb.
Court of Wick	Oct.–Mar.
Blenheim Pippin	Nov.–Feb.
Sykehouse Russet	Nov.–Feb.
Fearn's Pippin	Nov.–Mar.
Mannington's Pearmain	Nov.–Mar.
Margil	Nov.–Mar.
Ribston Pippin	Nov.–Mar.
Golden Pippin	Nov.–Jan.
Reinette de Canada	Nov.–Apr.
Ashmead's Kernel	Nov.–Apr.
White Winter Calville (grown under glass)	Dec.–Mar.
Braddick's Nonpareil	Dec.–Apr.
Court-pendû Plat	Dec.–Apr.
Northern Spy	Dec.-May
Cornish Gilliflower	Dec.–May
Scarlet Nonpareil	Jan.–Mar.
Cockle's Pippin	Jan.–Apr.
Lamb Abbey Pearmain	Jan.–May
Old Nonpareil	Jan.–May
Duke of Devonshire	Feb.–May
Sturmer Pippin	Feb.–June

Kitchen Apples.

Keswick Codlin	Aug.–Sept.
Lord Suffield	Aug.–Sept.
Manks Codlin	Aug.–Oct.
Ecklinville Seedling	Aug.–Nov.
Stirling Castle	Aug.–Nov.
New Hawthornden	Sept.–Oct.
Stone's Seedling	Sept.–Nov.
Emperor Alexander	Sept.–Dec.
Waltham Abbey Seedling	Sept.–Jan.
Cellini	Oct., Nov.
Gravenstein	Oct.–Dec.
Hawthornden	Oct.–Dec.
Baumann's Red Winter Reinette	Nov.–Mar.
Mère de Ménage	Oct.–Mar.
Beauty of Kent	Oct.–Feb.
Yorkshire Greening	Oct.–Feb.
Gloria Mundi	Nov.–Jan.
Blenheim Pippin	Nov.–Feb.
Tower of Glammis	Nov.–Feb.
Warner's King	Nov.–Mar.
Alfriston	Nov.–Apr.
Northern Greening	Nov.–Apr.
Reinette de Canada	Nov.–Apr.
Bess Pool	Nov.–May
Winter Queening	Nov.–May
Lane's Prince Albert	Oct.–May
Norfolk Beaufin	Nov.–July

Apples for table use should have a sweet juicy pulp and rich aromatic flavour, while those suitable for cooking should possess the property of forming a uniform soft pulpy mass when boiled or baked. In their uncooked state they are not very digestible, but when cooked they form a very safe and useful food, exercising a gentle laxative influence.

According to Hutchison their composition is as follows:—

	Water.	Proteid.	Ether Extract.	Carbohydrate.	Ash.	Cellulose.	Acids.
Fresh	82·5	0·4	0·5	12·5	0·4	2·7	1·0
Dried	36·2	1·4	3·0	49·1	1·8	4·9	3·6

Many exotic fruits, having nothing in common with the apple, are known by that name, *e.g.* the Balsam apple, *Momordica Balsamina*; the custard apple (*q.v.*), *Anona reticulata*; the egg apple, *Solanum esculentum*; the rose apple, various species of *Eugenia*; the pineapple (*q.v.*), *Ananas sativus*; the star apple, *Chrysophyllum Cainito*; and the apples of Sodom, *Solanum sodomeum*. (A. B. R.)

APPLEBY, a market town and municipal borough, and the county town of Westmorland, England, in the Appleby parliamentary division, 276 m. N.N.W. from London, on the Midland and a branch of the North Eastern railways. Pop. (1901) 1764. It is picturesquely placed in the valley of the Eden, which is richly wooded, and flanked on the north-east by spurs of Milburn Forest and Dufton and other fells, which rise up to 2600 ft. On a hill above the town stands the castle, retaining a fine Norman keep and surrounded by a double moat, now partly laid out as gardens. The remainder of the castle was rebuilt as a mansion in the 17th century. It was held for the royalists in the civil wars by Sir Philip Musgrave, and was the residence of Anne, countess of Pembroke, the last of the family of Clifford, which had great estates in this part of England. St Ann's hospital for thirteen poor women (1654) was of her foundation. The grammar school (1453) was refounded by Queen Elizabeth. The modern incorporation dates from 1885, with a mayor, four aldermen and twelve councillors. Area, 1876 acres.

Appleby is not mentioned in any Saxon records, but after the Conquest it rose to importance as the head of the barony of Appleby which extended over the eastern portion of the present county of Westmorland. This barony formed part of the province of Carlisle granted by Henry I. to Ranulf Meschin, who erected the castle at Appleby and made it his place of residence. Appleby is a borough by prescription, and the old charter of incorporation, granted in the first year of James II., was very shortly abandoned. In 1292 we find the mayor and commonalty claiming the right to elect a coroner and to have tolls of markets and fairs. In 1685 the governing body comprised a mayor, aldermen, a town clerk, burgesses of the common council, a coroner and subordinate officers. An undated charter from Henry II. conceding to the burgesses the customs of York, was confirmed in 1 John, 16 Henry III., 14 Edward I., and 5 Edward III. John granted the borough to the burgesses for a fee-farm rent. The impoverishment caused by the Scottish raids led to its seizure by Edward II. for arrears of payment, but Edward III. restored it on the same terms as before. Henry VIII. reduced the fee-farm rent from 20 marks to 2 marks, after an inquisition which found that Appleby was burnt by the Scots in 1388 and that part of it still lay in ruins. The town, however, never seems to have regained its prosperity, and 16th and 17th century writers speak of it as a poor and insignificant village. Appleby returned two members to parliament from 1295 until disfranchised by the Reform Act of 1832. The market and the St Lawrence fair are held by prescription. James I. granted an additional fair on the second Thursday in April. In the early 18th century Appleby was celebrated for the best corn-market in the country.

See *Victoria County History*, *Westmorland*; W. Hewitson, *Appleby Charters* (Cumberl. and Westm. Antiq. and Archaeol. Soc., Transactions, xi. 279-285; Kendal, 1891).

APPLETON, NATHAN (1779–1861) American merchant and politician, was born in New Ipswich, New Hampshire, on the 6th of October 1779. He was educated in the New Ipswich Academy, and in 1794 entered mercantile life in Boston, in the employment of his brother, Samuel (1766–1853), a successful and benevolent man of business, with whom he was in partnership

from 1800 to 1809. He co-operated with Francis C. Lowell and others in introducing the power-loom and the manufacture of cotton on a large scale into the United States, a factory being established at Waltham, Massachusetts, in 1814, and another in 1822 at Lowell, Massachusetts, of which city he was one of the founders. He was a member of the general court of Massachusetts in 1816, 1821, 1822, 1824 and 1827, and in 1831–1833 and 1842 of the national House of Representatives, in which he was prominent as an advocate of protective duties. He died in Boston on the 14th of July 1861.

His son, THOMAS GOLD APPLETON (1812–1884), who graduated at Harvard in 1831, had some reputation as a writer, an artist and a patron of the fine arts, but was better known for his witticisms, one of which, the oft-quoted "Good Americans, when they die, go to Paris," is sometimes attributed to Oliver Wendell Holmes. He published some poems and, in prose, *Nile Journal* (1876), *Syrian Sunshine* (1877), *Windfalls* (1878), and *Chequer-Work* (1879).

See the memoir of Nathan Appleton by Robert C. Winthrop (Boston, 1861); and Susan Hale's *Life and Letters of Thomas Gold Appleton* (New York, 1885).

APPLETON, a city and the county-seat of Outagamie county, Wisconsin, U.S.A., on the lower Fox river, about 90 m. N. of Milwaukee. Pop. (1890) 11,869; (1900) 15,085, of whom 3605 were foreign-born; (1910, census) 16,773. It is served by the Chicago & North-Western, and the Chicago, Milwaukee & St Paul railways, and by steamboats on the Fox river, by means of which it meets lake transportation at De Pere and Green Bay. Appleton was one of the first cities in the United States to have an electric street railway line in operation; and electric street railways now traverse the entire Fox river valley as far as Fond du Lac on the south and Green Bay on the north. The city is attractively laid out on high bluffs above the river. It has several beautiful parks, two hospitals, a number of fine churches and school buildings, and a public library. The city is the seat of Lawrence college (changed from university in 1908), an interdenominational (originally a Methodist Episcopal) co-educational institution, founded in 1847 as the Lawrence Institute of Wisconsin and named in honour of Amos Adams Lawrence (1814–1886) of Boston, son of Amos Lawrence, and giver of $10,000 for the founding of the Institute. The college comprises an academy, a college of liberal arts, a school of expression, a school of commerce, schools of music and of art, and a school of correspondence; and in 1907–1908 had 33 instructors, 575 students and a library of 24,400 volumes. The Fox river furnishes about 10,000 h.p., which is largely utilized for the manufacture of paper (of which Appleton is one of the largest producers in the United States), wood-pulp, sulphite fibre, machinery, wire screens, woollen goods, knit goods, furniture, dyes and flour. The total value of factory products in 1905 was $6,672,457, an increase of 72·8 % over the product value of 1900. Appleton was first permanently settled in 1833, and was named in honour of Samuel Appleton of Massachusetts, who owned part of the original town plot. It was incorporated as a village in 1853, and received in 1857 a city charter, which was revised in 1887 and in 1905.

APPOGGIATURA (from Ital. *appoggiare*, to lean upon), a musical term for a melodic ornament, a grace-note prefixed to a principal note and printed in small character. The effect is to suspend the principal note, by taking away the time-value of the *appoggiatura* prefixed to it. There are two kinds, the long *appoggiatura*, now usually printed as played, and the short, where the suspension of the principal note is scarcely perceptible; this is often called *acciatura*, a word properly applied to an ornament now obsolete, in which a principal note in a melody is struck together with the note immediately below, the lower note being at once released and the other held on.

APPOINTMENT, POWER OF, in English law, an authority reserved by or limited to a person, to dispose, either wholly or partially, of real or personal property, either for his own benefit or for that of others. Thus if A settle property upon trustees to such uses as B shall by deed or will appoint and in default of and until such appointment to the use of C and his heirs, B, though he has no interest in the property, can at any time appoint the property to any one he pleases, including himself, and C's interest which has hitherto been vested in him will be divested. In the above case A is said to be the donor, B the donee, and the persons in whose favour the appointment is exercised are called the appointees. Such powers are either general or limited. A general power is one which the appointor may exercise in favour of any person he pleases. It is obvious that such a power is very nearly equivalent to ownership, and consequently property which is the subject of a general power has been made to share the liabilities of ownership. By the Judgments Act 1838 all hereditaments over which a judgment debtor has such a power may be seized by the sheriff under a writ of *elegit*, and by the Bankruptcy Act 1883 similar property will vest in the trustees of a bankrupt. By the Finance Act 1894 property of which the deceased had a general power of appointment is subject to the payment of estate duty, even though the power has not been exercised. A limited power is one which can only be exercised in favour of certain specified persons or classes; such a power is frequently inserted in marriage settlements in which after life estates to the husband and wife a power is given to appoint among the children of the marriage. In such a case no appointment to any one but children of the marriage is valid. Formerly it was held that the intention of the donor of such a power was that each of the class which are the objects of the power should take some part of the fund, and from this arose the equitable doctrine of illusory appointments, by which the courts of equity set aside an appointment which was good at law on the ground that a merely nominal share had been appointed to one of the objects. The great difficulty of deciding what was a nominal or illusory share caused the passing of the Illusory Appointments Act of 1830, whereby it was enacted that no appointment should be set aside merely on the ground that a share appointed was illusory. It was still necessary, however, that some share should be appointed to each object, and consequently it was possible in the popular phrase to be "cut off with a shilling," but now by the Powers Amendment Act 1874 the appointor is no longer obliged to appoint a share to each object of the power.

It is a general rule that every circumstance required by the instrument creating the power to accompany the execution of it must be strictly observed. Thus it might be required that the appointment should be by an instrument witnessed by four witnesses, or that the consent in writing of some third party should be signified. The general rule, however, has been modified both by statute and by the rules of equity. By the Wills Act 1837 a will made pursuant to the requirements of that statute shall be a valid execution of a power of appointment by will, notwithstanding that some additional form or solemnity shall have been required by the instrument creating the power, and by the Wills Act 1861 a will made out of the United Kingdom by a British subject according to the forms required by the law of the place where the will was made shall, as regards personal estate, be held to be well executed and admitted to probate; consequently it has been held that an appointment made by such a will is a valid exercise of the power. As regards appointments by deed the Law of Property Amendment Act 1859 enacts that a deed attested by two witnesses shall, so far as execution and attestation go, be a valid exercise of a power to appoint by deed. The courts of equity also will interfere in some cases of defective execution in order to carry out the intentions of the settlor. The principle upon which the court acts is obscure, but the rule has been thus stated:—"Whenever a man having power over an estate, whether ownership or not, in discharge of moral or natural relations, shows an intention to execute such power, the court will operate upon the conscience of the heir (or of the persons entitled in default) to make him perfect this intention." Equity, however, only relieves against defects not of the essence of the power, such as the absence of seal or execution by will instead of deed, but where the defect is of the essence of the power, as where a consent is not obtained, equity will not assist,

nor will it relieve where a power to appoint by will is purported to be exercised by deed. A power of appointment if exercised must be exercised bona fide, otherwise it will be void as fraudulent; thus it has been frequently decided that where a father, having a limited power of appointment among his children, appoints the whole fund to an infant child, who is in no need of the appointment and who is ill, in the expectation of the death of the child whereby the fund will come to him as next of kin, such appointment is void as a fraud upon the power. Where an execution is partly fraudulent and partly valid the court will, if possible, separate the two and only revoke that which is fraudulent; if, however, the two parts are not separable the whole is void. The same rule is applied in cases of excessive execution where the power is exercised in favour of persons some of whom are and some of whom are not objects of the power. The doctrine of *Election* (*q.v.*) applies to appointments under powers, but there must be a gift of free and disposable property to the persons entitled in default of appointment.

The appointment must in law be read into the instrument creating the power in lieu of the power itself. Thus an appointor under a limited power cannot appoint to any person to whom the donor could not have appointed by reason of the rule against perpetuities, but this is not so in the case of a general power, for there the appointor is virtually owner of the property appointed. In applying this rule to appointments a distinction arises between powers created by deed and will, for a deed speaks from the date of its execution but a will from the death of the testator, and so limitations bad when the will was made may have become good when it comes into operation. Since the Conveyancing Act 1881 all powers may be released by the donees thereof, unless the power is coupled with a trust in respect of which there is a duty cast on the donee to exercise it; and this is so even though the donee gets a benefit by such release as one entitled in default of appointment, for this is not a fraud upon the power. (E. S. M. B.)

APPOMATTOX COURT HOUSE, a village of Appomattox county, Virginia, U.S.A., 25 m. E. of Lynchburg, in the S. part of the state. It is served by the Norfolk & Western railway. The village was the scene of the surrender of the Confederate Army of Northern Virginia under General Robert E. Lee to the Federal forces under Lieutenant-General U. S. Grant on Sunday the 9th of April 1865. The terms were: "the officers to give their individual paroles not to take up arms against the government of the United States until properly exchanged, and each company or regimental commander to sign a like parole for the men of their commands," . . . neither "side arms of the officers nor their private horses or baggage" to be surrendered; and, as many privates in the Confederate Army owned horses and mules, all horses and mules claimed by men in the Confederate Army to be left in their possession.

APPONYI, ALBERT, Count (1846–), Hungarian statesman, the most distinguished member of an ancient noble family, dating back to the 13th century, and son of the chancellor György Apponyi (1808–1899) and the accomplished and saintly Countess Julia Sztáray, was born at Pesth on the 29th of May 1846. Educated at the Jesuit seminary at Kalksburg and at the universities of Vienna and Pesth, a long foreign tour completed his curriculum, and at Paris he made the acquaintance of Montalembert, a kindred spirit, whose influence on the young Apponyi was permanent. He entered parliament in 1872 as a liberal Catholic, attaching himself at first to the Deák party; but the feudal and ultramontane traditions of his family circle profoundly modified, though they could never destroy, his popular ideals. On the break up of the Deák party he attached himself to the conservative group which followed Baron Pál Senynyey (1824–1888) and eventually became its leader. Until 1905 Count Albert was constantly in opposition, but in May of that year he consented to take office in the second Wekerle ministry. A lofty and magnetic orator, his speeches were published at Budapest in 1896; and he is the author of an interesting dissertation, *Esthetics and Politics, the Artist and the Statesman* (Hung.) (Budapest, 1895).

APPORTIONMENT (Fr. *apportionement*; Med. Lat. *apportionamentum*; derived from Lat. *portio*, share), distribution or allotment in proper shares; a term used in law in a variety of senses. (1) Sometimes it is employed roughly and with no technical meaning to indicate the distribution of a benefit (*e.g.* salvage or damages under the Fatal Accidents Act 1846, § 2), or liability (*e.g.* general average contributions, or tithe rent-charge), or the incidence of a duty (*e.g.* obligations as to the maintenance of highways). (2) In its strict legal interpretation apportionment falls into two classes, "apportionment in respect of estate" and "apportionment in respect of time."

1. *Apportionment in respect of Estate* may result either from the act of the parties or from the operation of law. Where a lessee is evicted from, or surrenders or forfeits possession of part of the property leased to him, he becomes liable at common law to pay only a rent apportioned to the value of the interest which he still retains. So where the person entitled to the reversion of an estate assigns part of it, the right to an apportioned part of the rent incident to the whole reversion passes to his assignee. The lessee is not bound, however, by an apportionment of rent made upon the grant of part of the reversion unless it is made either with his consent or by the verdict of a jury. The assignee of the reversion of part of demised premises could not, at common law, re-enter for breach of a condition, inasmuch as a condition of re-entry in a lease could not at common law be apportioned. But this has now been altered by statute both in England (Law of Property Amendment Act 1859, § 3; Conveyancing Act 1881, § 12) and in many of the British colonies (*e.g.* Ontario, Rev. Stats., 1897, c. 170, § 9; Barbados, No. 12 of 1891, § 9). In the cases just mentioned there is apportionment in respect of estate by act of the parties.

Apportionment by operation of law may be brought about where by act of law a lease becomes inoperative as regards its subject-matter, or by the "act of God" (as, for instance, where part of an estate is submerged by the encroachments of the sea). To the same category belongs the apportionment of rent which takes place under various statutes (*e.g.* the Lands Clauses Consolidation Act 1845, § 119, when land is required for public purposes; the Agricultural Holdings Act 1883, § 41, in the case of a tenant from year to year receiving notice to quit part of a holding; and the Irish Land Act 1903, § 61, apportionment of quit and crown rents).

2. *Apportionment in respect of Time.*—At common law, there was no apportionment of rent in respect of time. Such apportionment was, however, in certain cases allowed in England by the Distress for Rent Act 1737, and the Apportionment Act 1834, and is now allowed generally under the Apportionment Act 1870. Under that statute (§ 2) all rents, annuities, dividends and other periodical payments in the nature of income are to be considered as accruing from day to day and to be apportionable in respect of time accordingly. It is provided, however, that the apportioned part of such rents, &c., shall only be payable or recoverable in the case of a continuing payment, when the entire portion of which it forms part itself becomes payable, and, in the case of a payment determined by re-entry, death or otherwise, only when the next entire portion would have been payable if it had not so determined (§ 3). Persons entitled to apportioned parts of rent have the same remedies for recovering them when payable as they would have had in respect of the entire rent; but a lessee is not to be liable for any apportioned part specifically. The rent is recoverable by the heir or other person who would, but for the apportionment, be entitled to the entire rent, and he holds it subject to distribution (§ 4). The Apportionment Act 1870 extends to payments not made under any instrument in writing (§ 2), but not to annual sums made payable in policies of insurance (§ 6). Apportionment under the act can be excluded by express stipulation.

The apportionment created by this statute is "apportionment in respect of time." The cases to which it applies are mainly cases of either (A) apportionment of rent due under leases where at a time between the dates fixed for payment the lessor or lessee dies, or some other alteration in the position of parties occurs; or (B) apportionment of income between the representatives of a limited owner and the remainder-man when the limited interest

determines at a time between the date when such income became due.

(A) With regard to the former of these classes, it may be noticed that although apportioned rent becomes payable only when the whole rent is due, the landlord, in the case of the bankruptcy of an ordinary tenant, may prove for a proportionate part of the rent up to the date of the receiving order (Bankruptcy Act 1883, Sched. ii. r. 19); and that a similar rule holds good in the winding up of a company (*in re South Kensington Co-operative Stores*, 1881, 17 Ch.D. 161); and further that the act of 1870 applies to the liability to pay, as well as to the right to receive, rent (*in re Wilson*, 1893, 62 L.J.Q.B. 628, 632). Accordingly where an assignment of a lease is made between two half-yearly rent-days, the assignee is not liable to pay the full amount of the half-year's rent falling due on the rent-day next after the date of the assignment, but only an apportioned part of that half-year's rent, computed from the last mentioned date (*Glass* v. *Patterson*, 1902, 2 Ir.R. 660).

(B.) With regard to the apportionment of income, the only points requiring notice here are that all dividends payable by public companies are apportionable, whether paid at fixed periods or not, unless the payment is, in effect, a payment of capital (§ 5).

The Apportionment Act 1870 extends to Scotland and Ireland. It has been followed in many of the British colonies (*e.g.* Ontario, Rev. Stats., 1897, c. 170, §§ 4-8; New Zealand, No. 4 of 1886; Tasmania, No. 8 of 1871; Barbados, No. 12 of 1891, §§ 9-12). Similar legislation has been adopted in many of the states of the American Union, where, as in England, rent was not, at common law, apportionable as to time (Kent, *Comm.* iii. 469-472).

An *equitable apportionment*, apart from statute law, arises where property is bequeathed on trust to pay the income to a tenant for life and the reversion to others, and the realization of the property in the form of a fund capable of producing income is postponed for the benefit of the estate. In such cases there is an ultimate apportionment between the persons entitled to the income and those entitled to the capital of the accumulations for the period of such postponement. The rule followed is this: the proceeds, when realized, are apportionable between capital and income by ascertaining the sum which, put out and accumulated at 3% *per annum* from the day of the testator's death (with yearly rents and deducting income tax) would have produced at the day of receipt the sum actually received. The sum so ascertained should be treated as capital and the residue as income. (*In re Earl of Chesterfield's Trusts*, 1883, 24 Ch.D. 643; *In re Goodenough*, 1895, 2 Ch. 537; *Rowlls* v. *Bebb*, 1900, 2 Ch. 107.)

In addition to the authorities cited in the text, see Stroud, *Jud. Dict.* (2nd ed., London, 1903), s.v. "Apportion"; Bouvier, *Law Dict.* (London and Boston, 1897), s.v. "Apportionment"; *Ruling Cases* (London, 1895), tit. "Apportionment"; Fawcett, *Landlord and Tenant* (London, 1905), pp. 238 et seq.; Foa, *Landlord and Tenant* (3rd ed., London, 1901), pp. 112 et seq. (A. W. R.)

APPORTIONMENT BILL, an act passed by the Congress of the United States after each decennial census to determine the number of members which each state shall send to the House of Representatives. The ratio of representation fixed by the original constitution was 1 to 30,000 of the free population, and the number of the members of the first House was 65. As the House would, at this ratio, have become unmanageably large, the ratio, which is first settled by Congress before apportionment, has been raised after each census, as will be seen from the accompanying table.

Under	Census.		Apportionment.		Whole Number of Representatives.
	Year.	Population.	Year.	Ratio.	
Constitution	..	..	1789	30,000	65
First Census	1790	3,929,214	1793	33,000	105
Second Census	1800	5,308,483	1803	33,000	141
Third Census	1810	7,239,881	1813	35,000	181
Fourth Census	1820	9,633,822	1823	40,000	213
Fifth Census	1830	12,866,020	1833	47,700	240
Sixth Census	1840	17,069,453	1843	70,680	223
Seventh Census	1850	23,191,876	1853	93,423	234
Eighth Census	1860	31,443,321	1863	127,381	241
Ninth Census	1870	38,558,371	1873	131,425	292
Tenth Census	1880	50,155,783	1883	151,911	325
Eleventh Census	1890	62,622,250	1893	173,901	356
Twelfth Census	1900	75,568,686	1903	194,182	386

The same term is applied to the acts passed by the state legislatures for correcting and redistributing the representation of the counties. Such acts are usually passed at decennial intervals, more often after the federal census, but the dates may vary in different states. The state representatives are usually apportioned among the several counties according to population and not by geographical position. The electoral districts so formed are expected to be equal in proportion to the number of inhabitants; but this method has led to much abuse in the past, through the making of unequal districts for partisan purposes. (See GERRYMANDER.)

If a state has received an increase in the number of its representatives and its legislature does not pass an apportionment bill before the next congressional election, the votes of the whole state elect the additional members on a general ticket and they are called "congressmen-at-large."

APPRAISER (from Lat. *appretiare*, to value), one who sets a value upon property, real or personal. In England the business of an appraiser is usually combined with that of an auctioneer, while the word itself has given place, to a great extent, to that of "valuer." (See the articles AUCTIONS AND AUCTIONEERS, and VALUATION AND VALUERS.)

In the United States appraiser is a term often used to describe a person specially appointed by a judicial or quasi-judicial authority to put a valuation on property, *e.g.* on the items of an inventory of the estate of a deceased person or on land taken for public purposes by the right of eminent domain. Appraisers of imported goods and boards of general appraisers have extensive functions in administering the customs laws of the United States. Merchant appraisers are sometimes appointed temporarily under the revenue laws to value where there is no resident appraiser without holding the office of appraiser (U.S. Rev. Stats. § 2609).

APPREHENSION (Lat. *ad*, to; *prehendere*, to seize), in psychology, a term applied to a mode of consciousness in which nothing is affirmed or denied of the object in question, but the mind is merely aware of ("seizes") it. "Judgment" (says Reid, ed. Hamilton, i. p. 414) "is an act of the mind specifically different from simple apprehension or the bare conception of a thing"; and again, "Simple apprehension or conception can neither be true nor false." This distinction provides for the large class of mental acts in which we are simply aware of or "take in" a number of familiar objects, about which we in general make no judgment unless our attention is suddenly called by a new feature. Or again two alternatives may be apprehended without any resultant judgment as to their respective merits. Similarly G. F. Stout points out that while we have a very vivid idea of a character or an incident in a work of fiction, we can hardly be said in any real sense to have any belief or to make any judgment as to its existence or truth. With this mental state may be compared the purely aesthetic contemplation of music, wherein apart from, say, a false note, the faculty of judgment is for the time inoperative. To these examples may be added the fact that one can fully understand an argument in all its bearings without in any way judging its validity.

Without going into the question fully, it may be pointed out that the distinction between judgment and apprehension is relative. In every kind of thought there is judgment of some sort in a greater or less degree of prominence. Judgment and thought are in fact psychologically distinguishable merely as different, though correlative, activities of consciousness. Professor Stout further investigates the phenomena of apprehension, and comes to the conclusion that "it is possible to distinguish and identify a whole without apprehending any of its constituent details." On the other hand, if the attention

focuses itself for a time on the apprehended object, there is an expectation that such details will as it were emerge into consciousness. Hence he describes such apprehension as "implicit," and in so far as the implicit apprehension determines the order of such emergence he describes it as "schematic." A good example of this process is the use of formulae in calculations; ordinarily the formula is used without question; if attention is fixed upon it, the steps by which it is shown to be universally applicable emerge and the "schema" is complete in detail.

With this result may be compared Kant's theory of apprehension as a synthetic act (the "synthesis of apprehension") by which the sensory elements of a perception are subjected to the formal conditions of time and space.

See G. F. Stout, *Analytic Psychology* (London, 1896); F. Brentano, *Psychologie* (bk. ii. ch. vii.), and *Vom Ursprung sittlicher Erkenntnis*; B. Titchener, *Outlines of Psychology* (New York, 1902), and text-books of psychology. Also PSYCHOLOGY.

APPRENTICESHIP (from Fr. *apprendre*, to learn), a contract whereby one person, called the master, binds himself to teach, and another, called the apprentice, undertakes to learn, some trade or profession, the apprentice serving his master for a certain time.

Roman law is silent on the subject on this contract, nor does it seem to have had any connexion with the division of the Roman citizens into tribes or colleges. So far as can be seen it arose in the middle ages, and formed an integral part of the system of trade gilds and corporations by which skilled labourers of all kinds sought protection against the feudal lords, and the maintenance of those exclusive privileges with which in the interests of the public they were favoured. In those times it was believed that neither arts nor sciences would flourish unless such only were allowed to practise them as had given proofs of reasonable proficiency and were formed into bodies corporate, with certain powers of self-government and the exclusive monopoly of their respective arts within certain localities; and the medieval *universitas* (corporation)—whether of smiths and tailors or of scholars—included both such as were entitled to practise and teach and such as were in course of learning. The former were the masters, the latter the apprentices. Hence the term *apprentice* was applied indifferently to such as were being taught a trade or a learned profession, and even to undergraduates or scholars who were qualifying themselves for the degree of doctor or master in the liberal arts. When barristers were first appointed by Edward I. of England they were styled *apprenticii ad legem*—the serjeants-at-law being *servientes ad legem*; and these two terms corresponded respectively to the trade names of apprentices and journeymen. During the middle ages the term of apprenticeship was seven years, and this period was thought no more than sufficient to instruct the learner in his profession, craft or mystery under a properly qualified master, teacher or doctor—for these names were synonymous—and to reimburse the latter by service for the training received. After this the apprentice became himself a master and a member of the corporation, with full rights to practise the business and to teach others in his turn; so also it would seem that undergraduates had to pass through a curriculum of seven years before they could attain the degree of doctor or master in the liberal arts. On the continent of Europe these rules were observed with considerable rigour, both in the learned professions and in those which we now designate as trades. In England they made their way more slowly and did not receive much countenance, there being always a jealousy of anything savouring of interference with the freedom of trade. Nevertheless the formation of gilds and companies of tradesmen in England dates probably from the 12th century, and the institution of apprenticeships cannot be of much later date. In 1388 and 1405 it is noticed in acts of parliament. By various subsequent statutes provisions were made for the regulation of the institution, and from them it appears that seven years was its ordinary and normal term in the absence of special arrangement. By a statute of 1562 this was made the law of the land, and it was enacted that no person should exercise any "trade or mystery" without having served a seven years' apprenticeship. In no place did the apprentices become so formidable by their numbers and organization as in London. During the Great Rebellion they took an active part as a political body, and were conspicuous after the Restoration by being frequently engaged in tumults. It was probably owing to this circumstance, quite as much as to economic considerations of freedom of trade, that the act of Elizabeth never found much favour with the courts of law. Soon after the Great Rebellion we find the apprentice laws strongly reprobated by the judges, who endeavoured, on the theory that the act of Elizabeth could apply to no trades which were not in existence at its date, to limit its operation as far as possible. Such limitation of the act gave rise to many absurd anomalies and inconsistencies, *e.g.* that a coachmaker could not make his own wheels but must buy them of a wheelwright, while the latter might make both wheels and coaches, because coach-making was not a trade in England when the act of Elizabeth was passed. For the like reason the great textile and metal manufactures which arose at Manchester and Birmingham were held exempt from the operation of the statute. Concurrently with the dislike to the apprentice laws which such anomalies generated, the doctrines of Adam Smith, that all monopolies or restrictions on the freedom of trade were injurious to the public interest, had gradually been making their way, and notwithstanding much opposition an act was passed in 1814 by which the statute of Elizabeth, in so far as it enacts that no person shall engage in any trade without a seven years' apprenticeship, was wholly repealed. The effect of this act was to give every person the fullest right to exercise any occupation or calling of a mechanical or trading kind for which he deemed himself qualified.

Apprenticeship, therefore, which was formerly a compulsory, now became a voluntary contract. In the case of the learned professions the principles and theories which gave birth to corporations with monopolies, and required apprenticeship or its equivalents, have—contrary to what has taken place in trade—been not only maintained but intensified; that is to say, not only have such bodies retained and even extended in some cases their exclusive privileges, but in general no one is allowed to practise in such professions unless his capabilities have been tested and approved by public authority. Thus no man is allowed to practise law or medicine in any of their branches who has not undergone the appropriate training by attendance at a university or by apprenticeship—sometimes by both combined—and passed certain examinations. Entrance to the church is guarded by similar checks. In such instances the old principle—now generally abandoned in trade—of granting a monopoly to those possessing a certain standard of qualification is maintained in greater vigour than ever.

In some kinds of manufacture the old conditions have been modified by the subdivisions of labour or by the introduction of machinery, which have reduced the amount of skill which formerly was requisite, and thus they have passed out of the category of the higher skilled handicrafts, as only a very slight or short training is necessary to make an efficient worker; but a large number of the higher skilled trades remain which require a long period of training at the bench, and a careful inquiry into this subject has shown that in nearly all of such trades there is a scarcity of skilled workers, which is due to the falling off in the number of apprenticeships. Many persons qualified to form an opinion deplore that something in the nature of the old standard of qualification is not still applied to those trades, and consider that the only method of restoring a high standard of skill is by apprenticeship. The decay of apprenticeship in these trades is due, not to any inherent defect in the system, nor to its having been superseded by any other form of technical education, but to difficulties, especially in London and some other large towns, which place it beyond the reach of that class of persons who have the greatest need of it. Among these difficulties are:—first, insufficient organization, and secondly, want of funds to pay premiums where such are required. These difficulties are

accentuated in London and some other large towns, but in many other districts apprenticeship is actively proceeded with. Efforts are being made, notably by the National Institution of Apprenticeship, to meet these difficulties. The Charity Commissioners in their report for 1905 recognized the value of this institution, and stated that they would in future enable the trustees of charity endowments for apprenticeship to avail themselves of the practical co-operation of the institution. The modern trade unions, on the other hand, have done nothing to assist in restoring apprenticeship to its proper place; on the contrary, they have hampered it by restrictions which they have imposed, limiting the number of apprentices who may be taken. The result of fewer apprentices has been not only to lower the standard of skill in the higher trades, but to reduce the productive capacity of the artisans. The altered conditions now attending apprenticeship are, mainly, that the apprentice does not live with the master, and that the term is generally five years instead of a longer period; but the principle remains precisely the same, and the fact that it is applied more and more largely in Austria, Germany and other countries is an evidence of its necessity.

The contract of apprenticeship is generally created by indenture, but any writing properly expressed and attested will do. The full consideration must be set out, and the instrument, whether a premium is paid or not, must be duly stamped, except in the case of parish apprentices and apprentices to the sea service (see SEAMEN, LAWS RELATING TO). Where a charity or institution intervenes, it retains control over the indentures until the end of the term of apprenticeship, when the indenture should be cancelled and given up to the apprentice. Any one who is capable of making a contract can take an apprentice, and the law does not limit the number which may be taken by any master. Any person of legal capacity can bind himself as an apprentice, provided he is over seven years of age, though, as he is by the common law exempt from all liability *ex contractu*, it is usual for the apprentice's relations or friends to become bound for his service and good conduct during the period of his apprenticeship. The consent of the apprentice, however, must be expressed by his executing the indenture. No child under nine can be bound as a parish apprentice. The master must teach the apprentice the agreed trade or trades; should the master exercise two trades (which he has agreed to teach) and give up one, it would be good ground for dissolving the contract by the apprentice. An apprentice is not bound to work on Sundays, but he may be required to work on bank holidays. He cannot become a volunteer (soldier) without his master's consent. It is usual in the indenture to state whether the apprentice is to be paid wages or otherwise. If the contract is to pay wages, no deduction can be made owing to illness or accident, unless it has been so provided for in the indentures. Nor is the apprentice liable for breakages or similar faults. The master has been supposed to have a right to administer moderate corporal punishment, though he may not delegate it. But this right is really obsolete. According to old custom a master provided proper food for his apprentices, and medical attendance when required; but the modern practice is for apprentices to reside with their parents or friends who maintain them. A master cannot assign indentures without the approval of the apprentice or such parties as are named in the contract for this purpose, even if he should transfer his business. The contract of apprenticeship may be dissolved by (1) efflux of time; (2) by death (if the master dies, some part of the premium is usually returnable, but if the apprentice dies no part is returnable); (3) by consent; (4) in case of grave misconduct; (5) under the Bankruptcy Act 1883, providing for discharge of the indentures of apprenticeship and for payment on account of premium. Disputes between master and apprentice, in cases where no premium has been paid, or where the premium does not exceed £25, are dealt with by courts of summary jurisdiction. Apprentices bound according to the "custom of London," who are infants above the age of fourteen years and under twenty-one and unmarried, are responsible upon covenants contained in indentures executed by them just as if they were of full age. The term of apprenticeship is usually not less than four years. Apprentices by the custom of London in agreements made at the Guildhall are subject to the jurisdiction of the chamberlain of London.

Parish apprentices are those bound out by guardians of the poor in England. By the Poor Relief Act 1601, overseers of the poor were empowered, with the consent of two justices, to put out poor children as apprentices "where they shall be convenient." Owing to the disinclination to receive such apprentices it became necessary to make the reception compulsory (1696), but this compulsion to receive them was abolished in 1844. Many statutes have been passed from time to time regulating the apprenticing of parish children, but it is now under the control of the Local Government Board, which issues rules specifying fully the manner in which such children are to be bound, assigned and maintained.

AUTHORITIES.—See E. Austin, *Law Relating to Apprentices* (1890); Addison, *On Contracts* (1905). For the state of apprenticeship in European countries, and, more particularly in France, see *Apprentissage, enquête et documents* (Paris, 1904, Conseil Supérieur du Travail, Ministère du Commerce, de l'Industrie, des Postes et des Télégraphes, session de 1902). See also the literature issued by the National Institution of Apprenticeship, London. (J. S. B.)

APPROPRIATION (from Lat. *appropriare*, to set aside), the act of setting apart and applying to a particular use to the exclusion of all other. In ecclesiastical law, appropriation is the perpetual annexation of an ecclesiastical benefice to the use of some spiritual corporation, either aggregate or sole. In the middle ages in England the custom grew up of the monasteries reserving to their own use the greater part of the tithes of their appropriated benefices, leaving only a small portion to their vicars in the parishes. On the dissolution of the monasteries these "great tithes" were often granted, with the monastic lands, to laymen, whose successors, known as "lay impropriators" or "lay rectors," still hold them, the system being known as *impropriation*. Appropriation may be severed and the church become disappropriate, by the presentation of a clerk, properly instituted and inducted, or by the dissolution of the corporation possessing the benefice.

In the law of debtor and creditor, appropriation of payments is the application of a particular payment for the purpose of paying a particular debt. When a creditor has two debts due to him from the same debtor on distinct accounts, the general law as to the appropriation of payments made by the debtor is that the debtor is entitled to apply the payments to such account as he thinks fit; *solvitur in modum solventis*. In default of appropriation by the debtor the creditor is entitled to determine the application of the sums paid, and may appropriate them even to the discharge of debts barred by the Statute of Limitations. In default of appropriation by either debtor or creditor, the law implies an appropriation of the earlier payments to the earlier debts.

In constitutional law, appropriation is the assignment of money for a special purpose. In the United Kingdom an Appropriation Bill is a bill passed at the end of each session of parliament, enumerating the money grants made during the session, and appropriating the various sums, as voted by committee of supply, to the various purposes for which it is to be applied. The United States constitution (art. I. § 9) says: "No money shall be drawn from the treasury, but in consequence of appropriations made by law." Bills for appropriating money originate in the House of Representatives, but may be amended in the Senate.

APPURTENANCES (from late Lat. *appertinentia*, from *appertinere*, to appertain), a legal term for what belongs to and goes with something else, the accessories or things usually conjoined with the substantive matter in question.

APRAKSIN, THEDOR MATVYEEVICH (1671–1728), Russian soldier, began life as one of the pages of Tsar Theodore III., after whose death he served the little tsar Peter in the same capacity. The playfellowship of the two lads resulted in a lifelong friendship. In his twenty-first year Apraksin was appointed governor of Archangel, then the most important commercially of all the Russian provinces, and built ships capable of weathering storms, to the great delight of the tsar. He won his colonelcy at the siege of Azov (1696). In 1700 he was appointed chief of the admiralty,

in which post (from 1700 to 1706) his unusual technical ability was of great service. While Peter was combating Charles XII., Apraksin was constructing fleets, building fortresses and havens (Taganrog). In 1707 he was transferred to Moscow. In 1708 he was appointed commander-in-chief in Ingria, to defend the new capital against the Swedes, whom he utterly routed, besides capturing Viborg in Carelia. He held the chief command in the Black Sea during the campaign of the Pruth (1711), and in 1713 materially assisted the conquest of Finland by his operations from the side of the sea. In 1719–1720 he personally conducted the descents upon Sweden, ravaging that country mercilessly, and thus extorting the peace of Nystad, whereby she surrendered the best part of her Baltic provinces to Russia. For these great services he was made a senator and admiral-general of the empire. His last expedition was to Reval in 1726, to cover the town from an anticipated attack by the English government, with whom the relations of Russia at the beginning of the reign of Catharine I. were strained almost to breaking-point. Though frequently threatened with terrible penalties by Peter the Great for his incurable vice of peculation, Apraksin, nevertheless, contrived to save his head, though not his pocket, chiefly through the mediation of the good-natured empress, Catharine, who remained his friend to the last, and whom he assisted to place on the throne on the death of Peter. Apraksin was the most genial and kind-hearted of all Peter's pupils. He is said to have never made an enemy. He died on the 10th of November 1728.

See R. Nisbet Bain, *The Pupils of Peter the Great* (London, 1897). (R. N. B.)

APRICOT (from the Lat. *praecox*, or *praecoquus*, ripened early, *coquere*, to cook, or ripen; the English form, formerly "apricock" and "abrecox," comes through the Fr. *abricot*, from the Span. *albaricoque*, which was an adaptation of the Arabic *al-burquk*, itself a rendering of the late Gr. πρεκόκκια or πραικόκιον, adapted from the Latin; the derivation from *in aprico coctus* is a mere guess), the fruit of *Prunus armeniaca*, also called *Armeniaca vulgaris*. Under the former name it is regarded as a species of the genus to which the plums belong, the latter establishes it as a distinct genus of the natural order *Rosaceae*. The apricot is, like the plum, a stone fruit, cultivated generally throughout temperate regions, and used chiefly in the form of preserves and in tarts. The tree has long been cultivated in *Armenia* (hence the name *Armeniaca*); it is a native of north China and other parts of temperate Asia. It flowers very early in the season, and is a hardy tree, but the fruit will scarcely ripen in Britain unless the tree is trained against a wall. A great number of varieties of the apricot, as of most cultivated fruits, are distinguished by cultivators. The kernels of several varieties are edible, and in Egypt those of the Musch-Musch variety form a considerable article of commerce. The French liqueur *Eau de noyaux* is prepared from bitter apricot kernels. Large quantities of fruit are imported from France into the United Kingdom.

The apricot is propagated by budding on the mussel or common plum stock. The tree succeeds in good well-drained loamy soil, rather light than heavy. It is usually grown as a wall tree, the east and west aspects being preferred to the south, which induces mealiness in the fruit, though in Scotland the best aspects are necessary. The most usual and best mode of training is the fan method. The fruit is produced on shoots of the preceding year, and on small close spurs formed on the two-year-old wood. The trees should be planted about 20 ft. apart. The summer pruning should begin early in June, at which period all the irregular fore-right and useless shoots are pinched off; and, shortly afterwards, those which remain are fastened to the wall. At the winter pruning all branches not duly furnished with spurs and fruit buds are removed. The young bearing shoots are moderately pruned at the points, care being, however, taken to leave a terminal shoot or leader to each branch. The most common error in the pruning of apricots is laying in the bearing shoots too thickly; the branches naturally diverge in fan training, and when they extend so as to be about 15 in. apart, a fresh branch should be laid in, to be again subdivided as required. The blossoms of the apricot open early in spring, but are more hardy than those of the peach; the same means of protection when necessary may be employed for both. If the fruit sets too numerously, it is thinned out in June and in the beginning of July, the later thinnings being used for tarts. In the south of England, where the soil is suitable, the hardier sorts of apricot, as the Breda and Brussels, bear well as standard trees in favourable seasons. In such cases the trees may be planted from 20 to 25 ft. apart.

The ripening of the fruit of the apricot is accelerated by culture under glass, the trees being either planted out like peaches or grown in pots on the orchard-house system. They must be very gently excited, since they naturally bloom when the spring temperature is comparatively low. At first a maximum of 40° only must be permitted; after two or three weeks it may be raised to 45°, and later on to 50° and 55°, and thus continued till the trees are in flower, air being freely admitted, and the minimum or night temperature ranging from 40° to 45°. After the fruit is set the temperature should be gradually raised, being kept higher in clear weather than in dull. When the fruit has stoned, the temperature may be raised to 60° or 65° by day and 60° by night; and for ripening off it may be allowed to reach 70° or 80° by sun heat.

The Moorpark is one of the best and most useful sorts in cultivation, and should be planted for all general purposes; the Peach is a very similar variety, not quite identical; and the Hemskerk is also similar, but hardier. The Large Early, which ripens in the end of July and beginning of August, and the Kaisha, a sweet-kernelled variety, which ripens in the middle of August, are also to be recommended. For standard trees in favourable localities the Breda and Brussels may be added.

APRIES (Ἀπρίης), the name by which Herodotus (ii. 161) and Diodorus (i. 68) designate *Uchabrē*, Οὐαφρῆς (Pharaoh-Hophra), the fourth king (counting from Psammetichus I.) of the twenty-sixth Egyptian dynasty. He reigned from 589 to 570 B.C. See EGYPT and AMASIS.

APRIL, the second month of the ancient Roman, and the fourth of the modern calendar, containing thirty days. The derivation of the name is uncertain. The traditional etymology from Lat. *aperire*, "to open," in allusion to its being the season when trees and flowers begin to "open," is supported by comparison with the modern Greek use of ἄνοιξις (opening) for spring. This seems very possible, though, as all the Roman months were named in honour of divinities, and as April was sacred to Venus, the *Festum Veneris et Fortunae Virilis* being held on the first day, it has been suggested that Aprilis was originally her month Aphrilis, from her Greek name Aphrodite. Jacob Grimm suggests the name of a hypothetical god or hero, *Aper* or *Aprus*. On the fourth and the five following days, games (*Ludi Megalenses*) were celebrated in honour of Cybele; on the fifth there was the *Festum Fortunae Publicae*; on the tenth (?) games in the circus, and on the nineteenth equestrian combats, in honour of Ceres; on the twenty-first—which was regarded as the birthday of Rome—the *Vinalia urbana*, when the wine of the previous autumn was first tasted; on the twenty-fifth, the *Robigalia*, for the averting of mildew; and on the twenty-eighth and four following days, the riotous *Floralia*. The Anglo-Saxons called April *Oster-monath* or *Eostur-monath*, the period sacred to *Eostre* or *Ostara*, the pagan Saxon goddess of spring, from whose name is derived the modern Easter. St George's day is the twenty-third of the month; and St Mark's Eve, with its superstition that the ghosts of those who are doomed to die within the year will be seen to pass into the church, falls on the twenty-fourth. In China the symbolical ploughing of the earth by the emperor and princes of the blood takes place in their third month, which frequently corresponds to our April; and in Japan the feast of Dolls is celebrated in the same month. The "days of April" (*journées d'avril*) is a name appropriated in French history to a series of insurrections at Lyons, Paris and elsewhere, against the government of Louis Philippe in 1834, which led to violent repressive measures, and to a famous trial known as the *procès d'avril*.

See Chambers's *Book of Days*; Grimm's *Geschichte der deutschen Sprache*. Cap. "Monate"; also APRIL-FOOLS' DAY.

APRIL-FOOLS' DAY, or ALL-FOOLS' DAY, the name given to the 1st of April in allusion to the custom of playing practical jokes on friends and neighbours on that day, or sending them on fools' errands. The origin of this custom has been much disputed, and many ludicrous solutions have been suggested, *e.g.* that it is a farcical commemoration of Christ being sent from Annas to Caiaphas, from Caiaphas to Pilate, from Pilate to Herod, and from Herod back again to Pilate, the crucifixion having taken place about the 1st of April. What seems certain is that it is in some way or other a relic of those once universal festivities held at the vernal equinox, which, beginning on old New Year's day, the 25th of March, ended on the 1st of April. This view gains support from the fact that the exact counterpart of April-fooling is found to have been an immemorial custom in India. The festival of the spring equinox is there termed the feast of Huli, the last day of which is the 31st of March, upon which the chief amusement is the befooling of people by sending them on fruitless errands. It has been plausibly suggested that Europe derived its April-fooling from the French. They were the first nation to adopt the reformed calendar, Charles IX. in 1564 decreeing that the year should begin with the 1st of January. Thus the New Year's gifts and visits of felicitation which had been the feature of the 1st of April became associated with the first day of January, and those who disliked the change were fair butts for those wits who amused themselves by sending mock presents and paying calls of pretended ceremony on the 1st of April. Though the 1st of April appears to have been anciently observed in Great Britain as a general festival, it was apparently not until the beginning of the 18th century that the making of April-fools was a common custom. In Scotland the custom was known as "hunting the gowk," *i.e.* the cuckoo, and April-fools were "April-gowks," the cuckoo being there, as it is in most lands, a term of contempt. In France the person befooled is known as *poisson d'avril*. This has been explained from the association of ideas arising from the fact that in April the sun quits the zodiacal sign of the fish. A far more natural explanation would seem to be that the April fish would be a young fish and therefore easily caught.

A PRIORI (Lat. *a*, from, *prior*, *prius*, that which is before, precedes), (1) a phrase used popularly of a judgment based on general considerations in the absence of particular evidence; (2) a logical term first used, apparently, by Albert of Saxony (14th century), though the theory which it denotes is as old as Aristotle. In the order of human knowledge the particular facts of experience come first and are the basis of generalized laws or causes (the Scholastic *notiora nobis*); but in the order of nature the latter rank first as the self-existent, fundamental truths of existence (*notiora naturae*). Thus to Aristotle the *a priori* argument is from law or cause to effect, as opposed to what we call *a posteriori* (*posterior*, subsequent, derived), from effect to cause. Since Kant the two phrases have become purely adjectival (instead of adverbial) with a technical controversial sense, closely allied to the Aristotelian, in relation to knowledge and judgments generally. *A priori* is applied to judgments which are regarded as independent of experience, and belonging to the essence of thought; *a posteriori* to those which are derived from particular observations. The distinction is analogous to that between analysis and synthesis, deduction and induction (but there may be a synthesis of *a priori* judgments, cf. Kant's "Synthetic Judgment *a priori*"). Round this distinction a rather barren controversy has raged, and almost all modern philosophers have labelled themselves either "Intuitionalist" (*a priori*) or "Empiricist" (*a posteriori*) according to the view they take of knowledge. In fact, however, the rival schools are generally arguing at cross purposes; there is a knowledge based on particulars, and also a knowledge of laws or causes. But the two work in different spheres, and are complementary. The observation of isolated particulars gives not necessity, but merely strong probability; necessity is purely intellectual or "transcendental." If the empiricist denies the intellectual element in scientific knowledge, he must not claim absolute validity for his conclusions; but he may hold against the intuitionalist that absolute laws are impossible to the human intellect. On the other hand, pure *a priori* knowledge can be nothing more than form without content (*e.g.* formal logic, the laws of thought). The simple fact at the bottom of the controversy is that in all empirical knowledge there is an intellectual element, without which there is no correlation of empirical data, and every judgment, however simple, postulates a correlation of some sort if only that between the predicate and its contradictory.

APRON (a corruption arising from a wrong division of "a napron" into "an apron," from the Fr. *naperon*, *napperon*, a diminutive of *nappe*, Lat. *mappa*, a napkin), an article of costume used to protect the front of the clothes. It forms part of the ceremonial dress of Freemasons. The "apron" worn by church dignitaries is a shortened cassock (*q.v.*). The word has many technical uses, as for the protecting slope in front of the sill of dock-gates, or at the foot of weirs.

APSARAS, in Hindu mythology, a female spirit of the clouds and waters. In the Rig-Veda there is one Apsaras, wife of Gandharva; in the later scriptures there are many Apsaras who act as the handmaidens of Indra and dance before his throne. They are able to change their form, and specially rule over the fortunes of gaming. One of their duties is to guide to paradise the heroes who fall in battle, whose wives they then become. They are distinguished as *daivika* ("divine") or *laukika* ("worldly").

APSE (Gr. ἁψίς, a fastening, especially the felloe of a wheel; Lat. *absis*), in architecture, a semicircular recess covered with a hemispherical vault. The term is applied also to the termination to the choir, transept or aisle of any church which is either semicircular or polygonal in plan, whether vaulted or covered with a timber roof; a church is said to be "apsidal" when it terminates in an apse.

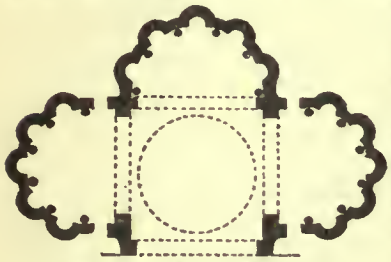
The earliest example of an apse is found in the temple of Mars Ultor at Rome (2 B.C.), and it formed afterwards the favourite feature terminating the rear of any temple, and one which gave importance to the statue of the deity to whom the temple was dedicated. Its use by the Romans was not confined to the temples, as it is found in the palaces on the Palatine Hill, the great Thermae (Baths) and other monuments. In the civil basilicas the apse was screened off by columns, and constituted the court of justice. In the Ulpian (Trajan's) Basilica the apses at each end were of such great dimensions as to come better under the definition of hemicycles (*q.v.*). In these apses the floor was raised, and had an altar placed in the centre of its chord, where sacrifices were made prior to the sittings. The only other two Roman basilicas in which the semicircular apse can still be traced are that commenced by Maxentius and completed by Constantine at Rome and the basilica at Trier (Trèves).

In the earliest Christian basilica, St Peter's at Rome, built 330 A.D., the apse, 57 ft. in diameter, raised above the confessio or crypt, was placed at the west end of the church. This orientation was originally followed in the churches of St Paul and St Lawrence (S. Lorenzo fuori le Mura), both outside the walls of Rome, and is found in most of the churches at Rome. On the other hand, in the Byzantine church, the apse was built at the east end of the church.

During the reign of Justin the Second (A.D. 565–574), owing to a change in the liturgy, two more apses were added, one on each side of the central apse. These in the Greek Church were provided not to hold altars but for ceremonial purposes. One of the earliest examples is found in the church of St Nicholas at Myra of the 6th century, and the basilica erected in the great court of the temple at Baalbek shows the triple apse. The earliest example in Rome is found in the church of Sta Maria in Cosmedin (772–795), built probably by Greek craftsmen, who had been exiled by the Iconoclasts. Other triapsal choirs are found in the cathedral of Parenzo (542 A.D.), in St Mark's, Venice, in Sta Fosca and the Duomo at Torcello, and in numerous examples throughout Italy and Germany. In central Syria there is one example only, at Kalat Seman, where the side apses were a later addition.

There is one important distinction to be drawn between the Byzantine and the Latin apses; they are both semicircular internally, but externally the former are nearly always polygonal. It follows, therefore, that in those churches in Italy where the apse is polygonal externally, it is a sign of direct Byzantine influence. This is found in St Mark's, Venice; Sta Fosca, Torcello; Murano; nearly all the churches at Ravenna; and in the Crusaders' churches throughout Syria.

In the Coptic church in Egypt we find other characteristics; in the churches of the Red and White Monasteries, attributed to St Helena, an unusual depth is given to the apse, in the walls of which niches are sunk; in the church of St John at Antinoë there are no fewer than seven. Similar niches are found in the apses of St Mark's, Venice, built in A.D. 828, it is said in imitation of St Mark's in Alexandria, to receive the relics of St Mark brought over from there.



Apse of the White Monastery.

In a large number of the apses in the Coptic churches the seats round the apse with the bishop's throne in the centre are still preserved; of these the best examples are at Abu Sargah, Al 'Adra and Abu-s-Sifain. Unfortunately there are no remains of the fittings in the tribunes of the ancient Roman basilicas, but those in St Peter's at Rome, which were probably copied from them, are recorded in drawings, there being two or three rows of stone seats with the papal throne in the centre. It is possible also that some may still exist in the other early Christian basilicas at Rome, but there have been so many changes that it is not possible to trace them. In the cathedral of Parenzo in Istria (A.D. 532–535), the hemicycle of marble seats for the clergy with the episcopal chair in the centre still exists. A similar arrangement is found in the apse of the church of the 6th century attached to the church of St Helena in the island of Paros, where there are eight steep grades of semicircular stone seats with the bishop's chair in the centre. The aspect of the interior of this apse has in consequence very much the appearance of a Roman theatre. A third example, better known, exists at Torcello, with six concentric seats rising one above the other, and in the centre the episcopal chair with a flight of thirteen steps down in front of it.

In the basilica at Bethlehem, the east end of which was reconstructed probably in the 5th century, apses of similar dimensions to the eastern apse were built at the north and south end of the transept. The same disposition is found in the Coptic churches of the Red and White Monasteries just referred to, in the church of St Elias at Salonica (*c.* 1012), the cathedral of Echmiadzin in Armenia, at Vatopedi, Mt. Athos, and some other Byzantine churches. An early example in France exists in the church of Germigny-des-Prés on the Loire (806; rebuilt 1868), where the three apses are horseshoe on plan, and the same is found in the church at Oberzell in the island of Reichenau, Lake of Constance, except that the eastern apse there is square. Small examples also are found at Querqueville and at St Wandrille near Caudebec, both in Normandy, but the finest development takes place in the church of St Maria im Capitol at Cologne, where the aisles are carried round both the northern and southern apses. The same feature exists in the cathedral of Tournai in Belgium and the churches at Cambrai, Soissons and Valenciennes (the last destroyed at the Revolution) in France, and also in the cathedrals of Como and of Pisa in Italy. Without aisles, there are examples in the churches of the Apostles and of St Martin at Cologne; St Quirinus at Neuss; at Roermond; St Cross, Breslau; the cathedral of Bonn; and, at a later date, in the Marienkirche at Trier; S. Elizabeth at Marburg; the church of Sta Maria-del-Fiore at Florence; and the cathedral of Parma.

In consequence of a change made in the orientation of apses in the 6th or 7th century, others were subsequently added at the west end of existing churches, and this is considered to have been the case at Canterbury; but in the German churches sometimes apses were built from the first at both ends, such as are shown on the manuscript plan of St Gall, of the 9th century. Western apses exist at Gernrode; Drübeck; Huyseburg; the Obermünster of Regensburg; St Godehard in Hildesheim; the cathedrals of Worms and Trier; the Abbey church of Laach; the Minster at Bonn; and in St Piëtro-in-Grado near Pisa.

The triapsal churches, to which we have referred, are those in which the side apses form the termination of the side aisles; but where there are transepts, the aisles are sometimes not continued beyond them, and the expansion of the transept to north and south gives more ample space for apses; of these there are many examples, as in the Abbey church of Laach in Germany; at Romsey; Christchurch, Hants; Gloucester, Ely, Norwich and Canterbury cathedrals, in England; and at St Georges de Boscherville in France; sometimes there being space for two apses on each side.

In the beginning of the 13th century in France, the apses became radiating chapels outside the choir aisle, henceforth known as the chevet. These radiating chapels would seem to have been suggested in Norwich and Canterbury cathedrals, but the feature is essentially a French one and in England is found only in Westminster Abbey, into which it was introduced by Henry III., to whom the chevets of Amiens, Beauvais and Reims were probably well known. (R. P. S.)

APSE and **APSIDES,** in mechanics, either of the two points of an orbit which are nearest to and farthest from the centre of motion. They are called the lower or nearer, and the higher or more distant apsides respectively. The "line of apsides" is that which joins them, forming the major axis of the orbit.

APSINES of Gadara, a Greek rhetorician, who flourished during the 3rd century A.D. After studying at Smyrna, he taught at Athens, and gained such a reputation that he was raised to the consulship by the emperor Maximinus (235–238). He was the friend of Philostratus, the author of the *Lives of the Sophists*, who speaks of his wonderful memory and accuracy. Two rhetorical treatises by him are extant: Τέχνη ῥητορική, a handbook of rhetoric greatly interpolated, a considerable portion being taken from the *Rhetoric* of Longinus; and a smaller work, Περὶ ἐσχηματισμένων προβλημάτων, on Propositions maintained figuratively.

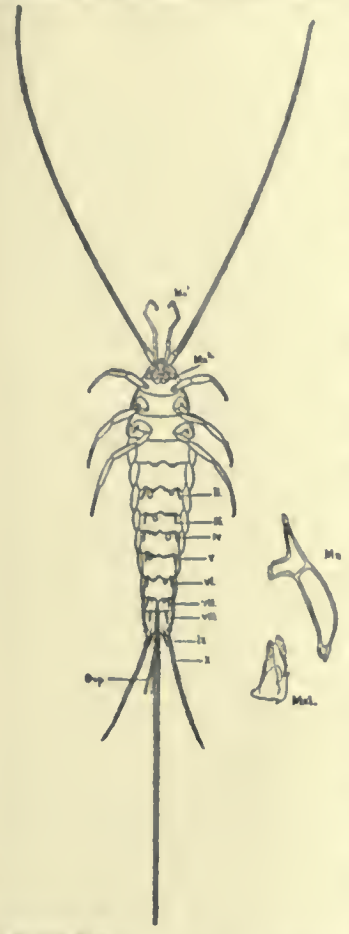
Editions by Bake, 1849; Spengel-Hammer in *Rhetores Graeci*, ii. (1894); see also Hammer, *De Apsine Rhetore* (1876); Volkmann, *Rhetorik der Griechen und Römer* (1885).

APT, a town of south-eastern France, in the department of Vaucluse, on the left bank of the Coulon, 41 m. E. of Avignon by rail. Pop. (1906) 4990. The town was formerly surrounded by massive ancient walls, but these have now been for the most part replaced by boulevards; many of its streets are narrow and irregular. The chief object of interest is the church of Sainte-Anne (once the cathedral), the building of which was begun about the year 1056 on the site of a much older edifice, but not completed until the latter half of the 17th century. Many Roman remains have been found in and near the town. A fine bridge, the Pont Julien, spanning the Coulon below the town, dates from the 2nd or 3rd century. A tribunal of first instance and a communal college are the chief public institutions. The chief manufactures are silk, confectionery and earthenware; and there is besides a considerable trade in fruit, grain and cattle. Apt was at one time the chief town of the Vulgientes, a Gallic tribe; it was destroyed by the Romans about 125 B.C. and restored by Julius Caesar, who conferred upon it the title *Apta Julia*; it was much injured by the Lombards and the Saracens, but its fortifications were rebuilt by the counts of Provence. The bishopric, founded in the 3rd century, was suppressed in 1790.

APTERA (Greek for "wingless"), a term in zoological classification applied by Linnaeus to various groups of wingless arthropods, including some of the insects, the centipedes, the millipedes, the Arachnida (scorpions, spiders, &c.) and the Crustacea. In

modern zoology the term has become restricted to the lowest order of the class Hexapoda or true insects. This order includes the bristle-tails and the springtails.

Many wingless insects—such as lice, fleas and certain earwigs and cockroaches—are placed in various orders together with winged insects to which they show evident relationships. In such cases the absence of wings must be regarded as secondary—due to a parasitic or other special manner of life. But the bristle-tails and springtails, which form the modern order Aptera, are all without any trace of wings, and, on account of several remarkable archaic characters which they exhibit, there is reason for believing that they are primitively wingless—that they represent an early offshoot which sprang from the ancestral stock of the Hexapoda before organs of flight had been acquired by the class.



From *Knowledge*.

FIG. 1.—A typical Thysanuran (*Machilis maritima*). Female, ventral view, magnified three times.
*Mx*¹, *Mx*², 1st and 2nd maxillae.
ii.-x, Appendages on 2nd to 10th abdominal segments. The eversible sacs on the abdominal segments are shown, some protruded and some retracted.
Ovp, Ovipositor.
Mn, Mandible, and *Mxl*. maxillula, dissected out of head and magnified fifteen times.

Characters.—In addition to the complete absence of wings and of metamorphosis, the Aptera are characterized by peculiar elongate mandibles (figs. 1, *Mn.*; 2, *4*), with toothed apex and sub-apical grinding surface, like those of certain Crustacea; by the presence between the mandibles and maxillae of a pair of appendages (superlinguae or maxillulae), fig. 1, *Mxl.*, which are absent or vestigial in all other insects; and, in most genera, by the presence in the adult of abdominal appendages used for locomotion, these latter varying in number from one to nine pairs. Among peculiarities of the internal organs the segmental arrangement of the ovaries in most members of the order is noteworthy. Many Aptera are covered with flattened scales like those of moths.

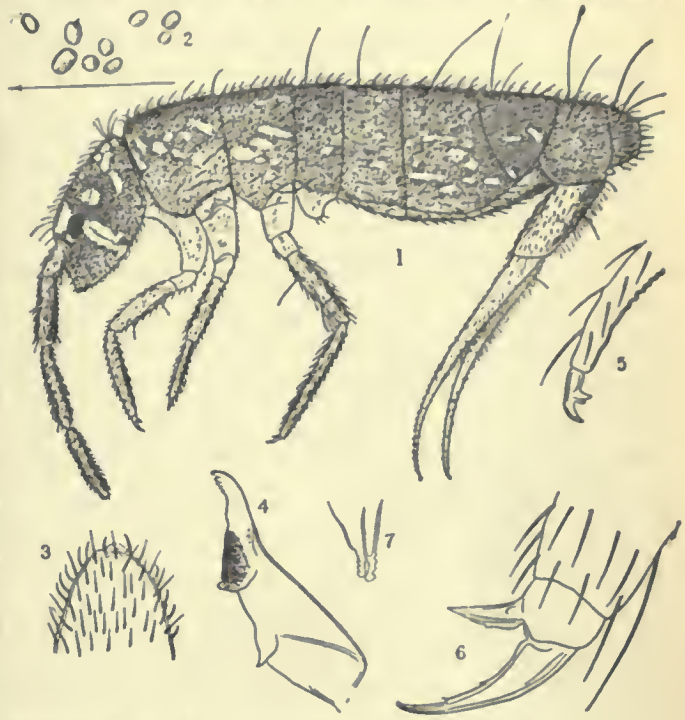
Classification.—The Aptera are divided into two divergent sub-orders, the *Thysanura* (*q.v.*) or bristle-tails, and the *Collembola* or springtails.

Thysanura.—The bristle-tails have an abdomen of eleven segments, the tenth usually carrying a pair of long many-jointed tail-feelers (cerci, fig. 1, x.); sometimes a median, jointed tail-appendage is also present. To these feelers the popular name is due. There may also be abdominal appendages—in the form of simple unjointed stylets (fig. 1, ii.-ix.), accompanied by paired eversible sacs, probably respiratory in function—on eight (or fewer) other abdominal segments. The head of a bristle-tail carries a pair of compound eyes and a pair of elongate many-jointed feelers.

The air-tube system is developed in varying degree in different bristle-tails, the number of pairs of spiracles being three (*Campodea*), nine (*Machilis*), ten (*Lepisma*), or eleven (*Japyx*).

Four families of Thysanura are usually recognized. In the *Machilidae* and *Lepismidae* (these two families are known as the Ectotrophi) the maxillae are like those of typical biting insects, and there is a median tail-bristle in addition to the paired cerci; while in the *Campodeidae* and *Japygidae* (which form the group Entotrophi) the jaws are apparently sunk in the head, through a deep inpushing at the mouth, and there is no median tail-bristle. The cerci in *Japyx* are not, as usual, jointed feelers, but strong, curved appendages forming a forceps as in earwigs.

Collembola.—In springtails, or *Collembola*, the jaws are sunk into the head, as in the entotrophous Thysanura; the head carries a pair of feelers with not more than six (usually four) segments, and there are eight (or fewer) distinct simple eyes on each side of the head (fig. 2, *1*, *2*). These are in some genera



From Carpenter, *Proc. R. Dub. Soc.* vol. xi.

FIG. 2.—Structure of Collembola.
1. *Isotoma hibernica*. Side view. × 30.
2. ,, Ocelli and post-antennal organ of right side. × 120.
3. ,, Tip of terminal antennal segment with antennal organ. × 240.
4. ,, Mandible. × 70.
5. ,, Tip of left dens with mucro. Outer view × 240.
6. ,, Hind-foot with claws. × 240.
7. *Entomobrya anomala*. Catch. × 240.

like the single elements (*ommatidia*) of a compound insect eye, in others like simple ocelli. The abdomen consists of six segments only. The first of these usually carries a ventral tube, furnished with paired eversible sacs which assist the insects in walking on smooth surfaces, and perhaps serve also as organs for breathing. From the researches of V. Willem it appears that the viscid fluid which causes the adherence of the ventral tube is secreted by a pair of glands in the head whose ducts open into a superficial groove leading from the second maxillae backward to the tube on the first abdominal segment. The third abdominal segment usually carries a pair of short appendages whose basal segments are fused together; this is the "catch" (fig. 2, *7*), whose function is to hold in place the "spring," which is formed by the fourth pair of abdominal appendages—also with fused basal segments. In most Collembola the spring appears to belong to the fifth abdominal somite, but Willem, by study of the muscles, has shown that it really belongs to the fourth. The fused basal segments of the appendages form the "manubrium" of the spring, which carries the two "dentes" (usually elongate

and flexible), each with a "mucro" at its tip (fig. 2, 5). The fifth abdominal segment is the genital, and the sixth the anal somite.

The spring serves the Collembola which possess it as an efficient leaping-organ (see SPRINGTAIL). But in some genera it is greatly reduced and in many quite vestigial.

Most springtails are without air-tubes, and breathe through the general cuticle of the body. But in one family (*Sminthuridae*) a spiracle, opening on either side between the head and the prothorax, leads to a branching system of air-tubes. The *Sminthuridae* are further characterized by the globular abdomen, which shows but little external trace of segmentation, and by the well-developed spring.

In the *Entomobryidae* the body is elongate and clearly segmented, but the dorsal region (tergum) of the prothorax is much reduced and the head downwardly directed; the spring is well developed. In the *Achorutidae* the head is forwardly directed, the tergum of the prothorax conspicuous, and the spring small or vestigial.

In many genera of springtails a curious post-antennal organ, consisting of sensory structures (often complex in form) surrounded by a firm ring, is to be noticed on the cuticle of the head between the eyes and the feelers. It may be of use as an organ of smell. Other sensory organs occur on the third and fourth antennal segments in the *Achorutidae* and *Entomobryidae* (fig. 2, 3).

Distribution and Habits.—The Aptera are probably the most widely distributed of all insects. Among the bristle-tails we find the genus *Machilis*, represented in Europe (including the Faeroe Islands) and in Chile; while *Campodea* lives high on the mountains and in the deepest caves. The springtails have even a wider distribution. The genus *Isotoma*, for example, has some of its numerous species in regions so remote as Alaska, Franz Josef Land, the Sandwich Islands, the South Orkneys, Graham Land, Kerguelen and South Victoria Land. As it is unlikely that these delicate insects could be transported across sea-channels, their wide and discontinuous range suggests both their great antiquity and the former existence of continental tracts over which they may have travelled to their present stations.

Springtails and bristle-tails live in damp concealed places—under stones or tree-bark, in moss, and in the decaying vegetable or animal matter which serves as food for most of them. Some species, however, eat fresh plant-tissues. A species of bristle-tail (*Machilis maritima*) and quite a number of springtails haunt the sea-coast at or below high-water mark. In such localities many thousands of individuals may sometimes be found associated together. The insect fauna of limestone caves both in Europe and North America is largely composed of Aptera, especially Collembola.

Geological History.—A supposed Thysanuran from the Silurian of New Brunswick has been described by G. F. Matthew, and another genus from the French Carboniferous by C. Brongniart. Not till the Tertiary do we find remains of Aptera in any quantity, species both of living and extinct genera being represented in the amber.

Development.—The embryonic development of several genera of Aptera, which has been carefully studied, will be more suitably described in comparison with that of other insects than here (see HEXAPODA).

BIBLIOGRAPHY.—The modern study of the Aptera may be said to date from the classical memoirs of T. Tullberg, "Sveriges Podurider," in *Kongl. Svensk Vetensk. Akad. Handl.* x., 1872, and Sir J. Lubbock (Lord Avebury), "Monograph of the Collembola and Thysanura," *Ray Society*, 1873. In these, full references to the older literature will be found. Subsequently our knowledge of the Thysanura has been markedly advanced by J. T. Oudemans, *Bijdrage tot de Kennis den Thysanura en Collembola* (Amsterdam, 1888); B. Grassi, who published between 1885 and 1889 a series of memoirs entitled "I progenitori dei Miriapodi e degli Insetti," in the *Atti Accad. di Scienz. Nat. Catania*, and the *Memor. R. Accad. dei Lincei*; and V. Willem, whose "Recherches sur les Collemboles et les Thysanoures," in *Mem. Cour. Acad. Roy. Belgique*, lviii., 1900, are indispensable to the student. In addition to this work of Willem, valuable anatomical papers on Collembola have been published by H. J. Hansen (*Zool. Anz.* xvi., 1893), J. W. Folsom (*Bull. Mus. Comp. Anat. Harv.* xxxv., 1899), C. Börner (*Zool. Anz.* xxiii., 1900), and K. Absolon (*Zool. Anz.* xxiii. and xxiv., 1900, 1901), the two latter writers having paid especial attention to the peculiar post-antennal and antennal sense-organs of springtails. Absolon has also written on the Collembola of caves. These writers, with H. Schött, C. Schäffer and others, have published many systematic papers on Collembola, as has F. Silvestri on Thysanura. British species are mentioned in Lubbock's monograph; for recent additions see G. H. Carpenter and W. Evans (*Proc. R. Phys. Soc. Edinb.* xiv., 1899, and xv., 1903). (G. H. C.)

APTERAL (from the Gr. ἄπτερος, wingless, ἀ-, privative and πτερόν, a wing), an architectural term applied to amphiprostyle temples which have no columns on the sides; in the Ionic temple on the Acropolis at Athens known as Nike Apteros, the adjective is used, not as applying to the goddess of victory but to the absence of any peristyle on the sides.

APTIAN (Fr. *Aptien*, from Apt in Vaucluse, France), in geology, the term introduced in 1843 by A. d'Orbigny (*Pal. France Crét.* ii.) for the upper stage of the Lower Cretaceous rocks. In England it comprises the Lower Greensand and part of the Speeton beds; in France it is divided into two sub-stages, the lower, "Bedoulian," of Bedoule in Provence, with *Hoplites deshayesei* and *Ancyloceras Matheroni*; and an upper, "Gargasian," from Gargas near Apt, with *Hoplites furcatus* (*Dufrenoyi*) and *Phylloceras Guettardi*. To this stage belong the *Toucasia* limestone and *Orbitolina* marls of Spain; the *Schrattenkalk* (part) of the Alpine and Carpathian regions; and the *Terebrirostra* limestone of the same area. Parts of the Flysch of the eastern Alps, the Biancone of Lombardy, and *argile scagliose* of Emilia, are of Aptian age; so also are the "Trinity Beds" of North America. Deposits of bauxite occur in the Aptian hippurite limestone at Les Baux near Arles, and in the Pyrenees. The Aptian rocks are generally clays, marls and green glauconitic sands with occasional limestones. (See GREENSAND and CRETACEOUS.)

APULEIUS, LUCIUS, Platonic philosopher and rhetorician, was born at Madaura in Numidia about A.D. 125. As the son of one of the principal officials, he received an excellent education, first at Carthage and subsequently at Athens. After leaving Athens he undertook a long course of travel, especially in the East, principally with the view of obtaining initiation into religious mysteries. Having practised for some time as an advocate at Rome, he returned to Africa. On a journey to Alexandria he fell sick at Oea (Tripoli), where he made the acquaintance of a rich widow, Aemilia Pudentilla, whom he subsequently married. The members of her family disapproved of the marriage, and indicted Apuleius on a charge of having gained her affections by magical arts. He easily established his innocence, and his spirited, highly entertaining, but inordinately long defence (*Apologia* or *De Magia*) before the proconsul Claudius Maximus is our principal authority for his biography. From allusions in his subsequent writings, and the mention of him by St Augustine, we gather that the remainder of his prosperous life was devoted to literature and philosophy. At Carthage he was elected provincial priest of the imperial cult, in which capacity he occupied a prominent position in the provincial council, had the duty of collecting and managing the funds for the temples of the cult, and the superintendence of the games in the amphitheatre. He lectured on philosophy and rhetoric, like the Greek sophists, apparently with success, since statues were erected in his honour at Carthage and elsewhere. The year of his death is not known.

The work on which the fame of Apuleius principally rests has little claim to originality. The *Metamorphoses* or *Golden Ass* (the latter title seems not to be the author's own, but to have been bestowed in compliment, just as the *Libri Rerum Quotidianarum* of Gaius were called *Aurei*) was founded on a narrative in the *Metamorphoses* of Lucius of Patrae, a work extant in the time of Photius. From Photius's account (impugned, however, by Wieland and Courier), this book would seem to have consisted of a collection of marvellous stories, related in an inartistic fashion, and in perfect good faith. The literary capabilities of this particular narrative attracted the attention of Apulcius's contemporary, Lucian, who proceeded to work it up in his own manner, adhering, as Photius seems to indicate, very closely to the original, but giving it a comic and satiric turn. Apuleius

followed this rifacimento, making it, however, the groundwork of an elaborate romance, interspersed with numerous episodes, of which the beautiful story of Cupid and Psyche is the most celebrated, and altering the *dénouement* to suit the religious revival of which he was an apostle.

The adventures of the youthful hero in the form of an ass are much the same in both romances, but in Apuleius he is restored to human shape by the aid of Isis, into whose mysteries he is initiated, and finally becomes her priestess. The book is a remarkable illustration of the contemporary reaction against a period of scepticism, of the general appetite for miracle and magic, and of the influx of oriental and Egyptian ideas into the old theology. It is also composed with a well-marked literary aim, defined by Kretzschmann as the emulation of the Greek sophists, and the transplantation of their *tours de force* into the Latin language. Nothing, indeed, is more characteristic of Apuleius than his versatility, unless it be his ostentation and self-confidence in the display of it. The dignified, the ludicrous, the voluptuous, the horrible, succeed each other with bewildering rapidity; fancy and feeling are everywhere apparent, but not less so affectation, meretricious ornament, and that effort to say everything finely which prevents anything being said well. The Latinity has a strong African colouring, and is crammed with obsolete words, agreeably to the taste of the time. When these defects are mitigated or overlooked, the *Golden Ass* will be pronounced a most successful work, invaluable as an illustration of ancient manners, and full of entertainment from beginning to end. The most famous and poetically beautiful portion is the episode of Cupid and Psyche, adapted from a popular legend of which traces are found in most fairy mythologies, which explains the seeming incongruity of its being placed in the mouth of an old hag. The allegorical purport he has infused into it is his own, and entirely in the spirit of the Platonic philosophy. Don Quixote's adventure with the wine-skins, and Gil Blas's captivity among the robbers, are palpably borrowed from Apuleius; and several of the humorous episodes, probably current as popular stories long before his time, reappear in Boccaccio.

Of Apuleius's other writings, the *Apology* has been already mentioned. The *Florida* (probably meaning simply "anthology," without any reference to style) consists of a collection of excerpts from his declamations, ingenious but highly affected, and in general perfect examples of the sophistical art of saying nothing with emphasis. They deal with the most varied subjects, and are intended to exemplify the author's versatility. The pleasing little tract *On the God of Socrates* expounds the Platonic doctrine of beneficent daemons, an intermediate class between gods and men. Two books on Plato (*De Platone et Ejus Dogmate*) treat of his life, and his physical and ethical philosophy; a third, treating of logic, is generally considered spurious. The *De Mundo* is an adaptation of the Περὶ κόσμου wrongly attributed to Aristotle. Apuleius informs us that he had also composed numerous poems in almost all possible styles, and several works on natural history, some in Greek. In the preparation of these he seems to have attended more closely to actual anatomical research than was customary with ancient naturalists. Some other works—dealing with theology, the properties of herbs, medical remedies and physiognomy, are wrongly attributed to him.

The character of Apuleius, as delineated by himself, is attractive; he appears vehement and passionate, but devoid of rancour; enterprising, munificent, genial and an enthusiast for the beautiful and good. His vanity and love of display are conspicuous, but are extenuated by a genuine thirst for knowledge and a surprising versatility of attainments. He prided himself on his proficiency in both Greek and Latin. His place in letters is accidentally more important than his genius strictly entitles him to hold. He is the only extant example in Latin literature of an accomplished sophist in the good sense of the term. The loss of other ancient romances has secured him a peculiar influence on modern fiction; while his chronological position in a transitional period renders him at once the evening star of the Platonic, and the morning star of the Neo-Platonic philosophy.

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APULIA (sometimes APPULIA in manuscripts but never in inscriptions), the district inhabited in ancient times by the Apuli. Strictly a Samnite tribe (see SAMNITES) settled round Mount Garganus on the east coast of Italy (Strabo vi. 3. 11), the Apuli mingled with the Iapygian tribes of that part of the coast (Dauni, Peucetii, Poediculi) who, like the Messapii, had come from Illyria, so that the name Apulia reached down to the border of the ancient Calabria. Almost the only monument of Samnite speech from the district is the famous *Tabula Bantina* from Bantia, a small city just inside the Peucetian part of Apulia, on the Lucanian border. This inscription is one of the latest and in some ways the most important monument of Oscan, though showing what appear to be some southern peculiarities (see OSCA LINGUA). Its date is almost certainly between 118 and 90 B.C., and it shows that Latin had not even then spread over the district (cf. LUCANIA). Far older than this are some coins from Ausculum and Teate (later known as Teanum Apulum), of which the earliest belong to the 4th century B.C. Roman or Latin colonies were few, Luceria (planted 314 B.C.) in the north and Brundisium (soon after 268) being the chief. (See R. S. Conway, *Italic Dialects*, xxviii.-xxx. pp. 15 f.; and Mommsen's introduction to the opening sections of *C.I.L.* ix.) (R. S. C.)

The wars of the 4th and 3rd centuries B.C. brought a great part of the pastures of the Apulian plain into the hands of the Roman state, and a tax was paid on every head of cattle and every sheep, at first to the tax farmer and later to the imperial procurator. It was under the Romans that the system of migration for the flocks reached its full development, and the practice is still continued; the sheep-tracks (*tratturi*), 350 ft. wide, leading from the mountains of the Abruzzi to the plain of Apulia date in the main at least from the Roman period, and are mentioned in inscriptions. The plain, however, which once served as winter grazing ground for a million sheep, now gives pasture to about one-half of that number.[1] The shepherds, who were slaves, often gave considerable trouble; we hear that some 7000 of them, who had made the whole country unsafe, were condemned to death in 185 B.C. (Livy xxxix. 29). Sheep-farming on a large scale was no doubt detrimental to the interests of the towns. We hear of repeated risings, for the last time in the Social War. Even in the 4th century B.C. the then chief town of Apulia, Teate or Teanum Apulum (see above), suffered in this way. Luceria subsequently took its place, largely owing to its military importance; but under the Empire it was succeeded by Canusium.

The road system of Apulia, which touched all the important towns, consisted of three main lines,—the Via Appia (see APPIA, VIA), the Via Traiana, and the coast road, running more or less parallel in an east-south-east direction. The first (the southernmost), coming east from Beneventum, entered Apulia at the Pons Aufidi, and ran through Venusia to Tarentum, and thence,

[1] The migration was made compulsory by Alphonso I. in 1442, and remained so until 1865. Since that time the *tratturi* have been to some extent absorbed by private proprietors.

turning north-east, to Brundusium. The second, coming north-east from Beneventum, turned east at Aecae, and ran through Herdoniae, Canusium, Butuntum, Barium and Gnathia (Gnatia) to Brundusium. There was also a short cut from Butuntum to Gnathia through Caelia, keeping inland. The third parallel line ran to the north of the Via Traiana, in continuation of the road along the north-east coast of Picenum and Samnium; it entered Apulia near Larinum (whence a branch ran south to Bovianum Undecimanorum), and thence, keeping in the plain to the south of the Mons Garganus, rejoined the coast at Sipontum, where it received a branch road from the Via Traiana at Aecae, passing through Luceria and Arpi. It then passed through Barduli (where it was joined by a road from Canusium by way of Cannae) to Barium, where it joined the Via Traiana. From Barium a road probably ran direct to Caelia, and thence south-south-east to join the Via Appia some 25 m. north-west of Tarentum.

Barium was an important harbour, though less so than Brundusium and Tarentum, which, however, belonged to Calabria in the Roman sense. Apulia, with Calabria, formed the second region of Augustus, though we once find Calabria treated as a part of the third region, Lucania (*C. I. L.* ix. 2213). The Hannibalic and later wars had, Strabo tells us, destroyed the former prosperity of the country; in imperial times we hear little or nothing of it. Both were governed by a *corrector* from the time of Constantine onwards, but in 668 the Lombards conquered Calabria and Apulia, and it was then that the former name was transferred to Bruttium, the meaning of the latter being extended to include Calabria also. In the 10th century the greater part of this territory was recovered by the Byzantine emperors, whose governor was called Κατεπανός, a name which, under the corrupt form Capitanata, belonged to the province of Foggia till 1861. It was conquered by the Normans under William Bras-de-fer, who took the title of *comes Apuliae* in 1042; it was raised to a dukedom with Calabria by Robert Guiscard in 1059, and united to the Sicilian monarchy in 1127. Many of the important towns possess fine Romanesque cathedrals, constructed under the Normans and the Hohenstaufen rulers. It shared the subsequent fate of Sicily, becoming a part of the kingdom of the Two Sicilies in 1734, and being united with Italy in 1861.

Modern Apulia comprises the three provinces of Foggia, Bari and Lecce (the latter corresponding roughly with the ancient Calabria, which, however, extended somewhat farther north inland), and is often known as Le Puglie; it stretches from Monte Gargano to the south-east extremity of Italy, with an area of 7376 sq. m.; it is bounded on the north and east by the Adriatic, on the south-east by the Gulf of Taranto, on the south by Basilicata and on the west by Campania and the Abruzzi. The three provinces correspond to the three natural divisions into which it falls. That of Foggia, though it has mountains on the west and south-west boundary, and the Monte Gargano at its north-east extremity, is in the main a great plain called the Tavoliere (chessboard) di Puglia, with considerable lagoons on its north and east coast. That of Bari, east-south-east of Foggia and divided from it by the Ofanto (Aufidus), the only considerable river of Apulia, 104 m. long, is a hilly district with a coast strip along which are the majority of the towns—the lack of villages is especially noticeable; in the *circondario* of Barletta, the north-east portion of the province, there are only eleven communes, with a total population of 335,934. That of Lecce, to the east-south-east again, is a low flat limestone terrace.

Modern Apulia.

The industries of Apulia are mainly pastoral or agricultural. Besides sheep, a considerable number of horses, cattle and swine are bred; while despite the lack of water, which is the great need of modern Apulia (in 1906 arrangements were made for a great aqueduct, to supply the three provinces from the head-waters of the Sele), cultivation is actively carried on, especially in the province of Bari, where grain, wine, olives, almonds, lemons, oranges, tobacco, &c., are produced in abundance, and the export of olive oil is attaining considerable importance. The salt works of Margherita di Savoia produce large quantities of salt, and nitre is extracted near Molfetta.

Railway communications are fairly good, the main line from Bologna to Brindisi passing through the whole length of Apulia, by way of Foggia and Bari, and having branches from Foggia (the main railway centre of Apulia) to Benevento and Caserta, to Manfredonia, to Lucera and to Rocchetta S. Antonio (and thence to either Avellino, Potenza or Gioia del Colle), from Ofantino to Margherita di Savoia, from Barletta to Spinazzola (between Rocchetta S. Antonio and Gioia del Colle), from Bari to Putignano, and via Gioia del Colle to Taranto, and from Brindisi to Taranto, and to Lecce and Otranto; besides which, there is a steam tramway from Barletta to Bari via Andria.

The most important harbours of Apulia are Brindisi, Bari, Taranto, Barletta, Molfetta and Gallipoli. The export of olive oil to foreign countries from the province of Lecce in 1905 amounted to 1048 tons, as against 3395 in 1901; but that to home ports increased from 7077 to 9025 tons in the same period. The production of wine was 358,953 tons in 1905 as against 203,995 tons in 1901 (an exceptionally bad year) and 284,156 tons in 1902. Of this 211,872 tons were forwarded by rail and sea, in the proportion of five to two respectively, the rest being used for home consumption and as a reserve. The cultivation of oriental tobacco is extending in the province (see *Consular Report*, No. 3672, July 1906).

The population of the province of Foggia was 425,450 (1901) as against 322,758 in 1871, the chief towns being Foggia (53,151), Cerignola (34,195), S. Severo (30,040), Monte S. Angelo (21,870), S. Marco in Lamis (17,309), Lucera (17,515); that of Bari, 827,698 (1901) as against 604,540 in 1871, the chief towns being Bari (77,478), Andria (49,569), Barletta (42,022), Corato (41,573), Molfetta (40,135), Trani (31,800), Bisceglie (30,885), Bitonto (30,617), Canosa (24,169), Ruvo (23,776), Terlizzi (23,232), Altamura (22,729), Monopoli (22,545), Gioia del Colle (21,721); that of Lecce, 706,520 (1901) as against 493,594 in 1871, the chief towns being Taranto (60,733), Lecce (32,687), Brindisi (25,317), Martina Franca (25,007), Ostuni (22,997), Francavilla Fontana (20,422), Ceglie Messapica (16,867), Nardo (14,387), Galatina (14,071), Gallipoli (13,552), Manduria (13,113). (T. As.)

APURÉ, a river of western Venezuela, formed by the confluence of the Sarare and Uribante at 6° 45′ N. lat. and 71° W. long., and flowing eastward across the Venezuelan *llanos* to a junction with the Orinoco at about 7° 40′ N. lat. and 66° 45′ W. long. Its drainage area includes the slopes of both the Colombian and Venezuelan Andes. It has a sluggish course across the *llanos* for about 300 m., and is navigable throughout its length. Its principal tributaries are the Caparro, Portuguesa and Guarico on the north, and the Caucagua on the south. Its lateral channels on the south mingle with those of the Arauca for many miles, forming an extensive district subject to annual inundations.

APURIMAC, a river of central Peru, rising in the Laguna de Villafra in the western Cordilleras, 7 m. from Caylloma, a village in the department of Arequipa, and less than 100 m. from the Pacific coast. It flows first north-easterly, then north-westerly past Cuzco to the mouth of the Perené tributary, thence east and north to its junction with the Ucayali at 10° 41′ S. lat., and 73° 34′ W. long. It is known as the Apurimac only down to the mouth of the Mantaro tributary, 11° 45′ S. lat. and 1325 ft. above sea-level. Thence to the mouth of the Perené (984 ft.) it is known as the Ené, and from that point to its junction with the Ucayali (859 ft.) as the Tambo.

APURIMAC, an interior department of southern Peru, bounded N. by the department of Ayacucho, E. by Cuzco, S. and W. by Cuzco and Ayacucho. Area, 8187 sq. m.; pop. (1896) 177,387. The department was created in 1873 and comprises five provinces. Its physical features and productions are very similar to those of Ayacucho (*q.v.*), with the exception that sugar-cane is cultivated with noteworthy success in the low valley of the province of Abancay. The capital, Abancay, 110 m. south-west of Cuzco, which is only a village in size but is rich in historical associations and Andahuaylas, in the north-west part of the department, are its principal towns.

APYREXIA (Gr. ἀπυρεξία, from ἀ-, privative, πυρέσσειν, to be in a fever, πῦρ, fire, fever), in pathology, the normal interval or period of intermission in a fever.

'AQĪBA BEN JOSEPH (*c.* 50–132), Jewish Palestinian rabbi, of the circle known as *tana* (*q.v.*). It is almost impossible to separate the true from the false in the numerous traditions respecting his life. He became the chief teacher in the rabbinical school of Jaffa, where, it is said, he had 24,000 scholars. Whatever their number, it seems certain that among them was the celebrated Rabbi Meir, and that through him and others 'Aqība exerted a great influence on the development of the doctrines embodied in the Mishnah. He sided with Bar Cochebas in the last Jewish revolt against Rome, recognized him as the Messiah, and acted as his sword-bearer. Being taken prisoner by the Romans under Julius Severus, he was flayed alive with circumstances of great cruelty, and met his fate, according to tradition, with marvellous steadfastness and composure. He is said by some to have been a hundred and twenty years old at the time of his death. He is one of the ten Jewish martyrs whose names occur in a penitential prayer still used in the synagogue service. 'Aqība was among the first to systematize the Jewish tradition, and he paved the way for the compilation of the Mishnah. From his school emanated the Greek translation of the scriptures by Aquila.

AQUAE (Lat. for "waters"), a name given by the Romans to sites where mineral springs issued from the earth. Over a hundred can be identified, some declaring by their modern names their ancient use: Aix-les-Bains in Savoy (*Aquae Sabaudicae*), Aix-en-Provence (*Aquae Sextiae*), Aix-la-Chapelle or Aachen (*Aquae Grani*), &c. Only two occur in Britain: *Aquae Sulis* —less correctly *Aquae Solis*—at Bath in Somerset, which was famous, and Buxton (called *Aquae* simply), which seems to have been far less important. Aquae Sulis was occupied by the Romans almost as soon as they entered the island in A.D. 43, and flourished till the end of the Roman period. It was frequented by soldiers quartered in Britain, by the Britons, and by visitors from north Gaul, and its name was known in Italy, though patients probably seldom travelled so far. Like most mineral springs known to the ancients, it was under the protection of a local deity, the Celtic Sul, whom the Romans equated with their Minerva. Stately remains of its baths and temple have been found at various times, especially in 1790 and 1878–1895, and may still be seen there.

AQUAE CUTILIAE, a mineral spring in Italy, near the modern Cittaducale, 9 m. E. of Rieti. The lake near it was supposed by classical writers to be the central point of Italy, and was renowned for its floating islands, which, as in other cases, were formed from the partial petrification of plants by the mineral substances contained in the water. Considerable remains of baths may still be seen there; they were apparently resorted to by both Vespasian and Titus in their last illnesses, for both died there.

AQUAMARINE (Lat. *aqua marina*, "water of the sea"), a transparent variety of beryl (*q.v.*), having a delicate blue or bluish-green colour, suggestive of the tint of sea-water. It occurs at most localities which yield ordinary beryl, some of the finest coming from Russia. The gem-gravels of Ceylon contain aquamarine. Clear yellow beryl, such as occurs in Brazil, is sometimes called aquamarine chrysolite. When corundum presents the bluish tint of typical aquamarine, it is often termed Oriental aquamarine.

AQUARELLE (from Ital. *acquarella*, water-colour), a form of painting with thin water-colour or ink.

AQUARII, a name given to the Christians who substituted water for wine in the Eucharist. They were not a sect, for we find the practice widely in vogue at an early time, even among the orthodox. In Greek they were called *Hydroparastatae*, or those who offer water. Theodosius, in his persecuting edict of 382, classes them as a special sect with the Manicheans, who also eschewed wine. See EUCHARIST.

AQUARIUM (plural *aquaria*), the name given to a receptacle for a marine flora and fauna. Until comparatively recently, aquaria were little more than domestic toys, or show-places of a popular character, but they have now not only assumed a profound scientific importance for the convenient study of anatomical and physiological problems in marine botany and zoology, but have also attained an economic value, as offering the best opportunities for that study of the habits and environment of marketable food-fish without which no steps for the improvement of sea-fisheries can be safely taken. The numerous "zoological stations" which have sprung up, chiefly in Europe and the United States, but also in the British colonies and Japan, often endeavour to unite these two aims, and have in many cases become centres of experimental work in problems relating to fisheries, as well as in less directly practical subjects. Of these stations, the oldest and the most important is that at Naples, which, though designed for purely scientific objects, also encourages popular study by means of a public aquarium. The following account (1902) of this station by Dr W. Giesbrecht, a member of the staff, will serve to show the methods and aims, and the complex and expensive equipment, of a modern aquarium:—

"The zoological station at Naples is an institution for the advancement of biological science—that is, of comparative anatomy, zoology, botany, physiology. It serves this end by providing the biologist with the various objects of his study and the necessary appliances; it is not a teaching institution. The station was founded by Dr Anton Dohrn, and opened in the spring of 1874; it is the oldest and largest of all biological stations, of which there are now about thirty in existence. Its two buildings are situated near the seashore in the western town park (Villa Nazionale) of Naples. The older and larger one, 33 metres long, 24 m. deep, 16 m. high, contains on the ground floor the aquarium, which is open to the public. On the first floor there is, facing south, the principal library, ornamented with fresco paintings, and, facing north, a large hall containing twelve working tables, several smaller rooms and the secretarial offices. On the second floor is the physiological laboratory, and on the third floor the small library, a hall with several working tables, and the dark rooms used in developing photographs. The ground floor of the smaller building, which was finished in 1887, contains the rooms in which the animals are delivered, sorted and preserved, and the fishing tackle kept, together with the workshop of the engineer; on the first and second floors are workrooms, amongst others the botanical laboratory; on the third floor are store-rooms. In the basement of both buildings, which is continued underneath the court, there are sea-water cisterns and filters, engines and store-rooms. The materials for study which the station offers to the biologist are specimens of marine animals and plants which abound in the western part of the Mediterranean, and especially in the Gulf of Naples. To obtain these, two screw-steamers and several rowing boats are required, which are moored in the harbour of Mergellina, situated close by. The larger steamer, 'Johannes Müller' (15 m. long, 2½ m. wide, 1 m. draught), which can steam eight to ten English miles per hour, is provided with a steam dredge working to a depth of eighty fathoms. From the small steamer, 'Frank Balfour,' and the rowing boats, the fishing is done by means of tow-nets. Besides these there are fishermen and others who daily supply living material for study. The plankton (small floating animals) is distributed in the morning, other animals as required. The animals brought in by the fishermen are at once distributed amongst the biologists, whereas the material brought up by the dredges is placed in flat revolving wooden vessels, so as to give the smaller animals time to come out of their hiding-places. The students who work in the station have the first claim on specimens of plants and animals; but specimens are also supplied to museums, laboratories and schools, and to individuals engaged in original research elsewhere. Up to the present time about 4000 such parcels have been despatched, and not infrequently live specimens of animals are sent to distant places. This side of the work has been of very great value to science. The principal appliances for study with which the station provides the biologist are workrooms furnished with the apparatus

and chemicals necessary for anatomical research and physiological experiments and tanks. Every student receives a tank for his own special use. The large tanks of the principal aquarium are also at his disposal for purposes of observation and experiment if necessary.

"The water in the tanks is kept fresh by continual circulation, and is thus charged with the oxygen necessary to the life of the organisms. It is not pumped into the tanks directly from the sea, but from three large cisterns (containing 300 cubic metres), to which it again returns from the tanks. The water wasted or evaporated during this process is replaced by new water pumped into the cisterns directly from the sea. The water flows from the large cisterns into a smaller cistern, from which it is distributed by means of an electric pump through vulcanite or lead pipes to the various tanks. The water with which the tanks on the upper floors are filled is first pumped into large wooden tanks placed beneath the roof, thence it flows, under almost constant pressure, into the tanks. The water circulated in this manner contains by far the largest number of such animals as are capable of living in captivity in good condition. Some of them even increase at an undesirable rate, and it sometimes happens that young Mytilus or Ciona stop up the pipes; in laying these, therefore, due regard must be had to the arrangements for cleaning. For the cultivation of very delicate animals it is necessary to keep the water absolutely free from harmful bacteria; for this purpose large sand-filters have lately been placed in the system, through which the water passes after leaving the cisterns. Each of the smaller cisterns, which are fixed in the workrooms, consist of two water-tanks, placed one above the other; their frames are of wrought iron and the walls generally of glass. Vessels containing minute animals can be placed between these two tanks, receiving their water through a siphon from the upper tank; the water afterwards flows away into the lower tank.

" The twenty-six tanks of the public aquarium (the largest of which contains 112 cubic metres of water) have stone walls, the front portion alone being made of glass. As the tanks hold a very large number of animals in proportion to the quantity of water, they require to be well aerated. The pipes through which the water is conducted are therefore placed above the surface of the water, and the fresh supply is driven through them under strong pressure. A large quantity of air in the form of fine bubbles is thus taken to the bottom of the tank and distributed through the entire mass of water. Should the organisms which it is desired to keep alive be very minute, there is a danger of their being washed away by the circulating water. To obviate this, either the water which flows away is passed through a strainer, or the water is not changed at all, air being driven through it by means of an apparatus put into motion by the drinking-water supply.

" The library contains about 9000 volumes, which students use with the help of a slip catalogue, arranged according to authors. The station has published at intervals since 1879 two periodicals treating of the organisms of the Mediterranean. One is *Fauna und Flora des Golfes von Neapel*, the other *Mittheilungen aus der zoologischen Station zu Neapel*. The former consists of monographs in which special groups of animals and plants are most exhaustively treated and the Mediterranean species portrayed according to life in natural colours; up to the present time twenty-one zoological and five botanical monographs have appeared, making altogether 1200 4to sheets with about 400 plates. Of the *Mittheilungen*, which contain smaller articles on organisms of the Mediterranean, fourteen volumes in 8vo have been published. The station also publishes a *Zoologischer Jahresbericht*, which at first treated of the entire field of zoology, but since 1886 has been confined principally to comparative anatomy and ontogeny; it appears eight to nine months after the end of the year reported. The *Guide to the Aquarium*, with its descriptions and numerous pictures, is meant to give the lay visitor an idea of the marine animal world.

"There are about forty officials, amongst them six zoologists, one physiologist, one secretary, two draughtsmen, one engineer. The station is a private institution, open to biologists of all nations under the following conditions: there are agreements with the governments of Austria, Baden, Bavaria, Belgium, Hamburg, Holland, Hesse, Italy, Prussia, Russia, Saxony, Switzerland, Hungary, Württemberg, the province of Naples, and the universities of Cambridge, Oxford, Strassburg, Columbia College (New York), and the British Association for the Advancement of Science, the Smithsonian Institution, and a society of women in the United States of North America (formerly also with Bulgaria, Rumania, Spain, the Academy of Sciences in Berlin, Williams College, University of Pennsylvania), by virtue of which the governments and corporate bodies named have the right, on payment of £100 per annum, to send a worker to the station; this places at his disposal a 'table' or workplace, furnished with all the necessary appliances and materials as set down in the agreement. At present there are agreements for thirty-three tables, and since the foundation of the station nearly 1200 biologists have worked there. The current expenses are paid out of the table-rents, the entrance fees to the public aquarium, and an annual subvention paid by the German empire."

In England a station on similar lines, but on a smaller scale, is maintained at Plymouth by the Marine Biological Association of the United Kingdom, with the help of subsidies from the government and the Fishmongers' Company.

Little difficulty is experienced in maintaining, breeding and rearing fresh-water animals in captivity, but for many various reasons it is only by unremitting attention and foresight that most marine animals can be kept even alive in aquaria, and very few indeed can be maintained in a condition healthy enough to breed. Much experience, however, has been gained of late years at considerable expense, both in England and abroad. In starting a marine aquarium of whatever size, it should be obvious that the first consideration must be a supply of the purest possible water, as free as may be, not only from land-drainage and sewage, but also from such suspended matters as chalk, fine sand or mud. This is most ideally and economically secured by placing the station a few feet above high-water mark, in as sheltered a position as possible, on a rocky coast, pumping from the sea to a large reservoir above the station, and allowing the water to circulate gently thence through the tanks by gravity (Banyuls). At an inland aquarium (Berlin, Hamburg), given pure water in the first instance, excellent if less complete results may nevertheless be obtained. The next consideration is the method by which oxygen is to be supplied to the organisms in the aquarium. Of the two methods hitherto in use, that of pumping a jet of air into tanks otherwise stagnant or nearly so (Brighton), while supplying sufficient oxygen, has so many other disadvantages, that it has not been employed regularly in any of the more modern aquaria. It is, however, still useful in aerating quite small bodies of water in which hardy and minute organisms can be isolated and kept under control. In the other method, now in general use, a fine jet of water under pressure falls on to the surface of the tank; this carries down with it a more than sufficient air-supply, analysis showing in some cases a higher percentage of oxygen in aquarium water than in the open sea.

The water supply is best effected by gravity from reservoirs placed above the tanks, but may be also achieved by direct pumping from low reservoirs or from the sea to the tanks. Provided that an unlimited supply of pure water can be obtained cheaply, the overflow from the tanks is best run to waste; but in aquaria less fortunately placed, it returns to a storage low-level reservoir, from which it is again pumped, thus circulating round and round (Naples, Plymouth). The storage reservoirs should be in all cases very large in comparison with the bulk of water in circulation; if practicable, they should be excavated in rock, and lined with the best cement. There is no reason why they should not be shallow, exposed to light and air, and cultivated as rock-pools by the introduction of seaweeds and small animals, but they must then be screened from rain, cold and dust. The pumps used in circulation will be less likely to kill minute animals if of the plunger or ram type, rather than

rotary, and should be of gun-metal or one of the new bronze-alloys which take a patina in salt water. For the circulating pipes many materials have been tried. Vulcanite is not only expensive and brittle, but has other disadvantages; common iron pipes, coated internally with cement or asphalt or glazed internally, with all unions and joints cemented, have been used with more or less success. Probably best of all is common lead piping, the joints being served with red-lead; water should be circulated through such pipes till they become coated with insoluble carbonate, for some time before animals are put into the tanks. For small installations glass may be used, the joints being made with marine glue or other suitable cement.

In building the tanks themselves, regard must be had to their special purposes. If intended for show-tanks for popular admiration, or for the study of large animals, they must be large with a plate-glass front; for ordinary scientific work small tanks with all sides opaque are preferable from every point of view. According to their character, size and position, fixed tanks may be of brickwork, masonry or rock, coated in each case with cement; asphalting the sides offers no particular advantages, and often gives rise to great trouble and expense. All materials, and especially the cements, must be of the finest quality procurable. For smaller and movable tanks, slate slabs bolted or screwed together have some disadvantages, notably those of expense, weight and brittleness, but are often used. Better, cheaper and lighter, if less permanent, are tanks of wood bolted together, pitched internally. Glass bell-jars, useful in particular cases, should generally have their sides darkened, except when required for observation. Provision should always be made for cleaning every part of the tanks, pipes and reservoirs; all rock-work in tanks should therefore be removable. As regards the lighting of fixed tanks, it should always be directly from above. In all tanks with glass sides, whether large or small, as much light as possible should be kept from entering through the glass; otherwise, with a side-light, many animals become restless, and wear themselves out against the glass, affected by even so little light as comes through an opposite tank.

In cases where distance from the sea or other causes make it impracticable to allow the overflow from the tanks to run to waste, special precautions must be taken to keep the water pure. Chemically speaking, the chief character of the water in an aquarium circulation, when compared with that of the open sea, lies in the excessive quantity of nitrogen present in various forms, and the reduced alkalinity; these two being probably connected. The excess of nitrogen is referable to dead animals, to waste food and to the excreta of the living organisms. The first two of these sources of contamination may be reduced by care and cleanliness, and by the maintenance of a flow of water sufficient to prevent the excessive accumulation of sediment in the tanks. The following experiment shows the rapid rise of nitrogen if unchecked. A tank with a considerable fauna was isolated from the general circulation and aerated by four air-jets, except during hours 124–166 of the experiment; column I. shows per 100,000 the nitrogen estimated as ammonia, column II. the total inorganic nitrogen:—

	I.	II.
Sea-water at source of original supply	0·001	0·003
Aquarium water in tank at commencement of experiment	0·012	0·400
After 22½ hours	0·020	..
,, 75 ,,	0·025	1·200
,, 93 ,,	0·019	..
,, 121½ ,,	0·012	..
,, 141 ,,	0·015	2·200
,, 165 ,,	0·025	..
,, 169 ,,	0·025	..
,, 189 ,,	0·012	..

During this time the alkalinity was reduced to the equivalent of 30 mg. $CaCO_3$ per litre, ocean water having an alkalinity equivalent to 50–55 mg. per litre. It has been suggested that the organic nitrogen becomes oxidized into nitrous, then into nitric acid, which lowers the carbonate values. A great deal of reduction of this nitrogenous contamination can be effected by filtration, a method first introduced successfully at Hamburg, where a most thriving aquarium has been maintained by the local Zoological Society for many years on the circulation principle, new water being added only to compensate for waste and evaporation. The filters consist of open double boxes, the inner having a bottom of perforated slate on which rests rough gravel; on the latter is fine gravel, then coarse, and finally fine sand. Filtration may be either upwards or downwards through the inner box to the outer. Such filters, intercalated between tanks and reservoir, have been shown by analysis to stop a very large proportion of nitrogenous matter. It is doubtful whether aquarium water will not always show an excess of nitrogenous compounds, but they must be kept down in every way possible. In small tanks, well lighted, seaweeds can be got to flourish in a way that has not been found practicable in large tanks with a circulation; these, with Lamellibranchs and small Crustacea as scavengers, will be found useful in this connexion. Slight or occasional circulation should be employed here also, to remove the film of dust and other matters, which otherwise covers the surface of the water and prevents due oxygenation.

In such small tanks for domestic use the fauna must be practically limited to bottom-living animals, but for purposes of research it is often desired to keep alive larval and other surface-swimming animals (plankton). In this case a further difficulty is presented, that of helping to suspend the animals in the water, and thus to avoid the exhaustion and death which soon follow their unaided efforts to keep off the bottom; this duty is effected in nature by specific gravity, tide and surface current. In order to deal with this difficulty a simple but efficient apparatus has been devised by Mr E. T. Browne; a "plunger," generally a glass plate or filter funnel, moves slowly up and down in a bell-jar or other small tank, with a period of rest between each stroke; the motive power is obtained through a simple bucket-and-siphon arrangement worked by the overflow from other tanks. This apparatus (first used at the Plymouth Laboratory of the Marine Biological Association in 1897, and since introduced into similar institutions), by causing slight eddies in the water, keeps the floating fauna in suspension, and has proved very successful in rearing larvae and in similar work. (G. H. Fo.)

AQUARIUS (the "Water-bearer" or "Cup-bearer"), in astronomy, the eleventh sign of the zodiac (*q.v.*), situated between Capricornus and Pisces. Its symbol is ♒, representing part of a stream of water, probably in allusion to the fact that when the sun is in this part of the heavens (January, February) the weather is rainy. It is also a constellation mentioned by Eudoxus (4th century B.C.) and Aratus (3rd century B.C.); Ptolemy catalogued forty-five stars, Tycho Brahe forty-one, Hevelius forty-seven. ζ *Aquarii* is a well-defined binary, having both components of the fourth magnitude; it is probably of long period.

AQUATINT (Lat. *aqua*, water, and *tincta*, dyed), a kind of etching (*q.v.*) which imitates washes with a brush. There are many ways of preparing a plate for aquatint, the following being recommended by P. G. Hamerton. Have three different solutions of rosin in rectified alcohol, making them of various degrees of strength, but always thin enough to be quite fluid, the weakest solution being almost colourless. First pour the strongest solution on the plate. When it dries it will produce a granulation; and you may now bite as in ordinary etching for your darker tones, stopping out what the acid is not to operate upon, or you may use a brush charged with acid, perchloride of iron being a very good mordant for the purpose. After cleaning the plate, you proceed with the weaker solutions in the same way, the weakest giving the finest granulation for skies, distances, &c. The process requires a good deal of stopping-out, and some burnishing, scraping, &c., at last. Aquatint may be effectively used in combination with line etching, and still more harmoniously with soft ground etching in which the line imitates that of the lead pencil.

AQUAVIVA, CLAUDIO (1542–1615), fifth general of the Jesuits, the youngest son of the duke d'Altri, was born at Naples. He joined the Jesuits at Rome in 1567, and his high administrative

gifts marked him out for the highest posts. He was soon nominated provincial of Naples and then of Rome; and during this office he offered to join the Jesuit mission to England that set out under Robert Parsons (*q.v.*) in the spring of 1580. The following year, being then only thirty-seven years old, he was elected, by a large majority, general of the society in succession to Mercurian, to the great surprise of Gregory XIII.; but the extraordinary political ability he displayed, and the vast increase that came to the Society during his long generalate, abundantly justified the votes of the electors. He, together with Lainez, may be regarded as the real founder of the Society as it is known to history. A born ruler, he secured all authority in his own hands, and insisted that those who prided themselves on their obedience should act up to the profession. In his first letter "On the happy increase of the Society" (25th of July 1581), he treats of the necessary qualifications for superiors, and points out that government should be directed not by the maxims of human wisdom but by those of supernatural prudence. He successfully quelled a revolt among the Spanish Jesuits, which was supported by Philip II., and he made use in this matter of Parsons. A more difficult task was the management of Sixtus V., who was hostile to the Society. By consummate tact and boldness Aquaviva succeeded in playing the king against the pope, and Sixtus against Philip. For prudential reasons, he silenced Mariana, whose doctrine on tyrannicide had produced deep indignation in France; and he also appears to have discountenanced the action of the French Jesuits in favour of the League, and was thus able to secure solid advantages when Henry IV. overcame the confederacy. To him is due the Jesuit system of education in the book *Ratio atque institutio studiorum* (Rome, 1586). But the Dominicans denounced it to the Inquisition, and it was condemned both in Spain and in Rome, on account of some opinions concerning the Thomist doctrines of the divine physical premotion in secondary causes and predestination. The incriminated chapters were withdrawn in the edition of 1591. In the fierce disputes that arose between the Jesuit theologians and the Dominicans on the subject of grace, Aquaviva managed, under Clement VIII. and Paul V., to save his party from a condemnation that at one time seemed probable. He died at Rome on the 31st of January 1615, leaving the Society numbering 13,000 members in 550 houses and 15 provinces. The subsequent influence exercised by the Jesuits, in their golden age, was largely due to the far-seeing policy of Aquaviva, who is undoubtedly the greatest general that has governed the Society. (E. Tn.)

AQUEDUCT (Lat. *aqua*, water, and *ducere*, to lead; Gr. *ὑδραγωγεῖον*, *ὑδραγώγιον*, *ὑπόνομος*), a term properly including artificial works of every kind by means of which water is conveyed from one place to another, but generally used in a more limited sense. It is, in fact, rarely employed except in cases where the work is of considerable magnitude and importance, and where the water flows naturally by gravitation. The most important purpose for which aqueducts are constructed is that of conveying pure water, from sources more or less distant, to large masses of population. Aqueducts are either below ground, on the surface, or raised on walls either solid or pierced with arches; to the last the term is often confined in popular language. The choice of method naturally depends on the contour of the country.

I. *Ancient Aqueducts.*—In Egypt, Babylonia and Assyria—flat countries traversed by big rivers and subject to floods—water was supplied by means of open canals with large basins. In Persia devices of all kinds were adopted according to the nature of the country. In relation to the achievements of Greece and Rome, the Phoenicians are the most important among pre-classical engineers. In Cyprus water was supplied to temples by rock-cut subterranean conduits carried across intervening valleys in siphons. Such conduits have been found near Citium, Amathus, &c. (Cesnola, *Cyprus*, pp. 187, 341). In Syria the most striking of Phoenician waterworks is the well of Ras-el-Ain near Tyre, which consisted of four strong octagonal towers through which rises to a height of 18 to 20 ft. the water from four deep artesian wells. The water thus accumulated was carried off in conduits to reservoirs near the shore, and thence in vessels or skins to the island. The aqueduct across to the island is, of course, of Roman work.

Phoenician.

It is not possible in all cases to find a satisfactory date for the numerous conduits which have supplied Jerusalem; some probably go back to the times of the kings of Judah. The principal reservoir consists of the three Pools of Solomon which supplied the old aqueduct; the highest is about 20 ft. above the middle one and 40 above the lowest. These pools collected the water from Ain Salch and other springs, and sent it to the city by two conduits. The higher of these—probably the older—was partly a rock-cut canal, partly carried on masonry; the siphon-pipe system was adopted across the lower ground near Rachel's Tomb, where the pipe (15 in. wide) is formed of large pierced stones embedded in rubble masonry. The lower conduit is still complete; it winds so much as to be altogether some 20 m. long. Near the Birket-es-Sultan it passes over the valley of Hinnom on nine low arches and reaches the city on the hill above the Tyropœon valley. It enters the Haram enclosure at the Gate of the Chain (Bāb es-Silsila), outside which is a basin 84 ft. by 42 by 24 deep. It is interesting to note in the case of the underground tunnel which brought water from the Virgin's Fountain to the pool of Siloam, that the two boring parties had no certain means of keeping the line; there is evidence that they had to make shafts to discover their position, and that ultimately the parties almost passed one another. Though the direct distance is 1100 ft., the length of the conduit is over 1700 ft. Perrot and Chipiez incline to attribute the Pools of Solomon to the 'Asmonaeans, followed by Roman governors, whereas the earlier tunnels of the Kedron and Tyropœon valley may be Punic-Jewish (see also *Palest. Explor. Fund Mem.*, "Jerusalem," pp. 346-365). Besides these conduits excavation has discovered traces of many other cisterns, tunnels and conduits of various kinds. Many of them point to periods of great prosperity and engineering enterprise which gave to the city a water-supply far superior to that which exists at present.

Jerusalem.

See the publications of the Palestine Exploration Fund; A. S. Murray's *Handbook to Syria and Palestine* (1903), pp. 63-67; Perrot and Chipiez, *History of Art in Sardinia, Judaea, &c.* (Eng. trans., 1890), pp. 321 ff.; other authorities quoted under Jerusalem.

The earliest attempts in Europe to solve the problems of water-supply were made by the Greeks, who perhaps derived their ideas from the Phoenicians. It has generally been held, partly on the strength of a passage in Strabo (v. 3. 8, p. 235), and partly owing to the comparative unimportance of the remains discovered, that the Greek works were altogether inferior to the Roman. Research in the Greek towns of Asia Minor, together with a juster appreciation of the remains as a whole, must be held to modify this view. Among the earliest examples of Greek work are the tunnels or *emissaria* which drained Lake Copais in Boeotia; these, though not strictly aqueducts, were undoubtedly the precursors of such works, consisting as they did of subterranean tunnels (*ὑπόνομοι*) with vertical shafts (*φρεατίαι*), sixteen of which are still recognizable, the deepest being about 150 ft. They may be compared with that described by Polybius as conveying water from Taurus to Hecatompylos, and with numerous other remains in Asia Minor, Syria, Phoenicia and Palmyra. Popular legend ascribed them to Cadmus, just as Argos referred the irrigation of its lands to Danaüs. They are undoubtedly of great antiquity.

Greek.

The insufficiency of water, supplied by natural springs and cisterns hewn in the rock, which in an early age had satisfied the small communities of Greece, had become a pressing public question by the time of the Tyrants, of whom Polycrates of Samos and Peisistratus of Athens were distinguished for their wisdom and enterprise in this respect. The former obtained the services of Eupalinus, an engineer celebrated for the skill with which he had carried out the works for the water-supply of Megara (see *Athen. Mittheil.* xxv., 1900, 23) under the direction of the Tyrant Theagenes (*c.* 625 B.C.). At Samos the difficulty lay in a hill which rose between the town and the water source. Through this hill Eupalinus cut a tunnel 8 ft. broad, 8 ft. high

and 4200 ft. long, building within the tunnel a channel 3 ft. broad and 11 ells deep. The water, flowing by an accurately reckoned declivity, and all along open to the fresh air, was received at the lower end by a conduit of masonry, and so led into the town, where it supplied fountains, pipes, baths, cloacae, &c., and ultimately passed into the harbour (Herod. iii. 60). In Athens, under the rule of the Peisistratids (*c.* 560–510 B.C.), a similarly extensive, if less difficult, series of works was completed to bring water from the neighbouring hills to supplement the inadequate supply from the springs. From Hymettus were two conduits passing under the bed of the Ilissus, most of the course being cut in the rock. Pentelicus, richer in water, supplied another conduit, which can still be traced from the modern village of Chalandri by the air shafts built several feet above the ground, and at a distance apart of 130–160 ft.; the diameter of these shafts is 4–5 ft., and the number of them still preserved is about sixty. Tributary channels conveyed into the main stream the waters of the district through which it passed. Outside Athens, those two conduits met in a large reservoir, from which the water was distributed by a ramification of underground channels throughout the city. These latter channels vary in form, being partly round, partly square, and generally walled with stone; the chief one is sufficiently large for two men to pass in it. The precise location of the reservoir depends on the value of Dr Wilhelm Dörpfeld's theory as to the site of the Enneacrunus of Thucydides and Pausanias (see ATHENS: *Topography and Antiquity*). Dörpfeld places it south-west of the Acropolis, where there is a cistern connected with an aqueduct which passed under the theatre of Dionysus and on towards the Ilissus (see map under ATHENS). Others have placed it south of the Olympieum in the Ilissus bed. Beside these works water was brought from Pentelicus in an underground conduit begun by the emperor Hadrian and completed by Antoninus Pius. This aqueduct is still in use, having been repaired in 1869.

In Sicily, the works by which Empedocles, it is said, brought the water into the town of Selinus, are no longer visible; but it is probable that, like those of Syracuse, they consisted chiefly of tunnels and pipes laid under the ground. Syracuse was supplied by two aqueducts, one of which the Athenians destroyed (Thuc. vi. 100). One was fed by an affluent (the mod. Buttigliara) of the Anapus (mod. Anapo); it carried the water up to the top of Epipolae, where the channel was open, and thence down to the city and finally into the harbour. The other also ascends to the top of Epipolae, skirts the city on the north, and then proceeds along the coast. Its course is marked by rectangular shafts (*spiragli*) at the bottom of which water is still visible.

An example of what appears to have been the earliest form of aqueduct in Greece was discovered in the island of Cos beside the fountain Burinna (mod. Fountain of Hippocrates) on Mount Oromedon. It consists of a bell-shaped chamber, built underground in the hill-side, to receive the water of the spring and keep it cool; a shaft from the top of the chamber supplied fresh air. From this reservoir the water was led by a subterranean channel, 114 ft. long and 6½ ft. high. (J. M. M.)

Roman.

In comparing Greek and Roman aqueducts, many writers have enlarged on the greatness of the latter as an example of Roman contempt for natural obstacles, or even of Roman ignorance of the laws of nature. Now, in the first place, the Romans were not unacquainted with the law that water finds its own level (see Pliny, *Hist. Nat.* xxxi. 57, "subit altitudinem exortus sui"), and took full advantage of it in the construction of lofty fountains and the supplying of the upper floors of houses. That they built aqueducts across valleys in preference to carrying pipes underground was due simply to economy. Pipes had to be made of lead which was weak, or of bronze which was expensive; and the Romans were not sufficiently expert in the casting of large pipes which would stand a very great pressure to employ them for the whole course of a great aqueduct. Secondly, the water was so extremely hard that it was important that the channels should be readily accessible for repair as well as for the detection of leakage.[1] Moreover, as we shall see, the Roman aqueducts did not, in fact, preserve a straight line regardless of the configuration of the country. A striking example is the aquecuct of Nemausus (Nîmes), the springs of which are some 10 m. from the town, though the actual distance traversed is about 25. Other devices, such as changing the level and then modifying the slope, and siphon arrangements of various kinds, were adopted (as in the aqueduct at Aspendus).

Sextus Julius Frontinus, appointed *curator aquarum* in A.D. 97, mentions in his treatise *de aquaeductibus urbis Romae* (on the aqueducts of the city of Rome) nine aqueducts as being in use in his time (the lengths of the aqueducts as given here follow his measurements). These are: (1) AQUA APPIA, which took its rise between the 6th and 7th milestones of the Via Collatina, and measured from its source to the Porta Trigemina 11 Roman miles, of which all but about 300 ft. were below ground. It appears to have been the first important enterprise of the kind at Rome, and was the work of the censor Appius Claudius Caecus, from whom it derived its name. The date of its construction was 312 B.C. (2) ANIO VETUS, constructed in 272–269 B.C. by the censor Manius Curius Dentatus. From its source near Tivoli, on the left side of the Anio, it flowed some 43 m.,[2] of which only 1100 ft. was above ground. At the distance of 2 m. from Rome (Frontinus, i. 21), it parted into two courses, one of which led to the *horti Asiniani*, and was thence distributed; while the other (*rectus ductus*) led by the temple of Spes to the Porta Esquilina. (3) AQUA MARCIA, reconstructed in 1869–1870 under the name of Acqua Pia or Marcia-Pia after Pius IX. (though from Tivoli to Rome the modern aqueduct takes an entirely different course), rising on the left side of the Via Valeria near the 36th milestone. It traversed 61¾ m., of which 54¼ were underground, and for the remaining distance was carried partly on substructions and partly on arches. It was the work of the praetor Quintus Marcius Rex (144–140 B.C.), not of Ancus Marcius, the fourth king of Rome, as Pliny (*N.H.* xxxi. 3) fancied, and took its name from its constructor. Its waters were celebrated for their coolness and excellent quality. Its volume was largely increased by Augustus, who added to it the Aqua Augusta; and it was repaired and restored by Titus, Septimus Severus, Caracalla and Diocletian. (4) AQUA TEPULA, from its source (now known as Sorgente Preziosa) in the district of Tusculum, to Rome, was some 11 m. in length. The first portion of its course must have been almost entirely subterranean and is not now traceable. For the last 6½ m. it ran on the same series of arches that carried the Aqua Marcia, but at a higher level. It was the work of the censors Cn. Servilius Caepio and L. Cassius Longinus, and was completed in the year 125 B.C. Its water is warm (about 63° Fahr.) and not of the best quality. (5) The AQUA JULIA, from a source 2 m. from that of the Tepula, joined its course at the 10th milestone of the Via Latina. The combined stream, after a distance of 4 m., was received in a reservoir, and then once more divided into two channels. The entire length of the Julia was 15½ m. It was constructed in the year 33 B.C. by M. Vipsanius Agrippa, who also built the (6) AQUA VIRGO which, from its origin at a copious spring in a marsh on the Via Collatina, measured 14 m. in length; it was conveyed in a channel, partly under and partly above ground. It was begun in the year 33 B.C. and was celebrated for the excellence of its waters. It was restored to use by Pius V. in 1570. (7) AQUA ALSIETINA or AUGUSTA, the source of which is the Lacus Alsietinus (mod. Lago di Martignano), to the north of Rome, was over 22 m. in length, of which 358 paces were on arches. It was the work of Augustus, probably with the object of furnishing water for his *naumachia* (a basin for sham sea-fights), and not for drinking purposes. Its course is

[1] There have been found at Caerwent, in Monmouthshire, clear traces of wooden pipes (internal diameter about 2 in.) which must have carried drinking-water, and almost certainly a pressure supply from the surrounding hills. Some patches of lead also have been found obviously nailed on to the pipes at points where they had burst (see *Archaeologia*, 1908).

[2] This distance will not agree with the length given on some of the *cippi* (Lanciani, *Bull. Com.*, 1899, 38).

unknown, as no remains of it exist, but an inscription relating to it is given in *Notizie d. Scavi* (1887), p. 182. (8, 9) The AQUA CLAUDIA and ANIO NOVUS were two aqueducts begun by Caligula in A.D. 38 and completed by Claudius in A.D. 52. The springs of the former belonged to the same group as those of the Marcia, and were situated near the 38th milestone of the Via Sublacensis, not far from its divergence from the Via Valeria, while the original intake of the latter from the river Anio was 4 m. farther along the same road. As the water was thick it was collected in a purifying tank, and 4 m. below, a branch stream, the Rivus Herculaneus, was added to it. According to Frontinus, over 10 m. of the course of the Claudia and nearly 9½ of that of the Anio Novus were above ground. Seven miles out of Rome they united and ran from that point into Rome, following a natural isthmus formed by a lava stream from the Alban volcano, upon a line of arches, which still forms one of the most conspicuous features of the Campagna. The original inscription of Claudius (A.D. 52) on the Porta Maggiore, by which the Aqua Claudia and Anio Novus crossed the Via Praenestina and the Via Labicana, gives the length of the Aqua Claudia as 45 m., and that of the Anio Novus as 62 m. Frontinus, on the other hand, gives 46·406 m. (*i.e.* about 43 English miles) and 58·700 m. (*i.e.* about 54 English miles). Albertini (*Mélanges de l'École Française*, 1906, 305) explains the difference as due to the fact that Frontinus was calculating the length of the Claudia from the farthest spring, the Fons Albudinus, and that of the Anio Novus from the new intake constructed by Trajan in one of the three lakes constructed by Nero for the adornment of his villa above Subiaco. Two other inscriptions on the Porta Maggiore record restorations by Vespasian in A.D. 70, and by Titus in A.D. 80. That the aqueducts should be spoken of as *vetustate dilapsi* so soon after their construction is not a little surprising, and may be attributed either to hasty construction in order to complete them by a fixed date, or to jobbery by the imperial freedmen who under Claudius were especially powerful, or to the fact that a line of arches intended originally in all probability for the Aqua Claudia alone was made to carry the Anio Novus as well.

The size of the channels (*specus*) of the principal aqueducts varies considerably at different points of their course. The Anio Novus has the largest of them all, measuring 3 to 4 ft. wide and 9 ft. high to the top of the roof, which is pointed. They are lined with hard cement (*opus signinum*) containing fragments of broken brick. Those aqueducts of which the most conspicuous remains exist in the neighbourhood of Rome are the four from the upper valley of the Anio, the two which took their supply and their name from the river itself, and the Marcia and the Claudia, which originated from the same group of springs, in the floor of the Anio valley 6 m. below Subiaco. Those of the Anio Vetus, which travelled at a considerably lower level than the other three, are the least conspicuous, while the Claudia and Anio Novus as a rule kept close together, the latter at the highest level of all. The ruins of bridges and substructions in the Anio valley down to Tivoli, though comparatively little known, are of great importance. In all the aqueducts the original construction of the bridges was in *opus quadratum* (masonry), while the substructions are in brick-faced concrete; but the bridges are as a rule strengthened (and often several times) with reinforcing walls of concrete faced with *opus reticulatum* or brickwork. Below Tivoli, where the Anio leaves its narrow valley, the aqueducts sweep round towards the Alban hills, and pass through some very difficult country between Tivoli and Gallicano, alternately crossing ravines, some of which are as much as 300 ft. deep, and tunnelling through hills.[1]

The engineering skill displayed is remarkable, and one wonders what instruments were employed—probably the so-called *chorobates*, an improvement upon the ordinary water-level (Vitruvius viii. 6), though this would be slow and complicated. The optical properties of glass lenses were, however, unknown to the ancients, and the *dioptra*, or angle measure, was considered by Vitruvius less trustworthy than the *chorobates* for the planning of aqueducts (cf. E. Hultsch, *s.v.* in Pauly-Wissowa, *Real-encyclopädie*). The aqueducts as a rule were carried on separate bridges, though all four united at the Ponte Lupo, a huge structure, which after the addition of all the four, and with the inclusion of all the later strengthening walls that were found necessary in course of time, measures 105 ft. in height, 508 in length, and 46 in thickness at the bottom, without including the buttresses. From Gallicano onwards the course of these four aqueducts follows the lower slopes of the Alban Hills. Previous writers on the subject have been unable to determine their course, which is largely subterranean; but it can be followed step by step with the indications given by the presence of the calcareous deposit which was thrown out at the *putei* or shafts (which were, as a rule, placed at intervals of 240 ft., as were the *cippi*) when the *specus* was cleaned; and remains of bridges, though less important, owing to the less difficult character of the country, are not entirely absent (cf. the works by T. Ashby cited in bibliography).[2] Near the 7th milestone of the Via Latina at Le Capanelle, the Aqua Claudia and Anio Novus emerge from their underground course, and run into Rome upon the long series of arches already mentioned, passing over the Porta Maggiore. The Claudia sent off an important branch from the Porta Maggiore over the Caelian to the Palatine, but the main aqueduct soon reached its termination. A mile farther on the Aqua Marcia also, owing to the gradual slope of the ground towards Rome, begins to be supported on arches, which were also used to carry the Aqua Tepula and the Aqua Julia (of the two latter, before their junction with the Marcia, no remains exist above ground, but inscribed *cippi* of the last named and its underground channel have been found at Le Capanelle, and *cippi* also close to its springs, which are a little way above Grottaferrata at Gli Squarciarelli). The Anio Vetus followed the same line, but kept underground (as was natural at the early period at which it was constructed) until the immediate neighbourhood of Rome, near the locality known as "ad Spem veterem" (from a temple of Spes, of which no remains are known) close to the Porta Maggiore. At this point, besides the aqueducts named, the Aqua Appia, as we are told by Frontinus, entered the city, and received an important branch, the Appia Augusta. No remains of either have been discovered outside the city.

The Aqua Alexandrina must also have entered the city here, though its channel, which lay at some depth below ground, has not been discovered. Considerable remains of its brick aqueducts exist in the district between the Via Praenestina and the Via Labicana.

Of the two aqueducts on the right bank of the Tiber, the Alsietina, as we have said, has no remains at all, while those of the Traiana are not of great importance. The line of the aqueducts was marked by *cippi*, inscribed (in the case of the Anio Vetus, Marcia, Tepula, Julia and Virgo—those of the Claudia and Anio Novus are uninscribed, and those of the Traiana are differently worded) with the name of the aqueduct, the distance from the next *cippus* (generally 240 ft.) and the number, counting from Rome (not from the springs). These boundary stones were erected in pairs, to mark off the strip of land 30 ft. in width reserved for the aqueduct, and for the road or path which generally followed it. The shafts (*putei*) often stood, but not necessarily, at the same points as the *cippi*.

To these nine must be added the two following, constructed after Frontinus's time: (10) AQUA TRAIANA, from springs to the north-west of the Lacus Sabatinus (Lago di Bracciano), constructed by Trajan in A.D. 109, about 36½ English miles in length. It was restored by Paul V. in 1611, who made use of and largely transformed the remains of the ancient aqueduct; he allowed some of the inferior water of the lake to flow into the channel, and it is thus no longer used for drinking. (11) AQUA ALEXANDRINA,

[1] The course of the Aqua Claudia was considerably shortened by the cutting of a tunnel 3 m. long under the Monte Affliano in the time of Domitian (T. Ashby, in *Papers of the British School at Rome*, iii, 133).

[2] About 3 m. south-east of this point the presence of large quantities of deposit and a sudden fall in the level of the channels seems to indicate the existence of settling tanks, of which no actual traces can be seen.

AQUA CLAUDIA, ROME. *Photo. Alinari.*

PONT DU GARD, NÎMES (NEMAUSUS). *Photo. Neurdein.*

AQUEDUCT

Photo, Laureat y Cia.

ROMAN AQUEDUCT AT SEGOVIA.

Photo, Brogi.

PISCINA MIRABILIS AT BAIAE.

AQUEDUCT OF ROQUEFAVOUR, MARSEILLES.
Early nineteenth century.

Photo, Dr. T. Ashby.

AQUA MARCIA, ROME.

rising about 14 English miles from Rome, between the Via Praenestina and the Via Labicana, the work of Alexander Severus (A.D. 226). The springs now supply the modern Acqua Felice, constructed by Sixtus V. in 1585, but the course of the latter is mainly subterranean and not identical with that of the former.

It is agreed that these eleven are all that were constructed. Procopius speaks of fourteen (and the Regionary catalogues mention others), but this number includes branch conduits. All the aqueducts ended in the city in huge *castella* or reservoirs for the purpose of distribution. Vitruvius recommends the division of these into three parts—one for the supply of fountains, &c., one for the public baths and one for private consumers. In the Piazza Vittorio Emmanuele at Rome there are still to be seen the remains of a large ornamental fountain built probably for the Aqua Julia by Domitian or Alexander Severus (Jordan-Hülsen, *Topographie*, i. 3350). Besides these main *castella* there were also many minor *castella* in various parts of the city for sub-distribution. To allow the water to purify itself before being distributed in the city, filtering and settling tanks (*piscinae limariae*) were built outside the walls. These *piscinae* were covered in with a vaulted roof, and were sometimes on a very large scale, as in the example still preserved at Fermo, which consists of two stories, each having three oblong basins communicating with each other; or the Piscina Mirabilis at Baiae, which is covered in by a vaulted roof, supported on forty-eight pillars and perforated to permit the escape of foul air. Two stairs lead by forty steps to the bottom of the reservoir. In the middle of the basin is a sinking to collect the deposit of the water. The walls and pillars are coated with a stucco so hard as to resist a tool.

The oversight of aqueducts was placed, in the times of the republic, under the aediles, who were not, however, the constructors of them; of the four aqueducts built during this period, three are the work of censors, one (the Marcia) of a praetor. Under the empire this task devolved on special officials styled *Curatores Aquarum*, instituted by Augustus, who, as he himself says, "rivos aquarum omnium refecit" (inscription on the arch by which the Aqua Marcia crossed the Via Tiburtina). (T. As.)

Among the aqueducts outside Italy, constructed in Roman times and existing still, the most remarkable are: (1) the aqueduct at Nîmes (Nemausus), erected probably by Vipsanius Agrippa in the time of Augustus, which rose to 160 ft. The Pont du Gard, as this aqueduct is now called, consists of three tiers of arches across the valley of the river Gardon. In the lowest tier are six arches, of which one has a span of 75 ft., the others each 60 ft. In the second tier are eleven arches, each with a span of 75 ft. In the third tier are thirty-five smaller arches which carried the *specus*. As a bridge, the Pont du Gard has no rival for lightness and boldness of design among the existing remains of works of this class carried out in Roman times. (2) The aqueduct bridges at Segovia (Merckel, *Ingenieurtechnik*, pp. 566–568), Tarragona (*ibid.* 565–566), and Merida in Spain, the former being 2400 ft. long, with 109 arches of fine masonry, in two tiers, and reaching the height of 102 ft. The bridge at Tarragona is 876 ft. long and 83 ft. high. (3) At Mainz are the ruins of an aqueduct 7000 yds. long, about half of which is carried on from 500 to 600 pillars (*Archaeological Journal*, xlvii., 1890, pp. 211-214). This aqueduct was built by the XIVth legion and was for the use of the camp, not for the townspeople. For the similar aqueduct at Luynes see *Arch. Journ.* xlv. (1888), pp. 235-237. Similar witnesses of Roman occupation are to be seen in Dacia, Africa (see especially under CARTHAGE), Greece and Asia Minor. (4) The aqueduct at Jouy-aux-Arches, near Metz, which originally extended across the Moselle, here very broad, conveyed to the city an abundance of excellent water from Gorze. From a large reservoir at the source of the aqueduct the water passed along subterranean channels built of hewn stone, and sufficiently spacious for a man to walk in them upright. Similar channels received the water after it had crossed the Moselle by this bridge, at the distance of about 6 m. from Metz, and conveyed it to the city. The bridge consisted of only one row of arches nearly 60 ft. high. The middle arches have given way under the force of the water, but the others are still perfectly solid. This aqueduct is probably to be attributed to the latter half of the 4th century A.D. It is for the use of the town; hence its size. (5) One of the principal bridges of the aqueduct of Antioch in Syria is 700 ft. long, and at the deepest point 200 ft. high. The lower part consists almost entirely of solid wall, and the upper part of a series of arches with very massive pillars. The masonry and design are rude. The water supply was drawn from several springs at a place called Beit el-Ma (anc. Daphne) about 4 or 5 m. from Antioch. From these separate springs the water was conducted by channels of hewn stone into a main channel, similarly constructed, which traversed the rest of the distance, being carried across streams and valleys by means of arches or bridges. (6) At the village of Moris, about an hour's distance north-west from the town of Mytilene, is the bridge of an aqueduct, carried by massive pillars built of large hewn blocks of grey marble, and connected by means of three rows of arches, of which the uppermost is of brick. The bridge extended about 500 ft. in length, and at the deepest point was from 70 to 80 ft. high. Judged by the masonry and the graceful design, it has been thought to be a work of the age of Augustus. Remains of this aqueduct are to be seen at Larisson Lamarousia, an hour's distance from Moris, and at St Demetri, two hours and a half from Ayasos, on the road to Vasilika.

Asia Minor.

The whole subject of the ancient and medieval aqueducts of Asia Minor has been considered in great detail by G. Weber ("Wasserleitungen in kleinasiatischen Städten," in the *Jahrbuch des kaiserl. deutsch. archäolog. Instit.* xix., 1904; see also earlier articles in *Jahrbuch*, 1892, 1899). The aqueducts examined are those at Pergamum, Laodicea and Smyrna (in the earlier articles), and those at Metropolis (Ionia), Tralles (Aidin), Antioch-on-Maeander, Aphrodisias, Trapezopolis, Hierapolis, Apamea Cibotus and Antioch in Pisidia. In most of these cases it is difficult or even impossible to decide whether the work is Hellenistic or Roman; to the Romans Weber inclines to attribute, *e.g.* those at Metropolis, Tralles (perhaps), Aphrodisias; to the Greeks, *e.g.* those at Antioch-on-Maeander and Antioch in Pisidia. Since, therefore, a detailed description of these remains does not provide material for any satisfactory generalizations as to the distinctive features of Hellenistic and Roman work, it will be sufficient here to mention a few of the more interesting discoveries.

In the case of Metropolis, the aqueduct in the valley of the Astracus consisted of an arcade about 13 to 16 ft. high. Nearer to the town in the hills there are distinct traces of a canal with brick walls. It is clear that the water could not have served more than the lower parts of the town, the acropolis of which is nearly 200 ft. above the level of the conduit. In the case of Tralles the water was supplied by a high pressure conduit and distributed from the acropolis, where there are the remains of a basin (13 ft. by 10) arched over with brick. The ancient aqueduct is to be distinguished from a later, probably Byzantine, canal conduit, the course of which avoids the deeper depressions, crossed by the old aqueduct. Of the Antioch-on-Maeander aqueduct only a few clay-pipes remain, and the same is true of the aqueduct which was built by Carminius in the 2nd century A.D. to supply the community when reinforced by the amalgamation of Plarasa and Tauropolis; two of its basins are still distinguishable, but the two water-towers which are still standing belong to a later Byzantine structure. Trapezopolis was supplied from Mt. Salbacus (Baba Dagh): some twenty stone-pipes have been found built into a low wall which varies from 3½ to about 5 ft. wide. Of the pillars which carried the conduit-pipe to Antioch in Pisidia, nineteen are still standing. Each arch consists of eleven keystones; no cement was used. The conduit, which was high-pressure, ends in a distributing tower and reservoir. (J. M. M.)

II. *Medieval.*—The aqueduct near Spoleto, which now serves also as a bridge, is deserving of notice as an early instance of the use of the pointed arch, belonging as it does to the 7th or 8th

century. It has ten arches, remarkable for the elegance of their design and the airy lightness of their proportions, each over 66 ft. in span, and about 300 ft. in height.

Constantinople.

The aqueduct of Pyrgos, near Constantinople, is a remarkable example of works of this class carried out in the later times of the Roman empire, and consisted of two branches. From this circumstance it was called Egri Kemer ("the Crooked Aqueduct"), to distinguish it from the Long Aqueduct, situated near the source of the waters. One of the branches extends 670 ft. in length, and is 106 ft. in height at the deepest part. It is composed of three tiers of arches, those in each row increasing in width from the bottom to the top—an arrangement very properly introduced with the view of saving materials without diminishing the strength of the work. The two upper rows consisted of arches of semicircles, the lower of Gothic arches; and this circumstance leads to the belief that the date of the structure is about the 10th century. The breadth of the building at the base was 21 ft., and it diminished with a regular batter on each side to the top, where it was only 11 ft. The base also was protected by strong buttresses or counterforts, erected against each of the pillars. The other branch of the aqueduct was 300 ft. long, and consisted of twelve semicircular arches. This aqueduct serves to convey to Constantinople the waters of the valley of Belgrad, one of the principal sources from which the city is supplied. These are situated on the heights of Mount Haemus, the extremity of the Balkan Mountains, which overhangs the Black Sea. The water rises about 15 m. from the city, and between 3 and 4 m. west of the village of Belgrad, in three sources, which run in three deep and very confined valleys. These unite a little below the village, and then are collected into a large reservoir. After flowing a mile or two from this reservoir, the waters are augmented by two other streams, and conveyed by a channel of stone to the Crooked Aqueduct. From this they are conveyed to another which is the Long Aqueduct; and then, with various accessions, into a third, termed the Aqueduct of Justinian. From this they enter a vaulted conduit, which skirts the hills on the left side of the valley, and crosses a broad valley 2 m. below the Aqueduct of Justinian, by means of an aqueduct, with two tiers of arches of a very beautiful construction. The conduit then proceeds onward in a circuitous route, till it reaches the reservoir of Egri Kapu, situated just without and on the walls of the city. From this the water is conducted to the various quarters of the city, and also to the reservoir of St Sophia, which supplies the seraglio of the grand signior. The Long Aqueduct (Usun Kemer) is more imposing by its extent than the Crooked one, but is far inferior in the regularity of design and disposition of the materials. It is evidently a work of the Turks. It consists of two tiers of arches, the lower being forty-eight in number, and the upper fifty. The whole length was about 2200 ft., and the height 80 ft. The aqueduct of Justinian (Muallak Kemer or "Hanging Aqueduct") is without doubt one of the finest monuments which remain to us of the middle ages. It consists of two tiers of large pointed arches, pierced transversely. Those of the lower story have 55 ft. of span, the upper ones 40 ft. The piers are supported by strong buttresses, and at different heights they have little arches passing through them laterally, which relieve the deadness of the solid pillar. The length of this aqueduct is 720 ft. and the height 108 ft. This aqueduct has been attributed both to Constantine I. and to Justinian, the latter being perhaps the more probable.

Besides the waters of Belgrad, Constantinople was supplied from several other principal sources, one of which took its rise on the heights of the same mountains, 3 or 4 m. east of Belgrad. This was conveyed in a similar manner by an arched channel elevated, when it was necessary, on aqueduct bridges, till it reached the northern parts of the city. It was in the course of this aqueduct that the contrivance of the *souterasi* or hydraulic obelisks, described by Andréossy (on his voyage to the Black Sea, the account of the Thracian Bosporus), was constructed, which excited some attention, as being an improvement on the method of conducting water by aqueduct bridges. "The souterasi," says Andréossy, "are masses of masonry, having generally the form of a truncated pyramid or an Egyptian obelisk. To form a conduit with souterasi, we choose sources of water, the level of which is several feet higher than the reservoir by which it is to be distributed over the city. We bring the water from its sources in subterranean canals, slightly declining until we come to the borders of a valley or broken ground. We there raise on each side a souterasi, to which we adapt vertically leaden pipes of determinate diameters, placed parallel to the two opposite sides of the building. These pipes are disjoined at the upper part of the obelisk, which forms a sort of basin, with which the pipes are connected. The one permits the water to rise to the level from whence it had descended; by the other, the water descends from this level to the foot of the souterasi, where it enters another canal underground, which conducts it to a second and to a third souterasi, where it rises and again descends, as at the last station. Here a reservoir receives it and distributes it in different directions by orifices of which the discharge is known." Again he says, "it requires but little attention to perceive that this system of conducting tubes is nothing but a series of siphons open at their upper part, and communicating with each other. The expense of a conduit by souterasi is estimated at only one-fifth of that of an aqueduct with arcades." There seems to be really no advantage in these pyramids, further than as they serve the purpose of discharging the air which collects in the pipes. They are in themselves an evident obstruction, and the water would flow more freely without any interruption of the kind. In regard to the leaden pipes, again, they would have required, with so little head pressure as is stated, to be used of very extraordinary dimensions to pass the same quantity of water as was discharged along the arched conduits (see also works quoted under CONSTANTINOPLE). The other principal source from which Constantinople is supplied, is from the high grounds 6 or 8 m. west of the town, from which it is conducted by conduits and arches, in the same manner as the others. The supply drawn from all these sources, as detailed by Andréossy, amounted to 400,000 cubic ft. per day. (A. S. M.; J. M. M.)

III. *Modern Construction.*—Where towns are favourably situated the aqueduct may be very short and its cost bear a relatively small proportion to the total outlay upon a scheme of water supply, but where distant sources have to be relied upon the cost of the aqueduct becomes one of the most important features in the scheme, and the quantity of water obtainable must be considerable to justify the outlay. Hence it is that only very large towns can undertake the responsibility for this expenditure. In Great Britain it has in all large schemes become a condition that, when a town is permitted to go outside its own watershed, it shall, subject to a priority of a certain number of gallons per day per head of its own inhabitants, allow local authorities, any part of whose district is within a certain number of miles of the aqueduct, to take a supply on reasonable terms. The first case in which this principle was adopted on a large scale was the Thirlmere scheme sanctioned by parliament in 1879, for augmenting the supply of Manchester. The previous supply was derived from a source only about 15 m. distant, and the cost of the aqueduct, chiefly cast-iron pipes, was insignificant compared with the cost of the impounding reservoirs. But Thirlmere is 96 m. distant from the service reservoir near Manchester, and the cost of the aqueduct was more than 90 % of the total cost. As a supply of about 50,000,000 gallons a day is available the outlay was justifiable, and the water is in fact very cheaply obtained. Liverpool derives a supply of about 40,000,000 gallons a day from the river Vyrnwy in North Wales, 68 m. distant, and Birmingham has constructed works for impounding water in Radnorshire, and conveying it a distance of 74 m., the supply being about 75,000,000 gallons a day. In the year 1899 an act of parliament was passed authorizing the towns of Derby, Leicester, Sheffield and Nottingham, jointly to obtain a supply of water from the head waters of the river Derwent in Derbyshire. Leicester is 60 m. distant from this source, and its share of the supply is about 10,000,000 gallons a day. For more than half the distance, however, the aqueduct

Aqueducts and water supply.

is common to Derby and Nottingham, which together are entitled to about 16,000,000 gallons a day, and the expense to Leicester is correspondingly reduced. These are the most important cases of long aqueducts in England, and all are subsequent to 1879. It is obvious, therefore, how greatly the design and construction of the aqueduct have grown in importance, and what care must be exercised in order that the supply upon which such large populations depend may not be interrupted, and that the country through which such large volumes of water are conveyed may not be flooded in consequence of the failure of any of the works.

Practically only two types of aqueduct are used in England. The one is built of concrete, brickwork, &c., the other of cast-iron (or, in special circumstances, steel) pipes. In the former type the water surface coincides with the hydraulic gradient, and the conditions are those of an artificial river; the aqueduct must therefore be carefully graded throughout, so that the fall available between source and termination may be economically distributed. This condition requires that the ground in which the work is built shall be at the proper elevation; if at any point this is not the case, the aqueduct must be carried on a substructure built up to the required level. Such large structures are, however, extremely expensive, and require elaborate devices for maintaining water-tightness against the expansion and contraction of the masonry due to changes of temperature. They are now only used where their length is very short, as in cases where mountain streams have to be crossed, and even these short lengths are avoided by some engineers, who arrange that the aqueduct shall pass, wherever practicable, under the streams. Where wide valleys interrupt the course of the built aqueduct, or where the absence of high ground prevents the adoption of that type at any part of the route, the cast-iron pipes hereafter referred to are used.

Construction.

The built aqueduct may be either in tunnel, or cut-and-cover, the latter term denoting the process of cutting the trench, building the floor, side-walls, and roof, and covering with earth, the surface of the ground being restored as before. For works conveying water for domestic supply, the aqueduct is in these days, in England, always covered. Where, as is usually the case, the water is derived from a tract of mountainous country, the tunnel work is sometimes very heavy. In the case of the Thirlmere aqueduct, out of the first 13 m. the length of the tunnelled portions is 8 m., the longest tunnel being 3 m. in length. Conditions of time, and the character of the rock, usually require the use of machinery for driving, at any rate in the case of the longer tunnels. For the comparatively small tunnels required for aqueducts, two percussion drilling machines are usually mounted on a carriage, the motive power being derived from compressed air sent up the tunnel in pipes. The holes when driven are charged with explosives and fired. In the Thirlmere tunnels, driven through very hard Lower Silurian strata, the progress was about 13 yds. a week at each face, work being carried on continuously day and night for six days a week. Where the character of the country through which the aqueduct passes is much the same as that from which the supply is derived, the tunnels need not be lined with concrete, &c., more than is absolutely necessary for retaining the water and supporting weak places in the rock; the floor, however, is nearly always so treated. The lining, whether in tunnel or cut-and-cover, may be either of concrete, or brickwork, or of concrete faced with brickwork. To ensure the impermeability of work constructed with these materials is in practice somewhat difficult, and no matter how much care is taken by those supervising the workmen, and even by the workmen themselves, it is impossible to guarantee entire freedom from trouble in this respect. With a wall only about 15 in. thick, any neglect is certain to make the work permeable; frequently the labourers do not distribute the broken stone and fine material of the concrete uniformly, and no matter how excellent the design, the quality of materials, &c., a leak is sure to occur at such places (unless, indeed, the pressure of the outside water is superior and an inflow occurs). A further cause of trouble lies in the water which flows from the strata on to the concrete, and washes away some of the cement upon which the work depends for its watertightness, before it has time to set. For this reason it is advisable to put in the floor before, and not after, the side-walls and arch have been built, otherwise the only outlet for the water in the strata is through the ground on which the floor has to be laid. Each length of about 20 ft. should be completely constructed before the next is begun, the water then having an easy exit at the leading end. Manholes, by which the aqueduct can be entered, are usually placed in the roof at convenient intervals; thus, in the case of the Thirlmere aqueduct, they occur at every quarter of a mile.

Masonry aqueducts.

In some parts of America aqueducts are frequently constructed of wood, being then termed flumes. These are probably more extensively used in California than in any other part of the world, for conveying large quantities of water which is required for hydraulic mining, for irrigation, for the supply of towns and for transporting timber. The flumes are frequently carried along precipitous mountain slopes, and across valleys, supported on trestles. In Fresno county, California, there is a flume 52 m. in length for transporting timber from the Sierra Nevada Mountains to the plain below; it has a rectangular V-shaped section, 3 ft. 7 in. wide at the top, and 21 in. deep vertically. The boards which form the sides are 1¼ in. thick, and some of the trestlework is 130 ft. high. The steepest grade occurs where there is a fall of 730 ft. in a length of 3000 ft. About 9,000,000 ft. of timber were used in the construction. At San Diego there is a flume 35 m. long for irrigation and domestic supply, the capacity being 50 ft. per second; it has 315 trestle bridges (the longest of which is that across Los Coches Creek, 1794 ft. in length and 65 ft. in height) and 8 tunnels, and the cost was $900,000. The great bench flume of the Highline canal, Colorado, is 2640 ft. in length, 28 ft. wide, and 7 ft. deep; the gradient is 5·28 ft. per mile, and the discharge 1184 ft. per second.

Timber aqueducts.

As previously stated, the type of aqueduct built of concrete, &c., can only be adopted where the ground is sufficiently elevated to carry it, and where the quantity of water to be conveyed makes it more economical than piping. Where the falling contour is interrupted by valleys too wide for a masonry structure above the surface of the ground, the detached portions of the built aqueduct must be connected by rows of pipes laid beneath, and following the main undulations of, the surface. In such cases the built aqueduct terminates in a chamber of sufficient size to enclose the mouths of the several pipes, which, thus charged, carry the water under the valley up to a corresponding chamber on the farther hillside from which the built aqueduct again carries on the supply. These connecting pipes are sometimes called siphons, although they have nothing whatever to do with the principle of a siphon, the water simply flowing into the pipe at one end and out at the other under the influence of gravity, and the pressure of the atmosphere being no element in the case. The pipes are almost always made of cast-iron, except in such cases as the lower part of some siphons, where the pressure is very great, or where they are for use abroad, when considerations of weight are of importance, and when they are made of rolled steel with riveted or welded seams. It is frequently necessary to lay them in deep cuttings, in which case cast-iron is much better adapted for sustaining a heavy weight of earth than the thinner steel, though the latter is more adapted to resist internal pressure. Mr D. Clarke (*Trans. Am. Soc. C.E.* vol. xxxviii. p. 93) gives some particulars of a riveted steel pipe 24 m. long, 33 to 42 in. diameter, varying in thickness from 0·22 in. to 0·375 in. After a length of 9 m. had been laid, and the trench refilled, it was found that the crown of the pipe had been flattened by an amount varying from ½ in. to 4 in. Steel pipes suffer more from corrosion than those made of cast-iron, and as the metal attacked is much thinner the strength is more seriously reduced. These considerations have prevented any general change from cast-iron to steel.

Aqueduct in iron piping.

Mr. Clemens Herschel has made some interesting remarks (*Proc. Inst. C.E.* vol. cxv. p. 162) as to the circumstances in which steel

pipes have been found preferable to cast-iron. He says that it had been demonstrated by practice that cast-iron cannot compete with wrought-iron or steel pipes in the states west of the Rocky Mountains, on the Pacific slope. This is due to the absence of coal and iron ore in these states, and to the weight of the imported cast-iron pipes compared with steel pipes of equal capacity and strength. The works of the East Jersey Water Company for the supply of Newark, N.J., include a riveted steel conduit 48 in. in diameter and 21 m. long. This conduit is designed to resist only the pressure due to the hydraulic gradient, in contradistinction to that which would be due to the hydrostatic head, this arrangement saving 40% in the weight and cost of the pipes. For the supply of Rochester, N.Y., there is a riveted steel conduit 36 in. in diameter and 20 m. long; and for Allegheny City, Pennsylvania, there is a steel conduit 5 ft. in diameter and nearly 10 m. long. The works for bringing the water from La Vigne and Verneuil to Paris include a steel main 5 ft. in diameter between St Cloud and Paris.

Cast-iron pipes rarely exceed 48 in. in diameter, and even this diameter is only practicable where the pressure of the water is low. In the Thirlmere aqueduct the greatest pressure is nearly 180 lb on the square inch, the pipes where this occurs being 40 in. in diameter and 1¾ in. thick. These large pipes, which are usually made in lengths of 12 ft., are generally cast with a socket at one end for receiving the spigot end of the next pipe, the annular space being run with lead, which is prevented from flowing into the interior of the pipe by a spring ring subsequently removed; the surface of the lead is then caulked all round the outside of the pipe. A wrought-iron ring is sometimes shrunk on the outer rim of the socket, previously turned to receive it, in order to strengthen it against the wedging action of the caulking tool. Sometimes the pipes are cast as plain tubes and joined with double collars, which are run with lead as in the last case. The reason for adopting the latter type is that the stresses set up in the thicker metal of the socket by unequal cooling are thereby avoided, a very usual place for pipes to crack under pressure being at the back of the socket. The method of turning and boring a portion, slightly tapered, of spigot and socket so as to ensure a watertight junction by close annular metallic contact, is not suitable for large pipes, though very convenient for smaller diameters in even ground. Spherical joints are sometimes used where a line of main has to be laid under a large river or estuary, and where, therefore, the pipes must be jointed before being lowered into the previously dredged trench. This was the case at the Willamette river, Portland, Oregon, where a length of 2000 ft. was required. The pipes are of cast-iron 28 in. in diameter, 1½ in. thick, and 17 ft. long. The spigots were turned to a spherical surface of 20 in. radius outside, the inside of the sockets being of a radius ⅜ in. greater. After the insertion of the spigot into the socket, a ring, 3 in. deep, turned inside to correspond with the socket, was bolted to the latter, the annular space then being run with lead. These pipes were laid on an inclined cradle, one end of which rested on the bed of the river and the other on a barge where the jointing was done; as the pipes were jointed the barge was carefully advanced, thus trailing the pipes into the trench (*Trans. Am. Soc. C.E.* vol. xxxiii. p. 257). As may be conjectured from the pressure which they have to stand, very great care has to be taken in the manufacture and handling of cast-iron pipes of large diameter, a care which must be unfailing from the time of casting until they are jointed in their final position in the ground. They are cast vertically, socket downwards, so that the densest metal may be at the weakest part, and it is advisable to allow an extra head of metal of about 12 in., which is subsequently cut off in a lathe. An inspector representing the purchaser watches every detail of the manufacture, and if, after being measured in every part and weighed, they are found satisfactory they are proved with internal fluid pressure, oil being preferable to water for this purpose. While under pressure, they are rapped from end to end with a hand hammer of about 5 lb in weight, in order to discover defects. The wrought-iron rings are then, if required, shrunk on to the sockets, and the pipes, after being made hot in a stove, are dipped vertically in a composition of pitch and oil, in order to preserve them from corrosion. All these operations are performed under cover. A record should be kept of the history of the pipe from the time it is cast to the time it is laid and jointed in the ground, giving the date, number, diameter, length, thickness, and proof pressure, with the name of the pipe-jointer whose work closes the record. Such a history sometimes enables the cause (which is often very obscure) of a burst in a pipe to be ascertained, the position of every pipe being recorded.

Cast-iron pipes, even when dipped in the composition referred to, suffer considerably from corrosion caused by the water, especially soft water, flowing through them. One pipe may be found in as good a condition as when made, while the next may be covered with nodules of rust. The effect of the rust is twofold; it reduces the area of the pipe, and also, in consequence of the resistance offered by the rough surface, retards the velocity of the water. These two results, expecially the latter, may seriously diminish the capability of discharge, and they should always be allowed for in deciding the diameter. Automatic scrapers are sometimes used with good results, but it is better to be independent of them as long as possible. In one case the discharge of pipes, 40 in. in diameter, was found after a period of about twelve years to have diminished at the rate of about 1% per year; in another case, where the water was soft and where the pipes were 40 in. in diameter, the discharge was diminished by 7% in ten years. An account of the state of two cast-iron mains supplying Boston with water is given in the *Trans. Am. Soc. C.E.* vol. xxxv. p. 241. These pipes, which were laid in 1877, are 48 in. in diameter and 1800 ft. long. When they were examined in 1894–1895, it was estimated that the tubercles of rust covered nearly one-third of the interior surfaces, the bottom of the pipe being more encrusted than the sides and top. They had central points of attachment to the iron, at which no doubt the coating was defective, and from them the tubercles spread over the surface of the surrounding coating. In this case they were removed by hand, and the coating of the pipes was not injured in the process. Cast-iron pipes must not be laid in contact with cinders from a blast furnace with which roads are sometimes made, because these corrode the metal. Mr Russell Aitken (*Proc. Inst. C.E.* vol. cxv. p. 93) found in India that cast-iron pipes buried in the soil rapidly corroded, owing to the presence of nitric acid secreted by bacteria which attacked the iron. The large cast-iron pipes conveying the water from the Tansa reservoir to Bombay are laid above the surface of the ground. Cast-iron pipes of these large diameters have not been in existence sufficiently long to enable their life to be predicted. A main, 40 in. in diameter, conveying soft water, after being in existence fifty years at Manchester, was apparently as good as ever. In 1867 Mr J. B. Francis found that no apparent deterioration had taken place in a cast-iron main, 8 in. diameter, which was laid in the year 1828, a period of thirty-nine years (*Trans. Soc. Am. C.E.* vol. i. p. 26). These two instances are probably not exceptional.

Methods of laying.

Pipes in England are usually laid with not less than 2 ft. 6 in. of cover, in order that the water may not be frozen in a severe winter. Where they are laid in deep cutting they should be partly surrounded with concrete, so that they may not be fractured by the weight of earth above them. Angles are turned by means of special bend pipes, the curves being made of as large a radius as convenient. In the case of the Thirlmere aqueduct, double socketed castings about 12 in. long (exclusive of the sockets) were used, the sockets being inclined to each other at the required angle. They were made to various angles, and for any particular curve several would be used connected by straight pipes 3 ft. long. As special castings are nearly double the price of the regular pipes, the cost was much diminished by making them as short as possible, while a curve, made up of the slight angles used, offered practically no more impediment to the flow of water in consequence of its polygonal form, than would be the case had special bend pipes been used. In all cases of curves on a line of pipes under internal fluid pressure, there exists a resultant force tending to displace the pipes. When the curve is in a horizontal plane and the pipes are buried in the ground, the side of the pipe trench offers sufficient resistance to this force. Where, however, the pipes are above ground, or when the curve is in a vertical plane, it is necessary to anchor them in position. In the case of the Tansa aqueduct to Bombay, there is a curve of 500 ft. radius near Bassein Creek. At this point the hydrostatic head is about 250 ft., and the engineer, Mr Clerke, mentions that a tendency to an outward movement of the line of pipes was observed. At the siphon under Kurla Creek the curves on the approaches as originally laid down were sharp, the hydrostatic head being there about 210 ft.; here the outward movement was so marked that it was considered advisable to realign the approaches with easier curves (*Proc. Inst. C.E.* vol. cxv. p. 34). In the case of the Thirlmere aqueduct the greatest hydrostatic pressure, 410 ft., occurs at the bridge over the river Lune, where the pipes are 40 in. in diameter, and in descending from the bridge make reverse angles of 31½°. The displacing force at each of these angles amounts to 54 tons, and as the design includes five lines of pipes, it is obvious that the anchoring arrangements must be very efficient. The steel straps used for anchoring these and all other bends were curved to fit as closely as possible the castings to be anchored. Naturally the metal was not in perfect contact, but when the pipes were charged the disappearance of all the slight inequalities showed that the straps were fulfilling their intended purpose. At every summit on a line of pipes one or more valves must be placed in order to allow the escape of air, and they must also be provided on long level stretches, and at changes of gradient where the depth of the point of change below the hydraulic gradient is less than that at both

sides, causing what may be called a virtual summit. It is better to have too many than too few, as accumulations of air may cause an enormous diminution in the quantity of water delivered. In all depressions discharge valves should be placed for emptying the pipes when desired, and for letting off the sediment which accumulates at such points. Automatic valves are frequently placed at suitable distances for cutting off the supply in case of a burst. At the inlet mouth of the pipe they may depend for their action on the sudden lowering of the water (due to a burst in the pipe) in the chamber from which they draw their supply, causing a float to sink and set the closing arrangement in motion. Those on the line of main are started by the increased velocity in the water, caused by the burst on the pipe at a lower level. The water, when thus accelerated, is able to move a disk hung in the pipe at the end of a lever and weighted so as to resist the normal velocity; this lever releases a catch, and a door is then gradually revolved by weights until it entirely closes the pipe. Reflux valves on the ascending leg of a siphon prevent water from flowing back in case of a burst below them; they have doors hung on hinges, opening only in the normal direction of flow. Due allowance must be made, in the amount of head allotted to a pipe, for any head which may be absorbed by such mechanical arrangements as those described where they offer opposition to the flow of the water. These large mains require most careful and gradual filling with water, and constant attention must be given to the air-valves to see that the gutta-percha balls do not wedge themselves in the openings. A large mass of water, having a considerable velocity, may cause a great many bursts by water-ramming, due to the admission of the water at too great a speed. In places where iron is absent and timber plentiful, as in some parts of America, pipes, even of large diameter and in the most important cases, are sometimes made of wooden staves hooped with iron. A description of two of these will be found below.

Thirlmere.

The *Thirlmere Aqueduct* is capable of conveying 50,000,000 gallons a day from Thirlmere, in the English lake district, to Manchester. The total length of 96 m. is made up of 14 m. of tunnels, 37 m. of cut-and-cover, and 45 m. of cast-iron pipes, five rows of the latter being required. The tunnels where lined, and the cut-and-cover, are formed of concrete, and are 7 ft. in height and width, the usual thickness of the concrete being 15 in. The inclination is 20 in. per mile. The floor is flat from side to side, and the side-walls are 5 ft. high to the springing of the arch, which has a rise of 2 ft. The water from the lake is received in a circular well 65 ft. deep and 40 ft. in diameter, at the bottom of which there is a ring of wire-gauze strainers. Wherever the concrete aqueduct is intersected by valleys, cast-iron pipes are laid; in the first instance only two of the five rows 40 in. in diameter were laid, the city not requiring its supply to be augmented by more than 20,000,000 gallons a day, but in 1907 it was decided to lay a third line. All the elaborate arrangements described above for stopping the water in case of a burst have been employed, and have perfectly fulfilled their duties in the few cases in which they have been called into action. The water is received in a service reservoir at Prestwich, near Manchester, from which it is supplied to the city. The supply from this source was begun in 1894. The total cost of the complete scheme may be taken at about £5,000,000, of which rather under £3,000,000 had been spent up to the date of the opening, at which time only one line of pipes had been laid.

Vyrnwy.

The *Vyrnwy Aqueduct* was sanctioned by parliament in 1880 for the supply of Liverpool from North Wales, the quantity of water obtainable being at least 40,000,000 gallons a day. A tower built in the artificial lake from which the supply is derived, contains the inlet and arrangements for straining the water. The aqueduct is 68 m. in length, and for nearly the whole distance will consist of three lines of cast-iron pipes, two of which, varying in diameter from 42 in. to 39 in., are now in use. As the total fall between Vyrnwy and the termination at Prescot reservoirs is about 550 ft., arrangements had to be made to ensure that no part of the aqueduct be subjected to a greater pressure than is required for the actual discharge. Balancing reservoirs have therefore been constructed at five points on the line, advantage being taken of high ground where available, so that the total pressure is broken up into sections. At one of these points, where the ground level is 110 ft. below the hydraulic gradient, a circular tower is built, making a most imposing architectural feature in the landscape. At the crossing of the river Weaver, 100 ft. wide and 15 ft. deep, the three pipes, here made of steel, were connected together laterally, floated into position, and sunk into a dredged trench prepared to receive them. Under the river Mersey the pipes are carried in a tunnel, from which, during construction, the water was excluded by compressed air.

Denver.

Denver Aqueduct.—The supply to Denver City, initiated by the Citizens Water Company in 1889, is derived from the Platte river, rising in the Rocky Mountains. The first aqueduct constructed is rather over 20 m. in length, of which a length of 16½ m. is made of wooden stave pipe, 30 in. in diameter. The maximum pressure is that due to 185 ft. of water; the average cost of the wooden pipe was $1·36½ per foot, and the capability of discharge 8,400,000 gallons a day. Within a year of the completion of the first conduit, it became evident that another of still greater capacity was required. This was completed in April 1893; it is 34 in. in diameter and will deliver 16,000,000 gallons a day. By increasing the head upon the first pipe, the combined discharge is 30,000,000 gallons a day. An incident in obtaining a temporary supply, without waiting for the completion of the second pipe, was the construction of two wooden pipes, 13 in. in diameter, crossing a stream with a span of 104 ft., and having no support other than that derived from their arched form. One end of the arch is 24½ ft. above the other end, and, when filled with water, the deflection with eight men on it was only ⅛ of an inch. A somewhat similar arch, 60 ft. span, occurs on the 34-in. pipe where it crosses a canal. Schuyler points out (*Trans. Am. Soc. C.E.* vol. xxxi. p. 148) that the fact that the entire water supply of a city of 150,000 inhabitants is conveyed in wooden mains, is so radical a departure from all precedents, that it is deserving of more than a passing notice. He says that it is manifestly and unreservedly successful, and has achieved an enormous saving in cost. The sum saved by the use of wooden, in preference to cast-iron pipes, is estimated at $1,100,000. It is perhaps necessary to state that the pipe is buried in the ground in the same way as metal pipes. The edges of the staves are dressed to the radius with a minute tongue ¼ in. high on one edge of each stave, but with no corresponding groove in the next stave; its object is to ensure a close joint when the bands are tightened up. Leaks seldom or never occur along the longitudinal seams, but the end shrinkage caused troublesome joint leaks. The shrinkage in California redwood, which had seasoned 60 to 90 days before milling, was frequently as much as 3 in. in the 20 staves that formed the 34-in. pipe, and the space so formed had to be filled by a special closing stave. Metallic tongues, ⅜ in. deep, are inserted at the ends of abutting staves, in a straight saw cut. The bands, which are of mild steel, have a head at one end and a nut and washer at the other; the ends are brought together on a wrought-iron shoe, against which the nut and washer set. The staves forming the lower half of the pipe are placed on an outside, and the top staves on an inside, mould. While the bands are being adjusted the pipe is rounded out to bring the staves out full, and the staves are carefully driven home on to the abutting staves. The spacing of the bands depends on circumstances, but is about 150 bands per 100 ft. With low heads the limit of spacing was fixed at 17 in. The outer surface of the pipe, when charged, shows moisture oozing slightly over the entire surface. This condition Schuyler considers an ideal one for perfect preservation, and the staves were kept as thin as possible to ensure its occurrence. Samples taken from pipes in use from three to nine years are quite sound, and it is concluded that the wood will last as long as cast-iron if the pipe is kept constantly charged. The bands are the only perishable portion, and their life is taken at from fifteen to twenty years. Other portions of the second conduit for a length of nearly 3 m. were formed of concrete piping, 38 in. diameter, formed on a mould in the trench, the thickness being 2½ to 3 in. So successful an instance of the use of wooden piping on a large scale is sure to lead to a large development of this type of aqueduct in districts where timber is plentiful and iron absent.

Pioneer, Utah.

Pioneer Aqueduct, Utah.—The construction of the Pioneer Aqueduct, Utah, was begun in 1896 by the Pioneer Electric Power Company, near the city of Ogden, 35 m. north of Salt Lake City. The storage reservoir, from which it draws its water, will cover an area of 2000 acres, and contain about 15,000 million gallons of water. The aqueduct is a pipe 6 ft. in diameter, and of a total length of 6 m.; for a distance of rather more than 5 m. it is formed of wooden staves, the remainder, where the head exceeds 117 ft., being of steel. It is laid in a trench and covered to a depth of 3 ft. The greatest pressure on the steel pipe is 200 lb per sq. in., and the thickness varies from ⅜ to ⅝ in. The pipe was constructed according to the usual practice of marine boiler-work for high pressures, and each section, about 9 ft. long, was dipped in asphalt for an hour. These sections were supported on timber blocking, placed from 5 to 9 ft. apart, and consisting of three to six pieces of 6 x 6 in. timbers laid one on the top of the other; they were then riveted together in the ordinary way. The wooden stave-pipe is of the type successfully used in the Western States for many years, but its diameter is believed to be unequalled for any but short lengths. There were thirty-two staves in the circle, 2 in. in thickness, and about 20 ft. long, hooped with round steel rods ⅝ in. in diameter, each hoop being in two pieces. The pipe is supported at intervals of 8 ft. by sills 6 x 8 in. and 8 ft. long. The flow through it is 250 cubic ft. per second.

Santa Ana.

The *Santa Ana Canal* was constructed for irrigation purposes in California, and is designed to carry 240 cub. ft. of water per second (*Trans. Am. Soc. C.E.* vol. xxxiii. p. 99). The cross section of the flumes shows an elliptical bottom and straight sides consisting of wooden staves held together by

iron and steel ribs. The width and depth are each 5 ft. 6 in., the intended depth of water being 5 ft. The staves are held by T-iron supports resting on wooden sills spaced 8 ft. apart, and are compressed together by a framework. They were caulked with oakum, on the top of which, to a third of the total depth, hot asphalt was run. The use of nails was altogether avoided except in parts of the framework, it being noticed that decay usually starts at nail-holes. It was found possible to make the flume absolutely watertight, and in case of repair being necessary at any part the framework is easily taken to pieces so that new staves can be inserted. The water in the flume has a velocity of 9·6 ft. per second. The Warm Springs, Deep, and Morton cañons on the line are crossed by wooden stave pipes 52 in. in diameter, bound with round steel rods, and laid above the surface of the ground. The work is planned for two rows of pipes, each capable of carrying 123 cub. ft. per second; of these one so far has been laid. The lengths of the pipes at each of the three cañons are 551, 964 and 756 ft. respectively, and the maximum head at any place is 160 ft. The pipes are not painted, and it has been suggested that they would suffer in their exposed position in case of a bush fire, a contingency to which, of course, flumes are also liable.

Aqueducts of New York.—There are three aqueducts in New York —the Old Croton Aqueduct (1837–1843), the Bronx River Conduit (1880–1885), and the New Croton Aqueduct (1884–1893), discharging respectively 95, 28, and 302 million U. S. gallons a day; their combined delivery is therefore 425 million gallons a day. The Old Croton Aqueduct is about 41 m. in length, and was constructed as a masonry conduit, except at the Harlem and Manhattan valleys, where two lines of 36-in. pipe were used. The inclination of the former is at the rate of about 13 in. per mile. The area of the cross-section is 53·34 sq. ft., the height is 8½ ft., and the greatest width 7 ft. 5 in.; the roof is semicircular, the floor segmental, and the sides have a batter on the face of ½ in. per foot. The sides and invert are of concrete, faced with 4 in. of brickwork, the roof being entirely of brickwork. There is a bridge over the Harlem river 1450 ft. in length, consisting of fifteen semicircular arches; its soffit is 100 ft. above high water, and its cost was $963,427. The construction of the New Croton Aqueduct was begun in 1885, and the works were sufficiently advanced by the 15th of July 1890 to allow the supply to be begun. The lengths of the various parts of the aqueduct are as follows:— *New York.*

	Miles.
Tunnel	29·75
Cut-and-cover	1·12
Cast-iron pipes, 48 in. diameter, 8 rows	2·38
Croton Inlet to Central Park	33·25

The length of tunnel under pressure (circular form) is 7·17 m., and that not under pressure (horse-shoe form) 23·70 m. The maximum pressure in the former is 55 lb per sq. in. The width and height of the horse-shoe form are each 13 ft. 7 in., and the diameter of the circular form (with the exception of two short lengths) is 12 ft. 3 in. The reason for constructing the aqueduct in tunnel for so long a distance was the enhanced value of the low-lying ground near the old aqueduct. The tunnel deviates from a straight line only for the purpose of intersecting a few transverse valleys at which it could be emptied. For 25 m. the gradient is 0·7 foot per mile; the tunnel is then depressed below the hydraulic gradient, the maximum depth being at the Harlem river, where it is 300 ft. below high water. The depth of the tunnel varies from 50 to 500 ft. from the surface of the ground. Forty-two shafts were sunk to facilitate driving, and in four cases where the surface of the ground is below the hydraulic gradient these are closed by watertight covers. The whole of the tunnel is lined with brickwork from 1 to 2 ft. in thickness, the voids behind the lining being filled with rubble-in-mortar. The entry to the old and new aqueducts is controlled by a gatehouse of elaborate and massive design, and the pipes which take up the supply at the end of the tunnel are also commanded by a gate-house. The aqueduct, where it passes under the Harlem river, is worthy of special notice. As it approaches the river it has a considerable fall, and eventually ends in a vertical shaft 12 ft. 3 in. in diameter (where the water has a fall of 174 ft.), from the bottom of which, at a depth of 300 ft. below high-water level, the tunnel under the river starts. The latter is circular in form, the diameter being 10 ft. 6 in., and the length is 1300 ft.; it terminates at the bottom of another vertical shaft also 12 ft. 3 in. in diameter. The depth of this shaft, measured from the floor of the lower tunnel to that of the upper tunnel leading away from it, is 321 ft.; it is continued up to the surface of the ground, though closed by double watertight covers a little above the level of the upper tunnel. Adjoining this shaft is another shaft of equal diameter, by means of which the water can be pumped out, and there is also a communication with the river above high-water level, so that the higher parts can be emptied by gravitation. The cost of the Old Croton Aqueduct was $11,500,000; that of the new aqueduct is not far short of $20,000,000.

The *Nadrai Aqueduct Bridge*, in India, opened at the end of 1889, is the largest structure of its kind in existence. It was built to carry the water of the Lower Ganges canal over the Kali Naddi, in connexion with the irrigation canals of the north-west provinces. In the year 1888–1889 this canal had 564 m. of main line, with 2050 m. of minor distributaries, and irrigated 519,022 acres of crops. The new bridge replaces one of much smaller size (five spans of 35 ft.), which was completely destroyed by a high flood in July 1885. It gives the river a waterway of 21,000 sq. ft., and the canal a waterway of 1040 sq. ft., the latter representing a discharge of 4100 cub. ft. per second. Its length is 1310 ft., and it is carried on fifteen arches having a span of 60 ft. The width between the faces of the arches is 149 ft. The foundations below the river-bed have a depth of 52 ft., and the total height of the structure is 88 ft. It cost 44½ lakhs of rupees, and occupied four years in building. The foundations consist of 268 circular brick cylinders, and the fifteen spans are arranged in three groups, divided by abutment piers; the latter are founded on a double row of 12-ft. cylinders, and the intermediate piers on a single row of 20-ft. cylinders, all the cylinders being hearted with hydraulic lime concrete filled in with skips. This aqueduct-bridge has a very fine appearance, owing to its massive proportions and design. (E. P. H.*) *Nadrai.*

AUTHORITIES.—For ancient aqueducts in general: Curt Merckel, *Die Ingenieurtechnik im Alterthum* (Berlin, 1899); ch. vi. contains a very full account from the earliest Assyrian aqueducts onwards, with illustrations, measurements and an excellent bibliography. For Greek aqueducts see E. Curtius, "Über städtische Wasserbauten der Hellenen," in *Archaeologische Zeitung* (1847); G. Weber (as above); papers in *Athen. Mittheil.* (Samos), 1877, (Enneacrunus) 1892, 1893, 1894, 1905, and articles on ATHENS, PERGAMUM, &c. For Roman aqueducts: R. Lanciani, "I Commentari di Frontino intorno le acque e gli acquedotti," in *Memorie dei Lincei*, serie iii. vol. iv. (Rome, 1880), 215 sqq., and separately; C. Herschel, *The Two Books on the Water Supply of the City of Rome of Sextus Julius Frontinus* (Boston, 1899); T. Ashby in *Classical Review* (1902), 336, and articles in *The Builder*; cf. also the maps to T. Ashby's "Classical Topography of the Roman Campagna," in *Papers of the British School at Rome*, i., iii., iv. (in progress).

For modern aqueducts, see Rickman's *Life of Telford* (1838); Schramke's *New York Croton Aqueduct; Second Annual Report of the Department of Public Works of the City of New York in 1872*; *Report of the Aqueduct Commissioners* (1887–1895), and *The Water Supply of the City of New York* (1896), by Wegmann; *Mémoires sur les eaux de Paris*, presentés par le Préfet de la Seine au Conseil Municipal (1854 and 1858); *Recherches statistiques sur les sources du bassin de la Seine*, par M. Belgrand, Ingénieur en chef des ponts et chaussées (1854); "Descriptions of Mechanical Arrangements of the Manchester Waterworks," by John Frederic Bateman, F.R.S., Engineer-in-chief, from the *Minutes of Proceedings of the Institution of Mechanical Engineers* (1866); *The Glasgow Waterworks*, by James M. Gale, Member Inst. C.E. (1863 and 1864); *The Report of the Royal Commission on Water Supply, and the Minutes of Evidence* (1867 and 1868). For accounts of other aqueducts, see the Transactions of the Societies of Engineers in the different countries, and the Engineering Journals.

AQUILA ('Ακύλας), (1) a Jew from Rome, who with his wife Prisca or Priscilla had settled in Corinth, where Paul stayed with them (Acts xviii. 2, 3). They became Christians and fellow-workers with Paul, to whom they seem to have shown their devotion in some special way (Rom. xvi. 3, 4). (2) A native of Pontus, celebrated for a very literal and accurate translation of the Old Testament into Greek. Epiphanius (*De Pond. et Mens.* c. 15) preserves a tradition that he was a kinsman of the emperor Hadrian, who employed him in rebuilding Jerusalem (Aelia Capitolina, *q.v.*), and that he was converted to Christianity, but, on being reproved for practising pagan astrology, apostatized to Judaism. He is said also to have been a disciple of Rabbi 'Aqîba (d. A.D. 132), and seems to be referred to in Jewish writings as עקילס. Aquila's version is said to have been used in place of the Septuagint in the synagogues. The Christians generally disliked it, alleging without due grounds that it rendered the Messianic passages incorrectly, but Jerome and Origen speak in its praise. Origen incorporated it in his *Hexapla*.

It was thought that this was the only copy extant, but in 1897 fragments of two codices were brought to the Cambridge University Library. These have been published—the fragments containing 1 Kings xx. 7-17; 2 Kings xxiii. 12-27 by F. C. Burkitt in 1897, those containing parts of Psalms xc.-ciii. by C. Taylor in 1899. See F. C. Burkitt's article in the *Jewish Encyclopaedia*.

AQUILA, CASPAR [KASPAR ADLER] (1488–1560), German reformer, was born at Augsburg on the 7th of August 1488, educated there and at Ulm (1502), in Italy (he met Erasmus in Rome), at Bern (1508), Leipzig (1510) and Wittenberg (1513). According to his son, he entered the ministry in August 1514, at Bern. He was for some time a military chaplain. In 1516 he became pastor of Jenga, near Augsburg. Openly proclaiming his adhesion to Luther's doctrine, he was imprisoned for

half a year (1520 or 1522) at Dillingen, by order of the bishop of Augsburg; a death sentence was commuted to banishment through the influence of Isabella, wife of Christian II. of Denmark and sister of Charles V. Returning to Wittenberg he met Luther, acted as tutor to the sons of Franz von Sickingen at Ebernburg, taught Hebrew at Wittenberg, and aided Luther in his version of the Old Testament. The dates and particulars of his career are uncertain till 1527, when he became pastor at Saalfeld, and in 1528, superintendent. His vehement opposition to the Augsburg Interim (1548) led him to take temporary shelter at Rudolstadt with Catherine, countess of Schwarzburg. In 1550 he was appointed dean of the Collegiatstift in Schmalkalden. Here he had a controversy with Andreas Osiander. Restored to Saalfeld, not without opposition, in 1552, he remained there, still engaged in controversy, till his death on the 12th of November 1560. He was twice married, and left four sons. He published numerous sermons, a few Old Testament expositions and some controversial tracts.

See G. Kawerau, in A. Hauck's *Realencyklopädie* (1896); *Allgemeine deutsche Biog.* (1875); Lives by J. Avenarius (1718); J. G. Hillinger (1731); Chr. Schlegel (1737); Fr. Gensler (1816).

AQUILA, SERAFINO DELL' (1466–1500), Italian poet and improvisatore, was born in 1466 at the town of Aquila, from which he took his name, and died in the year 1500. He spent several years at the courts of Cardinal Sforza and Ferdinand, duke of Calabria; but his principal patrons were the Borgias at Rome, from whom he received many favours. Aquila seems to have aimed at an imitation of Dante and Petrarch; and his poems, which were extravagantly praised during the author's lifetime, are occasionally of considerable merit. His reputation was in great measure due to his remarkable skill as an improvisatore and musician. His works were printed at Venice in 1502, and there have been several subsequent editions.

AQUILA, a city of the Abruzzi, Italy, the capital of the province of Aquila, and the seat of an archbishop, 2360 ft. above sea-level, 50 m. directly N.E. of Rome, and 145 m. by rail. Pop. (1901) town, 18,494; commune, 21,261. It lies on a hill in the wide valley of the Aterno, surrounded by mountains on all sides, the Gran Sasso d'Italia being conspicuous on the north-east. It is a favourite summer resort of the Italians, but is cold and windy in winter. In the highest part of the town is the massive citadel, erected by the Spanish viceroy Don Pedro de Toledo in 1534. The church of S. Bernardino di Siena (1472) has a fine Renaissance façade by Nicolò Filotesio (commonly called Cola dell' Amatrice), and contains the monumental tomb of the saint, decorated with beautiful sculptures, and executed by Silvestro Ariscola in 1480. The church of S. Maria di Collemaggio, just outside the town, has a very fine Romanesque façade of simple design (1270–1280) in red and white marble, with three finely decorated portals and a rose-window above each. The two side doors are also fine. The interior contains the mausoleum of Pope Celestine V. (d. 1296) erected in 1517. Many smaller churches in the town have similar façades (S. Giusta, S. Silvestro, &c.). The town also contains some fine palaces: the municipality has a museum, with a collection of Roman inscriptions and some illuminated service books. The Palazzi Dragonetti and Persichetti contain private collections of pictures. Outside the town is the *Fontana delle novantanove cannelle*, a fountain with ninety-nine jets distributed along three walls, constructed in 1272. Aquila has some trade in lace and saffron, and possesses other smaller industries. It was a university town in the middle ages, but most of its chairs have now been suppressed.

Aquila was founded by Conrad, son of the emperor Frederick II., about 1250, as a bulwark against the power of the papacy. It was destroyed by Manfred in 1259, but soon rebuilt by Charles I. of Anjou. Its walls were completed in 1316; and it maintained itself as an almost independent republic until it was subdued in 1521 by the Spaniards, who had become masters of the kingdom of Naples in 1503. It was twice sacked by the French in 1799.

See V. Bindi, *Monumenti storici ed artistici degli Abruzzi* (Naples, 1889), pp. 771 seq.

AQUILA, in astronomy, the "Eagle," sometimes named the "Vulture," a constellation of the northern hemisphere, mentioned by Eudoxus (4th cent. B.C.) and Aratus (3rd cent. B.C.). Ptolemy catalogued nineteen stars jointly in this constellation and in the constellation *Antinous*, which was named in the reign of the emperor Hadrian (A.D. 117–138), but sometimes, and wrongly, attributed to Tycho Brahe, who catalogued twelve stars in Aquila and seven in Antinous; Hevelius determined twenty-three stars in the first, and nineteen in the second. The most brilliant star of this constellation, *α-Aquilae* or Altair, has a parallax of 0·23″, and consequently is about eight times as bright as the sun; *η-Aquilae* is a short-period variable, while *Nova Aquilae* is a "temporary" or "new" star, discovered by Mrs Fleming of Harvard in 1899.

AQUILA ROMANUS, a Latin grammarian who flourished in the second half of the 3rd century A.D. He was the author of an extant treatise *De Figuris Sententiarum et Elocutionis*, written as an instalment of a complete rhetorical handbook for the use of a young and eager correspondent. While recommending Demosthenes and Cicero as models, he takes his own examples almost exclusively from Cicero. His treatise is really adapted from that by Alexander, son of Numenius, as is expressly stated by Julius Rufinianus, who brought out a supplementary treatise, augmented by material from other sources. Aquila's style is harsh and careless, and the Latin is inferior.

Halm, *Rhetores Latini minores* (1863); Wensch, *De Aquila Romano* (1861).

AQUILEIA, an ancient town of Italy, at the head of the Adriatic at the edge of the lagoons, about 6 m. from the sea, on the river Natiso (mod. Natisone), the course of which has changed somewhat since Roman times. It was founded by the Romans in 181 B.C. as a frontier fortress on the north-east, not far from the site where, two years before, Gaulish invaders had attempted to settle. The colony was led by two men of consular and one of praetorian rank, and 3000 *pedites* formed the bulk of the settlers. It was probably connected by road with Bononia in 175 B.C.; and subsequently with Genua in 148 B.C. by the Via Postumia, which ran through Cremona, Bedriacum and Altinum, joining the first-mentioned road at Concordia, while the construction of the Via Popilia from Ariminum to Ad Portum near Altinum in 132 B.C. improved the communications still further. In 169 B.C., 1500 more families were settled there as a reinforcement to the garrison. The discovery of the goldfields near the modern Klagenfurt in 150 B.C. (Strabo iv. 208) brought it into notice, and it soon became a place of importance, not only owing to its strategic position, but as a centre of trade, especially in agricultural products. It also had, in later times at least, considerable brickfields. It was originally a Latin colony, but became a *municipium* probably in 90 B.C. The customs boundary of Italy was close by in Cicero's day. It was plundered by the Iapydes under Augustus, but, in the period of peace which followed, was able to develop its resources. Augustus visited it during the Pannonian wars in 12–10 B.C. and it was the birthplace of Tiberius's son by Julia, in the latter year. It was the starting-point of several important roads leading to the north-eastern portion of the empire—the road (Via Iulia Augusta) by Iulium Carnicum to Veldidena (mod. Wilten, near Innsbruck), from which branched off the road into Noricum, leading by Virunum (Klagenfurt) to Lauricum (Lorch) on the Danube, the road into Pannonia, leading to Emona (Laibach)[1] and Sirmium (Mitrowitz), the road to Tarsatica (near Fiume) and Siscia (Sissek), and that to Tergeste (Trieste) and the Istrian coast.

In the war against the Marcomanni in A.D. 167, the town was hard pressed; the fortifications had fallen into disrepair during the long peace. In A.D. 238, when the town took the side of the senate against the emperor Maximinus, they were hastily restored, and proved of sufficient strength to resist for several months, until Maximinus himself was assassinated. The 4th century marks, however, the greatest importance of

[1] This road is described in detail by O. Cuntz in *Jahreshefte des Österr. Arch. Inst.* v. (1902). Beiblatt, pp. 139 seq.

Aquileia; it became a naval station and, probably, the seat of the *corrector Venetiarum et Histriae;* a mint was established here, the coins of which are very numerous, and the bishop obtained the rank of patriarch. An imperial palace was constructed here, in which the emperors after the time of Diocletian frequently resided; and the city often played a part in the struggles between the rulers of the 4th century. At the end of the century, Ausonius enumerated it as the ninth among the great cities of the world, placing Rome, Mediolanum and Capua before it, and called it "moenibus et portu celeberrima." In A.D. 452, however, it was destroyed by Attila, though it continued to exist until the Lombard invasion of A.D. 568. After this the patriarchate was transferred to Grado. In 606 the diocese was divided into two parts, and the patriarchate of Aquileia, protected by the Lombards, was revived, that of Grado being protected by the exarch of Ravenna and later by the doges of Venice. In 1027 and 1044 Patriarch Poppo of Aquileia entered and sacked Grado, and, though the pope reconfirmed the patriarch of the latter in his dignities, the town never recovered, though it continued to be the seat of the patriarchate until its formal transference to Venice in 1450. The seat of the patriarchate of Aquileia had been transferred to Udine in 1238, but returned in 1420 when Venice annexed the territory of Udine. It was finally suppressed in 1751, and the sees of Udine and Gorizia (Görz) established in its stead. Its buildings served as stone quarries for centuries, and no edifices of the Roman period remain above ground. Excavations have revealed one street and the north-west angle of the town walls, while the local museum contains over 2000 inscriptions, besides statues and other antiquities. The cathedral, a flat-roofed basilica, was erected by Patriarch Poppo in 1031 on the site of an earlier church, and rebuilt about 1379 in the Gothic style by Patriarch Marquad. The narthex and baptistery belong to an earlier period. Of the palace of the patriarchs only two isolated columns remain standing. The modern village (pop. 2300) is rendered unhealthy by rice-fields.

See T. W. Jackson, *Dalmatia, Istria and the Quarnero* (Oxford, 1887), iii. 377 seq.; H. Maionica, *Aquileia zur Römerzeit* (Görz, 1881), *Fundkarte von Aquileia* (Görz, 1893), "Inschriften in Grado" (Roman inscriptions removed thither from Aquileia) in *Jahreshefte des Österr. Arch. Instituts*, i. (1898), Beiblatt, 83, 125. (T. As.)

AQUILLIUS, MANIUS, Roman general, consul in 101 B.C. He successfully put down a revolt of the slaves under Athenion in Sicily. After his return, being accused of extortion, he was acquitted on account of his military services, although there was little doubt of his guilt. In 88 he acted as legate against Mithradates the Great, by whom he was defeated and taken prisoner. Mithradates treated him with great cruelty, and is said to have put him to death by pouring molten gold down his throat.

Diodorus Siculus xxxvi. 3; Appian, *Mithrid.* ii. 17. 21; Vell. Paterculus ii. 18; Cicero, *Verres*, iii. 54, *De Officiis*, ii. 14, *Tusc.* v. 5.

AQUINAS, THOMAS [THOMAS OF AQUIN or AQUINO], (*c* 1227–1274), scholastic philosopher, known as *Doctor Angelicus, Doctor Universalis*, was of noble descent, and nearly allied to several of the royal houses of Europe. He was born in 1225 or 1227, at Roccasecca, the castle of his father Landulf, count of Aquino, in the territories of Naples. Having received his elementary education at the monastery of Monte Cassino, he studied for six years at the university of Naples, leaving it in his sixteenth year. While there he probably came under the influence of the Dominicans, who were doing their utmost to enlist within their ranks the ablest young scholars of the age, for in spite of the opposition of his family, which was overcome only by the intervention of Pope Innocent IV., he assumed the habit of St Dominic in his seventeenth year.

His superiors, seeing his great aptitude for theological study, sent him to the Dominican school in Cologne, where Albertus Magnus was lecturing on philosophy and theology. In 1245 Albertus was called to Paris, and there Aquinas followed him, and remained with him for three years, at the end of which he graduated as bachelor of theology. In 1248 he returned to Cologne with Albertus, and was appointed second lecturer and *magister studentium*. This year may be taken as the beginning of his literary activity and public life. Before he left Paris he had thrown himself with ardour into the controversy raging between the university and the Friar-Preachers respecting the liberty of teaching, resisting both by speeches and pamphlets the authorities of the university; and when the dispute was referred to the pope, the youthful Aquinas was chosen to defend his order, which he did with such success as to overcome the arguments of Guillaume de St Amour, the champion of the university, and one of the most celebrated men of the day. In 1257, along with his friend Bonaventura, he was created doctor of theology, and began to give courses of lectures upon this subject in Paris, and also in Rome and other towns in Italy. From this time onwards his life was one of incessant toil; he was continually engaged in the active service of his order, was frequently travelling upon long and tedious journeys, and was constantly consulted on affairs of state by the reigning pontiff.

In 1263 we find him at the chapter of the Dominican order held in London. In 1268 he was lecturing now in Rome and now in Bologna, all the while engaged in the public business of the church. In 1271 he was again in Paris, lecturing to the students, managing the affairs of the church and consulted by the king, Louis VIII., his kinsman, on affairs of state. In 1272 the commands of the chief of his order and the request of King Charles brought him back to the professor's chair at Naples. All this time he was preaching every day, writing homilies, disputations, lectures, and finding time to work hard at his great work the *Summa Theologiae*. Such rewards as the church could bestow had been offered to him. He refused the archbishopric of Naples and the abbacy of Monte Cassino. In January 1274 he was summoned by Pope Gregory X. to attend the council convened at Lyons, to investigate and if possible settle the differences between the Greek and Latin churches. Though suffering from illness, he at once set out on the journey; finding his strength failing on the way, he was carried to the Cistercian monastery of Fossa Nuova, in the diocese of Terracina, where, after a lingering illness of seven weeks, he died on the 7th of March 1274. Dante (*Purg.* xx. 69) asserts that he was poisoned by order of Charles of Anjou. Villani (ix.218) quotes the belief, and the *Anonimo Fiorentino* describes the crime and its motive. But Muratori, reproducing the account given by one of Thomas's friends, gives no hint of foul play. Aquinas was canonized in 1323 by Pope John XXII., and in 1567 Pius V. ranked the festival of St Thomas with those of the four great Latin fathers, Ambrose, Augustine, Jerome and Gregory. No theologian save Augustine has had an equal influence on the theological thought and language of the Western Church, a fact which was strongly emphasized by Leo XIII. (*q.v.*) in his *Encyclical* of August 4, 1879, which directed the clergy to take the teachings of Aquinas as the basis of their theological position. In 1880 he was declared patron of all Roman Catholic educational establishments. In a monastery at Naples, near the cathedral of St Januarius, is still shown a cell in which he is said to have lived.

The writings of Thomas are of great importance for philosophy as well as for theology, for by nature and education he is the spirit of scholasticism incarnate. The principles on which his system rested were these. He held that there were two sources of knowledge—the mysteries of Christian faith and the truths of human reason. The distinction between these two was made emphatic by Aquinas, who is at pains, especially in his treatise *Contra Gentiles*, to make it plain that each is a distinct fountain of knowledge, but that revelation is the more important of the two. Revelation is a source of knowledge, rather than the manifestation in the world of a divine life, and its chief characteristic is that it presents men with mysteries, which are to be believed even when they cannot be understood. Revelation is not Scripture alone, for Scripture taken by itself does not correspond exactly with his description; nor is it church tradition alone, for church tradition must so far rest on Scripture. Revelation is a divine source of knowledge, of which Scripture and church tradition are the channels; and he who would rightly

understand theology must familiarize himself with Scripture, the teachings of the fathers, and the decisions of councils, in such a way as to be able to make part of himself, as it were, those channels along which this divine knowledge flowed. Aquinas's conception of reason is in some way parallel with his conception of revelation. Reason is in his idea not the individual reason, but the fountain of natural truth, whose chief channels are the various systems of heathen philosophy, and more especially the thoughts of Plato and the methods of Aristotle. Reason and revelation are separate sources of knowledge; and man can put himself in possession of each, because he can bring himself into relation to the church on the one hand, and the system of philosophy, or more strictly Aristotle, on the other. The conception will be made clearer when it is remembered that Aquinas, taught by the mysterious author of the writings of the pseudo-Dionysius, who so marvellously influenced medieval writers, sometimes spoke of a natural revelation, or of reason as a source of truths in themselves mysterious, and was always accustomed to say that reason as well as revelation contained two kinds of knowledge. The first kind lay quite beyond the power of man to receive it, the second was within man's reach. In reason, as in revelation, man can only attain to the lower kind of knowledge; there is a higher kind which we may not hope to reach.

But while reason and revelation are two distinct sources of truths, the truths are not contradictory; for in the last resort they rest on *one* absolute truth—they come from the one source of knowledge, God, the Absolute One. Hence arises the compatibility of philosophy and theology which was the fundamental axiom of scholasticism, and the possibility of a Summa Theologiae, which is a Summa Philosophiae as well. All the many writings of Thomas are preparatory to his great work the *Summa Theologiae*, and show us the progress of his mind training for this his life work. In the *Summa Catholicae Fidei contra Gentiles* he shows how a Christian theology is the sum and crown of all science. This work is in its design apologetic, and is meant to bring within the range of Christian thought all that is of value in Mahommedan science. He carefully establishes the necessity of revelation as a source of knowledge, not merely because it aids us in comprehending in a somewhat better way the truths already furnished by reason, as some of the Arabian philosophers and Maimonides had acknowledged, but because it is the absolute source of our knowledge of the mysteries of the Christian faith; and then he lays down the relations to be observed between reason and revelation, between philosophy and theology. This work, *Contra Gentiles*, may be taken as an elaborate exposition of the method of Aquinas. That method, however, implied a careful study and comprehension of the results which accrued to man from reason and revelation, and a thorough grasp of all that had been done by man in relation to those two sources of human knowledge; and so, in his preliminary writings, Thomas proceeds to master the two provinces. The results of revelation he found in the Holy Scriptures and in the writings of the fathers and the great theologians of the church; and his method was to proceed backwards. He began with Peter of Lombardy (who had reduced to theological order, in his famous book on the *Sentences*, the various authoritative statements of the church upon doctrine) in his *In Quatuor Sententiarum P. Lombardi libros*. Then came his deliverances upon undecided points in theology, in his *XII. Quodlibeta Disputata*, and his *Quaestiones Disputatae*. His *Catena Aurea* next appeared, which, under the form of a commentary on the Gospels, was really an exhaustive summary of the theological teaching of the greatest of the church fathers. This side of his preparation was finished by a close study of Scripture, the results of which are contained in his commentaries, *In omnes Epistolas Divi Apostoli Expositio*, his *Super Isaiam et Jeremiam*, and his *In Psalmos*. Turning now to the other side, we have evidence, not only from tradition but from his writings, that he was acquainted with Plato and the mystical Platonists; but he had the sagacity to perceive that Aristotle was *the* great representative of philosophy, and that his writings contained the best results and method which the natural reason had as yet attained to. Accordingly Aquinas prepared himself on this side by commentaries on Aristotle's *De Interpretatione*, on his *Posterior Analytics*, on the *Metaphysics*, the *Physics*, the *De Anima*, and on Aristotle's other psychological and physical writings, each commentary having for its aim to lay hold of the material and grasp the method contained and employed in each treatise. Fortified by this exhaustive preparation, Aquinas began his *Summa Theologiae*, which he intended to be the sum of all known learning, arranged according to the best method, and subordinate to the dictates of the church. Practically it came to be the theological dicta of the church, explained according to the philosophy of Aristotle and his Arabian commentators. The *Summa* is divided into three great parts, which shortly may be said to treat of God, Man and the God-Man. The first and the second parts are wholly the work of Aquinas, but of the third part only the first ninety quaestiones are his; the rest of it was finished in accordance with his designs. The first book, after a short introduction upon the nature of theology as understood by Aquinas, proceeds in 119 questions to discuss the nature, attributes and relations of God; and this is not done as in a modern work on theology, but the questions raised in the physics of Aristotle find a place alongside of the statements of Scripture, while all subjects in any way related to the central theme are brought into the discourse. The second part is divided into two, which are quoted as *Prima Secundae* and *Secunda Secundae*. This second part has often been described as ethic, but this is scarcely true. The subject is man, treated as Aristotle does, according to his τέλος, and so Aquinas discusses all the ethical, psychological and theological questions which arise; but any theological discussion upon man must be mainly ethical, and so a great proportion of the first part, and almost the whole of the second, has to do with ethical questions. In his ethical discussions (a full account of which is given under ETHICS) Aquinas distinguishes theological from natural virtues and vices; the theological virtues are faith, hope and charity; the natural, justice, prudence and the like. The theological virtues are founded on faith, in opposition to the natural, which are founded on reason; and as faith with Aquinas is always belief in a proposition, not trust in a personal Saviour, conformably with his idea that revelation is a new knowledge rather than a new life, the relation of unbelief to virtue is very strictly and narrowly laid down and enforced. The third part of the *Summa* is also divided into two parts, but by accident rather than by design. Aquinas died ere he had finished his great work, and what has been added to complete the scheme is appended as a *Supplementum Tertiae Partis*. In this third part Aquinas discusses the person, office and work of Christ, and had begun to discuss the sacraments, when death put an end to his labours.

The purely philosophical theories of Aquinas are explained in the article SCHOLASTICISM. In connexion with the problem of universals, he held that the diversity of individuals depends on the quantitative division of matter (*materia signata*), and in this way he attracted the criticism of the Scotists, who pointed out that this very matter is individual and determinate, and, therefore, itself requires explanation. In general, Aquinas maintained in different senses the real existence of universals *ante rem*, *in re* and *post rem*.

The best modern edition of the works of Aquinas is that prepared at the expense of Leo XIII. (Rome, 1882–1903). The Abbé Migne published a very useful edition of the *Summa Theologiae*, in four 8vo vols., as an appendix to his *Patrologiae Cursus Completus*; English editions, J. Rickaby (London, 1872), J. M. Ashley (London, 1888). See *Acta Sanct.*, vii. Martii; A. Touron, *La Vie de St Thomas d'Aquin, avec un exposé de sa doctrine et de ses ouvrages* (Paris, 1737); Karl Werner, *Der Heilige Thomas von Aquino* (1858); and R. B. Vaughan, *St Thomas of Aquin, his Life and Labours* (London, 1872): other lives by P. Cavanagh (London, 1890); E. Desmousseaux de Giuré (Paris, 1888); M. Didot (Louvain, 1894). For the philosophy of Aquinas, see Albert Stöckl, *Geschichte der Philosophie des Mittelalters*, ii.; B. Haurêau, *De la philosophie scolastique*, vol. ii.; J. Frohschammer, *Die Philos. d. Th. von A.* (Leipzig, 1889); K. Prantl, *Geschichte d. Logik*, vol. iii.; C. M. Schneider, *Natur, Vernunft, Gott* (Regensburg, 1883), *Das Wissen Gottes nach d. Lehre des Th. v. A.* (4 vols. Regensburg, 1884–1886), *Die socialistische Staatsidee beleuchtet durch Th. v. A.* (Paderborn, 1894); A. Harnack, *Hist. of Dogma* (trans. Wm.

Gilchrist, London, 1899); Ueberweg's *History of Philosophy*, vol. i. See also H. C. O'Neill, *New Things and Old in St Thomas Aquinas* (1909), with biography. (T. M. L.; J. M. M.)

AQUINO, a town and episcopal see of Campania, Italy, in the province of Caserta; it is 56 m. N.W. by rail from the town of Caserta, and 7½ m. N.W. of Cassino. Pop. (1901) 2672. The modern town, close to the ancient, is unimportant, though the canons of the cathedral have the privilege of wearing the mitre and *cappa magna* at great festivals. It is close to the site of the ancient Aquinum, a *municipium* in the time of Cicero, and made a colony by the Triumviri, the birthplace of Juvenal and of the emperor Pescennius Niger. The Via Latina traversed it; one of the gates through which it passed, now called Porta S. Lorenzo, is still well preserved, and there are remains within the walls (portions of which, built of large blocks of limestone, still remain) of two (so called) temples, a basilica and an amphitheatre (see R. Delbrück in *Röm. Mitteilungen*, 1903, p. 143). Outside, on the south is a well-preserved triumphal arch with composite capitals, and close to it the 11th-century basilica of S. Maria Libera, a handsome building in the Romanesque style, but now roofless. Several Roman inscriptions are built into it, and many others that have been found indicate the ancient importance of the place, which, though it does not appear in early history, is vouched for by Cicero and Strabo.[1] A colony was planted here by the Triumviri. St Thomas Aquinas was born in the castle of Roccasecca, 5 m. N.

See E. Grossi, *Aquinum* (Rome, 1907). (T. As.)

AQUITAINE, the name of an ancient province in France, the extent of which has varied considerably from time to time. About the time of Julius Caesar the name *Aquitania* was given to that part of Gaul lying between the Pyrenees and the Garonne, and its inhabitants were a race, or races, distinct from the Celts. The name Aquitania is probably a form of Auscetani, which in its turn is a lengthened form of Ausces, and is thus cognate with the words Basque and Wasconia, *i.e.* Gascony. Although many of the tribes of Aquitania submitted to Julius Caesar, it was not until about 28 B.C. that the district was brought under the Roman yoke. In keeping with the Roman policy of denationalization, the term Aquitania was extended, and under Augustus it included the whole of Gaul south and west of the Loire and the Allier, and thus ceased to possess ethnographical importance. In the 3rd century A.D. this larger Aquitania was divided into three parts: *Aquitania Prima*, the eastern part of the district between the Loire and the Garonne; *Aquitania Secunda*, the western part of the same district; and *Aquitania Tertia*, or *Novempopulana*, the region between the Garonne and the Pyrenees, or the original Aquitania. The seats of government were respectively Bourges, Bordeaux and Eauze; the province contained twenty-six cities, and was in the diocese of Vienne. Like the rest of Gaul, Aquitania absorbed a large measure of Roman civilization, and this continued to distinguish the district down to a late period. In the 5th century the Visigoths established themselves in Aquitania Secunda, and also in parts of Aquitania Prima and Novempopulana, but after the defeat of their king Alaric II. by the Franks under Clovis in 507, they were supplanted by their conquerors. Clovis and his successors extended their authority nominally to the Pyrenees, but, as Guizot has remarked, "the conquest of Aquitania by Clovis left it almost as alien to the people and king of Franks as it had formerly been." Subsequently during the Merovingian period it was contended for by the feeble rulers of the various Frankish kingdoms, and was frequently partitioned among them; but the Aquitanians had little difficulty in effectually resisting this authority, although they did not establish themselves as a separate kingdom. About 628, indeed, they gathered around Charibert, or Haribert, a brother of the Frankish king, Dagobert I., in the hope of national independence; but after his death in 630 they returned to their former condition. But this effort, although a failure, brought about a certain measure of concord between the two principal races inhabiting the district, and so prepared the way for the stubborn resistance which, subsequently, the Aquitanians were able to offer to the Franks.

The first line of dukes began about 660 with one Felix, who, like his successor, Lupus, probably owned allegiance to the Frankish kings, and whose seat of government was Toulouse. About the end of the 7th century an adventurer named Odo, or Eudes, made himself master of this region. Attacked by the Saracens he inflicted on them a crushing defeat, but when they reappeared, he was obliged to invoke the aid of Charles Martel, who, as the price of his support, claimed and received the homage of his ally. Odo was succeeded by his son Hunald, who after carrying on a war against the Franks under Pippin the Short, retired to a convent, leaving both the kingdom and the conflict to Waifer, or Guaifer. For some years Waifer strenuously carried on an unequal struggle with the Franks, but he was assassinated in 768, and with him perished the national independence, although not the national individuality, of the Aquitanians. In 781 Charlemagne bestowed Aquitaine upon his young son, Louis, and as Louis was generally described as a king, Aquitaine is referred to during the Carolingian period as a kingdom, and not as a duchy. When Louis succeeded Charlemagne as emperor in 814, he granted Aquitaine to his son Pippin, on whose death in 838 the Aquitanians chose his son Pippin II. (d. 865) as their king. The emperor Louis I., however, opposed this arrangement and gave the kingdom to his youngest son Charles, afterwards the emperor Charles the Bald. Now followed a time of confusion and conflict which resulted eventually in the success of Charles, although from 845 to 852 Pippin was in possession of the kingdom. In 852 Pippin was imprisoned by Charles the Bald, who soon afterwards gave to the Aquitanians his own son Charles as their king. On the death of the younger Charles in 866, his brother Louis the Stammerer succeeded to the kingdom, and when, in 877, Louis became king of the Franks, Aquitaine was united to the Frankish crown.

A new period now begins in the history of Aquitaine. By a treaty made in 845 between Charles the Bald and Pippin II. the kingdom had been diminished by the loss of Poitou, Saintonge and Angoumois, which had been given to Rainulf I., count of Poitiers. Somewhat earlier than this date the title of duke of the Aquitanians had been revived, and this was now borne by Rainulf, although it was also claimed by the counts of Toulouse. The new duchy of Aquitaine, comprising the three districts already mentioned, remained in the hands of Rainulf's successors, in spite of some trouble with their Frankish overlords, until 893 when Count Rainulf II. was poisoned by order of King Charles III. the Simple. Charles then bestowed the duchy upon William the Pious, count of Auvergne, the founder of the abbey of Cluny, who was succeeded in 918 by his nephew, Count William II., who died in 926. A succession of dukes followed, one of whom, William IV., fought against Hugh Capet, king of France, and another of whom, William V., called the Great, was able considerably to strengthen and extend his authority, although he failed in his attempt to secure the Lombard crown. William's duchy almost reached the limits of the Roman Aquitania Prima and Secunda, but did not stretch south of the Garonne, a district which was in the possession of the Gascons. William died in 1030, and the names of William VI. (d. 1038), Odo or Eudes (d. 1039), who joined Gascony to his duchy, William VII. and William VIII. bring us down to William IX. (d. 1127), who succeeded in 1087, and made himself famous as a crusader and a troubadour. William X. (d. 1137) married his daughter Eleanor to Louis VII., king of France, and Aquitaine went as her dowry. When Eleanor was divorced from Louis and was married in 1152 to Henry II. of England the duchy passed to her new husband, who, having suppressed a revolt there, gave it to his son Richard. When Richard died in 1199, it reverted to Eleanor, and on her death five years later, was united to the English crown and henceforward followed the fortunes of the English possessions in France. Aquitaine as it came to the English kings stretched as of old from the Loire to the Pyrenees, but its extent was curtailed on the

[1] According to H. Nissen, *Ital. Landeskunde* (Berlin, 1902), ii. 665, a road ran from here to Minturnae; but no traces of it are to be seen.

south-east by the wide lands of the counts of Toulouse. The name Guienne, a corruption of Aquitaine, seems to have come into use about the 10th century, and the subsequent history of Aquitaine is merged in that of Gascony (*q.v.*) and Guienne (*q.v.*).

See E. Desjardins, *Géographie historique et administrative de la Gaule romaine* (Paris, 1876, 93); A. Luchaire, *Les Origines linguistiques de l'Aquitaine* (Paris, 1877); A. Longnon, *Géographie de la Gaule au VIe siècle* (Paris, 1876); A. Perroud, *Les Origines du premier duché d'Aquitaine* (Paris, 1881); and E. Mabille, *Le Royaume d'Aquitaine et ses marches sous les Carlovingiens* (Paris, 1870).

ARABESQUE, a word meaning simply "Arabian," but technically used for a certain form of decorative design in flowing lines intertwined; hence comes the more metaphorical use of this word, whether in nature or in morals, indicating a fantastic or complicated interweaving of lines against a background. In decorative design the term is historically a misnomer. It is applied to the grotesque decoration derived from Roman remains of the early time of the empire, not to any style derived from Arabian or Moorish work. Arabesque and Moresque are really distinct; the latter is from the Arabian style of ornament, developed by the Byzantine Greeks for their new masters, after the conquests of the followers of Mahomet; and the former is a term pretty well restricted to varieties of cinquecento decoration, which have nothing in common with any Arabian examples in their details, but are a development derived from Greek and Roman grotesque designs, such as we find them in the remains of ancient palaces at Rome, and in ancient houses at Pompeii. These were reproduced by Raphael and his pupils in the decoration of some of the corridors of the Loggie of the Vatican at Rome: grotesque is thus a better name for these decorations than Arabesque. This technical Arabesque, therefore, is much more ancient than any Arabian or Moorish decoration, and has really nothing in common with it except the mere symmetrical principles of its arrangement. Pliny and Vitruvius give us no name for the extravagant decorative wall-painting in vogue in their time, to which the early Italian revivers of it seem to have given the designation of grotesque, because it was first discovered in the arched or underground chambers (*grotte*) of Roman ruins—as in the golden house of Nero, or the baths of Titus. What really took place in the Italian revival was in some measure a supplanting of the Arabesque for the classical grotesque, still retaining the original Arabian designation, while the genuine Arabian art, the Saracenic, was distinguished as Moresque or Moorish. So it is now the original Arabesque that is called by its specific names of Saracenic, Moorish and Alhambresque, while the term Arabesque is applied exclusively to the style developed from the debased classical grotesque of the Roman empire.

There is still much of the genuine Saracenic element in Renaissance Arabesques, especially in that selected for book-borders and for silver-work, the details of which consist largely of the conventional Saracenic foliations. But the Arabesque developed in the Italian cinquecento work repudiated all the original Arabian elements and devices, and limited itself to the manipulating of the classical elements, of which the most prominent feature is ever the floriated or foliated scroll; and it is in this cinquecento decoration, whether in sculpture or in painting, that *Arabesque* has been perfected.

In the Saracenic, as the elder sister of the two styles, which was ingeniously developed by the Byzantine Greek artists for their Arabian masters in the early times of Mahommedan conquest, every natural object was proscribed; the artists were, therefore, reduced to making symmetrical designs from forms which should have no positive meaning; yet the Byzantine Greeks, who were Christians, managed to work even their own ecclesiastical symbols, in a disguised manner, into their tracery and diapers; as the lily, for instance. The cross was not so introduced; this, of course, was inadmissible; but neither was the crescent ever introduced into any of this early work in Damascus or Cairo. The crescent was itself not a Mahommedan device till after the conquest of Constantinople in 1453 A.D. The crescent, as the new moon, was the symbol of Byzantium; and it was only after that capital of the Eastern empire fell into the hands of the Turks that this symbol was adopted by them. The crescent and the cross became antagonist standards, therefore, first in the 15th century. And the crescent is not an element of original Moorish decoration.

The Alhambra diapers and original Majolica (Majorca) ware afford admirable specimens of genuine Saracenic or Moorish decoration. A conventional floriage is common in these diapers; tracery also is a great feature in this work, in geometrical combinations, whether rectilinear or curvilinear; and the designs are rich in colour; idolatry was in the reproduction of natural forms, not in the fanciful combination of natural colours. These curves and angles, therefore, or interlacings, chiefly in stucco, constitute the prominent elements of an Arabian ornamental design, combining also Arabic inscriptions; composed of a mass of foliation or floral forms conventionally disguised, as the exclusion of all natural images was the fundamental principle of the style in its purity. The Alhambra displays almost endless specimens of this peculiar work, all in relief, highly coloured, and profusely enriched with gold. The mosque of Tulun, in Cairo, A.D. 876, the known work of a Greek, affords the completest example of this art in its early time; and Sicily contains many remains of this same exquisite Saracenic decoration.

Such is the genuine Arabesque of the Arabs, but a very different style of design is implied by the Arabesque of the cinquecento, a purely classical ornamentation. This owes its origin to the excavation and recovery of ancient monuments, and was developed chiefly by the sculptors of the north, and the painters of central Italy; by the Lombardi of Venice, by Agostino Busti of Milan, by Bramante of Urbino, by Raphael, by Giulio Romano, and others of nearly equal merit. Very beautiful examples in sculpture of this cinquecento Arabesque are found in the churches of Venice, Verona and Brescia; in painting, the most complete specimens are those of the Vatican Loggie, and the Villa Madama at Rome and the ducal palaces at Mantua. The Vatican Arabesques, chiefly executed for Raphael by Giulio Romano, Gian Francesco Penni, and Giovanni da Udine, though beautiful as works of painting, are often very extravagant in their composition, ludicrous and sometimes aesthetically offensive; as are also many of the decorations of Pompeii. The main features of these designs are balanced scrolls in panels; or standards variously composed, but symmetrically scrolled on either side, and on the tendrils of these scrolls are suspended or placed birds and animals, human figures and chimeras, of any or all kinds, or indeed any objects that may take the fancy of the artist. The most perfect specimens of cinquecento Arabesque are certainly found in sculpture. As specimens of exquisite work may be mentioned the Martinengo tomb, in the church of the Padri Riformati at Brescia, and the façade of the church of Santa Maria dei Miracoli there, by the Lombardi; and many of the carvings of the Château de Gaillon, France—all of which fairly illustrate the beauties and capabilities of the style.

See also Wornum, *Analysis of Ornament* (1874). (R. N. W.)

ARABGIR, or ARABKIR (Byz. *Arabraces*), a town of Turkey in Asia in the Mamuret el-Aziz or Kharput vilayet, situated near the confluence of the eastern and western Euphrates, but some miles from the right bank of the combined streams. Pop. about 20,000, of which the larger half is Mussulman. It is connected with Sivas by a *chaussée*, prolonged to the Euphrates. The inhabitants are enterprising and prosperous, many of them leaving their native city to push their fortunes elsewhere, while of those that remain the greater part is employed in the manufacture of silk and cotton goods, or in the production of fruit. The present town was built at a comparatively recent date; but about 2 m. north-east is the old town, now called Eski-Shehr, given (*c.* 1021) to Senekherim of Armenia by the emperor Basil II. It contains the ruins of a castle and of several Seljuk mosques. The Armenian population suffered severely during the massacres of 1895. (D. G. H.)

ARABIA, a peninsula in the south-west of Asia, lying between 34° 30′ and 12° 45′ N., and 32° 30′ and 60° E., is bounded W. by the Red Sea, S. by the Gulf of Aden and the Indian Ocean, and E. by the Gulf of Oman and the Persian Gulf. Its northern or land boundary is more difficult to define; most authorities, however, agree in taking it from El Arish on the Mediterranean, along the southern border of Palestine, between the Dead Sea and the Gulf of Akaba, then bending northwards along the Syrian border nearly to Tadmur, thence eastwards to the edge of the Euphrates valley near Anah, and thence south-east to the mouth of the Shat el Arab at the head of the Persian Gulf,—the boundary so defined includes the northern desert, which belongs geographically to Arabia rather than to Syria; while on the same grounds lower Mesopotamia and Irak, although occupied by an Arab population, are excluded.

In shape, the peninsula forms a rough trapezium, with its greatest length from north-west to south-east. The length of its western side from Port Said to Aden is 1500 m.; its base from the Straits of Bab-el-Mandeb (or Bab al Mandab) to Ras el Had is 1300 m., its northern side from Port Said to the Euphrates 600 m.; its total area approximately 1,200,000 sq. m.

Geography

General Features.—In general terms Arabia may be described as a plateau sloping gently from south-west to north-east, and attaining its greatest elevation in the extreme south-west. The western escarpment of the plateau rises steeply from the Red Sea littoral to a height of from 4000 to 8000 ft., leaving a narrow belt of lowland rarely exceeding 30 m. in width between the shore and the foot-hills. On the north-east and east the plateau shelves gradually to the Euphrates and the Persian Gulf; only in the extreme east is this general easterly slope arrested by the lofty range of Jebel Akhdar, which from Ras Musandan to Ras el Had borders the coast of Oman.

Its chief characteristic is the bareness and aridity of its surface; one-third of the whole desert, and of the remainder only a small proportion is suited to settled life, owing to its scanty water-supply and uncertain rainfall. Its mountains are insufficient in elevation and extent to attract their full share of the monsoon rains, which fall so abundantly on the Abyssinian highlands on the other side of the Red Sea; for this reason Arabia has neither lakes nor forests to control the water-supply and prevent its too rapid dissipation, and the rivers are mere torrent beds sweeping down occasionally in heavy floods, but otherwise dry.

The country falls naturally into three main divisions, a northern, a central and a southern; the first includes the area between the Midian coast on the west and the head of the Persian Gulf on the east, a desert tract throughout, stony in the north, sandy in the south, but furnishing at certain seasons excellent pasturage; its population is almost entirely nomad and pastoral. The central zone includes Hejaz (or Hijaz), Nejd and El Hasa; much of it is a dry, stony or sandy steppe, with few wells or watering-places, and only occupied by nomad tribes; but the great wadis which intersect it contain many fertile stretches of alluvial soil, where cultivation is possible and which support a considerable settled population, with several large towns and numerous villages.

The third or southern division contains the highland plateaus of Asir and Yemen in the west, and J. Akhdar in the east, which with a temperate climate, due to their great elevation and their proximity to the sea, deserve, if any part of Arabia does, the name of Arabia Felix—the population is settled and agricultural, and the soil, wherever the rainfall is sufficient, is productive. The Batina coast of Oman, irrigated by the mountain streams of J. Akhdar, is perhaps the most fertile district in the peninsula; Hadramut, too, contains many large and prosperous villages, and the torrents from the Yemen highlands fertilize several oases in the Tehama (or Tihama) or lowlands of the western and southern coast. These favourable conditions of soil and climate, however, extend only a comparatively short distance into the interior, by far the larger part of which is covered by the great southern desert, the Dahna, or Ruba el Khali, empty as its name implies, and uninhabitable.

Exploration.—Before entering on a detailed description of the several provinces of Arabia, our sources of information will be briefly indicated. Except in the neighbourhood of Aden, no regular surveys exist, and professional work is limited to the marine surveys of the Indian government and the admiralty, which, while laying down the coast line with fair accuracy, give little or no topographical information inland. For the mapping of the whole vast interior, except in rare cases, no data exist beyond the itineraries of explorers, travelling as a rule under conditions which precluded the use of even the simplest surveying instruments. These journeys, naturally following the most frequented routes, often cover the same ground, while immense tracts, owing to their difficulty of access, remain unvisited by any European.

The region most thoroughly explored is Yemen, in the south-west corner of the peninsula, where the labours of a succession of travellers from Niebuhr in 1761 to E. Glaser and R. Manzoni in 1887 have led to a fairly complete knowledge of all that part of the province west of the capital Sana; while in 1902–1904 the operations of the Anglo-Turkish boundary commission permitted the execution of a systematic topographical survey of the British protectorate from the Red Sea to the Wadi Bana, 30 m. east of Aden. North of Yemen up to the Hejaz border the only authority is that of E. F. Jomard's map, published in 1839, based on the information given by the French officers employed with Ibrahim Pasha's army in Asir from 1824 to 1827, and of J. Halévy in Nejran. On the south coast expeditions have penetrated but a short distance, the most notable exceptions being those of L. Hirsch and J. T. Bent in 1887 to the Hadramut valley. S. B. Miles, J. R. Wellsted, and S. M. Zwemer have explored Oman in the extreme east; but the interior south of a line drawn from Taif to El Katr on the Persian Gulf is still virgin ground. In northern Arabia the Syrian desert and the great Nafud (Nefud) have been crossed by several travellers, though a large area remains unexplored in the north-east between Kasim and the gulf. In the centre, the journeys of W. Palgrave, C. Doughty, W. Blunt and C. Huber have done much to elucidate the main physical features of the country. Lastly, in the north-west the Sinai peninsula has been thoroughly explored, and the list of travellers who have visited the Holy Cities and traversed the main pilgrim routes through Hejaz is a fairly long one, though, owing to the difficulties peculiar to that region, the hydrography of southern Hejaz is still incompletely known.

Modern Exploration in Yemen.

The story of modern exploration begins with the despatch of C. Niebuhr's mission by the Danish government in 1761. After a year spent in Egypt and the Sinai peninsula the party reached Jidda towards the end of 1762, and after a short stay sailed on to Lohaia in the north of Yemen, the exploration of which formed the principal object of the expedition; thence, travelling through the Tehama or lowlands, Niebuhr and his companions visited the towns of Bet el Fakih, Zubed and Mokha, then the great port for the coffee trade of Yemen. Continuing eastward they crossed the mountainous region and reached the highlands of Yemen at Uden, a small town and the centre of a district celebrated for its coffee. Thence proceeding eastwards to higher altitudes where coffee plantations give way to fields of wheat and barley, they reached the town of Jibla situated among a group of mountains exceeding 10,000 ft. above sea-level; and turning southwards to Taiz descended again to the Tehama via Hes and Zubed to Mokha. The mission, reduced in numbers by the death of its archaeologist, von Haven, again visited Taiz in June 1763, where after some delay permission was obtained to visit Sana, the capital of the province and the residence of the ruling sovereign or imam. The route lay by Jibla, passing the foot of the lofty Jebel Sorak, where, in spite of illness, Forskal, the botanist of the party, was able to make a last excursion; a few days later he died at Yarim. The mission continued its march, passing Dhamar, the seat of a university of the Zedi sect, then frequented by 500 students. Thence four marches, generally over a stony plateau dominated by bare, sterile mountains, brought them to

Sana, where they received a cordial welcome from the imam, el Mahdi Abbas.

The aspect of the city must have been nearly the same as at present; Niebuhr describes the *enceinte* flanked by towers, the citadel at the foot of J. Nukum which rises 1000 ft. above the valley, the fortress and palace of the imams, now replaced by the Turkish military hospital, the suburb of Bir el Azab with its scattered houses and gardens, the Jews' quarter and the village of Rauda, a few miles to the north in a fertile, irrigated plain which Niebuhr compares to that of Damascus. After a stay of ten days at Sana the mission set out again for Mokha, travelling by what is now the main route from the capital to Hodeda, through the rich coffee-bearing district of J. Haraz, and thence southward to Mokha, where they embarked for India. During the next year three other members of the party died, leaving Niebuhr the sole survivor. Returning to Arabia a year later, he visited Oman and the shores of the Persian Gulf, and travelling from Basra through Syria and Palestine he reached Denmark in 1764 after four years' absence.

The period was perhaps specially favourable for a scientific mission of the sort. The outburst of fanaticism which convulsed Arabia twenty years later had not then reached Yemen, and Europeans, as such, were not exposed to any special danger. The travellers were thus able to move freely and to pursue their scientific enquiries without hindrance from either people or ruler. The results published in 1772 gave for the first time a comprehensive description not only of Yemen but of all Arabia; while the parts actually visited by Niebuhr were described with a fulness and accuracy of detail which left little or nothing for his successors to discover.

C. G. Ehrenberg and W. F. Hemprich in 1825 visited the Tebama and the islands off the coast, and in 1836 P. E. Botta made an important journey in southern Yemen with a view to botanical research, but the next advance in geographical knowledge in south Arabia was due to the French officers, M. O. Tamisier, Chedufau and Mary, belonging to the Egyptian army in Asir; another Frenchman, L. Arnaud, formerly in the Egyptian service, was the first to visit the southern Jauf and to report on the rock-cut inscriptions and ruins of Marib, though it was not till 1869 that a competent archaeologist, J. Halévy, was able to carry out any complete exploration there. Starting from Sana, Halévy went north-eastward to El Madid, a town of 5000 inhabitants and the capital of the small district of Nihm; thence crossing a plateau, where he saw the ruins of numerous crenellated towers, he reached the village of Mijzar at the foot of J. Yam, on the borders of Jauf, a vast sandy plain, extending eastwards to El Jail and El Hazm, where Halévy made his most important discoveries of Sabaean inscriptions: here he explored Main, the ancient capital of the Minaeans, Kamna on the banks of the W. Kharid, the ancient Caminacum, and Kharibat el Beda, the Nesca of Pliny, where the Sabaean army was defeated by the Romans under Aelius Gallus in 24 B.C. From El Jail Halévy travelled northward, passing the oasis of Khab, and skirting the great desert, reached the fertile district of Nejran, where he found a colony of Jews, with whom he spent several weeks in the oasis of Makhlaf. An hour's march to the east he discovered at the village of Medinat el Mahud the ruins of the Nagra metropolis of Ptolemy. In June 1870 he at last reached the goal of his journey, Marib; here he explored the ruins of Medinat an Nahas (so called from its numerous inscriptions engraved on brass plates), and two hours to the east he found the famous dam constructed by the Himyarites across the W. Shibwan, on which the water-supply of their capital depended.

Asir.

Jauf and Marib.

One other explorer has since visited Marib, the Austrian archaeologist, E. Glaser (1855–1908), who achieved more for science in Yemen than any traveller since Niebuhr. Under Turkish protection, he visited the territory of the Hashid and Bakil tribes north-east of Sana, and though their hostile attitude compelled him to return after reaching their first important town, Khamr, he had time to reconnoitre the plateau lying between the two great wadis Kharid and Hirran, formerly covered with Himyaritic towns and villages; and to trace the course of these wadis to their junction at El Ish in the Dhu Husen country, and thence onward to the Jauf. In 1889 he succeeded, again under Turkish escort, in reaching Marib, where he obtained, during a stay of thirty days, a large number of new Himyaritic inscriptions. He was unable, however, to proceed farther east than his predecessors, and the problem of the Jauf drainage and its possible connexion with the upper part of the Hadramut valley still remains unsolved.

The earliest attempt to penetrate into the interior from the south coast was made in 1835 when Lieuts. C. Cruttenden and J. R. Wellsted of the "Palinurus," employed on the marine survey of the Arabian coast, visited the ruins of Nakb (el Hajar) in the W. Mefat. The Himyaritic inscriptions found there and at Husn Ghurab near Mukalla, were the first records discovered of ancient Arabian civilization in Hadramut. Neither of these officers was able to follow up their discoveries, but in 1843 Adolph von Wrede landed at Mukalla and, adopting the character of a pilgrim to the shrine of the prophet Hud, made his way northward across the high plateau into the W. Duwan, one of the main southern tributaries of the Hadramut valley, and pushed on to the edge of the great southern desert; on his return to the W. Duwan his disguise was detected and he was obliged to return to Mukalla. Though he did not actually enter the main Hadramut valley, which lay to the east of his track, his journey established the existence of this populous and fertile district which had been reported to the officers of the "Palinurus" as lying between the coast range and the great desert to the north. This was at last visited in 1893 by L. Hirsch under the protection of the sultan of Mukalla, the head of the Kaiti family, and practically ruler of all Hadramut, with the exception of the towns of Saiyun and Tarim, which belong to the Kathiri tribe. Starting like von Wrede from Mukalla, Hirsch first visited the W. Duwan and found ancient ruins and inscriptions near the village of Hajren; thence he proceeded north-eastward to Hauta in the main valley, where he was hospitably received by the Kaiti sultan, and sent on to his deputy at Shibam. Here he procured a Kathiri escort and pushed on through Saiyun to Tarim, the former capital. After a very brief stay, however, he was compelled by the hostility of the people to return in haste to Shibam, from which he travelled by the W. bin Ali and W. Adim back to Mukalla. J. Theodore Bent and his wife followed in the same track a few months later with a well-equipped party including a surveyor, Imam Sharif, lent by the Indian government, who made a very valuable survey of the country passed through. Both parties visited many sites where Himyaritic remains and inscriptions were found, but the hostile attitude of the natives, more particularly of the Seyyids, the religious hierarchy of Hadramut, prevented any adequate examination, and much of archaeological interest undoubtedly remains for future travellers to discover.

Exploration in Hadramut.

In Oman, where the conditions are more favourable, explorers have penetrated only a short distance from the coast. Niebuhr did not go inland from Muscat; the operations by a British Indian force on the Pirate coast in 1810 gave no opportunities for visiting the interior, and it was not till 1835 that J. R. Wellsted, who had already tried to penetrate into Hadramut from the south, landed at Muscat with the idea of reaching it from the north-east. Sailing thence to Sur near Ras el Had, he travelled southward through the country of the Bani bu Ali to the borders of the desert, then turning north-west up the Wadi Betha through a fertile, well-watered country, running up to the southern slopes of J. Akhdar, inhabited by a friendly people who seem to have welcomed him everywhere, he visited Ibra, Semed and Nizwa at the southern foot of the mountains. Owing to the disturbed state of the country, due to the presence of raiding parties from Nejd, Wellsted was unable to carry out his original intention of exploring the country to the west, and after an excursion along the Batina coast to Sohar he returned to India.

Exploration in Oman.

In 1876 Colonel S. B. Miles, who had already done much to

advance geographical interests in south Arabia, continued Wellsted's work in Oman; starting from Sohar on the Batina coast he crossed the dividing range into the Dhahira, and reached Birema, one of its principal oases. His investigations show that the Dhahira contains many settlements, with an industrious agricultural population, and that the unexplored tract extending 250 m. west to the peninsula of El Katr is a desolate gravelly steppe, shelving gradually down to the salt marshes which border the shores of the gulf.

Leaving southern Arabia, we now come to the centre and north. The first explorer to enter the sacred Hejaz with a definite scientific object was the Spaniard, Badia y Leblich, who, under the name of Ali Bey and claiming to be the last representative of the Abbasid Caliphs, arrived at Jidda in 1807, and performed the pilgrimage to Mecca. Besides giving to the world the first accurate description of the holy city and the Haj ceremonies, he was the first to fix the position of Mecca by astronomical observations, and to describe the physical character of its surroundings. But the true pioneer of exploration in Hejaz was J. L. Burckhardt, who had already won a reputation as the discoverer of Petra, and whose experience of travel in Arab lands and knowledge of Arab life qualified him to pass as a Moslem, even in the headquarters of Islam. Burckhardt landed in Jidda in July 1814, when Mehemet Ali had already driven the Wahhābi invaders out of Hejaz, and was preparing for his farther advance against their stronghold in Nejd. He first visited Taif at the invitation of the pasha, thence he proceeded to Mecca, where he spent three months studying every detail of the topography of the holy places, and going through all the ceremonies incumbent on a Moslem pilgrim. In January 1815 he travelled to Medina by the western or coast route, and arrived there safely but broken in health by the hardships of the journey. His illness did not, however, prevent his seeing and recording everything of interest in Medina with the same care as at Mecca, though it compelled him to cut short the further journey he had proposed to himself, and to return by Yambu and the sea to Cairo, where he died only two years later.

Exploration in Hejaz.

His striking successor, Sir Richard Burton, covered nearly the same ground thirty-eight years afterwards. He, too, travelling as a Moslem pilgrim, noted the whole ritual of the pilgrimage with the same keen observation as Burckhardt, and while amplifying somewhat the latter's description of Medina, confirms the accuracy of his work there and at Mecca in almost every detail. Burton's topographical descriptions are fuller, and his march to Mecca from Medina by the eastern route led him over ground not traversed by any other explorer in Hejaz: this route leads at first south-east from Medina, and then south across the lava beds of the Harra, keeping throughout its length on the high plateau which forms the borderland between Hejaz and Nejd. His original intention had been after visiting Mecca to find his way across the peninsula to Oman, but the time at his disposal (as an Indian officer on leave) was insufficient for so extended a journey; and his further contributions to Arabian geography were not made until twenty-five years later, when he was deputed by the Egyptian government to examine the reported gold deposits of Midian. Traces of ancient workings were found in several places, but the ores did not contain gold in paying quantities. Interesting archaeological discoveries were made, and a valuable topographical survey was carried out, covering the whole Midian coast from the head of the Gulf of Akaba to the mouth of the Wadi Hamd, and including both the Tehama range and the Hisma valley behind it; while the importance of the W. Hamd and the extent of the area drained by its tributaries was for the first time brought to light.

Burckhardt had hoped in 1815 that the advance of the Egyptian expedition would have given him the opportunity to see something of Nejd, but he had already left Arabia before the overthrow of the Wahhābi power by Ibrahim Pasha had opened Nejd to travellers from Hejaz, and though several European officers accompanied the expedition, none of them left any record of his experience. It is, however, to the Egyptian conquest that the first visit of a British traveller to Nejd is due. The Indian government, wishing to enter into relations with Ibrahim Pasha, as *de facto* ruler of Nejd and El Hasa, with a view to putting down piracy in the Persian Gulf, which was seriously affecting Indian trade, sent a small mission under Captain G. F. Sadlier to congratulate the pasha on the success of the Egyptian arms, and no doubt with the ulterior object of obtaining a first-hand report on the real situation. On his arrival at Hofuf, Sadlier found that Ibrahim had already left Deraiya, but still hoping to intercept him before quitting Nejd, he followed up the retreating Egyptians through Yemama, and Wushm to Ras in Kasim, where he caught up the main body of Ibrahim's army, though the pasha himself had gone on to Medina. Sadlier hesitated about going farther, but he was unable to obtain a safe conduct to Basra, or to return by the way he had come, and was compelled reluctantly to accompany the army to Medina. Here he at last met Ibrahim, but though courteously received, the interview had no results, and Sadlier soon after left for Yambu, whence he embarked for Jidda, and after another fruitless attempt to treat with Ibrahim, sailed for India. If the political results of the mission were *nil*, the value to geographical science was immense; for though no geographer himself, Sadlier's route across Arabia made it possible for the first time to locate the principal places in something like their proper relative positions; incidentally, too, it showed the practicability of a considerable body of regular troops crossing the deserts of Nejd even in the months of July and August.

Exploration in Nejd.

Sadlier's route had left Jebel Shammar to one side; his successor, G. A. Wallin, was to make that the objective of his journey. Commissioned by Mehemet Ali to inform him about the situation in Nejd brought about by the rising power of Abdallah Ibn Rashid, Wallin left Cairo in April 1845, and crossing the pilgrim road at Ma'an, pushed on across the Syrian desert to the Wadi Sirhan and the Jauf oasis, where he halted during the hot summer months. From the wells of Shakik he crossed the waterless Nafud in four days to Jubba, and after a halt there in the nomad camps, he moved on to Hail, already a thriving town, and the capital of the Shammar state whose limits included all northern Arabia from Kasim to the Syrian border. After a stay in Hail, where he had every opportunity of observing the character of the country and its inhabitants, and the hospitality and patriarchal, if sometimes stern, justice of its chief, he travelled on to Medina and Mecca, and returned thence to Cairo to report to his patron. Early in 1848 he again returned to Arabia, avoiding the long desert journey by landing at Muwela, thence striking inland to Tebuk on the pilgrim road, and re-entering Shammar territory at the oasis of Tema, he again visited Hail; and after spending a month there travelled northwards to Kerbela and Bagdad.

The effects of the Egyptian invasion had passed away, and central Arabia had settled down again under its native rulers when W. G. Palgrave made his adventurous journey through Nejd, and published the remarkable narrative which has taken its place as the classic of Arabian exploration. Like Burton he was once an officer in the Indian army, but for some time before his journey he had been connected with the Jesuit mission in Syria. By training and temperament he was better qualified to appreciate and describe the social life of the people than their physical surroundings, and if the results of his great journey are disappointing to the geographer, his account of the society of the oasis towns, and of the remarkable men who were then ruling in Hail and Riad, must always possess an absorbing interest as a portrait of Arab life in its freest development.

Palgrave's journey to Nejd.

Following Wallin's route across the desert by Ma'an and Jauf, Palgrave and his companion, a Syrian Christian, reached Hail in July 1862; here they were hospitably entertained by the amir Talāl, nephew of the founder of the Ibn Rashid dynasty, and after some stay passed on with his countenance through Kasim to southern Nejd. Palgrave says little of the desert part of the journey or of its Bedouin inhabitants, but much of the

fertility of the oases and of the civility of the townsmen; and like other travellers in Nejd he speaks with enthusiasm of its bright, exhilarating climate. At Riad, Fēsal, who had been in power since the Egyptian retirement, was still reigning; and the religious tyranny of Wahhābism prevailed, in marked contrast to the liberal régime of Talal in Jebel Shammar. Still, Palgrave and his companions, though known as Christians, spent nearly two months in the capital without molestation, making short excursions in the neighbourhood, the most important of which was to El Kharfa in Aflaj, the most southerly district of Nejd. Leaving Riad, they passed through Yemama, and across a strip of sandy desert to El Hasa where Palgrave found himself in more congenial surroundings. Finally, a voyage to the Oman coast and a brief stay there brought his adventures in Arabia to a successful ending.

Charles Doughty, the next Englishman to visit northern Arabia, though he covered little new ground, saw more of the desert life, and has described it more minutely and faithfully than any other explorer. Travelling down from Damascus in 1875 with the Haj caravan, he stopped at El Hajr, one of the pilgrim stations, with the intention of awaiting the return of the caravan and in the meantime of exploring the rock-cut tombs of Medain Salih and El Ala. Having successfully completed his investigations and sent copies of inscriptions and drawings of the tombs to Renan in Paris, he determined to push on farther into the desert. Under the protection of a sheikh of the Fukara Bedouin he wandered over the whole of the borderland between Hejaz and Nejd. Visiting Tema, where among other ancient remains he discovered the famous inscribed stone, afterwards acquired by Huber for the Louvre. Next summer he went on to Hail and thence back to Khaibar, where the negro governor and townsmen, less tolerant than his former Bedouin hosts, ill-treated him and even threatened his life. Returning to Hail in the absence of the amir, he was expelled by the governor; he succeeded, however, in finding protection at Aneza, where he spent several months, and eventually after many hardships and perils found his way to the coast at Jidda. *Doughty.*

Three years later Mr Wilfrid and Lady Anne Blunt made their expedition to J. Shammar. In their previous travels in Syria they had gained the confidence and friendship of a young sheikh whose family, though long settled at Tadmur, came originally from Nejd, and who was anxious to renew the connexion with his kinsmen by seeking a bride among them. In his company the Blunts set out from Damascus, and travelled across the Syrian desert by the Wadi Sirhan to Jauf. Here the sheikh found some of his relations and the matrimonial alliance was soon arranged; but though the object of the journey had been attained, the Blunts were anxious to visit Hail and make the acquaintance of the amir Ibn Rashid, of whose might and generosity they daily heard from their hosts in Jauf. The long stretch of waterless desert between Jauf and J. Shammar was crossed without difficulty, and the party was welcomed by the amir and hospitably entertained for a month, after which they travelled northwards in company with the Persian pilgrim caravan returning to Kerbela and Bagdad.

In 1883 the French traveller, C. Huber, accompanied by the archaeologist, J. Euting, followed the same route from Damascus to Hail. The narrative of the last named forms a valuable supplement to that published by the Blunts, and together with Doughty's, furnishes as complete a picture as could be wished for of the social and political life of J. Shammar, and of the general nature of the country. Huber's journal, published after his death from his original notes, contains a mass of topographical and archaeological detail of the greatest scientific value: his routes and observations form, in fact, the first and only scientific data for the construction of the map of northern Arabia. To archaeology also his services were of equal importance, for, besides copying numerous inscriptions in the district between Hail and Tema, he succeeded in gaining possession of the since famous Tema stone, which ranks with the Moabite stone among the most valuable of Semitic inscriptions. From Hail Huber followed nearly in Doughty's track to Aneza and thence across central Nejd to Mecca and Jidda, where he despatched his notes and copies of inscriptions. A month later, in July 1884, he was murdered by his guides a few marches north of Jidda, on his way back to Hail. *Huber.*

One other traveller visited Hail during the lifetime of the amir Mahommed—Baron E. Nolde—who arrived there in 1893, not long after the amir had by his victory over the combined forces of Riad and Kasim brought the whole of Nejd under his dominion. Nolde crossed the Nafud to Haiyania by a more direct track than that from Shakik to Jubba. The amir was away from his capital settling the affairs of his newly acquired territory; Nolde therefore, after a short halt at Hail, journeyed on to Ibn Rashid's camp somewhere in the neighbourhood of Shakra. Here he was on new ground, but unfortunately he gives little or no description of his route thither, or of his journey northwards by the Persian pilgrim road, already traversed by Huber in 1881. His narrative thus, while containing much of general interest on the climate and on the animal life of northern Arabia, its horses and camels in particular, adds little to those of his predecessors as regards topographical detail.

If the journeys detailed above be traced on the map they will be found to cover the northern half of the peninsula above the line Mecca-Hofuf, with a network of routes, which, though sometimes separated by wide intervals, are still close enough to ensure that no important geographical feature can have been overlooked, especially in a country whose general character varies so little over wide areas. In the southern half, on the other hand, except in Nejran and Jauf, no European traveller has penetrated 100 m. in a direct line from the coast. The vast extent of the Dahna, or great southern desert, covering perhaps 250,000 sq. m., accounts for about a third of this area, but some of the most favoured districts in Arabia—Asir and northern Yemen—remain unexplored, and the hydrography of the Dawasir basin offers some interesting problems, while a great field remains for the archaeologist in the seat of the old Sabaean kingdom from Jauf to the Hadramut valley. *General results of exploration.*

Topographical Details.—Beginning from the north-west, the Sinai peninsula belongs to Egypt, though geographically part of Arabia. It is bounded on the E. by a line drawn from Ar Rafa, a few miles E. of El Arish on the Mediterranean, to the head of the Gulf of Akaba; and on the W. by the Suez Canal; its length from El Arish to its most southern point is 240 m., and its breadth from Suez to Akaba is nearly 160 m. The greater part drains to the Mediterranean, from which the land rises gradually to the summit of the Tih plateau. The deep depression of Wadi Feran separates the Tih from the higher mass of Sinai (*q.v.*), in which J. Katherine attains a height of 8500 ft.; except in W. Feran there is little cultivable land, the greater part consisting of bare, rocky hills and sandy valleys, sparsely covered with tamarisk and acacia bushes. The Egyptian pilgrim road crosses the peninsula from Suez to Akaba, passing the post of An Nakhl, with a reservoir and a little cultivation, about half way; a steep descent leads down from the edge of the Tih plateau to Akaba. *Sinai Peninsula.*

The rest of the northern borderland is covered by the Syrian desert, extending from the borders of Palestine to the edge of the Euphrates valley. This tract, known as the Hamad, is a gravelly plain unbroken by any considerable range of hills or any continuous watercourse except the Wadi Hauran, which in rainy seasons forms a succession of pools from J. Hauran to the Euphrates. Its general slope is to the north-east from the volcanic plateau of the Harra south of J. Hauran to the edge of the Euphrates valley. The Wadi Sirhan, a broad depression some 500 ft. below the average level of the Hamad, crosses it from north-east to south-west between Hauran and Jauf; it has a nearly uniform height above sea-level of 1850 ft., and appears to be the bed of an inland sea rather than a true watercourse. Water is found in it a few feet below the surface, and a little cultivation is carried on at the small oases of Kaf and Ithri, whence salt produced in the neighbouring salt lakes is exported. The W. Sirhan is continuous with the depression known as the Jauf, situated on the northern edge of the Nefud or Nafud, and the halfway station between Damascus and Hail; and it is possible that this depression continues eastward towards the Euphrates along a line a little north of the thirtieth parallel, where wells and pasturages are known to exist. Jauf is a small town consisting, at the time of the Blunts' visit in 1879, of not more than 500 houses. The town with its gardens, surrounded by a mud wall, covers a space of 2 m. in length by half a mile in width; the basin in which it lies is barely 3 m. across, and except for the palm gardens and a few patches of corn, it is a dead flat of *Syrian desert.*

white sand, closed in by high sandstone cliffs, beyond which lies the open desert. The oases of Sakaka and Kara are situated in a similar basin 15 m. to the east; the former a town of 10,000 inhabitants and somewhat larger than Jauf according to Huber.

A short distance south of Jauf the character of the desert changes abruptly from a level black expanse of gravel to the red sands of the Nafud. The northern edge of this great desert follows very nearly the line of the thirtieth parallel, along which it extends east and west for a length of some 400 m.; its breadth from north to south is 200 m. Though almost waterless, it is in fact better wooded and richer in pasture than any part of the Hamad; the sand-hills are dotted with *ghada*, a species of tamarisk, and other bushes, and several grasses and succulent plants —among them the *adar*, on which sheep are said to feed for a month without requiring water—are found in abundance in good seasons. In the spring months, when their camels are in milk, the Bedouins care nothing for water, and wander far into the Nafud with their flocks in search of the green pasture which springs up everywhere after the winter rains. A few wells exist actually in the Nafud in the district called El Hajra, near its north-eastern border, and along its southern border, between J. Shammar and Tema, there are numerous wells and artificial as well as natural reservoirs resorted to by the nomad tribes. ***The Nafud.***

Owing to the great extent of the Nafud desert, the formation of sand-dunes is exemplified on a proportionate scale. In many places longitudinal dunes are found exceeding a day's journey in length, the valleys between which take three or four hours to cross; but the most striking feature of the Nafud are the high crescent-shaped sand-hills, known locally as *falk* or *falj*, described by Blunt and Huber, who devoted some time to their investigation. The falks enclose a deep hollow (known as *ka'r*), the floor of which is often hard soil bare of sand, and from which the inner slopes of the falk rise as steeply as the sand will lie (about 50°). On the summit of the falk there is generally a mound known as *tas* or *barkhus* composed of white sand which stands out conspicuously against the deep red of the surrounding deserts; the exterior slopes are comparatively gentle. The falks are singularly uniform in shape, but vary greatly in size; the largest were estimated by Huber and Euting at 1¼m. across and 330 ft. deep. They run in strings irregularly from east to west, corresponding in this with their individual direction, the convex face of the falk being towards the west, *i.e.* the direction of the prevailing wind, and the cusps to leeward. In the south of the Nafud, where Huber found the prevailing wind to be from the south, the falks are turned in that direction. Though perhaps subject to slight changes in the course of years, there is no doubt that these dunes are practically permanent features; the more prominent ones serve as landmarks and have well-known distinctive names. The character of the vegetation which clothes their slopes shows that even superficial changes must be slight. The general level of the Nafud was found by Huber's observations to be about 3000 ft. above sea-level; the highest point on the Jauf-Hail route is at Falk Alam, the rocky peaks of which rise 200 or 300 ft. above the surface of the sand. Other peaks cropping out of the Nafud are Jebel Tawil, near the wells of Shakik, and J. Abrak Rada, a long black ridge in the middle of the desert.

The high plateau which from J. Hauran southward forms the main watershed of the peninsula is covered in places by deep beds of lava, which from their hardness have preserved the underlying sandstones from degradation, and now stand up considerably above the general level. These tracts are known as *harra*; the most remarkable is the Harrat El Awerid, west of the Haj route from Tebuk to El Ala, a mountain mass 100 m. in length with an average height of over 5000 ft., and the highest summit of which, J. Anaz, exceeds 7000 ft. The harra east of Khaibar is also of considerable extent, and the same formation is found all along the Hejaz border from Medina to the Jebel el Kura, east of Mecca. The surface of the harra is extremely broken, forming a labyrinth of lava crags and blocks of every size; the whole region is sterile and almost waterless, and compared with the Nafud it produces little vegetation; but it is resorted to by the Bedouin in the spring and summer months when the air is always fresh and cool. In winter it is cold and snow often lies for some time. ***The Harra.***

Hejaz, if we except the Taif district in the south, which is properly a part of the Yemen plateau, forms a well-marked physical division, lying on the western slope of the peninsula, where that slope is at its widest, between the Harra and the Red Sea. A high range of granite hills, known as the Tehama range, the highest point of which, J. Shar, in Midian, exceeds 6500 ft., divides it longitudinally into a narrow littoral and a broader upland zone 2000 or 3000 ft. above the sea. Both are generally bare and unproductive, the uplands, however, contain the fertile valleys of Khaibar and Medina, draining to the Wadi Hamd, the principal river system of western Arabia; and the Wadi Jadid or Es Safra, rising in the Harra between Medina and Es Safina, which contain several settlements, of which the principal produce is dates. The quartz reefs which crop out in the granite ranges of the Tehama contain traces of gold. These and the ancient copper workings were investigated by Burton in 1877. The richer veins had evidently been long ago worked out, and nothing of sufficient value to justify further outlay was discovered. The coast-line is fringed with small islets and shoals and reefs, which make navigation dangerous. The only ports of importance are Yambu and Jidda, which serve respectively Medina and Mecca; they depend entirely on the pilgrim traffic to the holy cities, without which they could not exist. ***Hejaz.***

The great central province of Nejd occupies all inner Arabia between the Nafud and the southern desert. Its northern part forms the basin of the Wadi Rumma, which, rising in the Khaibar harra, runs north-eastward across the whole width of Nejd, till it is lost in the sands of the eastern Nafud, north of Aneza. The greater portion of this region is an open steppe, sandy in places and in others dotted with low volcanic hills, but with occasional ground water and in favourable seasons furnishing support for a considerable pastoral population. Its elevation varies from about 5000 ft. in the west to 2500 ft. in the east. In Jebel Shammar, Kasim and Wushm, where the water in the wadi beds rises nearly to the ground level, numerous fertile oases are found with thriving villages and towns. ***Nejd.***

Jebel Shammar, from which the northern district of Nejd takes its name, is a double range of mountains some 20 m. apart, rising sharply out of the desert in bare, granite cliffs. J. Aja, the western and higher of the two ranges, has a length of about 100 m. from north-east to south-west, where it merges into the high plateau extending from and continuous with the Khaibar harra. The highest point, J. Fara, near its north-eastern extremity, is about 4600 ft. above sea-level, or 1600 ft. above the town of Hail, which, like most of the larger villages, lies along the wadi bed at the foot of J. Aja. The town, which has risen with the fortunes of the Ibn Rashid family to be the capital of Upper Nejd, is at the mouth of the valley between the twin ranges, about 2 m. from the foot of J. Aja, and contained at the time of Nolde's visit in 1893 about 12,000 inhabitants.

The principal tributaries of the W. Rumma converge in lower Kasim, and at Aneza Doughty says its bed is 3 m. wide from bank to bank. Forty years before his visit a flood is said to have occurred, which passed down the river till it was blocked by sand-drifts at Thuwerat, 50 m. lower down, and for two years a lake stood nearly 100 m. long, crowded by waterfowl not known before in that desert country. Below this its course has not been followed by any European traveller, but it may be inferred from the line of watering-places on the road to Kuwet, that it runs out to the Persian Gulf in that neighbourhood.

East of Kasim the land rises gradually to the high plateau culminating in the ranges of Jebel Tuwek and J. Arid. The general direction of these hills is from north-west to south-east. On the west they rise somewhat steeply, exposing high cliffs of white limestone, which perhaps gave Palgrave the impression that the range is of greater absolute height than is actually the case. J. Tuwek in any case forms an important geographical feature in eastern Nejd, interrupting by a transverse barrier 200 m. in length the general north-easterly slope of the peninsula, and separating the basin of the W. Rumma from that of the other great river system of central Arabia, the Wadi Dawasir. The districts of Sudēr and Wushm lie on its northern side, Arid in the centre, and Aflaj, Harik and Yemama on its south, in the basin of the W. Dawasir; the whole of this hilly region of eastern Nejd is, perhaps, rather a rolling down country than truly mountainous, in which high pastures alternate with deep fertile valleys, supporting numerous villages with a large agricultural population. The W. Hanifa is its principal watercourse; its course is marked by an almost continuous series of palm groves and settlements, among which Deraiya the former, and Riad the present, capital of the Ibn Saūd kingdom are the most extensive. Its lower course is uncertain, but it probably continues in a south-east direction to the districts of El Harik and Yemama when, joined by the drainage from Aflaj and the W. Dawasir, it runs eastward till it disappears in the belt of sandy desert 100 m. in width that forms the eastern boundary of Nejd, to reappear in the copious springs that fertilize El Hasa and the Bahrein littoral.

As regards the unexplored southern region, Palgrave's informants in Aflaj, the most southerly district visited by him, stated that a day's march south of that place the Yemen road enters the W. Dawasir, up which it runs for ten days, perhaps 200 m., to El Kura, a thinly peopled district on the borders of Asir; this accords with the information of the French officers of the Egyptian army in that district, and with that of Halévy, who makes all the drainage from Nejran northward run to the same great wadi. Whether there be any second line of drainage in southern Nejd skirting the edge of the great desert and following the depression of the W. Yabrin must remain a matter of conjecture. Colonel Miles concluded, from his enquiries, that the low salt swamp, extending inland for some distance from Khor ed Duwan, in the bay east of El Katr, was the outlet of an extensive drainage system which may well be continuous with the W. Yabrin and extend far into the interior, if not to Nejran itself. ***Unexplored region of S. Nejd.***

East of Nejd a strip of sandy desert 50 m. in width extends almost continuously from the great Nafud to the Dahna. East of this again a succession of stony ridges running parallel to the coast has to be crossed before El Hasa is reached. This province, which skirts the Persian Gulf from the mouth of the Euphrates to the frontiers of Oman, is low and hot; its shores are flat, and with the exception of Kuwet at the north-west corner of ***El Hasa.***

the gulf, it possesses no deep water port. North of Katif it is desert and only inhabited by nomads; at Katif, however, and throughout the district to the south bordering on the Gulf of Bahrein there are ample supplies of underground water, welling up in abundant springs often at a high temperature, and bringing fertility to an extensive district of which El Hofuf, a town of 15,000 to 20,000 inhabitants, is the most important centre.

South-western Arabia, from the twenty-first parallel down to the Gulf of Aden, including the Taif district of Hejaz, Asir and Yemen, forms one province geographically. Throughout its length it consists of three zones, a narrow coastal strip, rarely exceeding 20 m. in width, a central mountainous tract, embracing the great chain which runs parallel to the coast from near Taif to within 50 m. of Aden, and an inner plateau falling gradually to the north-east till it merges in the Nejd steppes or the sands of the great desert. *South-western Arabia.*

The lowland strip or Tehama consists partly of a gravelly plain, the *Khabt*, covered sparsely with acacia and other desert shrubs and trees, and furnishing pasturage for large flocks of goats and camels; and partly of sterile wastes of sand like the *Ramla*, which extends on either side of Aden almost from the seashore to the foot of the hills. The Tehama is, however, by no means all desert, the mountain torrents where they debouch into the plain have formed considerable tracts of alluvial soil of the highest degree of fertility producing in that warm equable climate two and even three crops in the year. The flood-water is controlled by a system of dams and channels constructed so as to utilize every drop, and the extent of cultivation is limited more by the supply of water available than by the amount of suitable soil. These districts support a large settled population and several considerable towns, of which Bet el Fakih and Zubed in the western and Lahej in the southern Tehama, with 4000 to 6000 inhabitants, are the most important. There are signs that this coastal strip was until a geologically recent period below sea-level; and that the coast-line is still receding is evidenced by the history of the town of Muza, once a flourishing port, now 20 m. inland; while Bet el Fakih and Zubed, once important centres of the coffee trade, have lost their position through the silting up of the ports which formerly served them.

The jebel or mountain-land is, however, the typical Yemen, the *Arabia Felix* of the ancients. Deep valleys winding through the barren foothills lead gradually up to the higher mountains, and as the track ascends the scenery and vegetation change their character; the trees which line the banks of the wadi are overgrown with creepers, and the running stream is dammed at frequent intervals, and led off in artificial channels to irrigate the fields on either side; the steeper parts of the road are paved with large stones, substantially built villages, with their masonry towers or *dars*, crowning every height, replace the collection of mud walls and brushwood huts of the low country; while tier above tier, terraced fields cover the hill slopes and attest the industry of the inhabitants and the fertility of their mountains. On the main route from Hodeda to Sana the first coffee plantations are reached at Usil, at an altitude of 4300 ft., and throughout the western slopes of the range up to an altitude of 7000 ft. it is the most important crop. Jebel Haraz, of which Manakha, a small town of 3000 inhabitants is the chief place, is described by Glaser as one vast coffee garden. Here the traveller ascending from the coast sees the first example of the jebel or highland towns, with their high three-storeyed houses, built of quarried stone, their narrow façades pierced with small windows with white-washed borders and ornamented with varied arabesque patterns; each dar has the appearance of a small castle complete in itself, and the general effect is rather that of a cluster of separate forts than of a town occupied by a united community.

The scenery in this mountain region is of the most varied description; bare precipitous hill-sides seamed with dry, rocky watercourses give place with almost startling rapidity to fertile slopes, terraced literally for thousands of feet. General Haig in describing them says: "One can hardly realize the enormous labour, toil and perseverance that these represent; the terrace walls are usually 5 to 8 ft. in height, but towards the top of the mountains they are sometimes as much as 15 or 18 ft.; they are built entirely of rough stone without mortar, and I reckon that on an average each wall retains not more than twice its own height in breadth, and I do not think I saw a single break in them unrepaired."

The highest summits as determined by actual survey are between 10,000 and 11,000 ft. above sea-level. J. Sabur, a conspicuous mass in the extreme south, is 9900 ft., with a fall to the Taiz valley of 5000 ft.; farther north several points in the mountains above Ibb and Yarim attain a height of 10,500 ft., and J. Hadur, near the Sana-Hodeda road, exceeds 10,000 ft. From the crest of the range there is a short drop of 2000 or 3000 ft. to the broad open valleys which form the principal feature of the inner plateau. The town of Yarim lies near its southern extremity at an altitude of about 8000 ft.; within a short distance are the sources of the W. Yakla, W. Bana and W. Zubed, running respectively east and south and west. The first named is a dry watercourse ultimately joining the basin of the W. Hadramut; the two others run for a long distance through fertile valleys and, like many of the wadis on the seaward side of the range, have perennial streams down to within a few miles of the sea. Sana, the capital of Yemen, lies in a broad valley 7300 ft. above sea-level, sloping northwards to the W. Kharid which, with the Ghail Hirran, the sources of which are on the eastern slopes of J. Hadur, run north-eastward to the Jauf depression. The Arhab district, through which these two great wadis run, was formerly the centre of the Himyar kingdom; cultivation is now only to be found in the lower parts on the borders of the watercourses, all above being naked rock from which every particle of soil has been denuded. In the higher parts there are fine plains where Glaser found numerous Himyaritic remains, and which he considers were undoubtedly cultivated formerly, but they have long fallen out of cultivation owing to denudation and desiccation—the impoverishment of the country from these causes is increasing. Eastward the plateau becomes still more sterile, and its elevation probably falls more rapidly till it reaches the level of the Jauf and Nejran valleys on the borders of the desert. The water-parting between central and southern Arabia seems to be somewhere to the south of Nejran, which, according to Halévy, drains northward to the W. Dawasir, while the Jauf is either an isolated depression, or perhaps forms part of the Hadramut basin.

Farther north, in Asir, the plateau is more mountainous and contains many fertile valleys. Of these may be mentioned Khamis Mishet and the Wadi Shahran rising among the high summits of the maritime chain, and the principal affluents of the Wadi Besha; the latter is a broad well-watered valley, with numerous scattered hamlets, four days' journey (perhaps 80 m.) from the crest of the range. Still farther north is the Wadi Taraba and its branches running down from the highland district of Zahran. The lower valleys produce dates in abundance, and at higher elevations wheat, barley, millets and excellent fruit are grown, while juniper forests are said to cover the mountain slopes. In Yemen this tree was probably more common formerly; the place-name Arar, signifying juniper, is still often found where the tree no longer exists. *Asir.*

The western coast of Yemen, like that of Hejaz, is studded with shoals and islands, of which Perim in the Straits of Bab-el-Mandeb, Kamaran, the Turkish quarantine post, 40 m. north of Hodeda, and the Farsan group, off the Abu Arish coast, are the principal. Hodeda is the only port of any importance since the days of steamships began; the other ports, Mokha, Lohaia and Kanfuda merely share in the coasting trade. The south coast is free from the shoals that imperil the navigation of the Red Sea, and in Aden it possesses the only safe natural harbour on the route between Suez and India. Several isolated volcanic hills crop out on the shore line between Aden and the straits; the most remarkable are J. Kharaz, 2500 ft., and J. Shamshan, 1700 ft., at the base of which Aden itself is built. In both of these the crater form is very clearly marked. A low maritime plain, similar to the Tehama of the western coast, extends for some 200 m. east of the Straits of Bab-el-Mandeb, backed by mountains rising to 7000 ft. or more; farther east the elevation of the highland decreases steadily, and in the Hadramut, north of Mukalla, does not much exceed 4000 ft. The mountain chain, too, is less distinctly marked, and becomes little more than the seaward escarpment of the plateau which intervenes between the coast and the Hadramut valley. This valley runs nearly east and west for a distance of 500 m. from the eastern slopes of the Yemen highlands to its mouth on the Mahra coast near Sihut. The greater part of it is desert, but a short stretch lying between the 48th and 50th meridians is well watered and exceptionally fertile. This begins a little to the east of Shabwa, the ancient capital, now half buried in the advancing sand, and for a distance of over 70 m. a succession of villages and towns surrounded by fields and date groves extends along the main valley and into the tributaries which join it from the south. Shibam, Saiyun and Tarim are towns of 6000 or more inhabitants, and Hajren and Haura in the W. Duwan are among the larger villages. Himyaritic remains have been found here and in the W. Mefat which enters the Gulf of Aden near Balhaf. A few small fishing villages or ports are scattered along the coast, but except Mukalla and Shihr none is of any importance. *Coast of Yemen.* *Hadramut.*

The Gara coast was visited by the Bents, who went inland from Dhafar, one of the centres of the old frankincense trade, to the crest of the plateau. The narrow coastal strip seems to be moderately fertile, and the hills which in places come down to the seashore are covered with trees, among which the frankincense and other gum-bearing trees are found. On the plateau, which has an altitude of 4000 ft., there is good pasturage; inland the country slopes gently to a broad valley beyond which the view was bounded by the level horizon of the desert.

Oman (*q.v.*) includes all the south-eastern corner of the peninsula. Its chief feature is the lofty range of J. Akhdar, 10,000 ft. above sea-level. Like the great range of western Arabia, it runs parallel to the coast; it differs, however, from the western range in that its fall on the landward side is as abrupt and nearly as great as on its seaward side. Its northern extremity, Ras Musandan, rises precipitously from the straits of Hormuz; farther south the range curves inland somewhat, leaving a narrow but fertile strip, known as the Batina coast, between it and the sea, and containing several populous towns and villages of which Sohar, Barka and Sib are the chief. Muscat, the capital of the province and the principal port on the coast, is surrounded on three sides by bare, rocky hills, and has the reputation of being the hottest place in *Oman.*

Arabia. Zwemer says the fertility of the highland region of J. Akhdar is wonderful and is in striking contrast to the barrenness of so much of the coast; water issues in perennial springs from many rocky clefts, and is carefully husbanded by the ingenuity of the people; underground channels, known here as *faluj*, precisely similar to the *kanat* or *karez* of Persia and Afghanistan, are also largely used. The principal villages on the eastern slopes are Rustak, Nakhl and Semail in the well-watered valley of the same name; on the western slopes are Tanuf and Nizwa, lying immediately below the highest summit of the range; Semed, Ibra and Bidiya in the W. Betha are all well-built villages with palm-groves and irrigated fields. In the north-west the Dhahira district sloping towards the Jewasimi coast is more steppe-like in character; but there two oases of great fertility are found, of which Birema, visited by both Miles and Zwemer, supports a population of 15,000. West of Abu Dhabi a low flat steppe with no settled inhabitants extends up to the Katr peninsula, merging on the north into the saline marshes which border the Persian Gulf, and on the south into the desert.

The southern desert.

The great desert known as the Dahna or the Rub'a el Khali (" the empty quarter ") is believed to cover all the interior of southern Arabia from the borders of Yemen in the west to those of Oman in the east. Halévy in Nejran, Von Wrede in Hadramut, and Wellsted in Oman reached its edge, though none of them actually entered it, and the guides accompanying them all concurred in describing it as uninhabitable and uncrossed by any track. Its northern fringe is no doubt frequented by the Bedouin tribes of southern Nejd after the rains, when its sands, like those of the northern desert, produce herbage; but towards the east, according to Burckhardt's information, it is quite without vegetation even in the winter and spring. The farthest habitable spot to the south of Nejd is the Wadi Yabrin, which L. Pelly heard of from the Ahl Murra Bedouins as once a fertile district, and which still produces dates, though, owing to malaria, it is now deserted; thence southward to the Hadramut valley no communication is known to exist.

[*Geology*.—The geological structure of Arabia is very similar to that of Egypt. The oldest rocks consist of granite and schist, penetrated by intrusive dykes, and upon this foundation rest the flat-lying sedimentary deposits, beginning with a sandstone like the Nubian sandstone of Egypt. In the northern part of Arabia the crystalline rocks form a broad area extending from the peninsula of Sinai eastwards to Hail and southwards at least as far as Mecca. Towards the north the crystalline floor is overlaid by the great sandstone series which covers nearly the whole of the country north of Hail. Upon the sandstone rest a few scattered outliers of limestone, probably of Cretaceous age, the largest of which occur near Jauf and east of Bureda. Over both sandstone and granite great sheets of lava have been poured, and these, protecting the softer beds beneath from further denudation, now stand up as the high plateaus and hills called *harra*. Volcanic cones still exist in large numbers, and the sheets of lava appear as fresh as any recent flows of Etna or Vesuvius. Arabian manuscripts describe an eruption on the harra near Medina in A.D. 1256. In the south of Arabia the crystalline floor appears at intervals along the southern coast and on the shores of the Gulf of Oman. At Marbat the granite is overlaid by sandstone, presumably the Nubian sandstone: this is followed by marls containing Cenomanian fossils; and these are overlaid by Upper Cretaceous limestones, upon which rest isolated patches of *Alveolina* limestone. Generally, however, the Cretaceous beds do not appear, and the greater part of southern Arabia seems to be formed of *Alveolina* and nummulite limestones of Tertiary age. An extinct volcano occurs at Aden, and volcanic rocks are found at other places near the Straits of Bab-el-Mandeb. Throughout the whole of Arabia, so far as is known, the sedimentary beds show no signs of any but the most gentle folding. Faulting, however, is by no means absent, and some of the faults are of considerable magnitude. The Gulf of Akaba is a strip of country which has been let down between two parallel faults, and several similar faulted troughs occur in the Sinai peninsula. The Red Sea itself is a great trough bounded by faults along each side.]

Climate.—Owing to its low latitude and generally arid surface, Arabia is on the whole one of the hottest regions of the earth; this is especially the case along the coasts of the Persian Gulf and the southern half of the Red Sea, where the moist heat throughout the year is almost intolerable to Europeans. In the interior of northern and central Arabia, however, where the average level of the country exceeds 3000 ft., the fiery heat of the summer days is followed by cool nights, and the winter climate is fresh and invigorating; while in the highlands of Asir and Yemen in the south-west, and of Oman in the east, the summer heat is never excessive, and the winters are, comparatively speaking, cold.

In the northern desert the temperature is subject to extreme variations. Nolde states that on the 1st of February 1893 in the desert north of Hail the thermometer fell from 78° a little before sunset to 18° a quarter of an hour after. The midday temperatures recorded by Huber at Hail during January and the first half of February average about 65° F., and water froze on several nights; at Medina the winters are cold and night frosts of frequent occurrence, and these conditions prevail over all the western part of the Nejd plateau. In the east where the elevation is lower the climate is warmer. In the elevated highland district which extends from Taif to within 50 m. of Aden, the summer heat is tempered by the monsoon winds, and the seasonal variation of temperature is less marked. From observations made at Sana by Manzoni, Deflers and Glaser, the mean temperature for the year of that city at an altitude of 7300 ft. and in 15° 22′ N. appears to be 60° F.; for July the mean maximum was 77°, mean minimum 54°; for January the figures were 62° and 40° respectively, the lowest recorded temperature in 1878 was 26·6° on the 26th of January. At Aden at the sea-level the mean temperature for the year is 83°; the highest observed temperature in 1904 was 97·3°, the lowest 67·4°.

The rainfall throughout northern and central Arabia is chiefly in the winter months between October and April, and is scanty and irregular. Doughty states that in 1876 rain to wet the ground had not fallen for three years at Medain Salih; in that year showers fell on the 29th of December and on two days in January and again in March. After a very hot summer the bright weather changed to clouded skies on the 2nd of October, rain fell tempestuously the same evening, and there were showery days and nights till the 14th. The autumn rains fell that year abundantly in the Nafud towards Jauf, but very little in the basin of the W. Hamd (on the western slope). Doughty adds that the Nejd highlands between Kasim and Mecca are watered yearly by seasonable rains, which at Taif are expected about the end of August and last commonly from four to six weeks. This appears to be about the northern limit reached by the south-west monsoon, which from June to September brings a fairly abundant rainfall to the Yemen highlands, though the Tehama remains almost entirely rainless. The rainfall is heaviest along the western fringe of the plateau, and penetrates inland in decreasing quantity over a zone which perhaps extends to 100 m. in width. In good seasons it is sufficient for the cultivation of the summer crop of millet, and for the supply of the perennial streams and springs, on which the irrigation of the winter crops of wheat and barley depend. The amount measured at Dhala at the extreme south of the plateau at an elevation of 4800 ft. was in 1902 as follows:—June, 4·0 in.; July, 5·5; August, 5·8; September, 1·9. Only slight showers were recorded in the other months of the year. At higher elevations the rainfall is no doubt heavier; Manzoni mentions that at Sana there was constant rain throughout August and September 1878, and that the thermometer during August did not reach 65°. In the Tehama occasional showers fall during the winter months; at Aden the average rainfall for the year is 2·97 in., but during 1904 only 0·5 in. was recorded. Snow falls on the Harra and on the Tehama range in northern Arabia, and Nolde records a fall of snow which lay on the Nafud on the 1st of February 1893. It also falls on J. Akhdar in Oman, but is very rarely known on the Yemen mountains, probably because the precipitation during the winter months is so slight.

The prevailing winds in northern Arabia as far as is known are from the west; along the southern coast they are from the east; at Sana there is generally a light breeze from the north-north-west from 9 to 11 A.M., from noon till 4 P.M. a steady and often strong wind blows from the south-south-east, which dies away later. The climate is extremely dry, but this is compensated for by the heavy mists which sweep up from the plains during the rainless months and exercise a most beneficial effect in the coffee-growing districts. This phenomenon is known as the sukhemani or amama. In the morning the Tehama, as seen from the mountain tops, appears buried in a sea of white cloud; towards noon the clouds drift up the mountain slopes and cover the summits with wreaths of light mist charged with moisture which condenses on the trees and vegetation; in the afternoon they disappear, and the evenings are generally clear and still.

Fauna.—The wild animals of Arabia are all of the desert-loving type: antelopes and gazelles are found in small numbers throughout the peninsula; the latter are similar to the *chikara* or ravine deer of India. The larger antelopes, so common on the African side of the Gulf of Aden, are not found, except one variety, the *Oryx beatrix* (called by the Arabs, wild cow), which is an inhabitant of the Nafud between Tema and Hail; it is about the size of a donkey, white, and with long straight horns. Hares are numerous both in the desert and in cultivated tracts. In the Yemen mountains the *wal*, a wild goat with massive horns, similar to the Kashmir ibex, is found; monkeys also abound. Among smaller animals the jerboa and other descriptions of rat, and the *wabar* or cony are common; lizards and snakes are numerous, most of the latter being venomous. Hyenas, wolves and panthers are found in most parts of the country, and in the mountains the leopard and wild cat. Of birds the ostrich is found in the Nafud and in the W. Dawasir. Among game birds the bustard, guinea fowl, sand grouse (*kata*), blue rock, green pigeon, partridge, including a large chikor (*akb*) and a small species similar to the Punjab sisi; quail and several kinds of duck and snipe are met with. In the cultivated parts of Yemen and Tehama small birds are very numerous, so also are birds of prey, vultures, kites and hawks.

Insects of all sorts abound; scorpions, centipedes, spiders, and an ugly but harmless millipede known in Yemen as *hablub* are very common in summer. Ants and beetles too are very numerous, and anthills are prominent features in many places. Locusts appear in great swarms and do much damage; fires are lighted at night

to attract them, and large quantities are caught and eaten by the poorer people. Bees are kept, and in Yemen and Hadramut the honey is exceptionally good.

Of domesticated animals the camel is far the most useful to the Arab. Owing to its endurance of thirst the long desert journeys which separate the populous centres are made practicable, and in the spring months, when green forage is plentiful in the desert, the Bedouins pitch their camps for long periods far from any water, and not only men but horses subsist on camel's milk. The Arabian camel belongs to the one-humped species, though there are many varieties differing in appearance as much as the thoroughbred race-horse from the English cart-horse. The ordinary load for a pack camel is about 400 lb, and in hot weather good camels will march 20 to 25 m. daily and only require water every third or fourth day: in cool weather, with ample green fodder they can go twenty-five days or more without drinking. A good *dalul* or riding camel will carry his rider 100 m. a day for a week on end. Nolde gives an instance from his own experience of a camel rider covering 62 m. in seven hours. The pure-bred riding camel is only found in perfection in inner Arabia; for some unexplained reason when taken out of their own country or north of the 30th degree they rapidly degenerate. *Camel.*

The horse does not occupy the important position in the Bedouin economy that is popularly supposed. In Nejd the number of horses is, comparatively speaking, very small; the want of water in the Nafud where alone forage is obtainable, and the absence of forage in the neighbourhood of the towns makes horse-breeding on a large scale impracticable there. Horses are in fact only kept by the principal sheiks, and by far the larger proportion of those now in Nejd are the property of the amir and his family. These are kept most of the year in the Nafud, five or ten days' march from Hail, where they find their own food on the desert herbage. When a raid is in contemplation, they are brought in and given a little barley for a few weeks. Reared in this way they are capable of marvellous endurance, marching during a raid twenty hours a day for eight or ten days together. As a rule, they are only mounted at the moment of attack, or in pursuit. Water and forage have to be carried for them on camels. *Horse.*

The great majority of the horses that come into the market as Arabs, are bred in the northern desert and in Mesopotamia, by the various sections of the Aneza and Shammar tribes, who emigrated from Nejd generations ago, taking with them the original Nejd stock. In size and appearance, and in everything but endurance, these northern horses are admittedly superior to the true Nejdi. A few of the latter are collected by dealers in the nomad camps and exported chiefly from Kuwet. The amir Mahommed Ibn Rashid used to send down about one hundred young horses yearly.

Asses of excellent quality are bred all over the country; they are much used as mounts by the richer townsmen. Except in the settled districts horned cattle are not numerous; they are similar to the Indian humped cattle, but are greatly superior in milking qualities. The great wealth of the Arabs is in their flocks of sheep and goats; they are led out to pasture soon after sunrise, and in the hotter months drink every second day. In the spring when the succulent *ashub* and *adar* grow plentifully in the desert, they go for weeks without drinking. They are milked once a day about sunset by the women (the men milk the camels), and a large proportion of the milk is made into *samn*, clarified butter, or *marisi*, dried curd. The wool is not of much value, and is spun by the women and woven into rugs, and made up into saddlebags or into the black Bedouin tents.

Flora.—The flora of Arabia has been investigated by P. Forskal, the botanist of Niebuhr's mission, P. E. Botta, G. Schweinfurth and A. Deflers, to whose publications the technical reader is referred. Its general type approaches more closely to the African than to that of southern Asia. In the higher regions the principal trees are various species of fig, tamarind, carob and numerous kinds of cactiform *Euphorbia*, of which one, the *Euphorbia arborea*, grows to a height of 20 ft. Of Coniferae the juniper is found on the higher slopes of J. Sabur near Taiz, where Botta describes it as forming an extensive forest and growing to a large size; it is also found in the range overlooking the W. Madin, 50 m. W. of Aden. Considerable forests are said to exist in Asir, and Burton found a few fine specimens which he regarded as the remains of an old forest, on the Tehama range in Midian. On the rocky hill-sides in Yemen the *Adenium Obesum* is worthy of notice, with its enormous bulb-like stems and brilliant red flowers. Some fine aloes or agaves are also found. In the cultivated upland valleys all over Arabia the *Zizyphus jujuba*, called by some travellers lotus, grows to a large tree; its thorny branches are clipped yearly and used to fence the cornfields among which it grows. In the broad sandy wadi beds the tamarisk (*athl*) is everywhere found; its wood is used for making domestic implements of all sorts. Among fruit trees the vine, apricot, peach, apple, quince, fig and banana are cultivated in the highlands, and in the lower country the date palm flourishes, particularly throughout the central zone of Arabia, in Hejaz, Nejd and El Hasa, where it is the prime article of food. A hundred kinds of date are said to grow at Medina, of which the *birni* is considered the most wholesome; the *halwa* and the *jalebi* are the most delicately flavoured and sell at very high rates; the *khulas* of El Hasa is also much esteemed.

Of cereals the common millets, *dhura* and *dukhn*, are grown in all parts of the country as the summer crop, and in the hot irrigated Tehama districts three crops are reaped in the year; in the highlands maize, wheat and barley are grown to a limited extent as the winter crop, ripening at the end of March or in April. Among vegetables the common kinds grown include radishes, pumpkins, cucumbers, melons, potatoes, onions and leeks. Roses are grown in some places for the manufacture of *atr*, or attar of roses; mignonette, jasmine, thyme, lavender and other aromatic plants are favourites in Yemen, when the Arabs often stick a bunch in their head-dress.

Of the products special to Arabia coffee comes first; it is nowhere found wild, and is believed to have been introduced from Abyssinia in the 6th century A. D. It thrives on the seaward slopes of the western range in the zone of the tropical rains, at altitudes between 4000 and 7000 ft. The principal centres of production are the upper valleys of the W. Surdad, between Kaukaban and Manakha, and particularly on J. Haraz; in the Wadi Zubed west of Uden; in Hajaria on the slopes of J. Sabur, and in the Yafa district north-east of Aden. It is planted in terraces on the mountain slopes; shady trees, such as tamarind and fig, are planted in the border as a protection from the sun, and the terraces are irrigated by channels led from a neighbouring rivulet or spring. The plants are raised from seedlings, and when six or seven weeks old they are transplanted in rows 4 to 6 ft. apart; they require watering twice a month, and bear in two to four years. The berries are dried in the sun and sent down to Hodeda or Aden, where they are subjected to a process for separating the husk from the bean; the result is about 50% of cleaned berries, *bun safi*, which is exported, and a residue of husk or *kishr*, from which the Yemenis make their favourite beverage. *Coffee.*

Another plant universally used as a stimulant in Southern Arabia is *khat* (*Catha edulis*). The best is grown on J. Sabur and the mountainous country round Taiz. It is a small bush propagated from cuttings which are left to grow for three years; the leaves are then stripped, except a few buds which develop next year into young shoots, these being cut and sold in bunches under the name of *khat mubarak*; next year on the branches cut back new shoots grow; these are sold as *khat malhani*, or second-year kat, which commands the highest price. The bush is then left for three years, when the process is repeated. The leaves and young shoots are chewed; they have stimulating properties, comparable with those of the coca of Peru.

The aromatic gums for which Arabia was famed in ancient times are still produced, though the trade is a very small one. The tree from which myrrh is extracted grows in many places, but the industry is chiefly carried on at Suda, 60 m. north-north-east of Sana. Longitudinal slits are made in the bark, and the gum is caught in cups fixed beneath. The balsam of Mecca is produced in the same way, chiefly in the mountains near the W. Safra between Yambu and Medina.

The stony plains which cover so large a part of the country are often covered with acacia jungle, and in the dry water-courses a kind of wild palm, the *dom*, abounds, from the leaves of which baskets and mats are woven. Brushwood and rough pasturage of some sort is found almost everywhere, except in the neighbourhood of the larger settlements, where forage and firewood have to be brought in from long distances. The Nafud sands, too, are tufted in many places with bushes or small trees, and after the winter rains they produce excellent pasture.

Population.—The people, according to their own traditions, are derived from two stocks, the pure Arabs, descended from Kahtan or Joktan, fourth in descent from Shem; and the Mustarab or naturalized Arabs, from Ishmael. The former are represented at the present day by the inhabitants of Yemen, Hadramut and Oman, in general a settled agricultural population; the latter by those of Hejaz, Nejd, El Hasa, the Syrian desert and Mesopotamia, consisting of the Bedouin or pastoral tribes (see ARABS and BEDOUINS). This distinction between the characteristics of the two races is only true in a general sense, for a considerable population of true Bedouin origin has settled down to agricultural life in the oases of Hejaz and Nejd, while in southern Arabia the tribes dwelling on the fringe of the great desert have to a certain extent adopted the nomad life.

Both among the nomad and settled Arabs the organization is essentially tribal. The affairs of the tribe are administered by the sheiks, or heads of clans and families; the position of sheik in itself gives no real governing power, his word and counsel carry weight, but his influence depends on his own personal qualities. All matters affecting the community are discussed in the *majlis* or assembly, to which any tribesman has access; here, too, are brought the tribesmen's causes; both sides plead and judgment is given impartially, the loser is fined so many head of small cattle or camels, which he must pay or go into

exile. Murder can be expiated by the payment of *diya* or blood-money, if the kinsmen of the murdered man consent; they may, however, claim the life of the murderer, and long and troublesome blood feuds often ensue, involving the relatives of both sides for generations.

Apart from the tribesmen there is in Hejaz and south Arabia a privileged, religious class, the Sharifs or Seyyids, who claim descent from Mahomet through his daughter Fatima. Until the Egyptian invasion in 1814 the Sharifs of Mecca were the recognized rulers of Hejaz, and though the Turks have attempted to suppress their importance, the Sharif still executes justice according to the Mahommedan law in the holy cities, though, nominally, as a Turkish official. In Yemen and Hadramut many villages are occupied exclusively by this religious hierarchy, who are known as Ashraf, Sada or Kudha (*i.e.* Sharifs, Seyyids or Kadhis); the religious affairs of the tribes are left in their hands; they do not, however, interfere in tribal matters generally, or join in fighting.

Below these two classes, which may be looked on as the priestly and the military castes, there is, especially in the settled districts, a large population of artisans and labourers, besides negro slaves and their descendants, slave or free. The population of Khaibar consists almost entirely of the latter, and in Hail Huber estimates the pure Arab inhabitants at only one-third of the whole. In the desert, too, there is a widely scattered tribe, the Salubi, which from its name (*Salib*, cross) is conjectured to be of early Christian origin; they are great hunters, killing ostriches and gazelles; the Arabs despise them as an inferior race, but do not harm them; they pay a small tax to the tribe under whose protection they live, and render service as labourers, for which they receive in the spring milk and cheese; at the date harvest they get wages in kind; with this, and the produce of the chase, they manage to exist in the desert without agriculture or flocks.

The Jews in Arabia.

In southern Arabia the Jews form a large element in the town population. According to one authority their presence in Yemen dates from the time of Solomon, others say from the capture of Jerusalem by Nebuchadrezzar. Manzoni estimated their number in Sana in 1878 at 1700 out of a total population of 20,000; at Aden they are a numerous and wealthy community, with agents in most of the towns of Yemen. Even in remote Nejran, Halévy, himself a Jew, found a considerable colony of his co-religionists. They wear a distinctive garb and are not allowed to carry arms or live in the same quarter as Moslems. Another foreign element of considerable strength in the coast towns of Muscat, Aden and Jidda, is the British Indian trading class; many families of Indian origin also have settled at Mecca, having originally come as pilgrims.

Estimates of the population of Arabia vary enormously, and the figures given in the following table can only be regarded as a very rough approximation:—

Hejaz	300,000
Yemen and Asir	1,800,000
Nejd	1,000,000
Hadramut	150,000
Oman	1,000,000
El Hasa	300,000
Syrian desert and border	275,000
	4,825,000

Communications.—The principal land routes in Arabia are those leading to the holy cities. In the present day the Syrian pilgrim route, or Darb el Haj, from Damascus to Medina and Mecca is the most used. The annual pilgrim caravan or haj, numbering some 6000 people with 10,000 pack animals, is escorted by a few Turkish irregulars known as *agel*; small fortified posts have been established at the regular halting-places some 30 m. apart, each furnished with a well and reservoir, and for the further protection of the haj, payments are made to the Bedouin tribes through whose territories the route passes. The road is a mere camel track across the desert, the chief places passed are Ma'an on the Syrian border, a station on the old Sabaean trade route to Petra, and Medain Salih, the site of the rock-cut tombs and inscriptions first brought to notice by Doughty. From Medina the route usually followed descends the W. Safra to Badr Hunen, whence it keeps near the coast passing Rabigh and Khulesa to Mecca. The total distance, 1300 m., is covered in forty days.

The Egyptian pilgrim route from Cairo, across the Sinai peninsula and down the Midian coast to El Wijh, joins the Syrian route at Badr Hunen. It also was formerly provided with stations and reservoirs, but owing to the greater facilities of the sea journey from Suez to Jidda it is now little used. Another important route is that taken by the Persian or Shia pilgrims from Bagdad and Kerbela across the desert, by the wells of Lina, to Bureda in Kasim; thence across the steppes of western Nejd till it crosses the Hejaz border at the Ria Mecca, 50 m. north-east of the city. It lies almost entirely in the territory of the amir Ibn Rashid of J. Shammar, who derives a considerable revenue from the pilgrimage. The old reservoirs on this route attributed to Zubeda, wife of Harun al Rashid, were destroyed during the Wahhābi raids early in the 19th century, and have not been repaired. The Yemen pilgrim route, known as the Haj el Kabsi, led from Sada through Asir to Taif and Mecca, but it is no longer used.

The principal trade routes are those leading from Damascus to Jauf and across the Nafud to Hail. Other important routes leading to Nejd are those from Kuwet to Hail, and from El Hasa to Riad respectively. In the west and south the principal routes, other than those already mentioned, are from Yambu to Medina, from Jidda to Mecca, Hodeda to Sana, Aden to Sana, and from Mukalla to the Hadramut valley. Railway construction has begun in Arabia, and in 1908 the Hejaz line, intended to connect Damascus with Mecca, had reached Medina, 500 m. south of Ma'an. This line is of great strategical importance, as strengthening the Turkish hold on the Red Sea provinces. But the principal means of commercial communication for a country like Arabia must always be by sea. Bahrein, Kuwet and Muscat are in steam communication with India, and the Persian Gulf ports; all the great lines of steamships call at Aden on their way between Suez and the East, and regular services are maintained between Suez, Jidda, Hodeda and Aden, as well as to the ports on the African coast, while native coasting craft trade to the smaller ports on the Red Sea and Indian Ocean.

Commerce.—The total value of the trade of Aden for 1904 amounted to over £6,000,000. The imports to Jidda in the same year were £1,405,000, largely consisting of rice, wheat and other food stuffs from India; the exports, which have dwindled away in late years, amounted in 1904 to only £25,000. To balance the exports and imports specie was exported in the three years 1902–1904 amounting to £2,319,000; a large proportion of this was perhaps provided by cash brought into the country by pilgrims.

The pilgrim traffic increased largely in 1904 as compared with previous years; 74,600 persons landed at Jidda, 18,000 of whom were from British India, 13,000 from Java and the Straits Settlements, and the remainder from Turkish territory, Egypt and other countries: 235 out of a total of 334 steamships engaged in this traffic were British.

The trade of Hodeda, which contributes by far the largest share to that of Turkish Yemen, fell off considerably during the period from 1901–1905, chiefly owing to the disturbed state of the country. In the latter year the imports amounted to £467,000, and the exports to £451,000; coffee, the mainstay of Yemen trade, shows a serious decline from £302,000 in 1902 to £229,000 in 1904; this is attributable partly to the great increase of production in other countries, but mainly to the insecurity of the trade routes and the exorbitant transit dues levied by the Turkish administration.

Oman, through its chief port Muscat, had a total trade of about £550,000, two-thirds of which is due to imports and one-third to exports. The chief items of imports are arms and ammunition, rice, coffee and piece goods; the staple export is dates, which in a good year accounts for nearly half the total; much of the trade is in the hands of British Indians, and of the shipping 92% is British.

The principal trade centre of the Arabian side of the Persian Gulf is Bahrein; the total volume of trade of which amounted in 1904 to £1,900,000, nearly equally divided between imports and exports; rice, piece goods, &c., form the bulk of the former, while pearls are the most valuable part of the latter. (R. A. W.)

Antiquities

Arabia cannot be said to be "destitute of antiquities," but the material for the study of these is still very incomplete.

The difficulties in the way of travelling in Arabia with a view to scientific investigation are such that little or nothing is being done, and the systematic work which has given such good results in Egypt, Palestine and Babylonia-Assyria is unknown in Arabia. Yet the passing notes of travellers from the time of Carsten Niebuhr show that antiquities are to be found.

Prehistoric Remains.—Since prehistoric remains must be studied where they are found, the difficulty in the way of exploration makes itself severely felt. That such remains exist seems clear from the casual remarks of travellers. Thus Palgrave (*Central and Eastern Arabia*, vol. i. ch. 6) speaks of part of a circle of roughly shaped stones taken from the adjacent limestone mountains in the Nejd. Eight or nine of these stones still exist, some of them 15 ft. high. Two of them, 10 to 12 ft. apart, still bear their horizontal lintel. They are all without ornament. Palgrave compares them with the remains at Stonehenge and Karnak. Doughty (*Arabia Deserta*, vol. ii.), travelling in north-west Arabia, saw stones of granite in a row and "flagstones set edgewise" (though he does not regard these as religious), also "round heaps, perhaps barrows," and "dry-built round chambers," which may be ancient tombs. J. T. Bent (*Southern Arabia*, pp. 24 ff.) explored one of several mounds in Bahrein. It proved to be a tomb, and the remains in it are said to be Phoenician.

Castles and Walls.—In the south of Arabia, where an advanced civilization existed for centuries before the Christian era, the ruins of castles and city-walls are still in existence, and have been mentioned, though not examined carefully, by several travellers. In Yemen and Hadramut especially these ruins abound, and in some cases inscriptions seem to be still *in situ*. Great castles are often mentioned in early Arabian literature. One in the neighbourhood of San'a was described as one of the wonders of the world by Qazwīnī (*Athār ul-Bilād*, p. 33, ed. Wüstenfeld, Göttingen, 1847, cf. *Journal of the German Oriental Society*, vol. 7, pp. 472, 476, and for other castles vol. 10, pp. 20 ff.). The ruins of the city of Ma'rib, the old Sabaean capital, have been visited by Arnaud, Halévy and Glaser, but call for further description, as Arnaud confined himself to a description of the dike (see below), while Halévy and Glaser were interested chiefly in the inscriptions.

Wells and Dikes.—From the earliest times the conservation of water has been one of the serious cares of the Arabs. All over the country wells are to be found, and the masonry of some of them is undoubtedly ancient. Inscriptions are still found in some of these in the south. The famous well Zemzem at Mecca is said to belong to the early times, when the eastern traffic passed from the south to the north-west of Arabia through the Hejaz, and to have been rediscovered shortly before the time of Mahomet. Among the most famous remains of Ma'rib are those of a great dike reminding one of the restored tanks familiar to visitors at Aden. These remains were first described by Arnaud (*Journal asiatique*, January 1874, with plan). Their importance was afterwards emphasized by Glaser's publication of two long inscriptions concerning their restoration in the 5th and 6th centuries A.D. ("Zwei Inschriften über den Dammbruch von Mārib," in the *Mitteilungen der Vorderasiatischen Gesellschaft*, Berlin, 1897). Another dike about 150 yds. long was seen by W. B. Harris at Hirran in Yemen. Above it was a series of three tanks (*A Journey through the Yemen*, p. 279, London, 1893).

Stones and Bronzes.—The 19th century has brought to the museums of Europe (especially to London, Paris, Berlin and Vienna) a number of inscriptions in the languages of Minea and Saba, and a few in those of Hadramut and Katabania (Qattabania). These inscriptions are generally on limestone or marble or on tablets of bronze, and vary from a few inches to some feet in length and height. In some cases the originals have been brought to Europe, in other cases only squeezes of the inscriptions. The characters employed are apparently derived from the Phoenician (cf. Lidzbarski's *Ephemeris*, vol. i. pp. 109 ff.). The languages employed have been the subject of much study (cf. F. Hommel's *Süd-arabische Chrestomathie*, Munich, 1893), but the archaeological value of these remains has not been so fully treated. Very many of them are votive inscriptions and contain little more than the names of gods and princes or private men. A few are historical, but being (with few and late exceptions) undated, have given rise to much controversy among scholars. Their range seems to be from about 800 B.C. (or 1500 B.C. according to E. Glaser) to the 6th century A.D. Few are still *in situ*, the majority having been taken from their original positions and built into houses, mosques or wells of more recent date. Among these remains are altars, and bases for statues of gods or for golden images of animals dedicated to gods. The earlier stones are devoid of ornamentation, but the later stones and bronzes are sometimes ornamented with designs of leaves, flowers, ox-heads, men and women. Some bear figures of the conventionalized sacred tree with worshippers, similar to Babylonian designs. Besides these there are gravestones, stelae with human heads, fragments of limestone, architectural designs as well as bronze castings of camels, horses, mice, serpents, &c. (cf. D. H. Müller's *Südarabische Alterthümer im Kunsthistorischen Museum*, Vienna, 1899, with plates).

Seals, Weights and Coins.—The Vienna Museum possesses a small number of seals and gems. The seals are inscribed with Sabaean writing and are of bronze, copper, silver and stone. The gems of onyx, carnelian and agate are later and bear various figures, and in some cases Arabic inscriptions. One or two weights are also in existence. A number of coins have been brought to the British Museum from Aden, San'a and Ma'rib. Others were purchased by G. Schlumberger in Constantinople; others have been brought to Europe by Glaser, and are now in the Vienna Museum. These are imitations of Greek models, while the inscriptions are in Sabaean characters (cf. B. V. Head, in the *Numismatic Chronicle*, 1878, pp. 273–284; G. Schlumberger, *Le Trésor de San'a*, Paris, 1880; D. H. Müller, *op. cit.* pp. 65 ff. and plates).

For the problem of Arabic antiquities in Rhodesia see RHODESIA and ZIMBABWE. (G. W. T.)

HISTORY

Introduction.—Arabia is a land of Semites, and is supposed by some scholars to have been the original home of the Semitic peoples. Although this cannot be said to be proved, the studies, linguistic and archaeological, of Semitic scholars have shown it to be probable. The dispersion from Arabia is easy to imagine. The migration into Babylonia was simple, as there are no natural boundaries to separate it from north-east Arabia, and similar migrations have taken place in historic times. That of the Aramaeans at an early period is likewise free from any natural hindrance. The connexion with Palestine has always been close; and the Abyssinian settlement is probably as late as the beginning of the Christian era. Of these migrations, however, history knows nothing, nor are they expressed in literature. Arabian literature has its own version of prehistoric times, but it is entirely legendary and apocryphal. It was, and still is, the custom of Arabian historians to begin with the creation of the world and tell the history from then to the time of which they are writing. Consequently even the more sober histories contain a mass of fables about early days. Many of these, taken in part from Jewish and Christian sources, find a place in the Koran. Of all these stories current at the time of Mahomet, the only ones of any value are the accounts of the "days of the Arabs," *i.e.* accounts of some famous inter-tribal battles in Arabia.

Authorities.—Until recently the Arab traditions were practically the only source for the pre-Islamic history of Arabia. The Old Testament references to Arabs were obscure. The classical accounts of the invasion of Aelius Gallus in 26 B.C. threw little light on the state of Arabia at the time, still less on its past history. The Greek writers from Theophrastus in the 4th century B.C. to Ptolemy in the 2nd century A.D. mention many names of Arabian peoples and describe the situation of their cities, but contribute little to their history, and that little could not be controlled. The same applies to the information of Pliny in his *Natural History*. In the 19th century the discovery and decipherment of the Assyrian inscriptions gave a slight glance into the relations between Arabs and Assyrians from the

8th century B.C. But the great contribution of the century to the early history of Arabia was the collecting and translating of numerous early Arabian inscriptions (cf. section *Antiquities* above), which have done service both by their own indication of a great civilization in Arabia for nearly (or more than) a thousand years before the Christian era, and by the new stimulus which they gave to the study and appreciation of the materials in the Assyrian inscriptions, the Old Testament, and the Greek and Roman writers. At the same time the facts that the inscriptions are undated until a late period, that few are historical in their contents, and for the most part yield only names of gods and rulers and domestic and religious details, and that our collection is still very incomplete, have led to much serious disagreement among scholars as to the reconstruction of the history of Arabia in the pre-Christian centuries.

All scholars, however, are agreed that the inscriptions reach as far back as the 9th century B.C. (some say to the 16th) and prove the existence of at least four civilized kingdoms during these centuries. These are the kingdoms of Ma'īn (Minaean), of Saba (Sabaean), of Hadramaut (Hadramut) and of Katabania (Katabanū). Of the two latter little is known. That of Hadramut had kings from the time of the Minaeans to about A.D. 300, when it was conquered by Ethiopia. The limits of the kingdom of Katabania are not known, but it has its own inscriptions.

As to the Sabaean kingdom there is fair agreement among scholars. The inscriptions go back to 800 B.C. or earlier, and the same applies to the kingdom. A queen of this people (the "Queen of Sheba") is said (1 Kings x.) to have visited Solomon about 950 B.C. There is, however, no mention of such a queen in the inscriptions. An Assyrian inscription mentions Ith'amara the Sabaean who paid tribute to Sargon in 715 B.C. At this time the Sabaeans must have been in north Arabia unless the inscription refers to a northern colony of the southern Sabaeans. The former opinion is held by E. Glaser, who thinks that in the 9th and 8th centuries they moved down along the west coast to the south, where they conquered the Minaeans (see below). The Sabaean rule is generally divided into periods indicated by the titles given to their rulers. In the first of these ruled the Makārib, who seem to have been priest-kings. Their first capital was at Ṣirwāḥ. Ten such rulers are mentioned in the inscriptions. Their rule extended from the 9th to the 6th century. The second period begins about 550 B.C. The rulers are known as "kings of Saba." Their capital was Ma'rib. The names of seventeen of these kings are known from the inscriptions. Their sway lasted until about 115 B.C., when they were succeeded by the Himyarites. During this period they were engaged in constant strife with the neighbouring kingdoms of Hadramut and Katabania. The great prosperity of south-west Arabia at this time was due in large measure to the fact that the trade from India with Egypt came there by sea and then went by land up the west coast. This trade, however, was lost during this period, as the Ptolemies established an overland route from India to Alexandria. The connexion of Saba with the north, where the Nabataeans (*q.v.*) had existed from about 200 B.C., was now broken. The decay that followed caused a number of Sabaeans to migrate to other parts of Arabia.

The Minaean kingdom extended over the south Arabian Jauf, its chief cities being Karnau, Ma'īn and Yathil. Some twenty-five kings are known from the inscriptions; of these twenty are known to be related to one another. Their history must thus cover several centuries. As inscriptions in the Minaean language are found in al-'Ulā in north Arabia, it is probable that they had colonies in that district. With regard to their date opinion is very much divided; some, with E. Glaser and F. Hommel, maintaining that their kingdom existed prior to that of Saba, probably from about 1500 B.C. or earlier until the Sabaeans came from their home in the north and conquered them in the 9th century. Other scholars think, with D. H. Müller, partly on palaeographical grounds (cf. M. Lidzbarski's *Ephemeris*, vol. i. pp. 109 seq., Giessen, 1902), that none of the inscriptions are earlier than about 800 B.C. and that the Minaean kingdom existed side by side with the Sabaean. It is curious that the Sabaean inscriptions contain no mention of the Minaeans, though this may be due to the fact that very few of the inscriptions are historical in content.

About 115 B.C. the power over south Arabia passed from the Sabaeans to the Himyarites, a people from the extreme south-west of Arabia; and about this time the kingdom of Katabania came to an end. The title taken by the new rulers was "king of Saba and Raidān." Twenty-six kings of this period are known from the inscriptions, some of which are dated. In this period the Romans made their one attempt at direct interference in the affairs of Arabia. The invasion under Aelius Gallus was an absolute failure, the expedition being betrayed by the guides and lost in the sands of the desert. During the latter part of this time the Abyssinians, who had earlier migrated from Arabia to the opposite coast of Africa, began to flow back to the south of Arabia, where they seem to have settled gradually and increased in importance until about A.D. 300, when they became strong enough to overturn the Himyarite kings and establish a dynasty of their own. The title assumed by them was "king of Saba, Raidān, Hadramut and Yemen." The Himyarites were, however, still active, and after a struggle succeeded in establishing a Jewish Sabaean kingdom, having previously accepted Judaism as their religion. Their best-known king was Dhu Nuwās. The struggle between them and the Abyssinians now became one of Judaism against Christianity. The persecution of the Christians was very severe (see E. Glaser's *Die Abyssinier in Arabien und Afrika*, Munich, 1895, and F. M. E. Pereira's *Historia dos Martyres de Nagran*, Lisbon, 1899). Apparently for this reason Christian Abyssinia was supported from Byzantium in its attempts to regain power. These attempts were crowned with success in 525. Of the Christian Abyssinian kings in Arabia tradition tells of four, one only of whom is mentioned in inscriptions. The famous expedition of Abraha, the Abyssinian viceroy, against Mecca, took place in 570. Five years later the Persians, who had been called in by the opponents of Christianity, succeeded in taking over the rule and in appointing governors over Yemen. (See further ETHIOPIA: *The Axumite Kingdom.*)

Hīra, Ghassān and Kinda.—Before passing to the time of Mahomet it is necessary to take account of three other Arabian powers, those of Hīra, Ghassān and Kinda.

The kingdom of Hira (Ḥīra) was established in the boundary land between the Euphrates and the Arabian desert, a district renowned for its good air and extraordinary fertility. The chief town was Hīra, a few miles south of the site of the later town of Kufa. The inhabitants of this land are said in Ṭabari's history to have been of three classes:—(1) The Tanukh (Tnuhs), who lived in tents and were made up of Arabs from the Tehama and Nejd, who had united in Bahrein to form a new tribe, and who migrated from there to Hīra, probably at the beginning or middle of the 3rd century A.D., when the Arsacid power was growing weak. The Arabian historians relate their conflict with Zenobia. (2) The 'Ibād or 'Ibādites, who dwelt in the town of Hīra in houses and so led a settled life. These were Christians, whose ecclesiastical language was Syriac, though the language of intercourse was Arabic. A Christian bishop of Hīra is known to have attended a synod in 410. In the 5th century they became Nestorians. (3) Refugees of various tribes, who came into the land but did not belong to the Tanukh or the 'Ibād. There is no trustworthy information as to the earlier chiefs of this people. The dynasty of the Lakhmids, famed in Arabian history and literature, arose towards the end of the 3rd century and lasted until about 602. The names of twenty kings are given by Hishām al-Kalbī in Ṭabari's history. Although so many of their subjects were Christian, the Lakhmids remained heathen until Nu'mān, the last of the dynasty. The kingdom of Hīra was never really independent, but always stood in a relation of dependence on Persia, probably receiving pay from it and employing Persian soldiers. At the height of its power it was able to render valuable aid to its suzerain. Much of its time was spent in wars with Rome and Ghassān. Its revenues were derived from the Bedouins of the surrounding lands as well as from its own subjects at home. About 602 the

Hīra.

ARABIA
Scale, 1:13,000,000
English Miles
0 50 100 200 300 400
Railways
Principal Capitals (States and larger Provinces)
Capitals of smaller Provinces Governorships, Districts &c.
Sand Deserts
Lava Beds (Harra)
Pilgrim and Trade Routes
Swamps
ADEN AND VICINITY
Scale, 1:7,500,000
English 0 20 40 60 80 100 120 Miles
MEDITERRANEAN SEA
Beirut
Damascus
Tadmur
Mesopotamia
Bagdad
Kerbela
Kashan
Isfahan
Dizful
Shuster
Syrian Desert
(Badiet esh-Sham)
Hamad ar Stony Desert
Jauf
Sakaka
Kara
Tebuk
Akaba
Jerusalem
Jaffa
Haifa
Alexandria
Rosetta
Nile Delta
Damietta
Port Said
El Arish
Cairo
Suez
Lower Egypt
Upper Egypt
Great Nafud or Red Desert
El Hajra
Wadi Sirhan
Hamad
Basra
Muhammera
Behbehan
Ramhormuz
Shiraz
Lake Niriz
Persian Gulf
Bushire
Kangun
Lingah
Bahrein Is.
Katif
Hofuf
El Bidia
Abu Dhabi
Sharja
Pirate Coast
Trucial Oman
Gulf of Oman
Muscat
Kuryat
Sur
Ras el Had
Masira I.
Masira Gulf
Ras Madraka
Sachira Bay
Kamar Maria Is. (Fr.)
Kamae Bay
Ras Fartak
Mukalla
Shihr
Ghuzal
Hadhramaut
Arabian Sea
Sokotra
Gulf of Aden
Aden (British)
Aden Protectorate
Lahaja
Yemen
Hodeda
Bet-el-Fakih
Zebid
Beit-el-Fakih
Sana
Dhamar
Yarim
Taizz
Mokha
Shukra
Bedha
Jibla
Ibb
Kamaran
Farsan Islands
Massawa
Eritrea
Abyssinia
Red Sea
Str. of Bab-el-Mandeb
Shekh Said (Brit.)
Perim I. (Brit.)
Ras Banailah
Sheikh Othman
Lahej
Abyan
Shabwa
Makalla
Balhaf
Ras Fartak
Ras Sharbithat
Ras Asir
Ras Madraka
Ras Kasar
Ras Kuseir
Ras Hafun
Ras Hafa
Ras Hadarba
Ras Hamran
Ras Hamid

Lakhmid dynasty fell, and the Persian Chosroes (Khosrau) II. appointed as governor an Arab of the tribe of Tāl. Shortly after it came into relation with Islam.

See G. Rothstein's *Die Dynastie der Lakhmiden in al-Hira* (Berlin, 1899); Th. Nöldeke's *Geschichte der Perser und Araber zur Zeit der Sassaniden* (Leiden, 1879).

Ghassān.

In the beginning of the 6th century A.D. a dynasty known as the Jafnids, enter into the history alike of the Roman and Persian empires. They ruled over the tribe of Ghassān in the extreme north-west of Arabia, east of the Jordan, from near Petra in the south to the neighbourhood of Rosāfa in the north-east. Of their origin little is known except that they came from the south. A part of the same tribe inhabited Yathrib (Medina) at the time of Mahomet. The first certain prince of the Jafnid house was Hārith ibn Jabala, who, according to the chronicle of John Malalas, conquered Mondhir (Mundhir) of Hīra in 528. In the following year, according to Procopius, Justinian perceived the value of the Ghassānids as an outpost of the Roman empire, and as opponents of the Persian dependants of Hīra, and recognized Hārith as king of the Arabs and patrician of the Roman empire. He was thus constantly engaged in battles against Hīra. In 541 he fought under Belisarius in Mesopotamia. After his death about 569 or 570 the friendly relations with the West continued, but about 583 there was a breach. The Ghassānid kingdom split into sections each with its own prince. Some passed under the sway of Persia, others preserved their freedom at the expense of their neighbours. At this point their history ceases to be mentioned in the Western chronicles. There are references to the Ghassānid Nu'mān in the poems of Nābigha. Arabian tradition tells of their prince Jabala ibn Aiham who accepted Islam, after fighting against it, but finding it too democratic, returned to Christianity and exile in the Roman empire. As Islam advanced, some of the Ghassānids retreated to Cappadocia, others accepted the new faith.

See Th. Nöldeke, *Die ghassanischen Fürsten aus dem Hause Gafna's* (Berlin, 1887).

Kinda.

In the last decade of the 5th century a new power arose in central Arabia. This was the tribe of Kinda under the sway of the family of Āqil ul Murār, who came from the south. They seem to have stood in much the same relation to the rulers of Yemen, as the people of Hīra to the Persians and the Ghassānids to Rome. Abraha in his invasion of the Hejaz was accompanied by chiefs of Kinda. Details of their history are not known, but they seem to have gained power at one time even over the Lakhmids of Hīra; and to have ruled over Bahrein as well as Yemama until the battle of Shi'b ul Jabala, when they lost this province to Hīra. The poet Amru'ul Qais was a member of the princely family of Kinda.

Other parts of Arabia.

Outside the territory of the powers mentioned above, Arabia in the 6th century was in a state of political chaos. Bahrein, inhabited chiefly by the Bani'Abd Qais and the Bani Bakr, was largely subject to Persian influence near its coast, and a Persian governor, Sebocht, resided in Hajar, its chief town. In Oman the Arabs, who were chiefly engaged in fishing and seafaring, were Azdites mixed with Persians. The ruling dynasty of Julanda in their capital Suhār lasted on till the Abbasid period. No Persian officials are mentioned in this country; whether Persians exercised authority over it is doubtful. On the west coast of Arabia the influence of the kingdom of Yemen was felt in varying degree according to the strength of the rulers of that land. Apart from this influence the Hejaz was simply a collection of cities each with its own government, while outside the cities the various tribes governed themselves and fought continual battles with one another.

Time of Mahomet.—Thus at the time of Mahomet's advent the country was peopled by various tribes, some more or less settled under the governments of south Arabia, Kinda, Hīra and Ghassān, these in turn depending on Abyssinia, Persia and Rome (*i.e.* Byzantium); others as in the Hejaz were ruled in smaller communities by members of leading families, while in various parts of the peninsula were wandering Arabs still maintaining the traditions of old family and tribal rule, forming no state, sometimes passing, as suited them, under the influence and protection of one or another of the greater powers. To these may be added a certain number of Jewish tribes and families deriving their origin partly from migrations from Palestine, partly from converts among the Arabs themselves. Mahomet appealed at once to religion and patriotism, or rather created a feeling for both. For Mahomet as a religious teacher and for the details of his career see MAHOMET. It is enough here to outline his actions in so far as he attempted to create a united, and then a conquering, Arabia. Though the external conquests of the Arabs belong more properly to the period of the caliphate, yet they were the natural outcome of the prophet's ideas. His idea of Arabia for the Arabians could only be realized by summoning the great kings of the surrounding nations to recognize Islam; otherwise Abyssinia, Persia and Rome (Byzantium) would continue their former endeavours to influence and control the affairs of the peninsula. Tradition tells that a few years before his death he did actually send letters to the emperor Heraclius, to the negus of Abyssinia, the king of Persia, and Cyrus, patriarch of Alexandria, the "Mukaukis" of Egypt, summoning them to accept Islam and threatening them with punishment in case of refusal. But the task of carrying out these threats fell to the lot of his successors; the work of the prophet was to be the subjugating and uniting of Arabia. This work, scarcely begun in Mecca, was really started after the migration to Medina by the formation of a party of men—the *Muhājirun* (Refugees or Emigrants) and the *Ansār* (Helpers or Defenders)—who accepted Mahomet as their religious leader. As the necessity of overcoming his enemies became urgent, this party became military. A few successes in battle attracted to him men who were interested in fighting and who were willing to accept his religion as a condition of membership of his party, which soon began to assume a national form. Mahomet early found an excuse for attacking the Jews, who were naturally in the way of his schemes. The Bani Nadīr were expelled, the Bani Quraiza slaughtered. By the time he had successfully stormed the rich Jewish town of Khaibar, he had found that it was better to allow industrious Jews to remain in Arabia as payers of tribute than to expel or kill them: this policy he followed afterwards. The capture of Mecca (630) was not only an evidence of his growing power, which induced Arabs throughout the peninsula to join him, but gave him a valuable centre of pilgrimage, in which he was able by a politic adoption of some of the heathen Arabian ceremonies into his own rites to win men over the more easily to his own cause. At his death in 623 Mahomet left Arabia practically unified. It is true that rival prophets were leading rebellions in various parts of Arabia, that the tax-collectors were not always paid, and that the warriors of the land were much distressed for want of work owing to the brotherhood of Arabs proclaimed by Mahomet. The tribes were a seething mass of restlessness, their old feuds ready to break out again. But they had realized that they had common interests. The power of the foreigner in Arabia was broken. Islam promised rich booty for those who fought and won, paradise for those who fell.

Early Caliphs.[1] 1. *Conquest.*—One task of the early caliphs was to find an outlet for the restless fighting spirit. Abu Bekr (632–634), the first of these caliphs, was a man of simple life and profound faith. He understood the intention of Mahomet as to foreign nations, and set himself resolutely to carry it out in the face of much difficulty. Hence as soon as he assumed office he sent out the army already chosen to advance against the Romans in the north. The successful reduction of the rebels in Arabia enabled him in his first year to send his great general Khālid with his Arab warriors first against Persians, then against Romans. His early death prevented him from seeing the fruits of his policy. Under the second caliph Omar (634–644) the Persians were defeated at Kadesiya (Kadessia), and Irak was completely subdued and the new cities of Kufa and Basra were

[1] For the general history of the succeeding period see CALIPHATE; EGYPT: *History*, § "Mahommedan."

founded (635). In the same year Damascus fell into the hands of the Arabs under Abu 'Ubaida. In 636 Jerusalem fell and received a visit from the caliph. Three years later the fateful step was taken of appointing Moawiya (Mu'awīyya) governor of Syria. In 640 'Amr-ibn-el-Ass (Amr ibn al-'Ās) invaded Egypt and the following year took Alexandria and founded Fostat (which later became Cairo). The victory at Nehavend in 641 over the Persians, the flight of the last Sassanid king and the capture of Rei or Rai (class. Rhagae) in 643 meant the entire subjugation of Persia and crowned the conquests of Omar's caliphate. The reign of the third caliph Othman (644–656) was marked by the beginning of that internal strife which was to ruin Arabia; but the foreign conquests continued. In the north the Moslem arms reached Armenia and Asia Minor; on the west they were successful as far as Carthage on the north coast of Africa. After the murder of Othman, 'Ali (656–661) became caliph, but Moawiya, governor of Syria, soon rebelled on the pretext of avenging the death of Othman. After the battle of Siffin (657) arbitration was resorted to for the settlement of the rival claims. By a trick 'Ali was deposed (658), and the Omayyad dynasty was established with its capital at Damascus.

During these early years the Arabs had not only made conquests by land, but had found an outlet for their energy at sea. In 640 Omar sent a fleet of boats across the Red Sea to protect the Moslems on the Abyssinian coast. The boats were wrecked. Omar was so terrified by this that when Moawiya applied to him for permission to use ships for an attack on the islands of the Levant, he resolutely refused. Othman was less careful, and allowed a fleet from Africa to help in the conquests of the Levant and Asia Minor. In 649 he sanctioned the establishment of a maritime service, on condition that it should be voluntary. Abu Qais, appointed admiral, showed its usefulness by the capture of Cyprus. In 652 Abu Sarḥ with a fleet from Egypt won a naval battle over the Byzantine fleet near Alexandria.

Institution of navy.

2. *Internal Affairs.*—In the meantime what had become of Arabia and its unification? The first task of Abu Bekr had been to reduce those rebels who threatened to destroy that unity even before it was fully established. This he did by the aid of the great general Khālid. First he swept down on the Bani Hanīfa in Yemāma, who with their rival prophet Mosailama (Mosailima) and 40,000 men were in arms. The battle of Yemāma (633) was fierce and decisive. Mosailama was slain. The Bani Hanīfa returned to Islam. Bahrein was influenced by this battle, and the rebellion there, which was threatening, was crushed. Oman was reconquered by Huddhaifa, who became its governor. Ikrima settled Māhra. Muhājir, with the help of Ikrima, succeeded with difficulty, but thoroughly, in defeating Amr ibn Ma'dikārib and Qais ibn 'Abd Yaghūth in Yemen and Ashath ibn Qais in Hadramut. The Hejaz and Tehama were cleared of the plundering nomads by 'Attāb and Ṭāhir. At the end of the first year of his caliphate Abu Bekr saw Arabia united under Islam. The new national feeling demanded that all Arabs should be free men, so the caliph ordained that all Arab slaves should be freed on easy terms. The solidarity of Arabia survived the first foreign conquests. It was not intended that Arabs should settle in the conquered lands except as armies of occupation. Thus it was at first forbidden that Arabs should buy or possess land in these countries. Kūfa was to be only a military camp, as was Fostat in Egypt. The taxes with the booty from conquests were to be sent to Arabia for distribution among the Moslems. Omar tried to prevent the advance of conquests lest Arabia should suffer. "I would rather the safety of my people than thousands of spoil and further conquest." But men could not be prevented from pouring out from their homes in search of new conquests and more booty. Many of those who went forth did not return. They acquired property and rank in the new lands. Kūfa attracted chiefly men of south Arabia, Basra those of the north. Both became great cities, each with a population of 150,000 to 200,000 Arabians. Yet so long as the caliphs lived in Medina, the capital of Arabia was the capital of the expanding Arabian empire. To it was brought a large share of the booty. The caliphs were chosen there, and there the rules for the administration were framed. Thence went out the governors to their provinces. Omar was the great organizer of Arabian affairs. He compiled the Koran, instituted the civil list, regulated the military organization. He, too, desired that Mahomet's wish should be carried out and that Arabia should be purely Moslem. To this end he expelled the Christians from Nejrān and gave them lands in Syria and Irak, where they were allowed to live in peace on payment of tribute. The Jews, too, were shortly after expelled from Khaibar. The secondary position that Arabia was beginning to assume in the Arabian empire is clearly marked in the progress of events during the caliphate of Othmān. In his appointments to governorships and other offices, as well as in his distribution of spoil, Othmān showed a marked preference for the members of his own tribe the Koreish (Quraish) and the members of his own family the Bani Omayya (Umayya). The other Arab tribes became increasingly jealous of the Koreish, while among the Koreish themselves the Hāshimite family came to hate the Omayyad, which now had much power, although it had been among the last to accept Islam and never was very strict in its religious duties. But the quarrels which led to the murder of Othmān were fomented not so much in Arabia as in Kūfa and Baṣra and Fostat. In these cities the rival parties were composed of the most energetic fighting men, who were brought into the most intimate contact with one another, and who kept up their quarrels from the home land. In Kūfa a number of the Koreish had settled, and their arrogance became insupportable. The governors of all these towns were of Othmān's own family. After some years of growing dissatisfaction deputies from these places came to Medina, and the result was the murder of the caliph. Syria alone remained loyal to the house of Omayya, and Othmān had been advised to take refuge there, but had refused. Arabia itself counted for little in the strife. Yet its prestige was not altogether lost. After the murder the rebels were unwilling to return home until a new caliph had been chosen in the capital. The Egyptian rebels managed to gain most influence, and, in accordance with their desire, 'Alī was appointed caliph by the citizens of Medina. But Medina itself was being corrupted by the constant influx of captives, who, employed at first as servants, soon became powerful enough to dictate to their masters. In the struggle that ensued upon the election of 'Alī, Arabia was involved. Ayesha, Ṭalḥa and Zobair, who were strong in Mecca, succeeded in obtaining possession of Baṣra, but were defeated in 656 at the battle of the Camel (see Ali). In the south of Arabia 'Alī succeeded in establishing his own governor in Yemen, though the government treasure was carried off to Mecca. But the centre of strife was not to be Arabia. When 'Alī left Medina to secure Baṣra, he abandoned it as the capital of the Arabian empire. With the success of Moawiya Damascus became the capital of the caliphate (658) and Arabia became a mere province, though always of importance because of its possession of the two sacred cities Mecca and Medina. Both these cities were secured by Moawiya in 660, and at the same time Yemen was punished for its adherence to 'Alī. The final blow to any political pretensions of Medina was dealt by the caliph when he had his son Yazīd declared as his successor, thus taking away any claim on the part of the citizens of Medina to elect to the caliphate.

The Omayyads.—The early years of the Omayyads were years of constant strife in Arabia. The Khārijites who had opposed 'Alī on the ground that he had no right to allow the appeal to arbitration, were defeated at Nahrawān or Nahrwān (658), but those who escaped became fierce propagandists against the Koreish, some claiming that the caliph should be chosen by the Faithful from any tribe of the Arabs, some that there should be no caliph at all, that God alone was their ruler and that the government should be carried on by a council. They broke up into many sects, and were long a disturbing political force in Arabia as elsewhere. On the death of 'Alī his house was represented by his two sons Ḥasan and Ḥosain (Ḥusain). Ḥasan soon made peace with Moawiya. On the accession of Yazid, Ḥosain refused homage and raised an army, but was slain at

Kerbela (680). 'Ābdallah ibn Zobair (of the house of Hāshim) immediately stepped forward in Mecca as the avenger of 'Alī's family and the champion of religion. The two sacred cities supported him. Medina was besieged and sacked by the troops of Yazīd (682) and Mecca was besieged the following year. The siege was raised in the third month on the news of the death of Yazīd, but not before the Ka'ba had been destroyed. 'Ābdallah remained in Mecca recognized as caliph in Arabia, and soon after in Egypt and even a part of Syria. He defeated the troops of Merwān I., but could not win the support of the Khārijites. In 691 Abdalmalik ('Abdul-Malik) determined to crush his rival and sent his general Hajjāj against Mecca. The siege was begun in March 692, and in October the city was taken and 'Ābdallah slain. Abdalmalik was now supreme in Arabia and throughout the Moslem world. During the remaining years of the Omayyad dynasty (*i.e.* until 750) little is heard of Arabia in history. The conquests of Islam in Spain on the one side and India on the other had little or no effect on it. It was merely a province.

The 'Abbāsids.—The accession of Abul 'Abbās (of the house of Hāshim) and the transference of the capital of the caliphate from Damascus to Kūfa, then Anbar and soon after (in 760) to Bagdad meant still further degradation to Arabia and Arabs. From the beginning the 'Abbāsids depended for help on Persians and Turks, and the chief offices of state were frequently filled with foreigners. In one thing only the Arabs conquered to the end; that was in their language. The study of Arabic was taken up by lexicographers, grammarians and poets (mostly of foreign origin) with a zeal rarely shown elsewhere. The old Arabian war spirit was dying. Although the Arabians, as a rule, were in favour of the Omayyad family, they could not affect the succession of the 'Abbāsids. They returned more and more to their old inter-tribal disputes. They formed now not only a mere branch of the empire of the caliphate, but a branch deriving little life from and giving less to the main stock. In 762 there was a rebellion in favour of a descendant of 'Alī, but it was put down with great severity by the army of the caliph Manṣūr. A more local 'Alyite revolt in Mecca and Medina was crushed in 785. In the contest between the two sons of Harūn al Rashīd all Arabia sided with Mamūn (812). In 845–846 the lawless raids of Bedouin tribes compelled the caliph Wāthiq to send his Turkish general Bogha, who was more successful in the north than in the centre and south of Arabia in restoring peace.

The Carmathians.—Towards the close of the 9th century Arabia was disturbed by the rise of a new movement which during the next hundred years dominated the peninsula, and at its close left it shattered never to be united again. In the year 880 Yemen was listening to the propaganda of the new sect of the Carmathians (*q.v.*) or followers of Hamdān Qarmaṭ. Four years later these had become a public force. In 900 'Abū Sa'īd al-Jannābi, who had been sent to Bahrein by Hamdān, had secured a large part of this province and had won the city of Kaṭīf (Ketif) which contained many Jews and Persians. The Arabs who lived more inland were mostly Bedouin who found the obligations of Islam irksome, and do not seem to have made a very vigorous opposition to the Carmathians who took Hajar the capital of Bahrein in 903. From this they made successful attacks on Yemāma (Yamama), and attempts only partially successful at first at Oman. In 906 the court at Bagdad learned that these sectaries had gained almost all Yemen and were threatening Mecca and Medina. Abū Sa'īd was assassinated (913) in his palace at Laḥsa (which in 926 was fortified and became the Carmathian capital of Bahrein). His son Sa'īd succeeded him, but proved too weak and was deposed and succeeded by his brother Abu Ṭāhir. His success was constant and the caliphate was brought very low by him. In Arabia he subjugated Oman, and swooping down on the west in 929 he horrified the Moslem world by capturing Mecca and carrying off the sacred black stone to Bahrein. The Fatimite caliph 'Obaidallah (see FATIMITES), to whom Abu Ṭāhir professed allegiance, publicly wrote to him to restore the stone, but there is some reason to believe that he secretly encouraged him to retain it. In 939, however, the stone was restored and pilgrimages to the holy cities were allowed to pass unmolested on payment of a tax. So long as Abū Ṭāhir lived the Carmathians controlled Arabia. After his death, however, they quarrelled with the Fatimite rulers of Egypt (969) and began to lose their influence. In 985 they were completely defeated in Irak, and soon after lost control of the pilgrimages. Oman recovered its independence. Three years later Kaṭīf, at that time their chief city, was besieged and taken by a Bedouin sheik, and subsequently their political power in Arabia came to an end. It was significant that their power fell into the hands of Bedouins. Arabia was now completely disorganized, and was only nominally subject to the caliphate. The attempt of Mahomet to unify Arabia had failed. The country was once more split up into small governments, more or less independent, and groups of wandering tribes carrying on their petty feuds. Of the history of these during the next few centuries little is known, except in the case of the Hejaz. Here the presence of the sacred cities led writers to record their annals (cf. F. Wüstenfeld's *Die Chroniken der Stadt Mekka*, 4 vols., Leipzig, 1857–1861). The two cities were governed by Arabian nobles (*sherīfs*), often at feud with one another, recognizing formally the overlordship of the caliph at Bagdad or the caliph of Egypt. Thus in 966 the name of the caliph Moti was banished from the prayers at Mecca, and an 'Alyite took possession of the government of the city and recognized the Egyptian caliph as his master. About a century later (1075–1094) the 'Abbāsid caliph was again recognized as spiritual head owing to the success in arms of his protector the Seljuk Malik-Shah. With the fall of the Bagdad caliphate all attempts at control from that quarter came to an end. After the visit of the Sultan Bibars (1269) Mecca was governed by an amir dependent on Egypt. Outside the two cities anarchy prevailed, and the pilgrimage was frequently unsafe owing to marauding Bedouins. In 1517 the Osmānlī Turkish sultan Selīm conquered Egypt, and having received the right of succession to the caliphate was solemnly presented by the sherīf of Mecca with the keys of the city, and recognized as the spiritual head of Islam and ruler of the Hejaz. At the same time Yemen, which since the 9th century had been in the power of a number of small dynasties ruling in Zubed, San'ā, Sa'da and Aden, passed into the hands of the Turk.

For the history of Yemen during this period cf. H. C. Kay, *Omarah's History of Yaman* (London, 1892), and S. Lane-Poole, *The Mahommedan Dynasties*, pp. 87-103 (Westminster, 1894). Little more than a century later (1630), a Yemen noble Khāṣim succeeded in expelling the Turk and establishing a native imāmate, which lasted until 1871. For descriptions of it in the 18th century cf. C. Niebuhr's accounts of his travels in Arabia in 1761.

Oman.—Since the separation from the caliphate (before 1000 A.D.) Oman had remained independent. For more than a century it was governed by five elected imāms, who were chosen from the tribe of al-Azd and generally lived at Nizwa. After them the Bani Nebhān gained the upper hand and established a succession of kings (*māliks*) who governed from 1154 to 1406. During this time the country was twice invaded by Persians. The "kings of Hormūz" claimed authority over the coast land until the beginning of the 16th century. In 1435 the people rose against the tyranny of the Bani Nebhān and restored the imāmate of the tribe al-Azd. In 1508 the Portuguese under Albuquerque seized most of the east coast of Oman. In 1624 a new dynasty arose in the interior, when Nāṣir ibn Murshid of the Yariba (Ya'aruba) tribe (originally from Yemen) was elected imām and established his capital at Rustak. He was able to subdue the petty princes of the country, and the Portuguese were compelled to give up several towns and pay tribute for their residence at Muscat. About 1651 the Portuguese were finally expelled from this city, and about 1698 from the Omanite settlements on the east coast of Africa.

For the history of Oman from 661 to 1856 cf. G. P. Badger, *History of the Imāms and Seyyids of Oman by Salil-ibn-Razik* (London, Hakluyt Society, 1871). (G. W. T.)

Wahhābi Movement.—Modern Arabian history begins with that of the Wahhābi movement in the middle of the 18th century. Its originator, Mahommed Ibn Abdul Wahhāb, was born (1691)

at Ayana in Nejd, and after studying in Basra and Damascus, and making the pilgrimage to Mecca returned to his native country and settled down at Huremala near Deraiya. The abuses and corruptions which had overgrown the practice of orthodox Islam had deeply impressed him, and he set to work to combat them, and to inculcate on all good Moslems a return to the pure simplicity of their original faith. In 1742 Mahommed Ibn Saūd, sheik of Deraiya, accepted his doctrines, and enforced them by his sword with such effect that before his death in 1765 the whole of eastern Nejd and El Hasa was converted to the faith of Abdul Wahhāb, and accepted the political supremacy of Ibn Saūd. His son and successor, Abdul Aziz, in a rapid series of successful campaigns, extended his dominion and that of the reformed faith far beyond the limits of Nejd. His attacks on the pilgrim caravans, begun in 1783 and constantly repeated, startled the Mahommedan world,[1] and compelled the attention of the sultan, as the nominal protector of the faithful. In 1798 a Turkish force was sent from Bagdad into El Hasa, but was compelled to retreat without accomplishing anything, and its discomfiture added much to the renown of the Wahhābi power. In 1801 Saūd, son of the amir Abdul Aziz, led an expedition to the Euphrates, and on the festival of Bairam, the 20th of April, stormed Kerbela, put the defenders to the sword, destroyed the sacred tomb, scattered the sacred relics and returned laden with the treasures, accumulated during centuries in the sanctuary of the Shiā faith. Mecca itself was taken; plundering was forbidden, but the tombs of the saints and all objects of veneration were ruthlessly destroyed, and all ceremonies which seemed in the eye of the stern puritan conqueror to suggest the taint of idolatry were forbidden.

On the 14th of October 1802 the amir Abdul Aziz, at the age of eighty-two years, was murdered by a Shiā fanatic when at prayers in the mosque of Deraiya, and Saūd, who had for many years led the Wahhābi armies, became the reigning amir. In 1804 Medina was taken and with its fall all resistance ceased. The Wahhābi empire had now attained its zenith, a settled government was established able to enforce law and order in the desert and in the towns, and a spirit of Arabian nationality had grown up which bade fair to extend the Wahhābi dominion over all the Arab race. It already, however, bore within it the germ of decay; the accumulation of treasure in the capital had led to a corruption of the simple manners of the earlier times; the exhaustion of the tribes through the heavy blood tax had roused discontent among them; the plundering of the holy places, the attacks on the pilgrim caravans under the escort of Turkish soldiers, and finally, in 1810, the desecration of the tomb of Mahomet and the removal of its costly treasures, raised a cry of dismay throughout the Mahommedan world, and made it clear even to the Turkish sultan that unless the Wahhābi power were crushed his claims to the caliphate were at an end.

But Turkey was herself fully occupied by affairs in Europe, and to Mehemet Ali, then pasha of Egypt, was deputed the task of bringing the Wahhābis into subjection. In October 1811 an expedition consisting of 10,000 men under Tusun Pasha, the pasha's son, a youth of sixteen, landed in Hejaz without opposition. Saūd with his main forces had started northwards to attack Bagdad, but returning at once he met and defeated Tusun with great loss and compelled him to retire. Medina and subsequently Mecca were eventually taken by the Egyptians, but in spite of continual reinforcements they could do little more than hold their own in Hejaz. In 1813 Mehemet Ali was compelled to take the field himself with fresh troops, but was unable to achieve any decisive success, and in 1814 Tusun was again defeated beyond Taif. In May 1814 Saūd died, and his son, Ābdallah, attempted to negotiate, but Mehemet Ali refused all overtures, and in January 1815 advanced into Nejd, defeated the Wahhābi army and occupied Ras, then the chief town in Kasim. Terms of peace were made, but on the retirement of the Egyptians Ābdallah refused to carry out the conditions agreed on, which included the return of the jewels plundered by his father, and another campaign had to be fought before his submission was obtained. Ibrahim Pasha replaced Tusun in command, and on reaching Arabia in September 1816 his first aim was to gain over the great Bedouin tribes holding the roads between Hejaz and his objective in Nejd; having thus secured his line of advance he pushed on boldly and defeated Ābdallah at Wiya, where he put to death all prisoners taken; thence rapidly advancing, with contingents of the friendly Harb and Mutēr tribes in support of his regular troops, he laid siege to Ras; this place, however, held out and after a four months' siege he was compelled to give up the attack. Leaving it on one side he pushed on eastwards, took Aneza after six days' bombardment and occupied Bureda. Here he waited two months for reinforcements, and with his Bedouin contingent, strengthened by the adhesion of the Āteba and Bani Khālid tribes, advanced on Shakra in Wushm, which fell in January 1818 after a regular siege. After destroying Huremala and massacring its inhabitants, he arrived before Deraiya on the 14th of April 1818. For six months the siege went on with varying fortune, but at last the courage and determination of Ibrahim triumphed, and on the 9th of September, after a heroic resistance, Ābdallah, with a remnant of four hundred men, was compelled to surrender. The Wahhābi leader was soon after sent to Constantinople, where, in spite of Mehemet Ali's intercession, he and the companions who had followed him in his captivity were condemned to death, and after being paraded through the city with ignominy for three days were finally beheaded.

Deraiya was razed to the ground and the principal towns of Nejd were compelled to admit Egyptian garrisons; but though the Arabs saw themselves powerless to stand before disciplined troops, the Egyptians, on the other hand, had to confess that without useless sacrifices they could not retain their hold on the interior.

In 1824 Turki, son of the unfortunate Ābdallah, headed a rising which resulted in the re-establishment of the Wahhābi state with Riad as its new capital; and during the next ten years he consolidated his power, paying tribute to and under the nominal suzerainty of Egypt till his murder in 1834. His son, Fēsal, succeeded him, but in 1836 on his refusal to pay tribute an Egyptian force was sent to depose him and he was taken prisoner and sent to Cairo, while a rival claimant, Khalid, was established as amir in Riad. Mehemet Ali and his son Ibrahim Pasha were, however, now committed to their conflict with Turkey for Syria and Asia Minor, and had no troops to spare for the thankless task of holding the Arabian deserts; the garrisons were gradually withdrawn, and in 1842 Fēsal, who had escaped from his prison at Cairo reappeared and was everywhere recognized as amir. The few remaining Egyptian troops were ejected from Riad, and with them all semblance of Egyptian or Turkish rule disappeared from central Arabia.

For a time it looked as if the supremacy of the Wahhābi empire was to be renewed; El Hasa, Harik, Kasim and Asir returned to their allegiance, but over Oman and Yemen Fēsal never re-established his dominion, and the Bahrein sheiks with British support kept their independence.

Ibn Rashid.

A rival state had, however, arisen, under Ābdallah Ibn Rashid in Jebel Shammar. Driven into exile owing to a feud between his family and the Ibn Āli, the leading family of the Shammar, Ābdallah came to Riad in 1830, and was favourably received by the amir Turki. In 1834 he was with Fēsal on an expedition against El Hasa when news came of the amir's murder by his cousin Mashārah. By Ābdallah's advice the expedition was abandoned; Fēsal hastened back with all his forces to Riad, and invested the citadel where Mashārah had taken refuge, but failed to gain possession of it, until Ābdallah with two companions found his way into the palace, killed Mashārah, and placed Fēsal on the throne of his father. As a reward for his services Ābdallah was appointed governor of Jebel Shammar, and had already established himself in Hail when the Egyptian expedition of 1836 removed Fēsal temporarily from Nejd. During the exile of the latter he steadily

[1] For further details of this period, see EGYPT: *History*, "Mahommedan Period," § 8.

consolidated his power, extending his influence more especially over the desert tribes, till on Fēsal's return in 1842 he had created a state subject only in name to that of which Riad was the capital.

On the death of Ābdallah in 1843, his son Talāl succeeded. He set himself to work to establish law and order throughout the state, to arrange its finances, and to encourage the settlement in Hail of artificers and merchants from abroad; the building of the citadel and palace commenced by Mehemet Ali, and continued by Ābdallah Ibn Rashid, was completed by Talāl. The town walls were strengthened, new wells dug, gardens planted, mosques and schools built. His uncle Obed, to whom equally with Ābdallah is due the foundation of the Ibn Rashid dynasty, laboured to extend the Shammar boundaries. Khaibar, Tema and Jauf became tributary to Hail.

Though tolerant in religion Talāl was careful to avoid the suspicion of lukewarmness towards the Wahhābi formulas. Luxury in clothing and the use of tobacco were prohibited; attendance at the mosque was enforced: any doubt as to his orthodoxy was silenced by the amount and regularity of the tribute sent by him to Riad. Equally guarded was his attitude to the Turkish authorities; it is not improbable that Talāl had also entered into relations with the viceroy of Egypt to ensure his position in case of a collision with the Porte. During his twenty years' reign Jebel Shammar became a model state, where justice and security ruled in a manner before unheard of. Fēsal may well have watched with jealous anxiety the growing strength of his neighbour's state as compared with his own, where all progress was arrested by the deadening tyranny of religious fanaticism.

On the 11th of March 1868 Talāl, smitten with an incurable malady, fell by his own hand and was succeeded by his brother Matāb; after a brief reign he was murdered by his nephews, the elder of whom, Bandar, became amir. Mahommed, the third son of the amir Ābdallah, was at the time absent; with a view of getting his uncle into his power, Bandar invited him to return to Hail, and on his arrival went out to meet him accompanied by Hamud, son of Obed, and a small following. Warned by a hurried sign by Hamud that his life was in danger, Mahommed at once attacked Bandar, stabbed him and took possession of the citadel; a general massacre of all members of the house of Ibn Rashid followed, and next day Mahommed appeared with his cousin Hamud in the market-place of Hail, and announced his assumption of the amirship. A strong and capable ruler, he soon established his authority over all northern and western Nejd, and in 1872 the opportunity arrived for his intervention in the east. In that year Ābdallah, who had succeeded Fēsal in Riad in 1867, was deposed, but with the assistance of Mahommed was reinstated; two years later, however, he was again deposed and forced to seek refuge at Hail, from which place he appealed for assistance to the Turkish authorities at Bagdad. Midhat Pasha, then governor-general, seized the occasion of asserting Turkish dominion on the Persian Gulf coast, and in 1875, in spite of British protests, occupied El Hasa and established a new province under the title of Nejd, with its headquarters at Hofuf, of which Ābdallah was appointed governor. This was an event of some importance, as it consituted the first Turkish claim to the sovereignty over Nejd abandoned by Egypt thirty-three years earlier. The Turks did not support their client by advancing into Nejd itself, and he and his rivals were left to fight out their battles among themselves. Turkey was indeed too much occupied by the war with Russia to pay much attention to Arab affairs, though a few years later she attempted to occupy Bahrein by a *coup de main*, which was only frustrated by the action of a British gunboat.

The amir Mahommed.

Owing to the dissensions among the ruling family of Riad, the towns of eastern Nejd gradually reverted to their former condition of independence, but menaced in turn by the growing power of Hail, they formed a coalition under the leadership of Zāmil, sheik of Aneza, and in the spring of 1891, Aneza, Bureda, Shakra, Ras and Riad assembled their contingents to contest with Ibn Rashid the supremacy in Nejd. The latter had besides 20,000 of his own south Shammar tribesmen, the whole strength of the Harb Bedouins, some 10,000 men, and an additional support of 1000 mounted men from his kinsmen, the northern Shammar from the Euphrates, while the Muter and Āteba tribes took part with the allies. The total strength of each side amounted to about 30,000 men. Zāmil's forces held a strong position between Aneza and Bureda, and for over a month desultory fighting went on; finally an attack was made against the defenders' centre, covered by 20,000 camel riders; the men of Aneza broke and the whole allied forces fled in disorder; Zamil and his eldest son were killed, as were also two of the Ibn Saūd family, while the remainder were taken prisoners. Aneza and Bureda surrendered the same day, and shortly after Ras, Shakra and Riad tendered their submission.

This victory placed the whole of northern and central Arabia under the supremacy of Mahommed Ibn Rashid, which he held undisputed during the rest of his life.

On his death in 1897 his nephew Abdul-Aziz, son of the murdered amir Matāb, succeeded; during his reign a new element has been introduced into Nejd politics by the rising importance of Kuwet (Koweit) and the attempts of Turkey to obtain possession of its important harbour. In 1901 a quarrel arose between Sheik Mubārak of Kuwet and the amir of Hail whose cause was supported by Turkey. A force was equipped at Basra under Ahmad Feizi Pasha with the intention of occupying Kuwet; Mubārak thereupon appealed to Great Britain and action was taken which prevented the Turkish designs from being carried out. Kuwet was not formally placed under British protection, but it was officially announced by the government on the 5th of May 1903 "that the establishment of a naval base or fortified port in the Persian Gulf by any other power would be regarded as a very grave menace to British interests which would certainly be resisted with all the means at its disposal."

Recent history.

In the meantime Sheik Mubārak had found useful allies in the Muntafik Arabs from the lower Euphrates, and the Wahhābis of Riad; the latter under the amir Ibn Saūd marched against Ibn Rashid, who at the instigation of the Porte had again threatened Kuwet (Koweit), compelled him to retire to his own territory and took possession of the towns of Bureda and Aneza. Sheik Mubārak and his allies continued their advance, defeated Ibn Rashid in two engagements on the 22nd of July and the 26th of September 1904, and drove him back on his capital, Hail. The Porte now made another effort to assist its protégé; two columns were despatched from Medina and Basra respectively, to relieve Hail, and drive out the Wahhābis. Ahmad Feizi Pasha, in command of the Basra column, 4200 strong, crossed the desert and reached the wells of Lina, 200 m. from Hail, on the 5th of March 1905; here, however, he received orders to halt and negotiate before proceeding farther. The Turkish government realized by this time the strength of the hostile combination, and in view of the serious state of affairs in Yemen, hesitated to undertake another campaign in the deserts of Nejd. Arrangements were accordingly made with the Wahhābis, and on the 10th of April Ahmad Feizi Pasha left Lina, ostensibly with the object of protecting the pilgrim road, and joined the Medina column by the end of the month. Bureda and Aneza were occupied without opposition, the rebellious sheiks amnestied by the sultan and loaded with gifts, and formal peace was made between the rival factions.

European influence was not felt in Arabia until the arrival of the Portuguese in the eastern seas, following on the discovery of the Cape route. In 1506 Hormuz was taken by Albuquerque, and Muscat and the coast of Oman (*q.v.*) were occupied by the Portuguese till 1650. In 1516 their fleets appeared in the Red Sea and an unsuccessful attempt was made against Jidda; but the effective occupation of Yemen by the Turks in the next few years frustrated any designs the Portuguese may have had in S.W. Arabia. Even in Oman their hold on the country was limited to Muscat and the adjacent ports, while the interior was ruled by the old Yāriba

History of European influence.

(Ya-'aruba) dynasty from their capital at Rustak. The Persian occupation, which followed that of the Portuguese, came to an end in the middle of the 18th century, when Ahmad Ibn Sāid expelled the invaders and in 1759 established the Ghafari dynasty which still reigns in Oman. He was succeeded by his son, who in 1798 made a treaty with the East India Company with the object of excluding the French from Oman, and the connexion with Great Britain was further strengthened during the long reign of his grandson Sultan Sāid, 1804–1856. During the earlier years of his reign he was constantly at war with the Wahhābi empire, to which Oman became for a time tributary. The piracies committed by the Jawāsimi Arabs in the gulf compelled the intervention of England, and in 1810 their strongholds were destroyed by a British-Indian expedition. The overthrow of the Wahhābis in 1817 restored Sultan Sāid to independence; he equipped and armed on Western models a fleet built in Indian ports, and took possession of Sokotra and Zanzibar, as well as the Persian coast north of the straits of Hormuz as far east as Gwadur, while by his liberal policy at home Sohar, Barka and Muscat became prosperous commercial ports.

British intervention in Oman.

On his death in 1856 the kingdom was divided, Majīd, a younger son, taking Zanzibar, while the two elder sons contested the succession to Oman. The eldest, Thuwēni, with British support, finally obtained the throne, and in 1862 an engagement was entered into by the French and English governments respecting the independence of the sultans of Oman. He was assassinated in 1866, and his successor, Seyyid Turki, reigned till 1888. On his death several claimants disputed the succession; ultimately his son Fēsal was recognized by the British government, and was granted a subsidy from British-Indian revenues, in consideration of which he engaged not to cede any of his territory without the consent of the British government; similar engagements have been entered into by the tribes who occupy the south coast from the borders of Oman westward to the straits of Bab-el-Mandeb.

The opening of the overland route to India again brought the west coast of Arabia into importance. Aden was occupied by the British in 1839. The Hejaz coast and some of the Yemen ports were still held by Mehemet Ali, as viceroy of Egypt, but on his final withdrawal from Arabia in 1845, Hejaz came under direct Turkish rule, and the conquest of Yemen in 1872 placed the whole Red Sea littoral (with the exception of the Midian coast, ceded by Egypt on the accession of Abbas Hilmi Pasha) under Ottoman administration. The island of Perim at the southern entrance of the Red Sea has been a British possession since 1857, while the promontory of Shekh Said on the Arabian side of the strait is in Turkish occupation. In order to define the limits between Turkish territory and that of the independent Arab tribes in political relations with Great Britain, a joint commission of British and Turkish officers in 1902–1905 laid down a boundary line from Shekh Said to a point on the river Bana, 12 m. north-east of the small town of Kataba, from which it is continued in a north-easterly direction up to the great desert. This delimitation places the whole of southern Arabia, east of this line, within the British sphere of influence, which thus includes the district surrounding Aden (*q.v.*), the Hadramut and Oman with its dependencies.

British sphere of influence.

The provinces of Hejaz and Yemen are each administered by a Turkish governor-general, with headquarters at Taif and Sana respectively; the country is nominally divided up into divisions and districts under minor officials, but Turkish rule has never been acquiesced in by the inhabitants, and beyond the larger towns, all of which are held by strong garrisons, Turkish authority hardly exists. The powerful Bedouin tribes of Hejaz have always asserted their independence, and are only kept quiet by the large money payments made them by the sultan on the occasion of the annual pilgrimage to the holy cities. A large part of Asir and northern Yemen has never been visited by Turkish troops, and such revenues as are collected, mainly from vexatious customs and transit duties, are quite insufficient to meet the salaries of the officials, while the troops, ill-fed and their pay indefinitely in arrears, live on the country as best they can.

Turkish rule.

A serious revolt broke out in Yemen in 1892. A Turkish detachment collecting taxes in the Bani Merwan lands north of Hodeda was destroyed by a body of Arabs. This reverse set all Yemen aflame; under the leadership of the imām, who had, since the Turkish occupation, lived in retirement at Sada, 120 m. north of the capital, the powerful tribes between Asir and Sana advanced southwards, occupied the principal towns and besieged the few Turkish fortified posts that still held out. In many cases the garrisons, Arab troops from Syria, went over to the insurgents. Meanwhile, reinforcements under General Ahmad Feizi Pasha reached Hodeda, Manakha was retaken, Sana relieved, and by the end of January 1893 the country with the exception of the northern mountainous districts was reconquered.

Yemen revolt.

A state of intermittent rebellion, however, continued, and in 1904 a general revolt took place with which the normal garrison of Yemen, the 7th army corps, was quite unable to cope. The military posts were everywhere besieged, and Sana, the capital, was cut off from all communication with the coast. During February 1905 reinforcements were sent up which raised the garrison of Sana to a strength of eight battalions, and in March a further reinforcement of about the same strength arrived, and fought its way into the capital with the loss of almost all its guns and train. The position was then desperate, wholesale desertion and starvation had decimated the garrison, and three weeks later Ali Riza Pasha, the Turkish commander, was compelled to surrender. The fall of Sana made a deep impression at Constantinople, every effort was made to hasten out reinforcements, the veteran Ahmad Feizi Pasha was nominated to the supreme command, and Anatolian troops in place of the unreliable Syrian element were detailed. The scale of the operations may be judged from the fact that the total number of troops mobilized up to the beginning of July 1905 amounted to 126 battalions, 8 squadrons and 15 batteries; the rebel leader Mahommed Yahiya had at this time a following of 50,000.

By the end of June, Ahmad Feizi Pasha was in a position to advance on Manakha, where he organized an efficient transport, rallied the scattered remnants of Ali Riza's army, and with the newly arrived troops had by the middle of July a force of some 40 battalions available for the advance on Sana. He left Manakha on the 17th of July, and after almost daily fighting reached Sana on the 30th of August; on the 31st he entered the city without serious opposition, the insurgents having retreated northward.

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Literature

The literature of Arabia has its origin in the songs, improvisations, recitations and stories of the pre-Mahommedan Arabs. Of written literature in those days there was, so far as we know, none. But where books failed memory was strong and the power of retaining things heard was not confined to a professional class. At every festive meeting many could contribute a poem or a story, many could even improvise the one or the other. When members of different tribes met in peace (as at the fair of 'Ukāẓ) the most skilful reciters strove to maintain the honour of their own people, and a ready improviser was held in high esteem. The smartest epigrams, the fairest similes, the keenest satires, spoken or sung on such occasions, were treasured in the memory of the hearers and carried by them to their homes. But the experience of all peoples in that memory requires to be helped by form. Sentences became balanced and were made clear by some sort of definite ending. The simplest form of this in Arabian literature is the *saj'* or rhymed prose, in which the sentences are usually (though not always) short and end in a rhyme or assonance. Mahomet used this form in many parts of the Koran (*e.g. Sura*, 81). The next step was the introduction of metre into the body of the sentence and the restriction of the passages to a definite length. This in its simplest form gave rise to the *rajaz* verses, where each half-line ends in the same rhyme and consists of three feet of the measure ⏑ – ⏑ –. Other metres were introduced later until sixteen altogether were recognized. In all forms the rhyme is the same throughout the poem, and is confined to the second half of the line except in the first line where the two halves rhyme. While, however, these measures were in early use, they were not systematically analysed or their rules enunciated until the time of Khalīl ibn Aḥmad in the 8th century. Two other features of Arabian poetry are probably connected with the necessity for aiding the memory. The first of these is the requirement that each line should have a complete sense in itself; this produces a certain jerkiness, and often led among the Arabs to displacement in the order of the lines in a long poem. The other feature, peculiar to the long poem (*qasīda*, elegy), is that, whatever its real object, whatever its metre, it has a regular scheme in the arrangement of its material. It begins with a description of the old camping-ground, before which the poet calls on his companion to stop, while he bewails the traces of those who have left for other places. Then he tells of his love and how he had suffered from it, how he had journeyed through the desert (this part often contains some of the most famous descriptions and praises of animals) until his beast became thin and worn-out. Then at last comes the real subject of the poem, usually the panegyric of some man of influence or wealth to whom the poet has come in hope of reward and before whom he recites the poem.

Poetry.—The influence of the poet in pre-Mahommedan days was very great. As his name, *ash-Shā'ir*, "the knowing man," indicates, he was supposed to have more than natural knowledge and power. Panegyric and satire (*hijā'*) were his chief instruments. The praise of the tribe in well-chosen verses ennobled it throughout the land, a biting satire was enough to destroy its reputation (cf. I. Goldziher's *Abhandlungen zur arabischen Philologie*, i. pp. 1-105). Before Mahomet the ethics of the Arabs were summed up in *muruwwa* (custom). Hospitality, generosity, personal bravery were the subjects of praise; meanness and cowardice those of satire. The existence of poetry among the northern Arabs was known to the Greeks even in the 4th century (cf. St Nilos in Migne's *Patrologia Graeca*, vol. 79, col. 648, and Sozomen's *Ecclesiastical History*, bk. 6, ch. 38). Women as well as men composed and recited poems before the days of the Prophet (cf. L. Cheikho's *Poetesses of the Jāhilīyya*, in Arabic, Beirut, 1897).

The transmission of early Arabic poetry has been very imperfect. Many of the reciters were slain in battle, and it was not till the 8th to the 10th centuries and even later that the earliest collections of these poems were made. Many have to be recovered from grammars, dictionaries, &c., where single lines or groups of lines are quoted to illustrate the proper use of words, phrases or idioms. Moreover, many a reciter was not content to declaim the genuine verses of ancient poets, but interpolated some of his own composition, and the change of religion introduced by Islam led to the mutilation of many verses to suit the doctrines of the new creed.[1]

The language of the poems, as of all the best Arabian literature, was that of the desert Arabs of central Arabia; and to use it aright was the ambition of poets and scholars even in the Abbasid period. For the man of the towns its vocabulary was too copious to be easily understood, and in the age of linguistic studies many commentaries were written to explain words and idioms.

Of the pre-Mahommedan poets the most famous were the six whose poems were collected by Asma'ī about the beginning of the 9th century (ed. W. Ahlwardt, *The Diwans of the Six Ancient Arabic Poets*, London, 1870). Single poems of four of these—Amru-ul-Qais, Ṭarafa, Zuhair and 'Antara—appear in the Mo'allakat (*q.v.*). The other two were Nābigha (*q.v.*) and 'Alqama (*q.v.*). But besides these there were many others whose names were famous; such as Ta'abbata Sharran, a popular hero who recites his own adventures with great gusto; his companion Shanfarā, whose fame rests on a fine poem which has been translated into French by de Sacy (in his *Chrestomathie Arabe*) and into English by G. Hughes (London, 1896); Aus ibn Hajar of the Bani Tamīn, famous for his descriptions of weapons and hunting scenes (ed. R. Geyer, Vienna, 1892); Ḥātim Tā'i, renowned for his open-handed generosity as well as for his poetry (ed. F. Schulthess, Leipzig, 1897, with German translation); and 'Urwa ibn ul-Ward of the tribe of 'Abs, rival of Ḥātim in generosity as well as in poetry (ed. Th. Nöldeke, Göttingen, 1863). Among these early poets are found one Jew of repute, Samau'al (Samuel) ibn Adiyā (cf. Th. Nöldeke's *Beiträge*, pp. 52-86; art. *s.v.* "Samuel ibn Adiya" in *Jewish Encyc.* and authorities there quoted), and some Christians such as 'Adī ibn Zaid of Hira, who sang alike of the pleasures of drink and of death (ed. by Louis Cheikho in his *Les Poètes arabes chrétiens*, pp. 439-474, Beirut, 1890; in this work many Arabian poets are considered to be Christian without sufficient reason). One poet, a younger contemporary of Mahomet, has attracted much attention because his poems were religious and he was a monotheist. This is Umayya ibn Abi-ṣ-Ṣalt, a Meccan who did not accept Islam and died in 630. His poems are discussed by F. Schulthess in the *Orientalische Studien* dedicated by Th. Nöldeke, Giessen, 1906, and his relation to Mahomet by E. Power in the *Mélanges de la faculté orientale de l'université Saint-Joseph*, Beirut, 1906). Mahomet's relation to the poets generally was one of antagonism because of their influence over the Arabs and their devotion to the old religion and customs. Ka'b ibn Zuhair, however, first condemned to death, then pardoned, later won great favour for himself by writing a panegyric of the Prophet (ed. G. Freytag, Halle, 1823). Another poet, A'sha (*q.v.*), followed his example. Labīd (*q.v.*) and Hassān ibn Thābit (*q.v.*) were also contemporary. Among the poetesses of the time Khansa (*q.v.*) is supreme. In the scarcity of poets at this time two others deserve mention; Abū Mihjan, who made peace with Islam in 630 but was exiled for his love of wine, which he celebrated in his verse (ed. L. Abel, Leiden, 1887; cf. C. Landberg's *Primeurs arabes*, 1, Leiden, 1886), and Jarwal ibn Aus, known as al-Ḥuṭai'a, a wandering poet whose keen satires led to his imprisonment by Omar (Poems, ed. by I. Goldziher in the *Journal of the German Oriental Society*, vols. 46 and 47).

Had the simplicity and religious severity of the first four caliphs continued in their successors, the fate of poetry would have been hard. Probably little but religious poetry would have been allowed. But the Omayyads (with one exception) were not religious men and, while preserving the outward forms of Islam, allowed full liberty to the pre-Islamic customs of the Arabs and the beliefs and practices of Christians. At the same time the

[1] On the subject of transmission cf. Th. Nöldeke's *Beiträge zur Kenntniss der Poesie der alten Araber* (Hanover, 1804); and W. Ahlwardt's *Bemerkungen über die Aechtheit der alten arabischen Gedichte* (Greifswald, 1872).

circumstances of the poet's life were altered. Poetry depended on patronage, and that was to be had now chiefly in the court of the caliph and the residences of his governors. Hence the centre of attraction was now the city with its interests, not the desert. Yet the old forms of poetry were kept. The *qasīda* still required the long introduction (see above), which was entirely occupied with the affairs of the desert. Thus poetry became more and more artificial, until in the Abbasid period poets arose who felt themselves strong enough to give up the worn-out forms and adopt others more suitable. The names of three great poets adorn the Omayyad period: Akhtal, Farazdaq and Jarīr were contemporaries (see separate articles). The first was a Christian of the tribe of Taghlib, whose Christianity enabled him to write many verses which would have been impossible to a professing Moslem. Protected by the caliph he employed the old weapons of satire to support them against the "Helpers" and to exalt his own tribe against the Qaisites. Farazdaq of the Bani Tamīm, a good Moslem but loose in morals, lived chiefly in Medina and Kufa, and was renowned for his command of language. Jarīr of another branch of the Bani Tamīm lived in Irak and courted the favour of Hajjāj, its governor. His satires were so effective that he is said to have crushed forty-three rivals. His great efforts were against Farazdaq, who was supported by Akhtal (cf. *The Naka'id of Jarīr and al-Farazdaq*, ed. A. A. Bevan, Leiden, 1906 foll.). Among many minor poets one woman is conspicuous. Laila ul-Akhyalīyya (d. 706) was married to a stranger. On the death of her lover in battle, she wrote numerous elegies bewailing him, and so became famous and devoted the rest of her life to the writing of verse. Two poets of the Koreish attained celebrity in Arabia itself at this time. Qais ur-Ruqayyāt was the poet of 'Abdallah ibn uz-Zubair (Abdallah ibn Zobair) and helped him until circumstances went against him, when he made his peace with the caliph. His poems are chiefly panegyrics and love songs (ed. N. Rhodonakis, Vienna, 1902). 'Umar ibn Abī Rabī'a (*c.* 643–719) was a wealthy man, who lived a life of ease in his native town of Mecca, and devoted himself to intrigues and writing love songs (ed. P. Schwarz, Leipzig, 1901–1902). His poems were very popular throughout Arabia. As a dweller in the town he was independent of the old forms of poetry, which controlled all others, but his influence among poets was not great enough to perpetuate the new style. One other short-lived movement of the Omayyad period should be mentioned. The *rajaz* poems (see above) had been a subordinate class generally used for improvisations in pre-Mahommedan times. In the 7th and 8th centuries, however, a group of poets employed them more seriously. The most celebrated of these were 'Ajjāj and his son Ru'ba of the Bani Tamīm (editions by W. Ahlwardt, Berlin, 1903; German trans. of Ru'ba's poems by Ahlwardt, Berlin, 1904).

With the establishment of the Abbasid dynasty, a new epoch in Arabian poetry began. The stereotyped beginning of the *qasīda* had been recognized as antiquated and out of place in city life even in the Omayyad period (cf. Goldziher, *Abhandlungen*, i. 144 ff.). This form had been ridiculed but now it lost its hold altogether, and was only employed occasionally by way of direct imitation of the antique. The rise of Persian influence made itself felt in much the same way as the Norman influence in England by bringing a newer refinement into poetry. Tribal feuds are no longer the main incentives to verse. Individual experiences of life and matters of human interest become more usual subjects. Cynicism, often followed by religion in a poet's later life, is common. The tumultuous mixture of interests and passions to be found in a city like Bagdad are the subjects of a poet's verse. One of the earliest of these poets, Muti' ibn Ayās, shows the new depth of personal feeling and refinement of expression. Bashshār ibn Burd (d. 783), a blind poet of Persian descent, shows the ascendancy of Persian influence as he openly rails at the Arabs and makes clear his own leaning to the Persian religion. In the 8th century Abu Nuwās (*q.v.*) is the greatest poet of his time. His language has the purity of the desert, his morals are those of the city, his universalism is that of the man of the world. Abū-l-'Atāhiya (*q.v.*), his contemporary, is fluent, simple and often didactic. Muslim ibn ul-Walīd (ed. de Goeje, Leiden, 1875), also contemporary, is more conservative of old forms and given to panegyric and satire. In the 9th century two of the best-known poets—Abū Tammām (*q.v.*) and Buḥturī (*q.v.*)—were renowned for their knowledge of old poetry (see HAMASA) and were influenced by it in their own verse. On the other hand Ibn ul-Mo'tazz (son of the caliph) was the writer of brilliant occasional verse, free of all imitation. In the 10th century the centre of interest is in the court of Saif ud-Daula (addaula) at Aleppo. Here in Motanabbī (*q.v.*) the claims of modern poetry not only to equal but to excel the ancient were put forward and in part at any rate recognized. Abū Firās (932–968) was a member of the family of Saif ud-Daula, a soldier whose poems have all the charm that comes from the fact that the writer has lived through the events he narrates (ed. by R. Dvořák, Leiden, 1895). Many Arabian writers count Motanabbī the last of the great poets. Yet Abū-l-'Alā ul-Ma'arrī (*q.v.*) was original alike in his use of rhymes and in the philosophical nature of his poems. Ibn Fārid (*q.v.*) is the greatest of the mystic poets, and Busīri (*q.v.*) wrote the most famous poem extant in praise of the Prophet. In the provinces of the caliphate there were many poets, who, however, seldom produced original work. Spain, however, produced Ibn 'Abdūn (d. 1126), famous for the grace and finish of his style (ed. with commentary of Ibn Badrun by R. P. A. Dozy, Leiden, 1846). The Sicilian Ibn Hamdīs (1048–1132) spent the last fifty years of his life in Spain (*Diwān*, ed. Moaçada, Palermo, 1883; *Canzoniere*, ed. Schiaparelli, Rome, 1897). It was also apparently in this country that the strophe form was first used in Arabic poems (cf. M. Hartmann's *Das arabische Strophengedicht*, Weimar, 1897), and Ibn Quzmān (12th century), a wandering singer, here first used the language of everyday life in the form of verse known as *Zajal*.

Anthologies.—As supplemental to the account of poetry may be mentioned here some of the chief collections of ancient verse, sometimes made for the sake of the poems themselves, sometimes to give a *locus classicus* for usages of grammar or lexicography, sometimes to illustrate ancient manners and customs. The earliest of these is the *Mo'allakat* (*q.v.*). In the 8th century Ibn Mofaddal compiled the collection named after him the *Mofaddalīyāt*. From the 9th century we have the Hamasas of Abū Tammām and Buḥturī, and a collection of poems of the tribe Hudhail (second half ed. in part by J.G.L.Kosegarten, London, 1854; completed by J. Wellhausen in *Skizzen und Vorarbeiten*, i. Berlin, 1884). The numerous quotations of Ibn Qutaiba (*q.v.*) in the *'Uyūn ul-Akhbār* (ed. C. Brockelmann, Strassburg, 1900 ff.) and the *Book of Poetry and Poets* (ed. M. J. de Goeje, Leiden, 1904) bring these works into this class. In the 10th century were compiled the *Jamharat ash'ar al Arab*, containing forty-nine poems (ed. Būlāq, 1890), the work *al-'Iqd ul-Farīd* of Ibn'Abdi-r-Rabbihi (ed. Cairo, various years), and the greatest work of all this class, the *Kitāb ul-Aghāni* ("Book of Songs") (cf. ABU-L FARAJ). The 12th century contributes the *Diwān Mukhtarāt ush-Shu'arā'i* with fifty *qasīdas*. The *Khizānat ul-Adab* of Abdulqādir, written in the 17th century in the form of a commentary on verses cited in a grammar, contains much old verse (ed. 4 vols., Būlāq, 1882).

Belles-Lettres and Romances.—Mahomet in the Koran had made extensive use of *saj'* or rhymed prose (see above). This form then dropped out of use almost entirely for some time. In the 10th century, however, it was revived, occurring almost simultaneously in the *Sermons* of Ibn Nubāta (946–984) and the *Letters* of Abū Bakr ul-Khwārizmī. Both have been published several times in the East. The epistolary style was further cultivated by Hamadhāni (*q.v.*) and carried to perfection by Abū-l'Alā ul-Ma'arrī. Hamadhāni was also the first to write in this rhymed prose a new form of work, the *Maqāma* ("assembly"). The name arose from the fact that scholars were accustomed to assemble for the purpose of rivalling one another in orations showing their knowledge of Arabic language, proverb and verse. In the *Maqāmas* of Hamadhāni a narrator describes how in various places he met a wandering scholar who in these assemblies puts all his rivals to shame by his eloquence.

Each oration forms the substance of a *Maqāma*, while the *Maqāmas* themselves are united to one another by the constant meetings of narrator and scholar. Ḥarīrī (*q.v.*) quite eclipsed the fame of his predecessor in this department, and his *Maqāmas* retain their influence over Arabian literature to the present day. As late as the 19th century the sheik Nāṣīf ul Yāzijī (1800–1871) distinguished himself by writing sixty clever *Maqāmas* in the style of Ḥarīrī (ed. Beirut, 1856, 1872). While this class of literature had devoted itself chiefly to the finesses of the language, another set of works was given to meeting the requirements of moral education and the training of a gentleman. This, which is known as "Adab literature," is anecdotic in style with much quotation of early poetry and proverb. Thus government, war, friendship, morality, piety, eloquence, are some of the titles under which Ibn Qutaiba groups his stories and verses in the *'Uyūn ul Akhbār*. *Jāhiz* (*q.v.*) in the 9th century and Baihaqī (*The Kitāb al-Maḥāsin wal-Masāwi*, ed. F. Schwally, Giessen, 1900–1902) early in the 10th, wrote works of this class. A little later a Spaniard, Ibn 'Abdrabbihi (Abdi-r-Rabbihi), wrote his *'Iqd ul-Farīd* (see section *Anthologies*). The growth of city life in the Abbasid capital led to the desire for a new form of story, differing from the old tales of desert life. This was met in the first place by borrowing. In the 8th century Ibn Muqaffa', a convert from Mazdaism to Islam, translated the Pahlavi version of Bidpai's fables (itself a version of the Indian *Panchatantra*) into Arabic with the title *Kalīla wa Dimna* (ed. Beirūt, various years). Owing to the purity of its language and style it has remained a classic work. The *Book of the 1001 Nights* (*Arabian Nights*) also has its basis in translations from the Indian through the Persian, made as early as the 9th century. To these stories have been added others originating in Bagdad and Egypt and a few others, which were at first in independent circulation. The whole work seems to have taken its present form (with local variations) about the 13th century. Several other romances of considerable length are extant, such as the *Story of 'Antar* (ed. 32 vols., Cairo, 1869, &c., translated in part by Terrick Hamilton, 4 vols., London, 1820), and the *Story of Saif ibn Dhī Yezen* (ed. Cairo, 1892). (G. W. T.)

Historical Literature.—Arabian historians differ from all others in the unique form of their compositions. Each event is related in the words of eye-witnesses or contemporaries transmitted to the final narrator through a chain of intermediate reporters (*rāwis*), each of whom passed on the original report to his successor. Often the same account is given in two or more slightly divergent forms, which have come down through different chains of reporters. Often, too, one event or one important detail is told in several ways on the basis of several contemporary statements transmitted to the final narrator through distinct lines of tradition. The writer, therefore, exercises no independent criticism except as regards the choice of authorities; for he rejects accounts of which the first author or one of the intermediate links seems to him unworthy of credit, and sometimes he states which of several accounts seems to him the best.

A second type of Arabian historiography is that in which an author combines the different traditions about one occurrence into one continuous narrative, but prefixes a statement as to the lines of authorities used and states which of them he mainly follows. In this case the writer recurs to the first method, already described, only when the different traditions are greatly at variance with one another. In yet a third type of history the old method is entirely forsaken and we have a continuous narrative only occasionally interrupted by citation of the authority for some particular point. But the principle still is that what has been well said once need not be told again in other words. The writer, therefore, keeps as close as he can to the letter of his sources, so that quite a late writer often reproduces the very words of the first narrator.

From very early times story-tellers and singers found their subjects in the doughty deeds of the tribe on its forays, and sometimes in contests with foreign powers and in the impression produced by the wealth and might of the sovereigns of Persia and Constantinople. The appearance of the Prophet with the great changes that ensued, the conquests that made the Arabs lords of half the civilized world, supplied a vast store of new matter for relations which men were never weary of hearing and recounting. They wished to know everything about the apostle of God. Every one who had known or seen him was questioned and was eager to answer. Moreover, the word of God in the Koran left many practical points undecided, and therefore it was of the highest importance to know exactly how the Prophet had spoken and acted in various circumstances. Where could this be better learned than at Medina, where he had lived so long and where the majority of his companions continued to live? So at Medina a school was gradually formed, where the chief part of the traditions about Mahomet and his first successors took a form more or less fixed. Soon men began to assist memory by making notes, and pupils sought to take written jottings of what they had heard from their teachers. Thus by the close of the 1st century many *dictata* were already in circulation. For example, Ḥasan of Baṣra (d. 728 A.D.) had a great mass of such notes, and he was accused of sometimes passing off as oral tradition things he had really drawn from books; for oral tradition was still the one recognized authority, and it is related of more than one old scholar, and even of Ḥasan of Baṣra himself, that he directed his books to be burned at his death. The books were mere helps. Long after this date, when all scholars drew mainly from books, the old forms were still kept up. Ṭabarī, for example, when he cites a book expresses himself as if he had heard what he quotes from the master with whom he read the passage or from whose copy he transcribed it. He even expresses himself in this wise: "'Omar b. Shabba has *related* to me in his book on the history of Baṣra." No independent book of the 1st century from the Flight (*i.e.* 622–719) has come down to us. It is told, however, that Moawiya summoned an old man named 'Abid ibn Sharya from Yemen to Damascus to tell him all he knew about ancient history and that he induced him to write down his information. This very likely formed the nucleus of a book which bore the name of that sheik and was much read in the 3rd century from the Flight. It seems to be lost now. But in the 2nd century (719–816) real books began to be composed. The materials were supplied in the first place by oral tradition, in the second by the *dictata* of older scholars, and finally by various kinds of documents, such as treaties, letters, collections of poetry and genealogical lists. Genealogical studies had become necessary through Omar's system of assigning state pensions to certain classes of persons according to their kinship with the Prophet, or their deserts during his lifetime. This subject received much attention even in the 1st century, but books about it were first written in the 2nd, the most famous being those of Ibn al-Kalbī (d. 763), of his son Hishām (d. 819), and of Al-Sharqī ibn al-Quṭāmī. Genealogy, which often called for elucidations, led on to history. Balādhurī's excellent *Ansāb al-Ashrāf* (Genealogies of the Nobles) is a history of the Arabs on a genealogical plan.

The oldest extant history is the biography of the Prophet by Ibn Isḥāq (d. 767). This work is generally trustworthy. Mahomet's life before he appeared as a prophet and the story of his ancestors are indeed mixed with many fables illustrated by spurious verses. But in Ibn Isḥāq's day these fables were generally accepted as history—for many of them had been first related by contemporaries of Mahomet—and no one certainly thought it blameworthy to put pious verses in the mouth of the Prophet's forefathers, though, according to the *Fihrist* (p. 92), Ibn Isḥāq was duped by others with regard to the poems he quotes. The original work of Ibn Isḥāq seems to be lost. That which we possess is an edition of it by Ibn Hishām (d. 834) with additions and omissions (text ed. by F. Wüstenfeld, Göttingen, 1858–1860; German translation by Weil, Stuttgart, 1864).

The *Life* of the Prophet by Ibn Oqba (d. 758), based on the statements of two very trustworthy men, 'Urwa ibn az-Zubair (d. 713) and Az-zuhri (d. 742), was still much read in Syria in the 14th century. Fragments of this have been edited by E. Sachau, Berlin, 1904. We fortunately possess the *Book of the Campaigns* of the Prophet by al-Wāqidī (d. 822) and the

important *Book of Classes* of his disciple Ibn Sa'd (*q.v.*). Wāqidī had much more copious materials than Ibn Isḥāq, but gives way much more to a popular and sometimes romancing style of treatment. Nevertheless he sometimes helps us to recognize in Ibn Isḥāq's narrative modifications of the genuine tradition made for a purpose, and the additional details he supplies set various events before us in a clearer light. Apart from this his chief merits lie in his studies on the subject of the traditional authorities, the results of which are given by Ibn Sa'd, and in his chronology, which is often excellent. A special study of the traditions about the conquest of Syria made by M. J. de Goeje in 1864 (*Mémoires sur la conquête de la Syrie*, 2nd ed., Leiden, 1900), led to the conclusion that Wāqidī's chronology is sound as regards the main events, and that later historians have gone astray by forsaking his guidance. This result has been confirmed by certain contemporary notices found by Th. Nöldeke in 1874 in a Syriac MS. of the British Museum. And that Ibn Isḥāq agrees with Wāqidī in certain main dates is important evidence for the trustworthiness of the former also. For the chronology before the year 10 of the Flight Wāqidī did his best, but here, the material being defective, many of his conclusions are precarious. Wāqidī had already a great library at his disposal. He is said to have had 600 chests of books, chiefly *dictata* written by or for himself, but in part real books by Abū Mikhnaf (d. 748), Ibn Isḥāq (whom he uses but does not name), 'Awāna (d. 764), Abū Mashar (d. 791) and other authors. Abū Mikhnaf left a great number of monographs on the chief events from the death of the Prophet to the caliphate of Walīd II. These were much used by later writers, and we have many extracts from them, but none of the works themselves except a sort of romance based on his account of the death of Hosain (Ḥusain) of which Wüstenfeld has given a translation. With regard to the history of Irak in particular he was deemed to have the best information, and for this subject he is Ṭabarī's chief source, just as Madāinī, a younger contemporary of Wāqidī, is followed by preference in all that relates to Khorasan. Madāinī's *History of the Caliphs* is the best, if not the oldest, published before Ṭabarī; but this book is known only by the excerpts given by later writers, particularly Balādhurī and Ṭabarī. From these we judge that he had great narrative power, with much clear and exact learning, and must be placed high as a critical historian. His plan was to record the various traditions about an event, choosing them with critical skill; sometimes, however, he fused the several traditions into a continuous narrative. A just estimate of the relative value of the historians can only be reached by careful comparison in detail. This has been essayed by Brünnow in his study on the Khārijites (Leiden, 1884), in which the narrative of Mubarrad in the *Kāmil* is compared with the excerpts of Mādainī given by Balādhurī and those of Abū Mikhnaf given by Ṭabarī. The conclusion reached is that Abū Mikhnaf and Mādainī are both well informed and impartial.

Among the contemporaries of Wāqidī and Mādainī were Ibn Khidāsh (d. 838), the historian of the family Muhallab, whose work was one of Mubarrad's sources for the *History of the Khārijites*; Haitham ibn 'Adī (d. 822), whose works, though now lost, are often cited; and Saif ibn 'Omar at-Tamīmī, whose book on the revolt of the tribes under Abu-Bekr and on the Mahommedan conquests was much used by Ṭabarī. His narratives are detailed and often tinged with romance, and he is certainly much inferior to Wāqidī in accuracy. Wellhausen has thoroughly examined the work of Saif in *Skizzen und Vorarbeiten*, vi. Besides these are to be mentioned Abū 'Ubaida (d. 825), who was celebrated as a philologist and wrote several historical monographs that are often cited, and Azraqī, whose excellent *History of Mecca* was published after his death by his grandson (d. 858). With these writers we pass into the 3rd century of Islam. But we have still an important point to notice in the 2nd century; for in it learned Persians began to take part in the creation of Arabic historical literature. Ibn Muqaffa' translated the great *Book of Persian Kings*, and others followed his example. Ṭabarī and his contemporaries, senior and junior, such as Ibn Qutaiba, Ya'qūbī, Dīnawarī, preserve to us a good part of the information about Persian history made known through such translations.[1] But even more important than the knowledge conveyed by these works was their influence on literary style and composition. Half a century later began versions from the Greek either direct or through the Syriac. The pieces translated were mostly philosophical; but the Arabs also learned something, however superficially, of ancient history.

The 3rd century (816–913) was far more productive than the 2nd. Abū 'Ubaida was succeeded by Ibn al-A'rābī (d. 846), who in like manner was chiefly famous as a philologist, and who wrote about ancient poems and battles. Much that he wrote is quoted in Tabrīzī's commentary on the *Ḥamāsa*, which is still richer in extracts from the historical elucidations of early poems given by ar-Riyāshī (d. 871). Of special fame as a genealogist was Ibn Ḥabīb (d. 859), of whom we have a booklet on Arabian tribal names (ed. Wüstenfeld, 1850). Azraqī again was followed by Fākihī, who wrote a *History of Mecca* in 885,[2] and 'Omar b. Shabba (d. 876), who composed an excellent history of Baṣra, known to us only by excerpts. Of the works of Zubair b. Bakkār d. 870), one of Ṭabarī's teachers, a learned historian and genealogist much consulted by later writers, there is a fragment in the Köprülü library at Constantinople, and another in Göttingen, part of which has been made known by Wüstenfeld (*Die Familie Al-Zobair*, Göttingen, 1878). Ya'qūbī (Ibn Wāḍiḥ) wrote a short general history of much value (published by Houtsma, Leiden, 1883). About India he knows more than his predecessors and more than his successors down to Berūnī. Ibn Khordādhbeh's historical works are lost. Ibn 'Abdalḥakam (d. 871) wrote of the conquest of Egypt and the West. Extracts from this book are given by M'G. de Slane in his *Histoire des Berbères*, from which we gather that it was a medley of true tradition and romance, and must be reckoned, with the book of his slightly senior contemporary, the Spaniard Ibn Ḥābīb, in the class of historical romances. A high place must be assigned to the historian Ibn Qutaiba or Kotaiba (d. 889), who wrote a very useful *Handbook of History* (ed. Wüstenfeld, Göttingen, 1850). Much more eminent is Balādhurī (d. 893), whose book on the Arab conquest (ed. M. J. de Goeje, Leiden, 1865–1866) merits the special praise given to it by Mas'ūdī, and who also wrote a large work, the *Ansāb al-Ashrāf*. A contemporary, Ibn abī Tāhir Taifūr (d. 894), wrote on the Abbasid caliphs and was drawn on by Ṭabarī. The sixth part of his work is in the British Museum. The universal history of Dīnawarī (d. 896), entitled *The Long Narratives*, has been edited by Girgas (1887).

All these histories are more or less thrown into the shade by the great work of Ṭabarī (*q.v.*), whose fame has never faded from his own day to ours. The *Annals* (ed. M. de Goeje, Leiden, 1879–1901) are a general history from the creation to 302 A.H. (=A.D. 915). As a literary composition they do not rank very high, which may be due partly to the author's years, partly to the inequality of his sources, sometimes superabundant, sometimes defective, partly perhaps to the somewhat hasty condensation of his original draft. Nevertheless the value of the book is very great: the author's selection of traditions is usually happy, and the episodes of most importance are treated with most fulness of detail, so that it deserves the high reputation it has enjoyed from the first. This reputation rose steadily; there were twenty copies (one of them written by Ṭabarī's own hand) in the library of the Fatimite caliph 'Aziz (latter half of the 4th century), whereas, when Saladin became lord of Egypt, the princely library contained 1200 copies (Maqrīzī, i. 408 seq.).

The *Annals* soon came to be dealt with in various ways. They were published in shorter form with the omission of the names of authorities and of most of the poems cited; some passages quoted by later writers are not found even in the Leiden edition. On the other hand, some interpolations took place, one in the

[1] For details see the introduction to Nöldeke's translation of Ṭabarī's *Geschichte der Perser und Araber zur Zeit der Sasaniden* (Leiden, 1879).

[2] Published in excerpt by Wüstenfeld along with Azraqī (Leipzig, 1857–1859).

author's lifetime and perhaps by his own hand. Then many supplements were written, *e.g.* by Ferghānī (not extant) and by Hamadhānī (partly preserved in Paris). 'Arīb of Cordova made an abridgment, adding the history of the West and continuing the story to about 975.[1] Ibn Mashkawaih wrote a history from the creation to 980, with the purpose of drawing the lessons of the story, following Ṭabarī closely, as far as his book is known, and seldom recurring to other sources before the reign of Moqtadir; what follows is his own composition and shows him to be a writer of talent.[2] In 963 an abridgment of the *Annals* was translated into Persian by Bal'amī, who, however, interwove many fables.[3] Ibn al-Athīr (d. 1234) abridged the whole work, usually with judgment, but sometimes too hastily. Though he sometimes glided lightly over difficulties, his work is of service in fixing the text of Ṭabarī. He also furnished a continuation to the year 1224. Later writers took Ṭabarī as their main authority, but sometimes consulted other sources, and so add to our knowledge—especially Ibn al-Jauzī (d. 1201), who adds many important details. These later historians had valuable help from the biographies of famous men and special histories of countries and cities, dynasties and princes, on which much labour was spent from the 4th century from the Flight onwards.

The chief historians after Ṭabarī may be briefly mentioned in chronological order. Rāzī (d. A.D. 932) wrote a *History of Spain*; Eutychius (d. 940) wrote *Annals* (ed. L. Cheikho, Paris, 1906), which are very important because he gives the Christian tradition; Sūlī (d. 946) wrote on the Abbasid caliphs, their viziers and court poets; Mas'udi (*q.v.*) composed various historical and geographical works (d. 956). Of Ṭabarī's contemporary Hamza Ispahānī (*c.* 940) we have the *Annals* (ed. Gottwaldt, St Petersburg, 1844); Ibn al-Qūṭīya wrote a *History of Spain*; Ibn Zūlāq (d. 997) a *History of Egypt*; 'Otbi wrote the *History of Mahmud of Ghazna*, at whose court he lived (printed on the margin of the Egyptian edition of Ibn al-Athīr); Tha'labī (d. 1036) wrote a well-known *History of the Old Prophets*; Abu Nu'aim al-Ispahānī (d. 1039) wrote a *History of Ispahan*, chiefly of the scholars of that city; Tha'ālibī (d. *c.* 1038) wrote, *inter alia*, a well-known *History of the Poets of his Time*, published at Damascus, 1887; Birūnī (*q.v.*) (d. 1048) takes a high place among historians; Kodā'ī (d. 1062) wrote a *Description of Egypt* and also various historical pieces, of which some are extant; Ibn Sā'id of Cordova (d. 1070) wrote a *View of the History of the Various Nations*. Bagdad and its learned men found an excellent historian in al-Khātib al-Baghdādī (d. 1071), and Spain in Ibn Ḥayān (d. 1076), and half a century later in Ibn Khaqān (d. 1135) and Ibn Bassām (d. 1147). Sam'ani (d. 1167) wrote an excellent book on genealogies; 'Umāra (d. 1175) wrote a *History of Yemen* (ed. H. C. Kay, London, 1892); Ibn 'Asaqir (d. 1176) a *History of Damascus and her Scholars*, which is of great value, and exists in whole or in part in several libraries. The *Biographical Dictionary* of the Spaniard Ibn Pascual (d. 1182) and that of Dabbi, a somewhat junior contemporary, are edited in Codera's *Bibliotheca Arab. Hisp.* (1883–1885); Saladin found his historian in the famous 'Imād uddīn (d. 1201) (Arabic text, ed. C. Landberg, Leiden, 1888). Ibn ul-Jauzī, who died in the same year, has been already mentioned. Abdulwahid's *History of the Almohades*, written in 1224, was published by Dozy (2nd ed., 1881). Abdullatīf or Abdallatīf (d. 1232) is known by his writings about Egypt (trans. de Sacy, 1810); Ibn al-Athīr (d. 1233) wrote, in addition to the *Chronicle* already mentioned, a *Biographical Dictionary of Contemporarics of the Prophet*. Qiftī (d. 1248) is especially known by his *History of Arabic Philologists*. Sibt ibn al-Jauzi (d. 1256), grandson of the Ibn al-Jauzī already mentioned, wrote a great *Chronicle*, of which much the larger part still exists. Codera has edited (Madrid, 1886) Ibn al-'Abbar's (d. 1260) *Biographical Lexicon*, already known by Dozy's excerpts from it. Ibn al-'Adīm (d. 1262) is famed for his *History of Aleppo*, and Abu Shama (d. 1267) wrote a well-known *History of Saladin and Nureddin*, taking a great deal from 'Imad uddin. Ibn abī Usaibia (d. 1269) wrote a *History of Physicians*, ed. A. Müller. The *History* of Ibn al-'Amīd (d. 1276), better known as Elmacin, was printed by Erpenius in 1625. Ibn Sa'īd al-Maghribī (d. 1274 or 1286) is famous for his histories, but still more for his geographical writings. The noted theologian Nawāwī (*q.v.*; d. 1278) wrote a *Biographical Dictionary of the Worthies of the First Ages of Islam*. Pre-eminent as a biographer is Ibn Khallikān (*q.v.*; d. 1282), whose much-used work was partly edited by de Slane and completely by Wüstenfeld (1835–1840), and translated into English by the former scholar (4 vols., 1843–1871).

Abu 'l-Faraj, better known as Bar-Hebraeus (d. 1286), wrote, besides his Syriac *Chronicle*, an Arabic *History of Dynasties* (ed. E. Pocock, Oxford, 1663, Beirūt, 1890). Ibn 'Adharī's *History of Africa and Spain* has been published by Dozy (2 vols., Leiden, 1848–1851), and the *Qartās* of Ibn abī Zar' by Tornberg (1843). One of the best-known of Arab writers is Abulfeda (d. 1331) (*q.v.*). Not less famous is the great *Encyclopaedia* of his contemporary Nuwairī (d. 1332), but only extracts from it have been printed. Ibn Sayyid an-Nās (d. 1334) wrote a full biography of the Prophet; Mizzī (d. 1341) an extensive work on the men from whom traditions have been derived. We still possess, nearly complete, the great *Chronicle* of Dhahabī (d. 1347), a very learned biographer and historian. The geographical and historical *Masālik al-Absār* of Ibn Fadlallāh (d. 1348) is known at present by extracts given by Quatremère and Amari. Ibn al-Wardī (d. *c.* 1349), best known by his *Cosmography*, wrote a *Chronicle* which has been printed in Egypt. Ṣafadī (d. 1363) got a great name as a biographer. Yafi'ī (d. 1367) wrote a *Chronicle of Islam* and *Lives of Saints*. Subkī (d. 1369) published *Lives of the Theologians of the Shāfi'ite School*. Of Ibn Kathīr's *History* the greatest part is extant. For the history of Spain and the Maghrib the writings of Ibn al-Khatīb (d. 1374) are of acknowledged value. Another history, of which we possess the greater part, is the large work of Ibn al-Furāt (d. 1404). Far superior to all these, however, is the famous Ibn Khaldūn (*q.v.*) (d. 1406). Of the historical works of the famous lexicographer Fairūzabādī (*q.v.*) (d. 1414) only a *Life of the Prophet* remains. Maqrizī (d. 1442) is the subject of a separate article; Ibn Hajar (d. 1448) is best known by his *Biographical Dictionary of Contemporaries of the Prophet*, published in the *Bibliotheca Indica*. Ibn 'Arabshāh (d. 1450) is known by his *History of Timur* (Leeuwarden, 1767). 'Ainī (d. 1451) wrote a *General History*, still extant. Abu'l-Mahāsin ibn Taghrībirdī (d. 1469) wrote at length on the history of Egypt; the first two parts have been published by Juynboll and Matthes, Leiden, 1855–1861. Flügel has published Ibn Kotlubogha's *Biographies of the Hanifite Jurists*. Ibn Shihna (d. 1485) wrote a *History of Aleppo*. Of Sakhāwī we possess a bibliographical work on the historians. The polymath Suyūṭī (*q.v.*) (d. 1505) contributed a *History of the Caliphs* and many biographical pieces. Samhūdī's *History of Medina* is known through the excerpts of Wüstenfeld (1861). Ibn Iyās (d. 1524) wrote a *History of Egypt*, and Diarbekri (d. 1559) a *Life of Mahomet*. To these names must be added Maqqari (Makkari) (*q.v.*) and Hajji Khalīfa (*q.v.*) (d. 1658). He made use of European sources, and with him Arabic historiography may be said to cease, though he had some unimportant successors.

A word must be said of the historical romances, the beginnings of which go back to the first centuries of Islam. The interest in all that concerned Mahomet and in the allusions of the Koran to old prophets and races led many professional narrators to choose these subjects. The increasing veneration paid to the Prophet and love for the marvellous soon gave rise to fables about his childhood, his visit to heaven, &c., which have found their way even into sober histories, just as many Jewish legends told by the converted Jew Ka'b al-Aḥbār and by Wahb ibn Monabbih, and many fables about the old princes of Yemen told by 'Abīd, are taken as genuine history (see, however, Mas'ūdī, iv. 88 seq.). A fresh field for romantic legend was found in the history of the

[1] Of this work the Gotha Library has a portion containing 290–320 A.H., of which the part about the West has been printed by Dozy in the *Bayān*, and the rest was published at Leiden in 1897.

[2] A fragment (198–251 A.H.) is printed in de Goeje, *Fragm. Hist. Ar.* (vol. ii., Leiden, 1871).

[3] The first part was rendered into French by Dubeux in 1836. There is an excellent French translation by Zotenberg (1874).

victories of Islam, the exploits of the first heroes of the faith, the fortunes of 'Alī and his house. Then, too, history was often expressly forged for party ends. The people accepted all this, and so a romantic tradition sprang up side by side with the historical, and had a literature of its own, the beginnings of which must be placed as early as the 2nd century of the Flight. The oldest specimens still extant are the fables about the conquest of Spain ascribed to Ibn Ḥabīb (d. 852), and those about the conquest of Egypt and the West by Ibn 'Abd al-Hakam (d. 871). In these truth and falsehood are mingled. But most of the extant literature of this kind is, in its present form, much more recent; *e.g.* the *Story of the Death of Hosain* by the pseudo-Abū Mikhnaf (translated by Wüstenfeld); the *Conquest of Syria* by Abū Ismā'īl al-Basrī (edited by Nassau Lees, Calcutta, 1854, and discussed by de Goeje, 1864); the pseudo-Wāqidī (see Hamaker, *De Expugnatione Memphidis et Alexandriae*, Leiden, 1835); the pseudo-Ibn Qutaiba (see Dozy, *Recherches*); the book ascribed to A'ṣam Kūfī, &c. Further inquiry into the origin of these works is called for, but some of them were plainly directed to stirring up fresh zeal against the Christians. In the 6th century of the Flight some of these books had gained so much authority that they were used as sources, and thus many untruths crept into accepted history (M. J. DE G.; G. W. T.)

Geography.—The writing of geographical books naturally began with the description of the Moslem world, and that for practical purposes. Ibn Khordādhbeh, in the middle of the 9th century, wrote a *Book of Roads and Provinces* to give an account of the highways, the posting-stations and the revenues of the provinces. In the same century Ya'qūbī wrote his *Book of Countries*, describing specially the great cities of the empire. A similar work describing the provinces in some detail was that of Qudāma or Kodāma (d. 922). Hamdāni (*q.v.*) was led to write his great geography of Arabia by his love for the ancient history of his land. Muqaddasi (Mokaddasi) at the end of the 10th century was one of the early travellers whose works were founded on their own observation. The study of Ptolemy's geography led to a wider outlook, and the writing of works on geography (*q.v.*) in general. A third class of Arabian geographical works were those written to explain the names of places which occur in the older poets. Such books were written by Bakrī (*q.v.*) and Yāqūt (*q.v.*)[1]

Grammar and Lexicography.—Arab tradition ascribes the first grammatical treatment of the language to Abū-l-Aswad ud-Du'alī (latter half of the 7th century), but the certain beginnings of Arabic grammar are found a hundred years later. The Arabs from early times have always been proud of their language, but its systematic study seems to have arisen from contact with Persian and from the respect for the language of the Koran. In Irāk the two towns of Basra and Kūfa produced two rival schools of philologists. Bagdad soon had one of its own (cf. G. Flügel's *Die grammatischen Schulen der Araber*, Leipzig, 1862). Khalīl ibn Aḥmad (718–791), an Arab from Omān, of the school of Basra, was the first to enunciate the laws of Arabic metre and the first to write a dictionary. His pupil Sībawaihi (*q.v.*), a Persian, wrote the grammar known simply as *The Book*, which is generally regarded in the East as authoritative and almost above criticism. Other members of the school of Basra were Abū 'Ubaida (*q.v.*), Asma'ī (*q.v.*), Mubarrad (*q.v.*) and Ibn Duraid (*q.v.*). The school of Kūfa claimed to pay more attention to the living language (spoken among the Bedouins) than to written laws of grammar. Among its teachers were Kisā'ī, the tutor of Harūn al-Rashīd's sons, Ibn A'rābi, Ibn as-Sikkīt (d. 857) and Ibn ul-Anbāri (885–939). In the fourth century of Islam the two schools of Kūfa and Basra declined in importance before the increasing power of Bagdad, where Ibn Qutaiba, Ibn Jinnī (941–1002) and others carried on the work, but without the former rivalry of the older schools. Persia from the beginning of the 10th century produced some outstanding students of Arabic. Hamadhāni (d. 932) wrote a book of synonyms (ed. L. Cheikho, Beirūt, 1885). Jauharī (*q.v.*) wrote his great dictionary the *Sahāh*. Tha'ālibi (*q.v.*) and Jurjāni (*q.v.*) were almost contemporary, and a little later came Zamakhsharī (*q.v.*), whose philological works are almost as famous as his commentary on the Koran. The most important dictionaries of Arabic are late in origin. The immense work, *Lisān ul Arab* (ed. 20 vols., Būlāq, 1883–1889), was compiled by Ibn Manzūr (1232–1311), the *Qāmūs* by Fairūzābādī, the *Taj ul'Arūs* (ed. 10 vols., Būlāq, 1890), founded on the *Qāmūs*, by Murtadā uz-Zabīdī (1732–1790).

Scientific Literature.—The literature of the various sciences is dealt with elsewhere. It is enough here to mention that such existed, and that it was not indigenous. It was in the early Abbasid period that the scientific works of Greece were translated into Arabic, often through the Syriac, and at the same time the influence of Sanskrit works made itself felt. Astronomy seems in this way to have come chiefly from India. The study of mathematics learned from Greece and India was developed by Arabian writers, who in turn became the teachers of Europe in the 16th century. Medical literature was indebted for its origin to the works of Galen and the medical school of Gondesapur. Many of the Arabian philosophers were also physicians and wrote on medicine. Chemistry proper was not understood, but Arabian writings on alchemy led Europe to it later. So also the literature of the animal world (cf. Damīrī) is not zoological but legendary, and the works on minerals are practical and not scientific. See ARABIAN PHILOSOPHY and historical sections of such scientific articles as ASTRONOMY, &c. (G. W. T.)

[1] The chief Arabian geographical works have been edited by M. J. de Goeje in his *Bibliotheca Geographorum arabicorum* (Leiden, 1874 ff.).

ARABIAN PHILOSOPHY. What is known as "Arabian" philosophy owed to Arabia little more than its name and its language. It was a system of Greek thought, expressed in a Semitic tongue, and modified by Oriental influences, called into existence amongst the Moslem people by the patronage of their more liberal princes, and kept alive by the intrepidity and zeal of a small band of thinkers, who stood suspected and disliked in the eyes of their nation. Their chief claim to the notice of the historian of speculation comes from their warm reception of Greek philosophy when it had been banished from its original soil, and whilst western Europe was still too rude and ignorant to be its home (9th to 12th century).

Origin.

In the course of that exile the traces of Semitic or Mahommedan influence gradually faded away, and the last of the line of Saracenic thinkers was a truer exponent of the one philosophy which they all professed to teach than the first. The whole movement is little else than a chapter in the history of Aristotelianism. That system of thought, after passing through the minds of those who saw it in the hazy light of an orientalized Platonism, and finding many laborious but narrow-purposed cultivators in the monastic schools of heretical Syria, was then brought into contact with the ideas and mental habits of Islam. But those in whom the two currents converged did not belong to the pure Arab race. Of the so-called Arabian philosophers of the East, al-Fārābī, Ibn-Sīnā and al-Ghazālī were natives of Khorasan, Bokhara and the outlying provinces of north-eastern Persia; whilst al-Kindī, the earliest of them, sprang from Basra, on the Persian Gulf, on the debatable ground between the Semite and the Aryan. In Spain, again, where Ibn-Bājja, Ibn-Tufail and Ibn Rushd rivalled or exceeded the fame of the Eastern schools, the Arabians of pure blood were few, and the Moorish ruling class was deeply intersected by Jewish colonies, and even by the natives of Christian Spain. Thus, alike at Bagdad and at Cordova, Arabian philosophy represents the temporary victory of exotic ideas and of subject races over the theological one-sidedness of Islam, and the illiterate simplicity of the early Saracens.

Islam had, it is true, a philosophy of its own among its theologians (see MAHOMMEDAN RELIGION). It was with them that the Moslem theology—the science of the word (*Kalām*)—first came into existence. Its professors, the *Mutākallimūn* (known in Hebrew as *Medabberim*, and as *Loquentes* in the Latin versions), may be compared with the scholastic doctors of the Catholic Church. Driven in the first instance to speculation in theology by the needs of their natural reason, they came, in after days, when Greek philosophy had been naturalized in the Caliphate, to adapt its methods and doctrines to the support of their views. They employed a quasi-philosophical method, by which, according to Maimonides, they first reflected how things ought to be in order to support, or at least not contradict, their opinions, and then, when their minds were made up with regard to this imaginary system, declared that the world was no otherwise constituted. The dogmas of creation and providence, of divine omnipotence, chiefly exercised them; and they sought to assert for God an immediate action in the making and the keeping of the world. Space they looked upon as pervaded by atoms possessing no quality or extension, and time was similarly divided into innumerable instants. Each change in the constitution of the atoms is a direct act of the Almighty. When the fire burns, or the water moistens, these terms merely express the habitual connexion which our senses perceive between one thing

and another. It is not the man that throws a stone who is its real mover: the supreme agent has for the moment created motion. If a living being die, it is because God has created the attribute of death; and the body remains dead, only because that attribute is unceasingly created. Thus, on the one hand, the object called the cause is denied to have any efficient power to produce the so-called effect; and, on the other hand, the regularities or laws of nature are explained to be direct interferences by the Deity. The supposed uniformity and necessity of causation is only an effect of custom, and may be at any moment rescinded. In this way, by a theory which, according to Averroes, involves the negation of science, the Moslem theologians believed that they had exalted God beyond the limits of the metaphysical and scientific conceptions of law, form and matter; whilst they at the same time stood aloof from the vulgar doctrines, attributing a causality to things. Thus they deemed they had left a clear ground for the possibility of miracles.

But at least one point was common to the theological and the philosophical doctrine. Carrying out, it may be, the principles of the Neo-Platonists, they kept the sanctuary of the Deity securely guarded, and interposed between him and his creatures a spiritual order of potent principles, from the Intelligence, which is the first-born image of the great unity, to the Soul and Nature, which come later in the spiritual rank. Of God the philosophers said we could not tell what He is, but only what He is not. The highest point, beyond which strictly philosophical inquirers did not penetrate, was the active intellect,—a sort of soul of the world in Aristotelian garb—the principle which inspires and regulates the development of humanity, and in which lies the goal of perfection for the human spirit. In theological language the active intellect is described as an angel. The inspirations which the prophet receives by angelic messengers are compared with the irradiation of intellectual light, which the philosopher wins by contemplation of truth and increasing purity of life. But while the theologian incessantly postulated the agency of that God whose nature he deemed beyond the pale of science, the philosopher, following a purely human and natural aim, directed his efforts to the gradual elevation of his part of reason from its unformed state, and to its final union with the controlling intellect which moves and draws to itself the spirits of those who prepare themselves for its influences. The philosophers in their way, like the mystics of Persia (the Sufites) in another, tended towards a theory of the communion of man with the spiritual world, which may be considered a protest against the practical and almost prosaic definiteness of the creed of Mahomet.

Arabian philosophy, at the outset of its career in the 9th century, was able without difficulty to take possession of those resources for speculative thought which the Latins had barely achieved at the close of the 12th century by the slow process of rediscovering the Aristotelian logic from the commentaries and verses of Boëtius. What the Latins painfully accomplished, owing to their fragmentary and unintelligent acquaintance with ancient philosophy, was already done for the Arabians by the scholars of Syria. In the early centuries of the Christian era, both within and without the ranks of the church, the Platonic tone and method were paramount throughout the East. Their influence was felt in the creeds which formulated the orthodox dogmas in regard to the Trinity and the Incarnation. But in its later days the Neo-Platonist school came more and more to find in Aristotle the best exponent and interpreter of the philosopher whom they thought divine. It was in this spirit that Porphyry, Themistius and Joannes Philoponus composed their commentaries on the treatises of the Peripatetic system which, modified often unconsciously by the dominant ideas of its expositors, became in the 6th and 7th centuries the philosophy of the Eastern Church. But the instrument which, in the hands of John of Damascus (Damascenus), was made subservient to theological interests, became in the hands of others a dissolvent of the doctrines which had been reduced to shape under the prevalence of the elder Platonism. Peripatetic studies became the source of heresies; and conversely, the heretical sects prosecuted the study of Aristotle with peculiar zeal. The church of the Nestorians, and that of the Monophysites, in their several schools and monasteries, carried on from the 5th to the 8th century the study of the earlier part of the *Organon*, with almost the same means, purposes and results as were found among the Latin schoolmen of the earlier centuries. Up to the time when the religious zeal of the emperor Zeno put a stop to the Nestorian school at Edessa, this "Athens of Syria" was active in translating and popularizing the Aristotelian logic. Their banishment from Edessa in 489 drove the Nestorian scholars to Persia, where the Sassanid rulers gave them a welcome; and there they continued their labours on the *Organon*. A new seminary of logic and theology sprang up at Nisibis, not far from the old locality; and at Gandisapora (or Nishapur), in the east of Persia, there arose a medical school, whence Greek medicine, and in its company Greek science and philosophy, ere long spread over the lands of Iran. Meanwhile the Monophysites had followed in the steps of the Nestorians, multiplying Syriac versions of the logical and medical science of the Greeks. Their school at Resaina is known from the name of Sergius, one of the first of these translators, in the days of Justinian; and from their monasteries at Kinnesrîn (Chalcis) issued numerous versions of the introductory treatises of the Aristotelian logic. To the *Isagoge* of Porphyry, the *Categories* and the *Hermeneutica* of Aristotle, the labours of these Syrian schoolmen were confined. These they expounded, translated, epitomized and made the basis of their compilations, and the few who were bold enough to attempt the *Analytics* seem to have left their task unaccomplished.

The energy of the Monophysites, however, began to sink with the rise of the Moslem empire; and when philosophy revived amongst them in the 13th century, in the person of Gregorius Bar-Hebraeus (Abulfaragius) (1226–1286), the revival was due to the example and influence of the Arabian thinkers. It was otherwise with the Nestorians. Gaining by means of their professional skill as physicians a high rank in the society of the Moslem world, the Nestorian scholars soon made Bagdad familiar with the knowledge of Greek philosophy and science which they possessed. But the narrow limits of the Syrian studies, which added to a scanty knowledge of Aristotle some acquaintance with his Syrian commentators, were soon passed by the curiosity and zeal of the students in the Caliphate. During the 8th and 9th centuries, rough but generally faithful versions of Aristotle's principal works were made into Syriac, and then from the Syriac into Arabic. The names of some of these translators, such as Johannitius (Hunain ibn-Ishāq), were heard even in the Latin schools. By the labours of Hunain and his family the great body of Greek science, medical, astronomical and mathematical, became accessible to the Arab-speaking races. But for the next three centuries fresh versions, both of the philosopher and of his commentators, continued to succeed each other.

To the Arabians Aristotle represented and summed up Greek philosophy, even as Galen became to them the code of Greek medicine. They adopted the doctrine and system which the progress of human affairs had made the intellectual aliment of their Syrian guides. From first to last Arabian philosophers made no claim to originality; their aim was merely to propagate the truth of Peripateticism as it had been delivered to them. It was with them that the deification of Aristotle began; and from them the belief that in him human intelligence had reached its limit passed to the later schoolmen (see SCHOLASTICISM). The progress amongst the Arabians on this side lies in a closer adherence to their text, a nearer approach to the bare exegesis of their author, and an increasing emancipation from control by the tenets of the popular religion.

Under the Caliphate.

Secular philosophy found its first entrance amongst the Saracens in the days of the early caliphs of the Abbasid dynasty, whose ways and thoughts had been moulded by their residence in Persia amid the influences of an older creed, and of ideas which had in the last resort sprung from the Greeks. The seat of empire had been transferred to Bagdad, on the highway of Oriental commerce; and the distant

Khorasan became the favourite province of the caliph. Then was inaugurated the period of Persian supremacy, during which Islam was laid open to the full current of alien ideas and culture. The incitement came, however, not from the people, but from the prince: it was in the light of court favour that the colleges of Bagdad and Nishapur first came to attract students from every quarter, from the valleys of Andalusia as well as the upland plains of Transoxiana. Mansūr, the second of the Abbasids, encouraged the appropriation of Greek science; but it was al-Ma'mūn, the son of Harūn al-Rashīd, who deserves in the Mahommedan empire the same position of royal founder and benefactor which is held by Charlemagne in the history of the Latin schools. In his reign (813–833) Aristotle was first translated into Arabic. Orthodox Moslems, however, distrusted the course on which their chief had entered, and his philosophical proclivities became one ground for doubting as to his final salvation.

In the eastern provinces the chief names of Arabian philosophy are those known to the Latin schoolmen as Alkindius, Alfarabius, Avicenna and Algazel, or under forms resembling these. The first of these, Alkindius (see KINDI), flourished at the court of Bagdad in the first half of the 9th century. His claims to notice at the present day rest upon a few works on medicine, theology, music and natural science. With him begins that encyclopaedic character—the simultaneous cultivation of the whole field of investigation which is reflected from Aristotle on the Arabian school. In him too is found the union of Platonism and Aristotelianism expressed in Neo-Platonic terms. Towards the close of the 10th century the presentation of an entire scheme of knowledge, beginning with logic and mathematics, and ascending through the various departments of physical inquiry to the region of religious doctrine, was accomplished by a society which had its chief seat at Basra, the native town of al-Kindi. This society—the Brothers of Purity or Sincerity (Ikhwān us Safā'i)—divided into four orders, wrought in the interests of religion no less than of science; and though its attempt to compile an encyclopaedia of existing knowledge may have been premature, it yet contributed to spread abroad a desire for further information. The proposed reconciliation between science and faith was not accomplished, because the compromise could please neither party. The fifty-one treatises of which this encyclopaedia consists are interspersed with apologues in true Oriental style, and the idea of goodness, of moral perfection, is as prominent an end in every discourse as it was in the alleged dream of al-Ma'mūn. The materials of the work come chiefly from Aristotle, but they are conceived in a Platonizing spirit, which places as the bond of all things a universal soul of the world with its partial or fragmentary souls. Contemporary with this semi-religious and semi-philosophical society lived Alfarabius (see FARĀBĪ), who died in 950. His paraphrases of Aristotle formed the basis on which Avicenna constructed his system, and his logical treatises produced a permanent effect on the logic of the Latin scholars. He gave the tone and direction to nearly all subsequent speculations among the Arabians. His order and enumeration of the principles of being, his doctrine of the double aspect of intellect, and of the perfect beatitude which consists in the aggregation of noble minds when they are delivered from the separating barriers of individual bodies, present at least in germ the characteristic theory of Averroes. But al-Farābī was not always consistent in his views; a certain sobriety checked his speculative flights, and although holding that the true perfection of man is reached in this life by the elevation of the intellectual nature, he came towards the close to think the separate existence of intellect no better than a delusion.

Unquestionably the most illustrious name amongst the Oriental Moslems was Avicenna (980–1037). His rank in the medieval world as a philosopher was far beneath his fame as a physician. Still, the logic of Albertus Magnus and succeeding doctors was largely indebted to him for its formulae. In logic Avicenna starts from distinguishing between the isolated concept and the judgment or assertion; from which two primitive elements of knowledge there is artificially generated a complete and scientific knowledge by the two processes of definition and syllogism. But the chief interest for the history of logic belongs to his doctrine in so far as it bears upon the nature and function of abstract ideas. The question had been suggested alike to East and West by Porphyry, and the Arabians were the first to approach the full statement of the problem. Farābī had pointed out that the universal and individual are not distinguished from each other as understanding from the senses, but that both universal and individual are in one respect intellectual, just as in another connexion they play a part in perception. He had distinguished the universal essence in its abstract nature, from the universal considered in relation to a number of singulars. These suggestions formed the basis of Avicenna's doctrine. The essences or forms—the *intelligibilia* which constitute the world of real knowledge—may be looked at in themselves (metaphysically), or as embodied in the things of sense (physically), or as expressing the processes of thought (logically). The first of these three points of view deals with the form or idea as self-contained in the principles of its own being, apart from those connexions and distinctions which it receives in real (sensuous) science, and through the act of intellect. Secondly, the form may be looked at as the similarity evolved by a process of comparison, as the work of mental reflection, and in that way as essentially expressing a relation. When thus considered as the common features derived by examination from singular instances, it becomes a universal or common term strictly so called. It is intellect which first makes the abstract idea a true universal. *Intellectus in formis agit universalitatem.* In the third place, the form or essence may be looked upon as embodied in outward things (*in singularibus propriis*), and thus it is the type more or less represented by the members of a natural kind. It is the designation of these outward things which forms the " first intention " of names; and it is only at a later stage, when thought comes to observe its own modes, that names, looked upon as predicables and universals, are taken in their " second intention." Logic deals with such second intentions. It does not consider the forms *ante multiplicitatem*, *i.e.* as eternal ideas—nor *in multiplicitate*, *i.e.* as immersed in the matter of the phenomenal world—but *post multiplicitatem*, *i. e.* as they exist in and for the intellect which has examined and compared. Logic does not come in contact with things, except as they are subject to modification by intellectual forms. In other words, universality, individuality and speciality are all equally modes of our comprehension or notion; their meaning consists in their setting forth the relations attaching to any object of our conception. In the mind, *e.g.*, one form may be placed in reference to a multitude of things, and as thus related will be universal. The form animal, *e.g.*, is an abstract intelligible or metaphysical idea. When an act of thought employs it as a schema to unify several species, it acquires its logical aspect (*respectus*) of generality; and the various living beings qualified to have the name animal applied to them constitute the natural class or kind. Avicenna's view of the universal may be compared with that of Abelard, which calls it " that whose nature it is to be predicated of several," as if the generality became explicit only in the act of predication, in the *sermo* or proposition, and not in the abstract, unrelated form or essence. The three modes of the universal before things, in things, and after things, spring from Arabian influence, but depart somewhat from his standpoint.

Avicenna.

The place of Avicenna amongst Moslem philosophers is seen in the fact that Shahrastānī takes him as the type of all, and that Ghazālī's attack against philosophy is in reality almost entirely directed against Avicenna. His system is in the main a codification of Aristotle modified by fundamental views of Neo-Platonist origin, and it tends to be a compromise with theology. In order, for example, to maintain the necessity of creation, he taught that all things except God were admissible or possible in their own nature, but that certain of them were rendered necessary by the act of the creative first agent,—in other words, that the possible could be transformed into the necessary. Avicenna's

theory of the process of knowledge is an interesting part of his doctrine. Man has a rational soul, one face of which is turned towards the body, and, by the help of the higher aspect, acts as practical understanding; the other face lies open to the reception and acquisition of the intelligible forms, and its aim is to become a reasonable world, reproducing the forms of the universe and their intelligible order. In man there is only the susceptibility to reason, which is sustained and helped by the light of the active intellect. Man may prepare himself for this influx by removing the obstacles which prevent the union of the intellect with the human vessel destined for its reception. The stages of this process to the acquisition of mind are generally enumerated by Avicenna as four; in this part he follows not Aristotle, but the Greek commentator. The first stage is that of the hylic or material intellect, a state of mere potentiality, like that of a child for writing, before he has ever put pen to paper. The second stage is called *in habitu*; it is compared to the case of a child that has learned the elements of writing, when the bare possibility is on the way to be developed, and is seen to be real. In this period of half-trained reason, it appears as happy conjecture, not yet transformed into art or science proper. When the power of writing has been actualized, we have a parallel to the *intellectus in actu*—the way of science and demonstration is entered. And when writing has been made a permanent accomplishment, or lasting property of the subject, to be taken up at will, it corresponds to the *intellectus adeptus*—the complete mastery of science. The whole process may be compared to the gradual illumination of a body naturally capable of receiving light. There are, however, grades of susceptibility to the active intellect, *i.e.* in theological language, to communication with God and his angels. Sometimes the receptivity is so vigorous in its affinity, that without teaching it rises at one step to the vision of truth, by a certain "holy force" above ordinary measure. (In this way philosophy tried to account for the phenomenon of prophecy, one of the ruling ideas of Islam.) But the active intellect is not merely influential on human souls. It is the universal giver of forms in the world.

In several points Avicenna endeavoured to give a *rationale* of theological dogmas, particularly of prophetic rule, of miracles, divine providence and immortality. The permanence of individual souls he supports by arguments borrowed from those of Plato. The existence of a prophet is shown to be a corollary from a belief in God as a moral governor, and the phenomena of miracles are required to evidence the genuineness of the prophetic mission. Thus Avicenna, like his predecessors, tried to harmonize the abstract forms of philosphy with the religious faith of his nation. But his arguments are generally vitiated by the fallacy of assuming what they profess to prove. His failure is made obvious by the attack of Ghazālī on the tendencies and results of speculation.

To Ghazālī (*q.v.*) it seemed that the study of secular philosophy had resulted in a general indifference to religion, and that the scepticism which concealed itself under a pretence of piety was destroying the life and purity of the nation. With these views he carried into the fields of philosophy the aims and spirit of the Moslem theologian. His restless life was the reflex of a mental history disturbed by prolonged agitation. Revolting, in the height of his success, against the current creed, he began to examine the foundations of knowledge. The senses are contradicted by one another, and disproved by reason. Reason, indeed, professes to furnish us with necessary truths; but what assurance have we that the verdicts of reason may not be reversed by some higher authority? Ghazālī then interrogated all the sects in succession to learn their criterion of truth. He first applied to the theological schoolmen, who grounded their religion on reason; but their aim was only to preserve the faith from heresy. He turned to the philosophers, and examined the accepted Aristotelianism in a treatise which has come down to us—*The Destruction of the Philosophers*. He assails them on twenty points of their mixed physical and metaphysical peripateticism, from the statement of which, in spite of his pretended scepticism, we can deduce some very positive metaphysical opinions of his own. He claims to have shown that the dogmas of the eternity of matter and the permanence of the world are false; that their description of the Deity as the demiurgos is unspiritual; that they fail to prove the existence, the unity, the simplicity, the incorporeality or the knowledge (both of species and accidents) of God; that their ascription of souls to the celestial spheres is unproved; that their theory of causation, which attributes effects to the very natures of the causes, is false, for that all actions and events are to be ascribed to the Deity; and, finally, that they cannot establish the spirituality of the soul, nor prove its mortality. These criticisms disclose nothing like a sceptical state of mind, but rather a reversion from the metaphysical to the theological stage of thought. He denies the intrinsic tendencies, or souls, by which the Aristotelians explained the motion of the spheres, because he ascribes their motion to God. The sceptic would have denied both. G. H. Lewes censures Renan for asserting of Ghazālī's theory of causation—"*Hume n'a rien dit plus.*" It is true that Ghazālī maintains that the natural law according to which effects proceed inevitably from their causes is only custom, and that there is no *necessary* connexion between them. But while Hume absolutely denies the necessity, Ghazālī merely removes it one stage farther back, and plants it in the mind of the Deity. This, of course, is not metaphysics, but theology. Having, as he believed, refuted the opinions of the philosophers, he next investigated the pretensions of the Allegorists, who derived their doctrines from an imam. These Arabian ultramontanes had no word for the doubter. They could not, he says, even understand the problems they sought to resolve by the assumption of infallibility, and he turned again, in his despair, to the instructors of his youth—the Sūfīs. In their mystical intuition of the laws of life, and absorption in the immanent Deity, he at last found peace. This shows the true character of the treatise which, alike in medieval and modern times, has been quoted as containing an exposition of his opinions. The work called *The Tendencies of the Philosophers*, translated in 1506, with the title *Logica et Philosophia Algazelis Arabis*, contains neither the logic nor the philosophy of Ghazālī. It is a mere abstract or statement of the Peripatetic systems, and was made preliminary to that *Destruction* of which we have already spoken.

Ghazālī.

This indictment against liberal thought from the standpoint of the theological school was afterwards answered in Spain by Averroes; but in Bagdad it heralded the extinction of the light of philosophy. Moderate and compliant with the popular religion as Alfarabius and Avicenna had always been, as compared with their Spanish successor, they had equally failed to conciliate the popular spirit, and were classed in the same category with the heretic or the member of an immoral sect. The 12th century exhibits the decay of liberal intellectual activity in the Caliphate, and the gradual ascendancy of Turkish races animated with all the intolerance of semi-barbarian proselytes to the Mahommedan faith. Philosophy, which had only sprung up when the purely Arabian influences ceased to predominate, came to an end when the sceptre of the Moslem world passed away from the dynasty of Persia. Even in 1150 Bagdad had seen a library of philosophical books burned by command of the caliph Mostanjid; and in 1192 the same place might have witnessed a strange scene, in which the books of a physician were first publicly cursed, and then committed to the flames, while their owner was incarcerated. Thus, while the Latin church showed a marvellous receptivity for ethnic philosophy, and assimilated doctrines which it had at an earlier date declared impious, in Islam the theological system entrenched itself towards the end of the 12th century in the narrow orthodoxy of the Asharites, and reduced the votaries of Greek philosophy to silence.

The same phenomena were repeated in Spain under the Mahommedan rulers of Andalusia and Morocco, with this difference, that the time of philosophical development was shorter, and the heights to which Spanish thinkers soared were greater. The reign of al-Hakam the Second (961–976) inaugurated in Andalusia those scientific and philosophical

In Spain.

studies which were simultaneously prosecuted by the Society of Basra. From Cairo, Bagdad, Damascus and Alexandria, books both old and new were procured at any price for the library of the prince; twenty-seven free schools were opened in Cordova for the education of the poor; and intelligent knowledge was perhaps more widely diffused in Mahommedan Spain than in any other part of Europe at that day. The mosques of the city were filled with crowds who listened to lectures on science and literature, law and religion. But the future glory thus promised was long postponed. The usurping successor of Hakam found it a politic step to request the most notable doctors of the sacred law to examine the royal library; and every book treating of philosophy, astronomy and other forbidden topics was condemned to the flames. But the spirit of research, fostered by the fusion of races and the social and intellectual competition thus engendered, was not crushed by these proceedings; and for the next century and more the higher minds of Spain found in Damascus and Bagdad the intellectual aliment which they desired. At last, towards the close of the 11th century, the long-pent spiritual energies of Mahommedan Spain burst forth in a brief series of illustrious men. Whilst the native Spaniards were narrowing the limits of the Moorish kingdoms, and whilst the generally fanatical dynasty of the Almohades might have been expected to repress speculation, the century preceding the close of Mahommedan sway saw philosophy cultivated by Avempace, Abubacer and Averroes. Even amongst the Almohades there were princes, such as Yusūf (who began his reign in 1163) and Yaqūb Almansūr (who succeeded in 1184), who welcomed the philosopher at their courts and treated him as an intellectual compeer. But about 1195 the old distrust of philosophy revived; the philosophers were banished in disgrace; works on philosophical topics were ordered to be confiscated and burned; and the son of Almansūr condemned a certain Ibn-Habīb to death for the crime of philosophizing.

Arabian speculation in Spain was heralded by Avicebron or Ibn Gabirol (*q.v.*), a Jewish philosopher (1021–1058). About a generation later the rank of Moslem thinkers was introduced by Abū-Bakr Muhammad ibn Yahya, surnamed Ibn-Bājja, and known to the Latin world as Avempace. He was born at Saragossa, and died comparatively young at Fez in 1138. Besides commenting on various physical treatises of Aristotle's, he wrote some philosophical essays, notably one on the *Republic or Régime of the Solitary*, understanding by that the organized system of rules, by obedience to which the individual may rise from the mere life of the senses to the perception of pure intelligible principles and may participate in the divine thought which sustains the world. These rules for the individual are but the image or reflex of the political organization of the perfect or ideal state; and the man who strives to lead this life is called the *solitary*, not because he withdraws from society, but because, while in it, he guides himself by reference to a higher state, an ideal society. Avempace does not develop at any length this curious Platonic idea of the perfect state. His object is to discover the highest end of human life, and with this view he classifies the various activities of the human soul, rejects such as are material or animal, and then analyses the various spiritual forms to which the activities may be directed. He points out the graduated scale of such forms, through which the soul may rise, and shows that none are final or complete in themselves, except the pure intelligible forms, the ideas of ideas. These the intellect can grasp, and in so doing it becomes what he calls *intellectus acquisitus*, and is in a measure divine. This self-consciousness of pure reason is the highest object of human activity, and is to be attained by the speculative method. The intellect has in itself power to know ultimate truth and intelligence, and does not require a mystical illumination as Ghazālī taught. Avempace's principles, it is clear, lead directly to the Averroistic doctrine of the unity of intellect, but the obscurity and incompleteness of the *Régime* do not permit us to judge how far he anticipated the later thinker. (See Munk, *Mélanges de phil. juive et arabe*, pp. 383-410.)

Avempace.

The same theme was developed by Ibn.-Ṭufail (*q.v.*) in his philosophical romance, called *Hayy ibn-Yakdhān* (the Living, Son of the Waking One), best known by Pococke's Latin version, as the *Philosophus Autodidactus*. It describes the process by which an isolated truth-seeker detaches himself from his lower passions, and raises himself above the material earth and the orbs of heaven to the forms which are the source of their movement, until he arrives at a union with the supreme intellect. The experiences of the religious mystic are paralleled with the ecstatic vision in which the philosophical hermit sees a world of pure intelligences, where birth and decease are unknown. It was this theory which Averroes (1126–1198), the last and most famous of the thinkers of Moslem Spain, carried out to his doctrine of the unity of intellect.

For Aristotle the reverence of Averroes was unbounded, and to expound him was his chosen task. The uncritical receptivity of his age, the defects of the Arabic versions, the emphatic theism of his creed, and the rationalizing mysticism of some Oriental thought, may have sometimes led him astray, and given prominence to the less obvious features of Aristotelianism. But in his conception of the relation between philosophy and religion, Averroes had a light which the Latins were without. The science, falsely so called, of the several theological schools, their groundless distinctions and sophistical demonstrations, he regarded as the great source of heresy and scepticism. The allegorical interpretations and metaphysics which had been imported into religion had taken men's minds away from the plain sense of the Koran. God had declared a truth meet for all men, which needed no intellectual superiority to understand, in a tongue which each human soul could apprehend. Accordingly, the expositors of religious metaphysics, Ghazālī included, are the enemies of true religion, because they make it a mere matter of syllogism. Averroes maintains that a return must be made to the words and teaching of the prophet; that science must not expend itself in dogmatizing on the metaphysical consequences of fragments of doctrine for popular acceptance, but must proceed to reflect upon and examine the existing things of the world. Averroes, at the same time, condemns the attempts of those who tried to give demonstrative science where the mind was not capable of more than rhetoric: they harm religion by their mere negations, destroying an old sensuous creed, but cannot build up a higher and intellectual faith.

Averroes.

In this spirit Averroes does not allow the fancied needs of theological reasoning to interfere with his study of Aristotle, whom he simply interprets as a truth-seeker. The points by which he told on Europe were all implicit in Aristotle, but Averroes set in relief what the original had left obscure, and emphasized things which the Christian theologian passed by or misconceived. Thus Averroes had a double effect. He was the great interpreter of Aristotle to the later Schoolmen. On the other hand, he came to represent those aspects of Peripateticism most alien to the spirit of Christendom; and the deeply religious Moslem gave his name to the anti-sacerdotal party, to the materialists, sceptics and atheists, who defied or undermined the dominant beliefs of the church.

On three points Averroes, like other Moslem thinkers, came specially into relation, real or supposed, with the religious creed, viz. the creation of the world, the divine knowledge of particular things, and the future of the human soul.

The real grandeur of Averroes is seen in his resolute prosecution of the standpoint of science in matters of this world, and in his recognition that religion is not a branch of knowledge to be reduced to propositions and systems of dogma, but a personal and inward power, an individual truth which stands distinct from, but not contradictory to, the universalities of scientific law. In his science he followed the Greeks, and to the Schoolmen he and his compatriots rightly seemed philosophers of the ancient world. He maintained alike the claim of demonstrative science with its generalities for the few who could live in that ethereal world, and the claim of religion for all—the common life of each soul as an individual and personal consciousness. But theology, or the mixture of the two, he regarded as a source

of evil to both—fostering the vain belief in a hostility of philosophers to religion, and meanwhile corrupting religion by a pseudo-science.

The latent nominalism of Aristotle only came gradually to be emphasized through the prominence which Christianity gave to the individual life, and, apart from passing notices as in Abelard, first found clear enunciation in the school of Duns Scotus. The Arabians, on the contrary, emphasized the idealist aspect which had been adopted and promoted by the Neo-Platonist commentators. Hence, to Averroes the eternity of the world finds its true expression in the eternity of God. The ceaseless movement of growth and change, which presents matter in form after form as a continual search after a finality which in time and movement is not and cannot be reached, represents only the aspect the world shows to the physicist and to the senses. In the eye of reason the full fruition of this desired finality is already and always attained; the actualization, invisible to the senses, is achieved now and ever, and is thus beyond the element of time. This transcendent or abstract being *is* that which the world of nature is always *seeking*. He is thought or intellect, the actuality, of which movement is but the fragmentary attainment in successive instants of time. Such a mind is not in the theological sense a creator, yet the onward movement is not the same as what some modern thinkers seem to mean by development. For the perfect and absolute, the consummation of movement is not generated at any point in the process; it is an ideal end, which guides the operations of nature, and does not wait upon them for its achievement. God is the unchanging essence of the movement, and therefore its eternal cause.

A special application of this relation between the prior perfect, and the imperfect, which it influences, is found in the doctrine of the connexion of the abstract (transcendent) intellect with man. This transcendent mind is sometimes connected with the moon, according to the theory of Aristotle, who assigned an imperishable matter to the sphere beyond the sublunary, and in general looked upon the celestial orbs as living and intelligent. Such an intellect, named active or productive, as being the author of the development of reason in man, is the permanent, eternal thought, which is the truth of the cosmic and physical movement. It is in man that the physical or sensible passes most evidently into the metaphysical and rational. Humanity is the chosen vessel in which the light of the intellect is revealed; and so long as mankind lasts there must always be some individuals destined to receive this light. What seems from the material point of view to be the acquisition of learning, study and a moral life, is from the higher point of view the manifestation of the transcendent intellect in the individual. The preparation of the heart and faculties gives rise to a series of grades between the original predisposition and the full acquisition of actual intellect. These grades in the main resemble those given by Avicenna. But beyond these, Averroes claims as the highest bliss of the soul a union in this life with the actual intellect. The intellect, therefore, is one and continuous in all individuals, who differ only in the degree which their illumination has attained. Such was the Averroist doctrine of the unity of intellect—the eternal and universal nature of true intellectual life. By his interpreters it was transformed into a theory of one soul common to all mankind, and when thus corrupted conflicted not unreasonably with the doctrines of a future life, common to Islam and Christendom.

Averroes, rejected by his Moslem countrymen, found a hearing among the Jews, to whom Maimonides had shown the free paths of Greek speculation. In the cities of Languedoc and Provence, to which they had been driven by Spanish fanaticism, the Jews no longer used the learned Arabic, and translations of the works of Averroes became necessary. His writings became the text-book of Levi ben Gerson at Perpignan, and of Moses of Narbonne. Meanwhile, before 1250, Averroes became accessible to the Latin Schoolmen by means of versions, accredited by the names of Michael Scot and others. William of Auvergne is the first Schoolman who criticizes the doctrines of Averroes, not, however, by name. Albertus Magnus and St Thomas devote special treatises to an examination of the Averroist theory of the unity of intellect, which they labour to confute in order to establish the orthodoxy of Aristotle. But as early as Aegidius Romanus (1247–1316), Averroes had been stamped as the patron of indifference to theological dogmas, and credited with the emancipation which was equally due to wider experience and the lessons of the Crusades. There had never been an absence of protest against the hierarchical doctrine. Berengar of Tours (11th century) had struggled in that interest, and with Abelard, in the 12th century, the revolt against authority in belief grew loud. The dialogue between a Christian, a Jew and a philosopher suggested a comparative estimate of religions, and placed the natural religion of the moral law above all positive revelations. Nihilists and naturalists, who deified logic and science at the expense of faith, were not unknown at Paris in the days of John of Salisbury. In such a critical generation the words of Averroism found willing ears, and pupils who outran their teacher. Paris became the centre of a sceptical society, which the decrees of bishops and councils, and the enthusiasm of the orthodox doctors and knights-errant of Catholicism, were powerless to extinguish. At Oxford Averroes told more as the great commentator. In the days of Roger Bacon he had become an authority. Bacon, placing him beside Aristotle and Avicenna, recommends the study of Arabic as the only way of getting the knowledge which bad versions made almost hopeless. In Duns Scotus, Averroes and Aristotle are the unequalled masters of the science of proof; and he pronounces distinctly the separation between Catholic and philosophical truth, which became the watchword of Averroism. By the 14th century Averroism was the common leaven of philosophy; John Baconthorpe is the chief of Averroists, and Walter Burley has similar tendencies.

Opponents of Averroism.

Meanwhile Averroism had come to be regarded by the great Dominican school as the arch-enemy of the truth. When the emperor Frederick II. consulted a Moslem free-thinker on the mysteries of the faith, when the phrase or legend of the "Three Impostors" presented in its most offensive form the scientific survey of the three laws of Moses, Christ and Mahomet, and when the characteristic doctrines of Averroes were misunderstood, it soon followed that his name became the badge of the scoffer and the sceptic. What had begun with the subtle disputes of the universities of Paris, went on to the materialist teachers in the medical schools and the sceptical men of the world in the cities of northern Italy. The patricians of Venice and the lecturers of Padua made Averroism synonymous with doubt and criticism in theology, and with sarcasm against the hierarchy. Petrarch refuses to believe that any good thing can come out of Arabia, and speaks of Averroes as a mad dog barking against the church. In works of contemporary art Averroes is at one time the comrade of Mahomet and Antichrist; at another he lies with Arius and Sabellius, vanquished by the lance of St Thomas.

It was in the universities of north Italy that Averroism finally settled, and there for three centuries it continued as a stronghold of Scholasticism to resist the efforts of revived antiquity and of advancing science. Padua became the seat of Averroist Aristotelianism; and, when Padua was conquered by Venice in 1405, the printers of the republic spread abroad the teaching of the professors in the university. As early as 1300, at Padua, Petrus Aponensis, a notable expositor of medical theories, had betrayed a heterodoxy in faith; and John of Jandun, one of the pamphleteers on the side of Louis of Bavaria, was a keen follower of Averroes, whom he styles a "perfect and most glorious physicist." Urbanus of Bologna, Paul of Venice (d. 1428), and Cajetanus de Thienis (1387–1465), established by their lectures and their discussions the authority of Averroes; and a long list of manuscripts rests in the libraries of Lombardy to witness the diligence of these writers and their successors. Even a lady of Venice, Cassandra Fedele, in 1480, gained her laurels in defence of Averroist theses.

The school of Padua.

With Pietro Pomponazzi (*q.v.*) in 1495, a brilliant epoch began

for the school of Padua. Questions of permanent and present interest took the place of outworn scholastic problems. The disputants ranged themselves under the rival commentators, Alexander and Averroes; and the immortality of the soul became the battle-ground of the two parties. Pomponazzi defended the Alexandrist doctrine of the utter mortality of the soul, whilst Agostino Nifo (*q.v.*), the Averroist, was entrusted by Leo X. with the task of defending the Catholic doctrine. The parties seemed to have changed when Averroism thus took the side of the church; but the change was probably due to compulsion. Nifo had edited the works of Averroes (1495–1497); but his expressions gave offence to the dominant theologians, and he had to save himself by distinguishing his personal faith from his editorial capacity. Alessandro Achillini, the persistent philosophical adversary of Pomponazzi, both at Padua and subsequently at Bologna, attempted, along with other moderate but not brilliant Averroists, to accommodate their philosophical theory with the requirements of Catholicism. It was this comparatively mild Averroism, reduced to the merely explanatory activity of a commentator, which continued to be the official dogma at Padua during the 16th century. Its typical representative is Marc-Antonio Zimara (d. 1552), the author of a reconciliation between the tenets of Averroes and those of Aristotle.

Meanwhile, in 1497, Aristotle was for the first time expounded in Greek at Padua. Plato had long been the favourite study at Florence; and Humanists, like Erasmus, Ludovicus Vives and Nizolius, enamoured of the popular philosophy of Cicero and Quintilian, poured out the vials of their contempt on scholastic barbarism with its "impious and thrice-accursed Averroes." The editors of Averroes complain that the popular taste had forsaken them for the Greek. Nevertheless, while Fallopius, Vesalius and Galileo were claiming attention to their discoveries, G. Zabarella, Francesco Piccolomini (1520–1604) and Cesare Cremonini (1550–1631) continued the traditions of Averroism, not without changes and additions. Cremonini, the last of them, died in 1631, after lecturing twelve years at Ferrara, and forty at Padua. The great educational value of Arabian philosophy for the later schoolmen consisted in its making them acquainted with an entire Aristotle. At the moment when it seemed as if everything had been made that could be made out of the fragments of Aristotle, and the compilations of Capella, Cassiodorus and others, and when mysticism and scepticism seemed the only resources left for the mind, the horizon of knowledge was suddenly widened by the acquisition of a complete Aristotle. Thus the mistakes inevitable in the isolated study of an imperfect *Organon* could not henceforth be made. The real bearing of old questions, and the meaninglessness of many disputes, were seen in the new conception of Aristotelianism given by the *Metaphysics* and other treatises. The former Realism and Nominalism were lifted into a higher phase by the principle of the universalizing action of intellect—*Intellectus in formis agit universalitatem.* The commentaries of the Arabians in this respect supplied nutriment more readily assimilated by the pupils than the pure text would have been.

Summary.

Arabian philosophy, whilst it promoted the exegesis of Aristotle and increased his authority, was not less notable as the source of the separation between theology and philosophy. Speculation fell on irreligious paths. In many cases the heretical movement was due less to foreign example than to the indwelling tendencies of the dominant school of realism. But it is not less certain that the very considerable freedom of the Arabians from theological bias prepared the time when philosophy shook off its ecclesiastical vestments. In the hurry of first terror, the church struck Aristotle with the anathema launched against innovations in philosophy. The provincial council of Paris in 1209, which condemned Amalricus and his followers, as well as David of Dinant's works, forbade the study of Aristotle's *Natural Philosophy* and the *Commentaries*. In 1215 the same prohibition was repeated, specifying the *Metaphysics* and *Physics*, and the *Commentaries* by the Spaniard Mauritius (*i.e.* probably Averroes). Meanwhile Albertus Magnus and Thomas Aquinas, accepting the exegetical services of the Arabians, did their best to controvert the obnoxious doctrine of the Intellect, and to defend the orthodoxy of Aristotle against the unholy glosses of infidels. But it is doubtful whether even they kept as pure from the infection of illegitimate doctrine as they supposed. The tide meanwhile flowed in stronger and stronger. In 1270 Étienne Tempier, bishop of Paris, supported by an assembly of theologians, anathematized thirteen propositions bearing the stamp of Arabian authorship; but in 1277 the same views and others more directly offensive to Christians and theologians had to be censured again. Raymond Lully, in a dialogue with an infidel thinker, broke a lance in support of the orthodox doctrine, and carried on a crusade against the Arabians in every university; and a disciple of Thomas Aquinas drew up a list (*De erroribus philosophorum*) of the several delusions and errors of each of the thinkers from Kindi to Averroes. Strong in their conviction of the truth of Aristotelianism, the Arabians carried out their logical results in the theological field, and made the distinction of necessary and possible, of form and matter, the basis of conclusions in the most momentous questions. They refused to accept the doctrine of creation because it conflicted with the explanation of forms as the necessary evolution of matter. They denied the particular providence of God, because knowledge in the divine sphere did not descend to singulars. They excluded the Deity from all direct action upon the world, and substituted for a cosmic principle the active intellect,—thus holding a form of Pantheism. But all did not go the same length in their divergence from the popular creed.

The half-legendary accounts which attribute the introduction of Arabian science to Gerbert, afterwards Pope Sylvester II., to Constantinus Africanus and to Adelard of Bath, if they have any value, refer mainly to medical science and mathematics. It was not till about the middle of the 12th century that under the patronage of Raymond, archbishop of Toledo, a society of translators, with the archdeacon Dominicus Gundisalvi at their head, produced Latin versions of the *Commentaries* of Avicenna, and Ghazālī, of the *Fons Vitae* of Avicebron, and of several Aristotelian treatises. The working translators were converted Jews, the best-known among them being Joannes Avendeath. With this effort began the chief translating epoch for Arabic works. Avicenna's *Canon of Medicine* was first translated into Latin by Gerard of Cremona (d. 1187), to whom versions of other medical and astronomical works are due. The movement towards introducing Arabian science and philosophy into Europe, however, culminated under the patronage of the emperor Frederick II. (1212–1250). Partly from superiority to the narrowness of his age, and partly in the interest of his struggle with the Papacy, this *Malleus ecclesiae Romanae* drew to his court those savants whose pursuits were discouraged by the church, and especially students in the forbidden lore of the Arabians. He is said to have pensioned Jews for purposes of translation. One of the scholars to whom Frederick gave a welcome was Michael Scot, the first translator of Averroes. Scot had sojourned at Toledo about 1217, and had accomplished the versions of several astronomical and physical treatises, mainly, if we believe Roger Bacon, by the labours of a Jew named Andrew. But Bacon is apparently hypercritical in his estimate of the translators from the Arabic. Another protégé of Frederick's was Hermann the German (Alemannus), who, between the years 1243 and 1256, translated amongst other things a paraphrase of al-Fārābī on the *Rhetoric*, and of Averroes on the *Poetics* and *Ethics* of Aristotle. Jewish scholars held an honourable place in transmitting the Arabian commentators to the schoolmen. It was amongst them, especially in Maimonides, that Aristotelianism found refuge after the light of philosophy was extinguished in Islam; and the Jewish family of the Ben-Tibbon were mainly instrumental in making Averroes known to southern France.

See S. Munk, *Mélanges de philosophie juive et arabe* (Paris, 1859); E. Renan, *De Philosophia Peripatetica apud Syros* (1852), and *Averroës et l'Averroisme* (Paris, 3rd ed., 1867); Am. Jourdain, *Recherches critiques sur l'âge et l'origine des traductions latines d'Aristote* (Paris, 2me ed., 1843); B. Hauréau, *Philosophie scolastique*

(Paris, 1850), tome i. p. 359; E. Vacherot, *École d'Alexandrie* (1846–1851), tome iii. p. 85; Schmölders, *Documenta philosophiae Arabum* (Bonn, 1836), and *Essai sur les écoles philosophiques chez les Arabes* (Paris, 1842); Shahrastani, *History of Religious and Philosophical Sects*, in German translation by Haarbrücker (Halle, 1850–1851); Dieterici, *Streit zwischen Mensch und Thier* (Berlin, 1858), and his other translations of the *Encyclopaedia of the Brothers of Sincerity* (1861 to 1872); T. J. de Boer, *The History of Philosophy in Islam* (London, 1903); K. Prantl, *Geschichte der Logik* (Leipzig, 1861); and the Histories of Philosophy; also the literature under the biographies of philosophers mentioned. (W. W.; G. W. T.)

ARABIAN SEA (anc. *Mare Erythraeum*), the name applied to the portion of the Indian Ocean bounded E. by India, N. by Baluchistan and part of the southern Persian littoral, W. by Arabia, and S., approximately, by a line between Cape Guardafui, the north-east point of Somaliland, and Cape Comorin in India. It has two important branches—at the south-west the Gulf of Aden, connecting with the Red Sea through the strait of Bab-el-Mandeb; and at the north-west the Gulf of Oman, connecting with the Persian Gulf. Besides these larger ramifications, there are the Gulfs of Cambay and Kach on the Indian coast. An interest and importance belong to this sea as forming part of the chief highway between Europe and India. Its islands are few and insignificant, the chief being Sokotra, off the African, and the Laccadives, off the Indian coast.

ARABICI, a religious sect originating about the beginning of the 3rd century, which is mentioned by Augustine (*De Haeres.* c. lxxxiii.), and called also *θνητοψυχῖται* ("mortal-souled") by John of Damascus (*De Haeres.* c. xc.) The name is given to the Arabians mentioned by Eusebius (*Hist. Eccl.* vi. 37), whose distinctive doctrine was a form of Christian materialism, showing itself in the belief that the soul perished and was restored to life along with the body. We may compare Tatian's view of the soul as a subtler variety of matter. According to Eusebius, they were convinced of their error by Origen, and renounced it at a council held about A.D. 246.

ARABI PASHA (*c.* 1839–), more correctly AHMAD 'ARĀBĪ, to which in later years he added the epithet *al-Misrī*, "the Egyptian," Egyptian soldier and revolutionary leader, was born in Lower Egypt in 1839 or 1840 of a fellah family. Having entered the army as a conscript he was made an officer by Said Pasha in 1862, and was employed in the transport department in the Abyssinian campaign of 1875 under Ismail Pasha. A charge of peculation, unproved, was made against him in connexion with this expedition and he was placed on half-pay. During this time he joined a secret society formed by Ali Rubi with the object of getting rid of Turkish officers from the Egyptian army. Arabi also attended lectures at the mosque El Azhar and acquired a reputation as an orator. In 1878 he was employed by Ismail in fomenting a disturbance against the ministry of Nubar, Rivers Wilson and de Blignières, and received in payment a wife from Ismail's harem and the command of a regiment. This increased his influence with the secret society, which, under the feeble government of Tewfik Pasha and the Dual Control, began to agitate against Europeans. In all that followed Arabi was put forward as the leader of the discontented Egyptians; he was in reality little more than the mouthpiece and puppet of abler men such as Ali Rubi and Mahmud Sami. On the 1st of February 1881 Arabi and two other Egyptian colonels, summoned before a court-martial for acts of disobedience, were rescued by their soldiers, and the khedive was forced to dismiss his then minister of war in favour of Mahmud Sami. A military demonstration on the 8th of September 1881, led by Arabi, forced the khedive to increase the numbers and pay of the army, to substitute Sherif Pasha for Riaz Pasha as prime minister, and to convene an assembly of notables. Arabi became under-secretary for war at the beginning of 1882, but continued his intrigues. The assembly of notables claimed the right of voting the budget, and thus came into conflict with the foreign controllers who had been appointed to guard the interests of the bondholders in the management of the Egyptian finances. Sherif fell in February, Mahmud Sami became prime minister, and Arabi (created a pasha) minister of war. Arabi, after a brief fall from office, acquired a dictatorial power that alarmed the British government. British and French warships went to Alexandria at the beginning of June; on the 11th of that month rioting in that city led to the sacrifice of many European lives. Order could only be restored through the intervention of Arabi, who now adopted a more distinctly anti-European attitude. His arming of the forts at Alexandria was held to constitute a menace to the British fleet. On the refusal of France to co-operate, the British fleet bombarded the forts (11th July), and a British force, under Sir Garnet Wolseley, defeated Arabi on the 13th of September at Tel-el-Kebir. Arabi fled to Cairo where he surrendered, and was tried (3rd of December) for rebellion. In accordance with an understanding made with the British representative, Lord Dufferin, Arabi pleaded guilty, and sentence of death was immediately commuted to one of banishment for life to Ceylon. The same sentence was passed on Mahmud Sami and others. After Arabi's exile had lasted for nearly twenty years, however, the khedive Abbas II. exercised his prerogative of mercy, and in May 1901 Arabi was permitted to return to Egypt. Arabi, as has been said, was rather the figurehead than the inspirer of the movement of 1881–1882; and was probably more honest, as he was certainly less intelligent, than those whose tool, in a large measure, he was. The movement which he represented in the eye of Europe, whatever the motives of its leaders, "was in its essence a genuine revolt against misgovernment,"[1] and it was a dim recognition of this fact which led Arabi to style himself "the Egyptian."

See EGYPT: *History*; also the accounts of Arabi in *Khedives and Pashas*, by C. F. Moberly Bell (1884); and in Lord Cromer's *Modern Egypt* (1908).

ARABISTAN (formerly KHUZISTAN), a province of Persia, bounded on the S. by the Persian Gulf, on the W. by Turkish territory, on the N. by Luristan and on the E. by the Bakhtiari district and Fars. It has its modern name, signifying "land of the Arabs," from the Arabs who form the bulk of the population, and is subdivided into the districts of Muhamrah, Fellahiyeh (the old Dorak), Ram Hormuz (popularly known as Ramiz), Havizeh, Shushter and Dizful. It has a population of about 200,000 and pays a yearly revenue of about £30,000. The soil is very fertile, but since the dam over the Karun at Ahvaz was swept away and the numerous canals which diverted the waters of the river for irrigation became useless, a great part of the province is uncultivated, and most of the crops and produce depend for water on rainfall and wells. The climate is hot, and in the low-lying, swampy districts very unhealthy; the prevailing winds are north-west and south-east, the former hot and dry from the arid districts west of Mesopotamia, the latter bearing much moisture from the Persian Gulf and the Indian Ocean. The principal Arab tribes are the Kab (generally known as Chaab) and Beni Lam, the former mostly settled in towns and villages and by religion Shi'ites, the latter nomads and Sunnites. The staples of food are dates and fish in the south, elsewhere the produce of the herds and flocks and rice, wheat and barley. Other products are maize, cotton, silk and indigo, and the manufactures include carpets without pile, coarse woollens, cottons and silk nettings. Dyeing is extensively carried on in Dizful where most of the indigo is grown.

Khuzistan (meaning "the land of the Khuz") was a part of the Biblical Elam, the classical Susiana, and appears in the great inscription of Darius as Uvaja.

ARABS, the name given to that branch of the Semitic race which from the earliest historic times inhabited the south-western portion of the Arabian peninsula. The name, to-day the collective term for the overwhelming majority of the surviving Semitic peoples, was originally restricted to the nomad tribes who ranged the north of the peninsula east of Palestine and the Syro-Arabian desert. In this narrow sense "Arab" is used in the Assyrian inscriptions, in the Old Testament and in the Minaean inscriptions. Before the Christian era it had come to include all the inhabitants of the peninsula. This, it is suggested, may have been due to the fact that the "Arabs"

[1] Lord Cromer in *Egypt*, No. 1, 1905, p. 2.

were the chief people near the Greek and Roman colonies in Syria and Mesopotamia. Classical writers use the term both in its local and general sense. The Arabs to-day occupy, besides Arabia, a part of Mesopotamia, the western shores of the Red Sea, the eastern coast of the Persian Gulf and the north of Africa. The finest type of the race is found in south Arabia among the Ariba Arabs, among the mountaineers of Hadramut and Yemen and among the Bedouin tribes roaming over the interior of central and northern Arabia. The Arabs of the coasts and those of Mesopotamia are hybrids, showing Turkish, Negroid and Hamitic crossings. The people of Syria and Palestine are hybrids of Arab, Phoenician and Jewish descent. The theory that early Arab settlements were made on the east coast of Africa as far as Sofala south of the Zambezi, is without foundation; the earliest Arab settlement on the east coast of Africa that can be proved is Magadoxo (Mukdishu) in the 10th century, and the ruined cities of Mashonaland, once supposed to be the remains of Arab settlements, are now known to be of medieval African origin. On the East African coast-lands Arab influence is still considerable. Traces of the Arab type are met with in Asia Minor, the Caucasus, western Persia and India, while the influence of the Arab language and civilization is found in Europe (Malta and Spain), China and Central Asia.

The Arabs are at once the most ancient as they in many ways are the purest surviving type of the true Semite. Certainly the inhabitants of Yemen are not, and in historic times never were, pure Semites. Somali and other elements, generally described under the collective racial name of Hamitic, are clearly traceable; but the inland Arabs still present the nearest approach to the primitive Semitic type. The origin of the Arab race can only be a matter of conjecture. From the remotest historic times it has been divided into two branches, which from their geographical position it is simplest to call the North Arabians and the South Arabians. Arabic and Jewish tradition trace the descent of the latter from Joktan (Arabic *Kahtan*) son of Heber, of the former from Ishmael. The South Arabians—the older branch—were settled in the south-western part of the peninsula centuries before the uprise of the Ishmaelites. These latter include not only Ishmael's direct descendants through the twelve princes (Gen. xxv. 16), but the Edomites, Moabites, Ammonites, Midianites and other tribes. This ancient and undoubted division of the Arab race —roughly represented to-day by the universally adopted classification into Arabs proper and Bedouin Arabs (see Bedouins)—has caused much dispute among ethnologists. All authorities agree in declaring the race to be Semitic in the broadest ethnological signification of that term, but some thought they saw in this division of the race an indication of a dual origin. They asserted that the purer branch of the Arab family was represented by the sedentary Arabs who were of Hamitic (Biblical Cushite), *i.e.* African ancestry, and that the nomad Arabs were Arabs only by adoption, and were nearer akin to the true Semite as sons of Ishmael. Many arguments were adduced in support of this theory. (1) The unquestioned division in remote historic times of the Arab race, and the immemorial hostility between the two branches. (2) The concurrence of pre-Islamitic literature and records in representing the first settlement of the "pure" Arab as made in the extreme south-western part of the peninsula, near Aden. (3) The use of Himyar, "dusky" or "red" (suggesting African affinities), as the name sometimes for the ruling class, sometimes for the entire people. (4) The African affinities of the Himyaritic language. (5) The resemblance of the grammar of the Arabic now spoken by the "pure" Arabs, where it differs from that of the North, to the Abyssinian grammar. (6) The marked resemblance of the pre-Islamitic institutions of Yemen and its allied provinces—its monarchies, courts, armies and serfs—to the historical Africo-Egyptian type and even to modern Abyssinia. (7) The physique of the "pure" Arab, the shape and size of the head, the slenderness of the lower limbs, all suggesting an African rather than an Asiatic origin. (8) The habits of the people, viz. their sedentary rather than nomad occupations, their fondness for village life, for dancing, music and society, their cultivation of the soil, having more in common with African life than with that of the western Asiatic continent. (9) The extreme facility of marriage which exists in all classes of the southern Arabs with the African races, the fecundity of such unions and the slightness or even total absence of any caste feeling between the dusky "pure" Arab and the still darker African, pointing to a community of origin. And further arguments were found in the characteristics of the Bedouins, their pastoral and nomad tendencies; the peculiarities of their idiom allied to the Hebrew; their strong clan feeling, their continued resistance to anything like regal power or centralized organization.

Ethnology.

Such, briefly, were the more important arguments; but latterly ethnologists are inclined to agree that there is little really to be said for the African ancestry theory and that the Arab race had its beginning in the deserts of south Arabia, that in short the true Arabs are aborigines.

Mahommedans call the centuries before the Prophet's birth *waqt-el jahilīya*, "the time of ignorance," but the fact is that the Arab world has in some respects never since reached so high a level as it had in those days which it suits Moslems to paint in dreary colours. Writing was a fine art and poetry flourished. Eloquence was an accomplishment all strove to acquire, and each year there were assemblies, lasting sometimes a month, which were devoted to contests of skill among the orators and poets, to listen to whose friendly rivalry tribesmen journeyed long distances. Last, that surest index of a people's civilization —the treatment of women—contrasted very favourably with their position under the Koran. Women had rights and were respected. The veil and the harem system were unknown before Mahomet. According to Nöldeke the Nabataean inscriptions and coins show that women held a high social position in northern Arabia, owning large estates and trading independently. Polyandry and polygamy, it is true, were practised, but the right of divorce belonged to the woman as well as the man. Two kinds of marriage were celebrated. One was a purely personal contract, with no witnesses, the wife not leaving her home or passing under marital authority. The other was a formal marriage, the woman becoming subject to her husband by purchase or capture. Even captive women were not kept in slavery. Arabic wealth and culture had indeed thus early reached a stage which justified Professor Robertson Smith in writing, "In this period the name of Arab was associated to Western writers with ideas of effeminate indolence and peaceful opulence . . . the golden age of Yemen." But long before Mahomet's time this early Arab predominance was at an end, possibly due in great measure to the loss of the caravan trade through the increase of shipping. The abandonment of great cities and the ruin of many tribes contributed to the apparent nationalization of the Arab peoples. Though the traditional jealousy and hostility of the two branches, the Yemenites and Maadites or Ishmaelites, remained, the Arab world had attained by the levelling process of common misfortune the superficial unity it presents to-day. The nation thus formed, never a nation in the strict sense of the word, was distinctively and thoroughly Semitic in character and language, and has remained unchanged to the present day. The sporadic brilliancy of the ancient Arab kingdoms gave place to a social and political lethargy, the continuation of which for many centuries made the uprise of Saracenic empires seem a miracle to a world ignorant of the Arab past. The Arab race up to Mahomet's day had been in the main pagan. Monotheism, if it ever prevailed, early gave place to sun and star worship, or simple idolatry. Professor Robertson Smith suggests that totemism was the earliest form of Arabian idolatry, and that each tribe had its sacred animal. This he supports by the fact that some tribal names were derived from those of animals, and that animal-worship was not unknown in Arabia. What seems certain is that Arab religion was of a complex hybrid nature, not much to be wondered at when one remembers that Arabia was the asylum of many religious refugees, Zoroastrians, Jews,

Christians. In the later pre-Islamitic times spirits, or jinns, as they were called, of which each tribe or family had its own, were worshipped, and there was but a vague idea of a Supreme Being. Images of the jinns to the number of 360, one for each day of the lunar year, were collected in the temple at Mecca, the chief seat of their worship. That worship was of a sanguinary nature. Human sacrifice was fairly frequent. Under the guise of religion female infanticide was a common practice. At Mecca the great object of worship was a plain black stone, and to it pilgrimages were made from every part of Arabia. This stone was so sacred to the Arabs that even Mahomet dared not dispense with it, and it remains the central object of sanctity in the Ka'ba to-day. The temples of the Sabaeans and the Minaeans were built east of their cities, a fact suggesting sun-worship, yet this is not believed to have been the cult of the Minaeans. Common to both was the worship of Attar, the male Ashtoreth.

With the appearance of Mahomet the Arabs took anew a place in the world's history.

Physically the Arabs are one of the strongest and noblest races of the world. Baron de Larrey, surgeon-general to Napoleon on his expedition to Egypt and Syria, writes: "Their physical structure is in all respects more perfect than that of Europeans; their organs of sense exquisitely acute, their size above the average of men in general, their figure robust and elegant, their colour brown; their intelligence proportionate to their physical perfection and without doubt superior, other things being equal, to that of other nations." The typical Arab face is of an oval form, lean-featured; the eyes a brilliant black, deep-set under bushy eyebrows; nose aquiline, forehead straight but not high. In body the Arab is muscular and long-limbed, but lean. Deformed individuals or dwarfs are rare among Arabs; nor, except leprosy, which is common, does any disease seem to be hereditary among them. They often suffer from ophthalmia, though not in the virulent Egyptian form. They are scrupulously clean in their persons, and take special care of their teeth, which are generally white and even. Simple and abstemious in their habits, they often reach an extreme yet healthy old age; nor is it common among them for the faculties of the mind to give way sooner than those of the body. *Physique.*

Thus, physically, they yield to few races, if any, of mankind; mentally, they surpass most, and are only kept back in the march of progress by the remarkable defect of organizing power and incapacity for combined action. Lax and imperfect as are their forms of government, it is with impatience that even these are borne; of the four caliphs who alone reigned—if reign theirs could be called—in Arabia proper, three died a violent death; and of the Wahhābi princes, the most genuine representatives in later times of pure Arab rule, almost all have met the same fate. The Arab face, which is not unkindly, but never smiling, expresses that dignity and gravity which are typical of the race. While the Arab is always polite, good-natured, manly and brave, he is also revengeful, cruel, untruthful and superstitious. Of the Arab nature Burckhardt (other authorities, *e.g.* Barth and Rohlfs, are far less complimentary) wrote: "The Arab displays his manly character when he defends his guest at the peril of his own life, and submits to the reverses of fortune, to disappointment and distress, with the most patient resignation. He is distinguished from a Turk by the virtues of pity and gratitude. The Turk is cruel, the Arab of a more kind temper; he pities and supports the wretched, and never forgets the generosity shown to him even by an enemy." The Arab will lie and cheat and swear false oaths, but once his word is pledged he may be trusted to the last. There are some oaths such as *Wallah* (by Allah) which mean nothing, but such an oath as the threefold one with *wa*, *bi* and *ta* as particles of swearing the meanest thief will not break. In temper, or at least in the manifestation of it, the Arab is studiously calm; and he rarely so much as raises his voice in a dispute. But this outward tranquillity covers feelings alike keen and permanent; and the remembrance of a rash jest or injurious word, uttered years before, leads only too often to that blood-revenge which is a sacred duty everywhere in Arabia. *Character.*

There exist, however, marked tribal or almost semi-national diversities of character among the Arabs. Thus, the inhabitants of Hejaz are noted for courtesy and blamed for fickleness; those of Nejd are distinguished by their stern tenacity and dignity of deportment; the nations of Yemen are gentle and pliant, but revengeful; those of Hasa and Oman cheerful and fond of sport, though at the same time turbulent and unsteady. Anything approaching to a game is rare in Nejd, and in the Hejaz religion and the yearly occurrence of the pilgrim ceremonies almost exclude all public diversions; but in Yemen the well-known game of the "jerîd," or palm-stick, with dances and music is not rare. In Oman such amusements are still more frequent. Again in Yemen and Oman, coffee-houses, where people resort for conversation, and where public recitals, songs and other amusements are indulged in, stand open all day; while nothing of the sort is tolerated in Nejd. So too the ceremonies of circumcision or marriage are occasions of gaiety and pastime on the coast, but not in the central provinces.

An Arab town, or even village, except it be the merest hamlet, is invariably walled round; but seldom is a stronger material than dried earth used; the walls are occasionally flanked by towers of like construction. A dry ditch often surrounds the whole. The streets are irregular and seldom parallel. The Arab, indeed, lacks an eye for the straight. The Arab carpenter cannot form a right angle; an Arab servant cannot place a cloth square on a table. The Ka'ba at Mecca has none of its sides or angles equal. The houses are of one or two storeys, rarely of three, with flat mud roofs, little windows and no external ornament. If the town be large, the expansion of one or two streets becomes a market-place, where are ranged a few shops of eatables, drugs, coffee, cottons or other goods. Many of these shops are kept by women. The chief mosque is always near the market-place; so is also the governor's residence, which, except in size and in being more or less fortified Arab fashion, does not differ from a private house. Drainage is unthought of; but the extreme dryness of the air obviates the inconvenience and disease that under other skies could not fail to ensue, and which in the damper climates of the coast make themselves seriously felt. But the streets are roughly swept every day, each householder taking care of the roadway that lies before his own door. Whitewash and colour are occasionally used in Yemen, Hejaz and Oman; elsewhere a light ochre tint, the colour of the sun-dried bricks, predominates, and gives an Arab town the appearance at a distance of a large dust-heap in the centre of the bright green ring of gardens and palm-groves. Baked bricks are unknown in Arabia, and stone buildings are rare, especially in Nejd. Palm branches and the like, woven in wattles, form the dwellings of the poorer classes in the southern districts. Many Arab towns possess watch-towers, like huge round factory chimneys in appearance, built of sun-dried bricks, and varying in height from 50 to 100 ft. or even more. Indeed, two of these constructions at the town of Birkat-el-Mauj, in Oman, are said to be each of 170 ft. in height, and that of Nezwah, in the same province, is reckoned at 140; but these are of stone. *Manners and customs.*

The principal feature in the interior of an Arab house is the "kahwah" or coffee-room. It is a large apartment spread with mats, and sometimes furnished with carpets and a few cushions. At one end is a small furnace or fireplace for preparing coffee. In this room the men congregate; here guests are received, and even lodged; women rarely enter it, except at times when strangers are unlikely to be present. Some of these apartments are very spacious and supported by pillars; one wall is usually built transversely to the compass direction of the Ka'ba; it serves to facilitate the performance of prayer by those who may happen to be in the kahwah at the appointed times. The other rooms are ordinarily small.

The Arabs are proverbially hospitable. A stranger's arrival is often the occasion of an amicable dispute among the wealthier inhabitants as to who shall have the privilege of receiving him.

Arab cookery is of the simplest. Roughly-ground wheat cooked with butter; bread in thin cakes, prepared on a heated iron plate or against the walls of an open oven; a few vegetables, generally of the leguminous kinds; boiled mutton or camel's flesh, among the wealthy; dates and fruits—this is the *menu* of an ordinary meal. Rice is eaten by the rich and fish is common on the coasts. Tea, introduced only a few decades back, is now largely drunk. A food of which the Arabs are fond is locusts boiled in salt and water and then dried in the sun. They taste like stale shrimps, but there is a great sale for them. Spices are freely employed; butter much too largely for a European taste.

After eating, the hands are always washed, soap or the ashes of an alkaline plant being used. A covered censer with burning incense is then passed round, and each guest perfumes his hands, face, and sometimes his clothes; this censer serves also on first receptions and whenever special honour is intended. In Yemen and Oman scented water often does duty for it. Coffee, without milk or sugar, but flavoured with an aromatic seed brought from India, is served to all. This, too, is done on the occasion of a first welcome, when the cups often make two or three successive rounds; but, in fact, coffee is made and drunk at any time, as frequently as the desire for it may suggest itself; and each time fresh grains are sifted, roasted, pounded and boiled—a very laborious process, and one that requires in the better sort of establishments a special servant or slave for the work. Arabs generally make but one solid meal a day—that of supper, soon after sunset. Even then they do not eat much, gluttony being rare among them, and even daintiness esteemed disgraceful. Wine, like other fermented drinks, is prohibited by the Koran, and is, in fact, very rarely taken, though the inhabitants of the mountains of Oman are said to indulge in it. On the coast spirits of the worst quality are sometimes procured; opium and hashish are sparingly indulged in. On the other hand, wherever Wahhābiism has left freedom of action, tobacco-smoking prevails; short pipes of clay, long pipes with large open bowls, or most frequently the water-pipe or "narghileh," being used. The tobacco smoked is generally strong and is either brought from the neighbourhood of Bagdad or grown in the country itself. The strongest quality is that of Oman; the leaf is broad and coarse, and retains its green colour even when dried; a few whiffs have been known to produce absolute stupor. The aversion of the Wahhābis to tobacco is well known; they entitle it "mukhzi" or "the shameful," and its use is punished with blows, as the public use of wine would be elsewhere.

In dress much variety prevails. The loose cotton drawers girded at the waist, which in hot climates do duty for trousers, are not often worn, even by the upper classes, in Nejd or Yemama, where a kind of silk dressing-gown is thrown over the long shirt; frequently, too, a brown or black cloak distinguishes the wealthier citizen; his head-dress is a handkerchief fastened round the head by a band. But in Hejaz, Yemen and Oman, turbans are by no means uncommon; the ordinary colour is white; they are worn over one or more skull-caps. Trousers also form part of the dress in the two former of these districts; and a voluminous sash, in which a dagger or an inkstand is stuck, is wrapped round the waist. The poorer folk, however, and the villagers often content themselves with a broad piece of cloth round the loins, and another across the shoulders. In Oman trousers are rare, but over the shirt a long gown, of peculiar and somewhat close-fitting cut, dyed yellow, is often worn. The women in these provinces commonly put on loose drawers and some add veils to their head-dresses; they are over-fond of ornaments (gold and silver); their hair is generally arranged in a long plait hanging down behind. All men allow their beards and moustaches full growth, though this is usually scanty. Most Arabs shave their heads, and indeed all, strictly speaking, ought by Mahommedan custom to do so. An Arab seldom or never dyes his hair. Sandals are worn more often than shoes; none but the very poorest go barefoot.

Dress.

Slavery is still, as of old times, a recognized institution throughout Arabia; and an illicit traffic in blacks is carried on along the coasts of the Persian Gulf and the Red Sea. The slaves themselves were obtained chiefly from the east African coast districts down as far as Zanzibar, but this source of supply was practically closed by the end of the 19th century. Slaves are usually employed in Arabia as herdsmen or as domestic servants, rarely in agricultural work; they also form a considerable portion of the bodyguards with which Eastern greatness loves to surround itself. Like their countrymen elsewhere, they readily embrace the religion of their masters and become zealous Mahommedans. Arab custom enfranchises a slave who has accepted Islam at the end of seven years of bondage, and when that period has arrived, the master, instead of exacting from his slave the price of freedom, generally, on giving him his liberty, adds the requisite means for supporting himself and a family in comfort. Further, on every important occasion, such as a birth, circumcision, a marriage or a death, one or more of the household slaves are sure of acquiring their freedom. Hence Arabia has a considerable free black population; and these again, by inter-marriage with the whites around, have filled the land with a mulatto breed of every shade, till, in the eastern and southern provinces especially, a white skin is almost an exception. In Arabia no prejudice exists against negro alliances; no social or political line separates the African from the Arab. A negro may become a sheik, a kadi, an amir, or whatever his industry and his talents may render him capable of being. This is particularly so in Nejd, Yemen and Hadramut; in the Hejaz and the north a faint line of demarcation may be observed between the races.

Slavery.

The Arabs are good soldiers but poor generals. Personal courage, wonderful endurance of privation, fixity of purpose, and a contempt of death are qualities common to almost every race, tribe and clan that compose the Arab nation. In skirmishing and harassing they have few equals, while at close quarters they have often shown themselves capable of maintaining, armed with swords and spears alone, a desperate struggle against guns and bayonets, neither giving nor receiving quarter. Nor are they wholly ignorant of tactics, their armies, when engaged in regular war, being divided into centre and wings, with skirmishers in front and a reserve behind, often screened at the outset of the engagement by the camels of the expedition. These animals, kneeling and ranged in long parallel rows, form a sort of entrenchment, from behind which the soldiers of the main body fire their matchlocks, while the front divisions, opening out, act on either flank of the enemy. This arrangement of troops may be traced in Arab records as far back as the 5th century, and was often exemplified during the Wahhābi wars.

Military qualities.

Arab women are scarcely less distinguished for their bravery than the men. Records of armed heroines occur frequently in the chronicles or myths of the pre-Islamitic time; and in authentic history the Battle of the Camel, 656 A.D., where Ayesha, the wife of Mahomet, headed the charge, is only the first of a number of instances in which Arab amazons have taken, sword in hand, no inconsiderable share in the wars and victories of Islam. Even now it is the custom for an Arab force to be always accompanied by some courageous maiden, who, mounted on a blackened camel, leads the onslaught, singing verses of encouragement for her own, of insult for the opposing tribe. Round her litter the fiercest of the battle rages, and her capture or death is the signal of utter rout; it is hers also to head the triumph after the victory of her clan.

There is little education, in the European sense of the word, in Arabia. Among the Bedouins there are no schools, and few, even of the most elementary character, in the towns or villages. Where they exist, little beyond the mechanical reading of the Koran, and the equally mechanical learning of it by rote, is taught. On the other hand, Arab male-children, brought up from early years among the grown-up men of the house or tent, learn more from their own parents and at home than is common in other countries; reading and writing are in most instances thus acquired, or rather

Education.

transmitted; besides such general principles of grammar and eloquence, often of poetry and history, as the elders themselves may be able to impart. To this family schooling too are due the good manners, politeness, and self-restraint that early distinguish Arab children. In the very few instances where a public school of a higher class exists, writing, grammar and rhetoric sum up its teachings. Law and theology, in the narrow sense that both these words have in the Islamitic system, are explained in afternoon lectures given in most mosques; and some verses of the Koran, with one of the accepted commentaries, that of Baidāwī for example, form the basis of the instruction. Great attention is paid to accuracy of grammar and purity of diction throughout Arabia; yet something of a dialectic difference may be observed in the various districts. The purest Arabic, that which is as nearly as possible identical in the choice of words and in its inflections with the language of the Koran, is spoken in Nejd, and the best again of that in the province of Sudēr. Next in purity comes the Arabic of Shammar. Throughout the Hejaz in general, the language, though extremely elegant, is not equally correct; in el-Hasa, Bahrein and Oman it is decidedly influenced by the foreign element called Nabataean. In Yemen, as in other southern districts of the peninsula, Arabic merges insensibly into the Himyaritic or African dialect of Hadramut and Mahra. (See SEMITIC LANGUAGES.)

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ARACAJÚ, a city and seaport of Brazil, capital of the state of Sergipe, 170 m. N.N.E. of Bahia, on the river Cotinguiba, or Cotindiba, 6 m. from the coast. The municipality, of which it forms a part, had a population in 1890 of 16,336, about two-thirds of whom lived in the city itself. Aracajú is a badly built town on the right bank of the river at the base of a ridge of low sand-hills and has the usual features of an unprogressive provincial capital. Good limestone is quarried in its vicinity, and the country tributary to this port produces large quantities of sugar. Cotton is also grown, and the back country sends down hides and skins for shipment. The anchorage is good, but a dangerous bar at the mouth of the river prevents the entrance of vessels drawing more than 12 ft. The port is visited, therefore, only by the smaller steamers of the coastwise lines. The river is navigable as far as the town of Maroim, about 10 m. beyond Aracajú. The city was founded in 1855.

ARACATY, or ARACATÍ, a city and port of Brazil, in the state of Ceará, 75 m. S.E. of Fortaleza, on the river Jaguaribe, 8 m. from the sea. Pop. of the municipality (1890) 20,182, of whom about 12,000 belonged to the city. A dangerous bar at the mouth of the river permits the entrance only of the smaller coasting steamers, but the port is an important commercial centre, and exports considerable quantities of cotton, hides, maniçoba, rubber, fruit, and palm wax.

ARACHNE, in Greek mythology, the daughter of Idmon of Colophon in Lydia, a dyer in purple. She had acquired such skill in the art of weaving that she ventured to challenge Athena. While the goddess took as subjects her quarrel with Poseidon as to the naming and possession of Attica, and the warning examples of those who ventured to pit themselves against the immortals, Arachne depicted the metamorphoses of the gods and their amorous adventures. Her work was so perfect that Athena, enraged at being unable to find any blemish in it, tore it to pieces. Arachne hanged herself in despair; but the goddess out of pity loosened the rope, which became a cobweb, while Arachne herself was changed into a spider (Ovid, *Metam.* vi. 5-145). The story probably indicates the superiority of Asia over Greece in the textile arts.

ARACHNIDA, the zoological name given in 1815 by Lamarck (Gr. ἀράχνη, a spider) to a class which he instituted for the reception of the spiders, scorpions and mites, previously classified by Linnaeus in the order Aptera of his great group Insecta. Lamarck at the same time founded the class Crustacea for the lobsters, crabs and water-fleas, also until then included in the order Aptera of Linnaeus. Lamarck included the Thysanura and the Myriapoda in his class Arachnida. The Insecta of Linnaeus was a group exactly equivalent to the Arthropoda founded a hundred years later by Siebold and Stannius. It was thus reduced by Lamarck in area, and made to comprise only the six-legged, wing-bearing "Insécta." For these Lamarck proposed the name Hexapoda; but that name has been little used, and they have retained to this day the title of the much larger Linnaean group, viz. Insecta. The position of the Arachnida in the great sub-phylum Arthropoda, according to recent anatomical and embryological researches, is explained in the article ARTHROPODA. The Arachnida form a distinct class or line of descent in the grade Euarthropoda, diverging (perhaps in common at the start with the Crustacea) from primitive Euarthropods, which gave rise also to the separate lines of descent known as the classes Diplopoda, Crustacea, Chilopoda and Hexapoda.

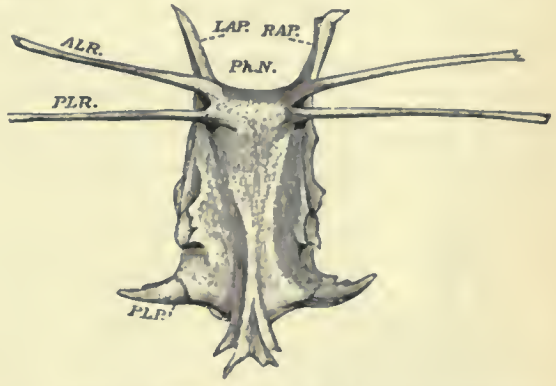


FIG. 1.—Entosternum, entosternite or plastron of *Limulus polyphemus*, Latr. Dorsal surface.

LAP, Left anterior process.
RAP, Right anterior process.
PhN, Pharyngeal notch.
ALR, Anterior lateral rod or tendon.
PLR, Posterior lateral rod or tendon.
PLP, Posterior lateral process.
Natural size.

(From Lankester, *Q. J. Mic. Sci.*, N.S. vol. xxiv., 1884.)

Limulus an Arachnid.—Modern views as to the classification and affinities of the Arachnida have been determined by the demonstration that *Limulus* and the extinct Eurypterines (*Pterygotus*, &c.) are Arachnida; that is to say, are identical in the structure and relation of so many important parts with *Scorpio*, whilst differing in those respects from other Arthropoda, that it is impossible to suppose that the identity is due to homoplasy or convergence, and the conclusion must be accepted that the resemblances arise from close genetic relationship. The view that Limulus, the king-crab, is an Arachnid was maintained as long ago as 1829 by Strauss-Dürckheim (1), on the ground of its possession of an internal cartilaginous sternum—also possessed by the Arachnida (see figs. 1, 2, 3, 4, 5 and 6)—and of the similarity of the disposition of the six leg-like appendages around the mouth in the two cases (see figs. 45 and 63). The evidence of the exact equivalence of the segmentation and appendages of Limulus and Scorpio, and of a number of remarkable points of agreement in structure, was furnished by Ray Lankester in an article published in 1881 ("Limulus an Arachnid," *Quart. Journ. Micr. Sci.* vol. xxi. N.S.), and in a series of subsequent memoirs, in which the structure of the entosternum, of the coxal glands, of the eyes, of the veno-pericardiac muscles, of the

respiratory lamellae, and of other parts, was for the first time described, and in which the new facts discovered were shown uniformly to support the hypothesis that Limulus is an Arachnid. A list of these memoirs is given at the close of this article (**2, 3, 4, 5** and **13**). The Eurypterines (Gigantostraca) were included in the identification, although at that time they were supposed

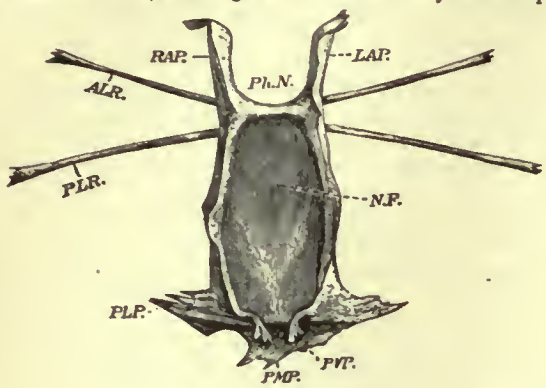


FIG. 2.—Ventral surface of the entosternum of *Limulus polyphemus*, Latr. Letters as in fig. 1 with the addition of NF, neural fossa protecting the aggregated ganglia of the central nervous system; PVP, left posterior ventral process; PMP, posterior median process. Natural size.

(From Lankester.)

to possess only five pairs of anterior or prosomatic appendages. They have now been shown to possess six pairs (fig. 47), as do Limulus and Scorpio.

The various comparisons previously made between the structure of Limulus and the Eurypterines on the one hand, and that of a typical Arachnid, such as Scorpio, on the other, had been vitiated by erroneous notions as to the origin of the nerves supplying the anterior appendages of Limulus (which were finally removed by Alphonse Milne-Edwards in his beautiful memoir (**6**) on the structure of that animal), and secondly by the erroneous identification of the double sternal plates of Limulus, called "chilaria," by Owen, with a pair of appendages (**7**). Once the identity of the chilaria with the pentagonal sternal plate of the scorpion is recognized—an identification first insisted on by Lankester—the whole series of segments and appendages in the two animals, Limulus and Scorpio, are seen to correspond most closely, segment for segment, with one another (see figs. 7 and 8). The structure of the prosomatic appendages or legs is also seen to present many significant points of agreement (see figures), but a curious discrepancy existed in the six-jointed structure of the limb in Limulus, which differed from the seven-jointed limb of Scorpio by the defect of one joint. R. I. Pocock of the British Museum has observed that in Limulus a marking exists on the fourth joint, which apparently indicates a previous

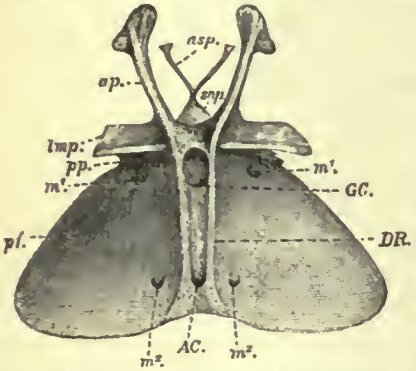


FIG. 3.—Entosternum of scorpion (*Palamnaeus indus*, de Geer); dorsal surface.
asp, Paired anterior process of the suboeural arch.
snp, Sub-neural arch.
ap, Anterior lateral process (same as RAP and LAP in fig. 1).
lmp, Lateral median process (same as ALR and PLR of fig. 1).
pp, Posterior process (same as PLP in fig. 1).
pf, Posterior flap or diaphragm of Newport.
m^1 and m^2, Perforations of the diaphragm for the passage of muscles.
DR, The paired dorsal ridges.
GC, Gastric canal or foramen.
AC, Arterial canal or foramen. Magnified five times linear.

(After Lankester, *loc. cit.*)

division of this segment into two, and thus establishes the agreement of Limulus and Scorpio in this small feature of the number of segments in the legs (see fig. 11).

It is not desirable to occupy the limited space of this article by a full description of the limbs and segments of Limulus and Scorpio. The reader is referred to the complete series of figures here given, with their explanatory legends (figs. 12, 13, 14, 15). Certain matters, however, require comment and explanation to render the comparison intelligible. The tergites, or chitinized dorsal halves of the body rings, are fused to form a "prosomatic carapace," or carapace of the prosoma, in both Limulus and Scorpio (see figs. 7 and 8). This region corresponds in both cases to six somites, as indicated by the presence of six pairs of limbs. On the surface of the carapace there are in both animals a pair of central eyes with simple lens and a pair of lateral eye-tracts, which in Limulus consist of closely-aggregated simple eyes, forming a "compound" eye, whilst in Scorpio they present several separate small eyes. The microscopic structure of the central and the lateral eyes has been shown by Lankester and A. G. Bourne (**5**) to differ; but the lateral eyes of Scorpio were shown by them to be similar in structure to the lateral eyes of Limulus, and the central eyes of Scorpio to be identical in structure with the central eyes of Limulus (see below).

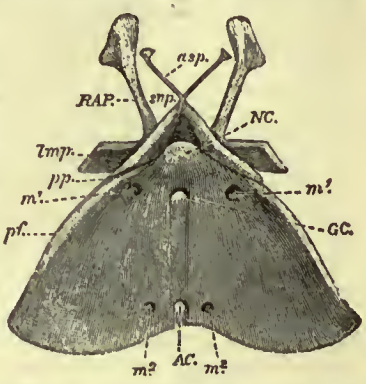


FIG. 4.—Ventral surface of the same entosternum as that drawn in fig. 3. Letters as in fig. 3 with the addition of NC, neural canal or foramen.

(After Lankester, *loc. cit.*)

Following the prosoma is a region consisting of six segments (figs. 14 and 15), each carrying a pair of plate-like appendages in both Limulus and Scorpio. This region is called the mesosoma. The tergites of this region and those of the following region, the metasoma, are fused to form a second or posterior carapace in Limulus, whilst remaining free in Scorpio. The first pair of foliaceous appendages in each animal is the genital operculum; beneath it are found the openings of the genital ducts. The second pair of mesosomatic appendages in Scorpio are known as the "pectens." Each consists of an axis, bearing numerous blunt tooth-like processes arranged in a series. This is represented in Limulus by the first gill-bearing appendage. The leaves (some 150 in number) of the gill-book (see figure) correspond to the tooth-like processes of the pectens of Scorpio. The next four pairs of appendages (completing the mesosomatic series of six) consist, in both Scorpio and Limulus, of a base carrying each 130 to 150 blood-holding, leaf-like plates, lying on one another like the leaves of a book.

FIG. 5.—Entosternum of one of the mygalomorphous spiders; ventral surface. Ph.N., pharyngeal notch. The posterior median process with its repetition of triangular segments closely resembles the same process in Limulus. Magnified five times linear.

(From Lankester, *loc. cit.*)

Their minute structure is closely similar in the two cases; the leaf-like plates receive blood from the great sternal sinus, and serve as respiratory organs. The difference between the gill-books of Limulus and the lung-books of Scorpio depends on the fact that the latter are adapted to aerial respiration, while the former serve for aquatic respiration. The appendage carrying the gill-book stands out on the surface of the body in Limulus, and has other portions developed besides the gill-book and its base; it is fused with its fellow of the opposite side On the other hand, in Scorpio, the gill-book-bearing appendage has sunk below the surface, forming a recess or chamber for itself, which communicates with the exterior by an oval or circular "stigma" (fig. 10, *stg*). That this in-sinking has taken place, and that the lung-books or in-sunken gill-books of Scorpio really represent appendages (that is to say, limbs or parapodia) is proved by their developmental history (see

FIG. 6.—Dorsal surface of the same entosternum as that drawn in fig. 5. Ph.N., pharyngeal notch.

(After Lankester, *loc. cit.*)

figs. 17 and 18). They appear at first as outstanding processes on the surface of the body.

The exact mode in which the in-sinking of superficial outstanding limbs, carrying gill-lamellae, has historically taken place has been a matter of much speculation. It was to be hoped that the specimen of the Silurian scorpion (*Palaeophonus*) from Scotland, showing the ventral surface of the mesosoma (fig. 49), would throw light on this matter; but the specimen recently carefully studied by the writer and Pocock reveals neither gill-bearing limbs nor stigmata. The probability appears to be against an actual introversion of the appendage and its lamellae, as was at one time suggested by Lankester. It is probable that such an in-sinking as is shown in the

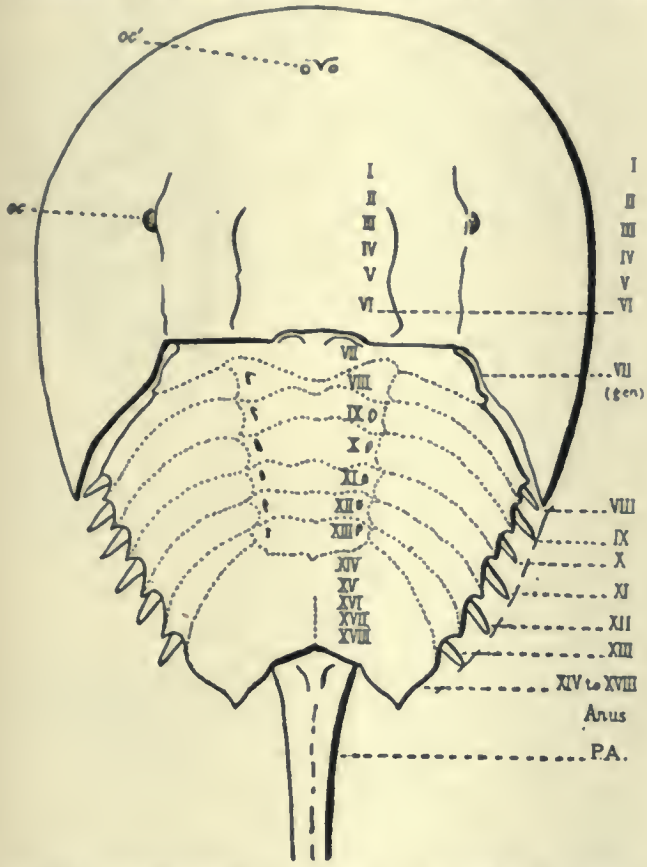


FIG. 7.—Diagram of the dorsal surface of *Limulus polyphemus*.

oc, Lateral compound eyes.
oc', Central monomeniscous eyes.
PA, Post-anal spine.
I to VI, The six appendage-bearing somites of the prosoma.
VII, Usually considered to be the tergum of the genital somite, but suggested by Pocock to be that of the otherwise suppressed praegenital somite.
VIII to XIII, The six somites of the mesosoma, each with a movable pleural spine and a pair of dorsal entopophysis or muscle-attaching ingrowths.
XIV to XVIII, The confluent or unexpressed six somites of the metasoma.

[According to the system of numbering explained in the text, if VII is the tergum of the praegenital somite (as is probable) it should be labelled *Prg* without any number, and the somites VIII to XIII should be lettered 1 to 6, indicating that they are the six normal somites of the mesosoma; whilst XV to XVIII should be replaced by the numbers 7 to 12—an additional suppressed segment (making up the typical six) being reckoned to the metasomatic fusion.]

(From Lankester, *Q. J. Micr. Sci.* vol. xxi., 1881.)

accompanying diagram has taken place (fig. 15); but we are yet in need of evidence as to the exact equivalence of margins, axis, &c., obtaining between the lung-book of Scorpio and the gill-book of Limulus. Zoologists are familiar with many instances (fishes, crustaceans) in which the protective walls of a water-breathing organ or gill-apparatus become converted into an air-breathing organ or lung, but there is no other case known of the conversion of gill processes themselves into air-breathing plates.

The identification of the lung-books of Scorpio with the gill-books of Limulus is practically settled by the existence of the pectens in Scorpio (fig. 14, VIII) on the second mesosomatic somite. There is no doubt that *these* are parapodial or limb appendages, carrying numerous imbricated secondary processes, and therefore comparable in essential structure to the leaf-bearing plates of the second mesosomatic somite of Limulus. They have remained unenclosed and projecting on the surface of the body, as once were the appendages of the four following somites. But they have lost their respiratory function. In non-aquatic life such an unprotected organ cannot subserve respiration. The "pectens" have become more firmly chitinized and probably somewhat altered in shape as compared with their condition in the aquatic ancestral scorpions. Their present function in scorpions is not ascertained. They are not specially sensitive under ordinary conditions, and may be touched or even pinched without causing any discomfort to the scorpion. It is probable that they acquire special sensibility at the breeding season and serve as "guides" in copulation. The shape of the legs and the absence of paired terminal claws in the Silurian *Palaeophonus* (see figs. 48 and 49) as compared with living scorpions (see fig. 10) show that the early scorpions were aquatic, and we may hope some day in better-preserved specimens than the two as yet discovered, to find the respiratory organs of those creatures in the condition of projecting appendages serving aquatic respiration somewhat as in Limulus, though not necessarily repeating the exact form of the broad plates of Limulus.

It is important to note that the series of lamellae of the lung-book and the gill-book correspond *exactly* in structure, the narrow, flat blood-space in the lamellae being interrupted by pillar-like junctions of the two surfaces in both cases (see Lankester (4)), and the free surfaces of the adjacent lamellae being covered with a very delicate chitinous cuticle which is drawn out into delicate hairs and processes. The elongated axis which opens at the stigma in Scorpio and which can be cleared of soft, surrounding tissues and coagulated blood so as to present the appearance of a limb axis carrying the book-like leaves of the lung is not really, as it would seem to be at first sight, the limb axis. That is necessarily a blood-holding structure and is obliterated and fused with soft tissues of the sternal region so that the lamellae cannot be detached and presented as standing out from it. The apparent axis or basal support of the scorpion's lung-books shown in the figures, is a false or secondary axis and merely a part of the infolded surface which forms the air-chamber. The maceration of the soft parts of a scorpion preserved in weak spirit and the cleaning of the chitinized in-grown cuticle give rise to the false appearance of a limb axis carrying the lamellae. The margins of the lamellae of the scorpion's lung-book, which are *lowermost* in the figures (fig. 15) and appear to be free, are really those which are attached to the blood-holding axis. The true free ends are those nearest the stigma.

Passing on now from the mesosoma we come in Scorpio to the metasoma of six segments, the first of which is broad whilst the rest are cylindrical. The last is perforated by the anus and carries the post-anal spine or sting. The somites of the metasoma carry no parapodia. In Limulus the metasoma is practically suppressed. In the allied extinct Eurypterines it is well developed, and resembles that of Scorpio. In the embryo Limulus (fig. 42) the six somites of the mesosoma are not fused to form a carapace at an early stage, and they are followed by three separately marked metasomatic somites; the other three somites of the metasoma have disappeared in Limulus, but are represented by the unsegmented prae-anal region. It is probable that we have in the metasoma of Limulus a case of the disappearance of once clearly demarcated somites. It would be possible to suppose, on the other hand, that new somites are only beginning to make their appearance here. The balance of various considerations is against the latter hypothesis. Following the metasoma in Limulus, we have as in Scorpio the post-anal spine — in this case not a sting, but a powerful and important organ of locomotion, serving to turn the animal over when it has fallen upon its back. The nature of the post-anal spine has been strangely misinterpreted by some writers. Owen (7) maintained that it represented a number of coalesced somites, regardless of its post-anal position and mode of development. The agreement of the grouping of the somites, of the form of the parapodia (appendages, limbs) in each region, of the position of the genital aperture and operculum, of the position and character of the eyes, and of the powerful post-anal spines not seen in other Arthropods, is very convincing as to the affinity

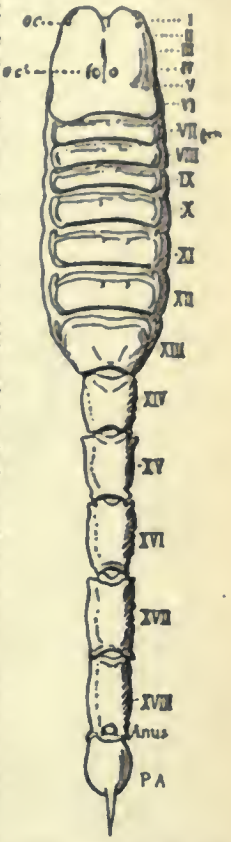


FIG. 8.—Diagram of the dorsal surface of a scorpion to compare with fig. 7. Letters and Roman numerals as in fig. 7, excepting that VII is here certainly the tergum of the first somite of the mesosoma—the genital somite—and is *not* a survival of the embryonic praegenital somite. The anus (not seen) is on the sternal surface.

(From Lankester, *loc. cit.*)

of Limulus and Scorpio. Perhaps the most important general agreement of Scorpio compared with Limulus and the Eurypterines is the division of the body into the three regions (or tagmata)—prosoma, mesosoma and metasoma—each consisting of six segments, the prosoma having leg-like appendages, the mesosoma having foliaceous appendages, and the metasoma being destitute of appendages.

In 1893, some years after the identification of the somites of Limulus with those of Scorpio, thus indicated, had been published, zoologists were startled by the discovery by a Japanese zoologist, Kishinouye (8), of a seventh prosomatic somite in the embryo of Limulus longispina. This was seen in longitudinal sections, as shown in fig. 19. The simple identification of somite with somite in Limulus and Scorpio seemed to be threatened by this discovery. But in 1896 Dr August Brauer of Marburg (9) discovered in the embryo of Scorpio a seventh prosomatic somite (see VII PrG, figs. 17 and 18), or, if we please so to term it, a *praegenital* somite, hitherto unrecognized. In the case of Scorpio this segment is indicated in the embryo by the presence of a pair of rudimentary appendages, carried by a well-marked somite. As in Limulus, so in Scorpio, this unexpected somite and its appendages disappear in the course of development. In fact, more or less complete "excalation" of the somite takes place. Owing to its position it is convenient to term the somite which is excalated in Limulus and Scorpio "the praegenital somite." It appears not improbable that the sternal plates wedged in between

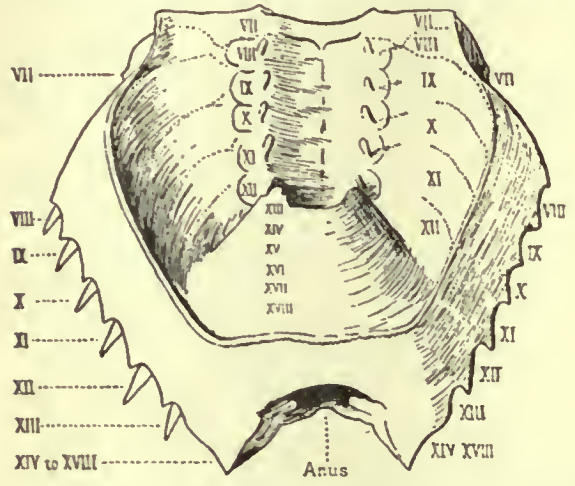


FIG. 9.— Ventral view of the posterior carapace or meso-metasomatic (opisthosomatic) fusion of *Limulus polyphemus*. The soft integument and limbs of the mesosoma have been removed as well as all the viscera and muscles, so that the inner surface of the terga of these somites with their entopophyses are seen. The unsegmented dense chitinous sternal plate of the metasoma (XIII to XVIII) is not removed. Letters as in fig. 7.

(After Lankester, *loc. cit.*)

the last pair of legs in both Scorpio and Limulus, viz. the pentagonal sternite of Scorpio (fig. 10) and the chilaria of Limulus (see figs. 13 and 20), may in part represent in the adult the sternum of the excalated praegenital somite. This has not been demonstrated by an actual following out of the development, but the position of these pieces and the fact that they are (in Limulus) supplied by an independent segmental nerve, favours the view that they may comprise the sternal area of the vanished praegenital somite. This interpretation, however, of the "metasternites" of Limulus and Scorpio is opposed by the coexistence in Thelyphonus (figs. 55, 57 and 58) of a similar metasternite with a complete praegenital somite. H. J. Hansen (10) has recognized that the "praegenital somite" persists in a rudimentary condition, forming a "waist" to the series of somites in the Pedipalpi and Araneae. The present writer is of opinion that it will be found most convenient to treat this evanescent somite as something special, and not to attempt to reckon it to either the prosoma or the mesosoma. These will then remain as typically composed each of six appendage-bearing somites—the prosoma comprising in addition the ocular prosthomere.[1] When the praegenital somite or traces of it are present it should not be called "the seventh prosomatic" or the "first mesosomatic," but simply the "praegenital somite." The first segment of the mesosoma of Scorpio and Limulus thus remains the first segment, and can be identified as such throughout the Eu-arachnida, carrying as it always does the genital apertures. But it is necessary to remember, in the light of recent discoveries, that the sixth prosomatic pair of appendages is carried on the seventh somite of the whole series, there being two prosthomeres or somites in front of the mouth, the first carrying the eyes, the second the chelicerae; also that the first mesosomatic or genital somite is not the seventh or even the eighth of the whole series of somites which have been historically present, but is the ninth, owing to the presence or to the excalation of a praegenital somite. It seems that confusion and trouble will be best avoided by abstaining from the introduction of the non-evident somites, the ocular and the praegenital, into the numerical nomenclature of the component somites of the three great body regions. We shall, therefore, ignoring the ocular somite, speak of the first, second, third, fourth, fifth and sixth leg-bearing somites of the prosoma, and indicate the appendages by the Roman numerals, I, II, III, IV, V, VI, and whilst ignoring the praegenital somite we shall speak of the first, second, third, &c., somite of the mesosoma or opisthosoma (united mesosoma and metasoma) and indicate them by the Arabic numerals.

There are a number of other important points of structure besides those referring to the somites and appendages in which Limulus agrees with Scorpio or other Arachnida and differs from other Arthropoda. The chief of these are as follows:—

1. *The Composition of the Head* (that is to say, of the anterior part of the prosoma) *with especial Reference to the Region in Front of the Mouth.*—It appears (see ARTHROPODA) that there is embryological evidence of the existence of two somites in Arachnida which were originally post-oral, but have become prae-oral by adaptational shifting of the oral aperture. These forwardly-slipped somites are called "prosthomeres." The first of these has, in Arachnids as in other Arthropods, its pair of appendages represented by the eyes. The second has for its pair of appendages the small pair of limbs which in all living Arachnids is either chelate or retrovert (as in spiders), and is known as the chelicerae. It is possible, as maintained by some writers (Patten and others), that the lobes of the cerebral nervous mass in Arachnids indicate a larger number of prosthomeres as having fused in this region, but there is no *embryological* evidence at present which justifies us in assuming the existence in Arachnids of more than two prosthomeres. The position of the chelicerae of Limulus and of the ganglionic nerve-masses from which they receive their nerve-supply, is closely similar to that of the same structures in Scorpio. The cerebral mass is in Limulus more easily separated by dissection as a median lobe distinct from the laterally-placed ganglia of the cheliceral somite than is the case in Scorpio, but the relations are practically the same in the two forms. Formerly it was supposed that in Limulus both the chelicerae and the next following pair of appendages were prosthomerous, as in Crustacea, but the dissections of Alphonse Milne-Edwards (6) demonstrated

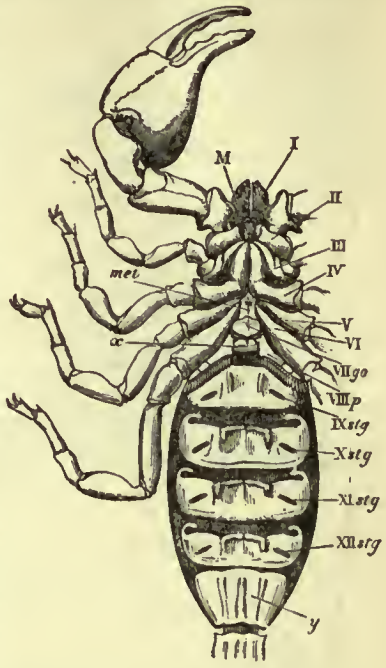


FIG. 10.—Ventral view of a scorpion. *Palamnaeus indus*, de Geer, to show the arrangement of the coxae of the limbs, the sternal elements, genital plate and pectens.

M, Mouth behind the oval median camerostome.
I, The chelicerae.
II, The chelae.
III to VI, the four pairs of walking legs.
VII*go*, The genital somite or first somite of the mesosoma with the genital operculum (a fused pair of limbs).
VIII*p*, The pectiniferous somite.
IX*stg* to XII*stg*, the four pulmonary somites.
met, The pentagonal metasternite of the prosoma behind all the coxae.
x, The sternum of the pectiniferous somite.
y, The broad first somite of the metasoma.

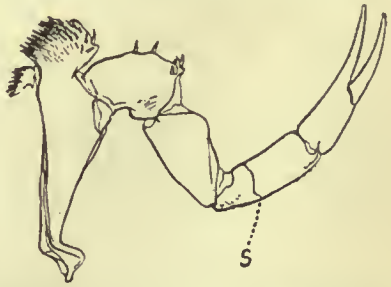


FIG. 11.—Third leg of *Limulus polyphemus*, showing the division of the fourth segment of the leg by a groove S into two, thus giving seven segments to the leg as in scorpion.

(From a drawing by Pocock.)

[1] See the article ARTHROPODA for the use of the term "prosthomere."

the true limitations of the cerebrum, whilst embryological researches have done as much for Scorpio. Limulus thus agrees with Scorpio and differs from the Crustacea, in which there are three prosthomeres—one ocular and two carrying palpiform appendages. It is true that in the lower Crustacea (Apus, &c.) we have evidence of the gradual movement forward of the nerve-ganglia belonging to these

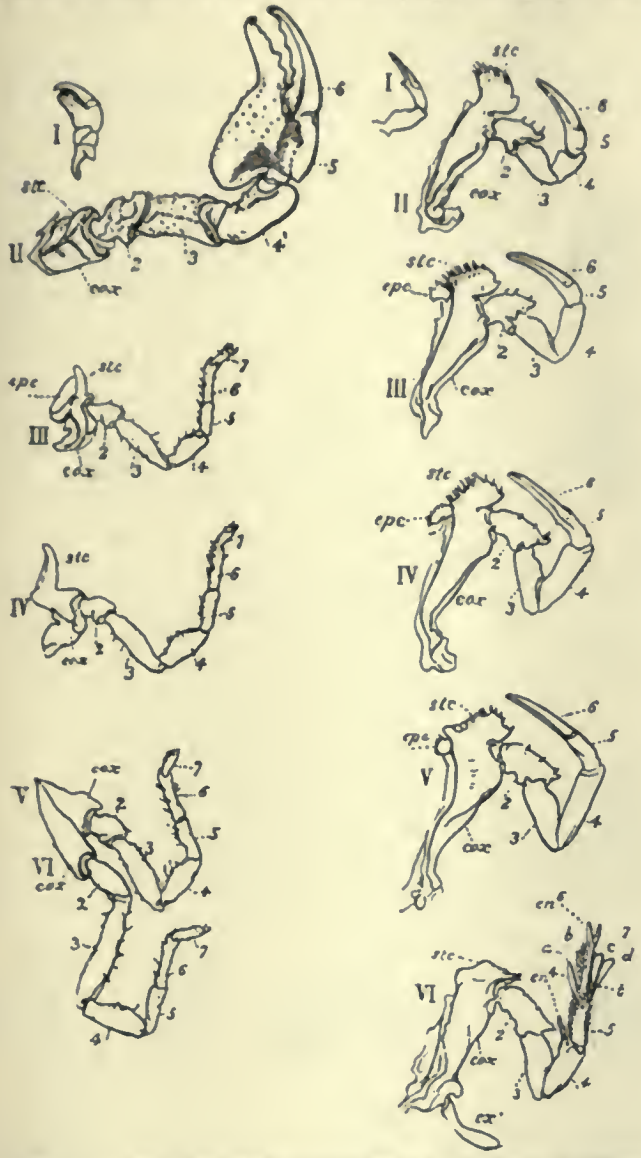


FIG. 12.—The prosomatic appendages of *Limulus polyphemus* (right) and Scorpio (left), *Palamnaeus indus* compared. The corresponding appendages are marked with the same Roman numeral. The Arabic numerals indicate the segments of the legs.

cox, Coxa or basal segment of the leg.
stc, The sterno-coxal process or jaw-like up-growth of the coxa.
epc, The articulated movable outgrowth of the coxa, called the epi-coxite (present only in III of the scorpion and III, IV and V of Limulus).
*ex*¹, The exopodite of the sixth limb of Limulus.
a, *b*, *c*, *d*, Movable processes on the same leg (see for some suggestions on the morphology of this leg, Pocock in *Quart. Journ. Micr. Sci.* March 1901; see also fig. 50 below and explanation).

(From Lankester, *loc. cit.*)

palpiform appendages. But although in such lower Crustacea the nerve-ganglia of the third prosthomere have not fused with the anterior nerve-mass, there is no question as to the prae-oral position of two appendage-bearing somites in addition to the ocular prosthomere. The Crustacea have, in fact, three prosthomeres in the head and the Arachnida only two, and Limulus agrees with the Arachnida in this respect and differs from the Crustacea. The central nervous systems of Limulus and of Scorpio present closer agreement in structure than can be found when a Crustacean is compared with either. The wide divarication of the lateral cords in the prosoma and their connexion by transverse commissures, together with the "attraction" of ganglia to the prosomatic ganglion group which properly belong to hinder segments, are very nearly identical in the two animals. The form and disposition of the ganglion cells are also peculiar and closely similar in the two. (See Patten (42) for important observations on the neuromeres, &c., of Limulus and Scorpio.)

2. *The Minute Structure of the Central Eyes and of the Lateral Eyes.*—Limulus agrees with Scorpio not only in having a pair of central eyes and also lateral eyes, but in the microscopic structure of those organs, which differs in the central and lateral eyes respectively. The central eyes are "simple eyes," that is to say, have a single lens, and are hence called "monomeniscous." The lateral eyes are in Limulus "compound eyes," that is to say, consist of many lenses placed close together; beneath each lens is a complex of protoplasmic cells, in which the optic nerve terminates. Each such unit is termed an "ommatidium." The lateral eyes of Scorpio consist of groups of separate small lenses each with its ommatidium, but they do not form a continuous compound eye as in Limulus. The ommatidium (soft structure beneath the lens-unit of a compound eye) is very simple in both Scorpio and Limulus. It consists of a single layer of cells, continuous with those which secrete the general chitinous covering of the prosoma. The cells of the ommatidium are a good deal larger than the neighbouring common cells of the epidermis. They secrete the knob-like lens (fig. 22). But they also receive the nerve fibres of the optic nerve. They are at the same time both optic nerve-end cells, that is to say, retina cells, and corneagen cells or secretors of the chitinous lens-like cornea. In Limulus (fig. 23) each ommatidium has a peculiar ganglion cell developed in a central position, whilst the ommatidium of the lateral eyelets of Scorpio shows small intermediate cells between the larger nerve-end cells. The structure of the lateral eye of Limulus was first described by Grenacher, and further and more accurately by Lankester and Bourne (5) and by Watase; that of Scorpio by Lankester and Bourne, who showed that the statements of von Graber were erroneous, and that the lateral eyes of Scorpio have a single cell-layered or "monostichous" ommatidium like that of Limulus. Watase has shown, in a very convincing way, how by deepening the pit-like set of cells beneath a simple lens the more complex ommatidia of the compound eyes of Crustacea and Hexapoda may be derived from such a condition as that presented in the lateral eyes of Limulus and Scorpio. (For details the reader is referred to Watase (11) and to Lankester and Bourne (5).) The structure of the central eyes of Scorpio and spiders and also of Limulus differs essentially from that of the lateral eyes in having two layers of cells (hence called diplostichous) beneath the lens, separated from one another by a membrane (figs. 24 and 25). The upper layer is the corneagen and secretes the lens, the lower is the retinal layer. The mass of soft cell-structures beneath a large lens of a central eye is called an "ommatoeum." It shows in Scorpio and Limulus a tendency to segregate into minor groups or "ommatidia." It is found that in embryological growth the retinal layer of the central eyes forms as a separate pouch, which is pushed in laterally beneath the corneagen layer from the epidermic cell layer. Hence it is in origin double, and consists of a true retinal layer and a post-retinal layer (fig. 24, B), though these are not separated by a membrane. Accordingly the diplostichous ommatoeum or soft tissue of the Arachnid's central eye should strictly be called "triplostichous," since the deep layer is itself doubled or folded. The retinal cells of both the lateral and central eyes of Limulus and Scorpio produce cuticular structures on their sides; each such piece is a rhabdomere and a number (five or ten) uniting form a rhabdom (fig. 26). In the specialized ommatidia of the compound eyes of Crustacea and Hexapods the rhabdom is an important structure.[1] It is a very significant fact that the lateral and central eyes of Limulus and Scorpio not only agree each with each in regard to their monostichous and diplostichous structure, but also in the formation in both classes of eyes of rhabdomeres and rhabdoms in which the component pieces are five or a multiple of five (fig. 26). Whilst each unit of the lateral eye of Limulus has a rhabdom of ten[2] pieces

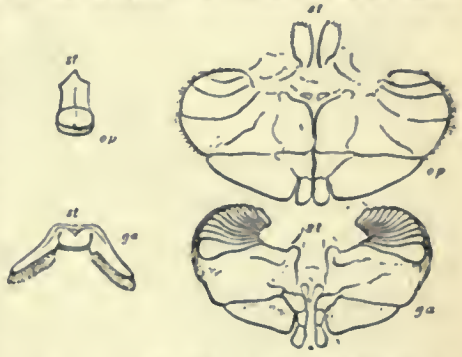


FIG. 13.—Diagrams of the meta-sternite *st*, with genital operculum *op*, and the first lamelligerous pair of appendages *ga*, with uniting sternal element *st* of Scorpio (left) and Limulus (right).

(From Lankester, *loc. cit.*)

[1] See fig. 12 in the article ARTHROPODA.

[2] Though ten is the prevailing number of retinula cells and rhabdomeres in the lateral eye of Limulus, Watase states that they may be as few as nine and as many as eighteen.

forming a star-like chitinous centre in section, each lateral eye of Scorpio has several rhabdoms of five or less rhabdomeres, indicating that the Limulus lateral eye-unit is more specialized than the detached lateral eyelet of Scorpio, so as to present a coincidence of one lens with one rhabdom. Numerous rhabdomeres (grouped as rhabdoms in Limulus) are found in the retinal layer of the central eyes also.

Whilst Limulus agrees thus closely with Scorpio in regard to eyes, it is to be noted that no Crustacean has structures corresponding to the peculiar diplostichous central eyes, though these occur again (with differences in detail) in Hexapoda. Possibly, however, an investigation of the development of the median eyes of some Crustacea (Apus, Palaemon) may prove them to be diplostichous in origin.

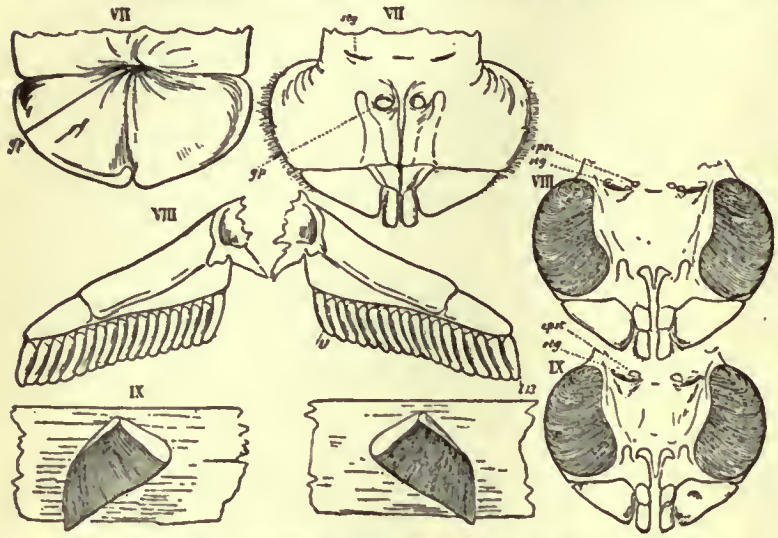


FIG. 14.—The first three pairs of mesosomatic appendages of Scorpio and Limulus compared.

VII, The genital operculum.
VIII, The pectens of Scorpio and the first branchial plate of Limulus.
IX, The first pair of lung-books of Scorpio and the second branchial plate of Limulus.
gp, Genital pore.
epst, Epistigmatic sclerite.
stg, Stigma or orifice of the hollow tendons of the branchial plates of Limulus.

(After Lankester, *loc. cit.*)

3. *The so-called "Coxal Glands."*—In 1882 (*Proc. Roy. Soc.* No. 221) Lankester described under the name "coxal glands" a pair of brilliantly white oviform bodies lying in the Scorpion's prosoma immediately above the coxae of the fifth and sixth pairs of legs (fig. 27). These bodies had been erroneously supposed by Newport (12) and other observers to be glandular outgrowths of the alimentary canal. They are really excretory glands, and communicate with the exterior by a very minute aperture on the posterior face of the coxa of the fifth limb on each side. When examined with the microscope, by means of the usual section method, they are seen to consist of a labyrinthine tube lined with peculiar cells, each cell having a deep vertically striated border on the surface farthest from the lumen, as is seen in the cells of some renal organs. The coils and branches of the tube are packed by connective tissue and blood spaces. A similar pair of coxal glands, lobate instead of ovoid in shape, was described by Lankester in Mygale, and it was also shown by him that the structures in Limulus called "brick-red glands" by Packard have the same structure and position as the coxal glands of Scorpio and Mygale. In Limulus these organs consist each of four horizontal lobes lying on the coxal margin of the second, third, fourth, and fifth prosomatic limbs, the four lobes being connected to one another by a transverse piece or stem (fig. 28). Microscopically their structure is the same in essentials as that of the coxal glands of Scorpio (13). Coxal glands have since been recognized and described in other Arachnida. In 1900 it was shown that the coxal gland of Limulus is provided with a very delicate thin-walled coiled duct which opens, even in the adult condition, by a minute pore on the coxa of the fifth leg (Patten and Hazen, 13A). Previously to this, Lankester's pupil Gulland had shown (1885) that in the embryo the coxal gland is a comparatively simple tube, which opens to the exterior in this position and by its other extremity into a coelomic space. Similar observations were made by Laurie (17) in Lankester's laboratory (1890) with regard to the early condition of the coxal gland of Scorpio, and by Bertkau (41) as to that of the spider Atypus. H. M. Bernard (13B) showed that the opening remains in the adult scorpion. In all the embryonic or permanent opening is on the coxa of the fifth pair of prosomatic limbs. Thus an organ newly discovered in Scorpio was found to have its counterpart in Limulus.

The name "coxal gland" needs to be carefully distinguished from "crural gland," with which it is apt to be confused. The crural glands, which occur in many terrestrial Arthropods, are epidermal in origin and totally distinct from the coxal glands. The coxal glands of the Arachnida are structures of the same nature as the green glands of the higher Crustacea and the so-called "shell glands" of the Entomostraca. The latter open at the base of the fifth pair of limbs of the Crustacean, just as the coxal glands open on the coxal joint of the fifth pair of limbs of the Arachnid. Both belong to the category of "coelomoducts," namely, tubular or funnel-like portions of the coelom opening to the exterior in pairs in each somite (potentially,) and usually persisting in only a few somites as either "urocoels" (renal organs) or "gonocoels" (genital tubes). In Peripatus they occur in every somite of the body. They have till recently been very generally identified with the nephridia of Chaetopod worms, but there is good reason for considering the true nephridia (typified by the nephridia of the earthworm) as a distinct class of organs (see Lankester in vol. ii. chap. iii. of *A Treatise on Zoology*, 1900). The genital ducts of Arthropoda are, like the green glands, shell glands and coxal glands, to be regarded as coelomoducts (gonocoels). The coxal glands do not establish any special connexion between Limulus and Scorpio, since thay also occur in the same somite in the lower Crustacea, but it is to be noted that the coxal glands of Limulus are in minute structure and probably in function more like those of Arachnids than those of Crustacea.

4. *The Entosternites and their Minute Structure.*—Strauss-Dürckheim (1) was the first to insist on the affinity between Limulus and the Arachnids, indicated by the presence of a free suspended entosternum or plastron or entosternite in both. We have figured here (figs. 1 to 6) the entosternites of Limulus, Scorpio and Mygale. Lankester some years ago made a special study of the histology (3) of these entosternites for the purpose of comparison, and also ascertained the relations of the very numerous muscles which are inserted into them (4). The entosternites are cartilaginous in texture, but they have neither the chemical character nor the microscopic structure of the hyaline cartilage of Vertebrates. They yield chitin in place of chondrin or gelatin—as does also the cartilage of the Cephalopod's endoskeleton. In microscopic structure they all present the closest agreement with one another. We find a firm, homogeneous or sparsely fibrillated matrix in which are embedded nucleated cells (corpuscles of protoplasm) arranged in rows of three, six or eight, parallel with the adjacent lines of fibrillation.

A minute entosternite having the above-described structure is found in the Crustacean Apus between the bases of the mandibles, and also in the Decapoda in a similar position, but in no Crustacean does it attain to any size or importance. On the other hand, the entosternite of the Arachnida is a very large and important feature

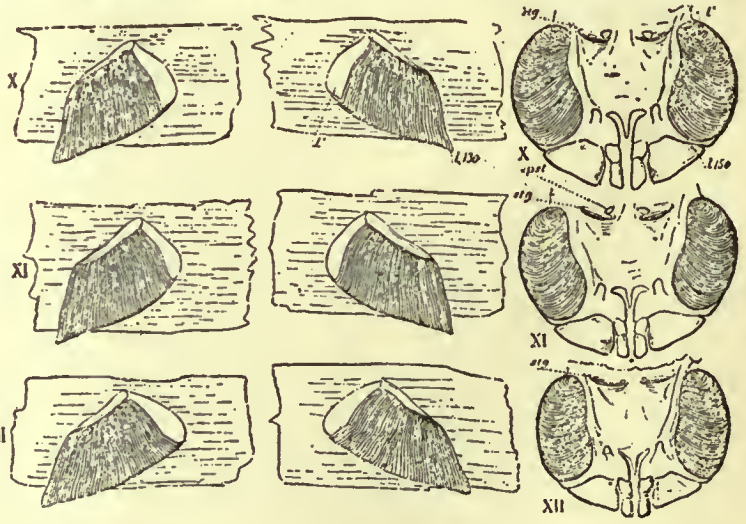


FIG. 15.—The remaining three pairs of mesosomatic appendages of Scorpio and Limulus. Letters as in fig. 14. *l*130 indicates that there are 130 lamellae in the scorpion's lung-book, whilst *l*150 indicates that 150 similar lamellae are counted in the gill of Limulus.

(After Lankester, *loc. cit.*)

in the structure of the prosoma, and must play an important part in the economy of these organisms. In Limulus (figs. 1 and 2) it has as many as twenty-five pairs of muscles attached to it, coming

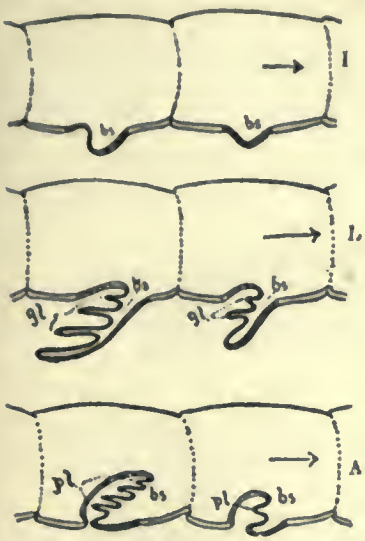


FIG. 16.—Diagram to show the way in which an outgrowing gill-process bearing blood-holding lamellae, may give rise, if the sternal body wall sinks inwards, to a lung-chamber with air-holding lamellae.

I is the embryonic condition.

bs, Blood sinus.

L is the condition of outgrowth with *gl*, gill lamellae.

A is the condition of insinking of the sternal surface and consequent enclosure of the lamelligerous surface of the appendage in a chamber with narrow orifice—the pulmonary air-holding chamber.

pl, Pulmonary lamellae.

bs, Blood sinus.

(After Kingsley.)

to it from the bases of the surrounding limbs and from the dorsal carapace and from the pharynx. It consists of an oblong plate 2 in. in length and 1 in breadth, with a pair of tendinous outgrowths standing out from it at right angles on each side. It "floats" between the prosomatic nerve centres and the alimentary canal. In each somite of the mesosoma is a small, free entosternite having a similar position, but below or ventral to the nerve cords, and having a smaller number of muscles attached to it. The entosternite was probably in origin part of the fibrous connective tissue lying close to the integument of the sternal surface—giving attachment to muscles corresponding more or less to those at present attached to it. It became isolated and detached, why or with what advantage to the organism it is difficult to say, and at that period of Arachnidan development the great ventral nerve cords occupied a more lateral position than they do at present. We know that such a lateral position of the nerve cords preceded the median position in both Arthropoda and Chaetopoda. Subsequently to the floating off of the entosternite the approximation of the nerve cords took place in the prosoma, and thus they were able to take up a position below the entosternite. In the mesosoma the approximation had occurred before the entosternites were formed.

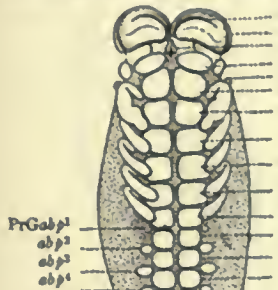


FIG. 17.—Embryo of scorpion, ventral view showing somites and appendages.

sgc, Frontal groove.

sa, Rudiment of lateral eyes.

obl, Camerostome (upper lip).

so, Sense-organ of Patten.

PrG*abp*^{1}, Rudiment of the appendage of the praegenital somite which disappears.

abp^2, Rudiment of the right half of the genital operculum.

abp^3, Rudiment of the right pecten.

abp^4 to *abp*^{7}, Rudiments of the four appendages which carry the pulmonary lamellae.

I to VI, Rudiments of the six limbs of the prosoma.

VIIPrG, The evanescent praegenital somite.

VIII, The first mesosomatic somite or genital somite.

IX, The second mesosomatic somite or pectiniferous somite.

X to XIII, The four pulmoniferous somites.

XIV, The first metasomatic somite.

(After Brauer, *Zeitsch. wiss. Zool.* vol. lix., 1895.)

In the scorpion (figs. 3 and 4) the entosternite has tough membrane-like outgrowths which connect it with the body-wall, both dorsally and ventrally forming an oblique diaphragm, cutting off the cavity of the prosoma from that of the mesosoma. It was described by Newport as "the diaphragm." Only the central and horizontal parts of this structure correspond precisely to the entosternite of Limulus: the right and left anterior processes (marked *ap* in figs. 3 and 4; and RAP, LAP, in figs. 1 and 2) correspond in the two animals, and the median lateral process *lmp* of the scorpion represents the tendinous outgrowths ALR, PLR of Limulus. The scorpion's entosternite gives rise to outgrowths, besides the great posterior flaps, *pf*, which form the diaphragm, unrepresented in Limulus. These are a ventral arch forming a neural canal through which the great nerve cords pass (figs. 3 and 4, *snp*), and further a dorsal gastric canal and arterial canal which transmit the alimentary tract and the dorsal artery respectively (figs. 3 and 4, GC, DR).

In Limulus small entosternites are found in each somite of the appendage-bearing mesosoma, and we find in Scorpio, in the only somite of the mesosoma which has a well-developed pair of appendages, that of the pectens, a small entosternite with ten pairs of muscles inserted into it. The supra-pectinal entosternite lies ventral to the nerve cords.

In Mygale (figs. 5 and 6) the form of the entosternite is more like that of Limulus than is that of Scorpio. The anterior notch Ph.N. is similar to that in Limulus, whilst the imbricate triangular pieces of the posterior median region resemble the similarly-placed structures of Limulus in a striking manner.

It must be confessed that we are singularly ignorant as to the functional significance of these remarkable organs—the entosternites. Their movement in an upward or downward direction in Limulus and Mygale must exert a pumping action on the blood contained in the dorsal arteries and the ventral veins respectively. In Scorpio the completion of the horizontal plate by oblique flaps, so as to form an actual diaphragm shutting off the cavity of the prosoma from the rest of the body, possibly gives to the organs contained in the anterior chamber a physiological advantage in respect of the supply of arterial blood and its separation from the venous blood of the mesosoma. Possibly the movement of the diaphragm may determine the passage of air into or out of the lung-sacs. Muscular fibres connected with the suctorial pharynx are in Limulus inserted into the entosternite, and the activity of the two organs may be correlated.

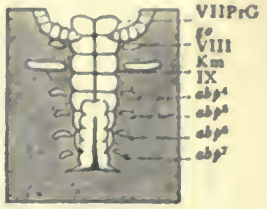


FIG. 18.—Portion of a similar embryo at a later stage of growth. The praegenital somite, VII PrG, is still present, but has lost its rudimentary appendages; *go*, the genital operculum, left half; Km, the left pecten; *abp*^{4} to *abp*^{7}, the rudimentary appendages of the lung-sacs.

(After Brauer, *loc. cit.*)

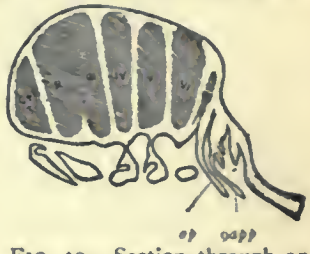


FIG. 19.—Section through an early embryo of *Limulus longispina*, showing seven transverse divisions in the region of the unsegmented anterior carapace. The seventh, VII, is anterior to the genital operculum, *op*, and is the cavity of the praegenital somite which is more or less completely suppressed in subsequent development, possibly indicated by the area marked VII in fig. 7 and by the great entopophyses of the prosomatic carapace.

(After Kishinouye, *Journ. Sci. Coll. Japan*, vol. v., 1892.)

5. *The Blood and the Blood-vascular System.*—The blood fluids of Limulus and Scorpio are very similar. Not only are the blood corpuscles of Limulus more like in form and granulation to those of Scorpio than to those of any Crustacean, but the fluid is in both animals strongly impregnated with the blue-coloured respiratory proteid, haemocyanin. This body occurs also in the blood of Crustacea and of Molluscs, but its abundance in both Limulus and Scorpio is very marked, and gives to the freshly-shed blood a strong indigo-blue tint.

The great dorsal contractile vessel or "heart" of Limulus is closely similar to that of Scorpio; its ostia or incurrent orifices are placed in the same somites as those of Scorpio, but there is one additional posterior pair. The origin of the paired arteries from the

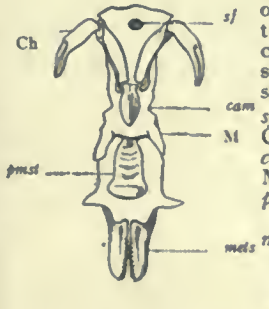


FIG. 20.—View of the ventral surface of the mid-line of the prosomatic region of *Limulus polyphemus*. The coxae of the five pairs of limbs following the chelicerae were arranged in a series on each side between the mouth, M, and the metasternites, *mets*.

sf, The sub-frontal median sclerite.

Ch, The chelicerae.

cam, The camerostome or upper lip.

M, The mouth.

pmst, The promesosternal sclerite or chitinous plate, unpaired.

mets, The right and left metasternites (corresponding to the similarly placed pentagonal sternite of Scorpio). Natural size.

(After Lankester.)

heart differs in Limulus from the arrangement obtaining in Scorpio, in that a pair of lateral commissural arteries exist in Limulus (as described by Alphonse Milne-Edwards (6)) leading to a suppression of the more primitive direct connexion of the four pairs of posterior

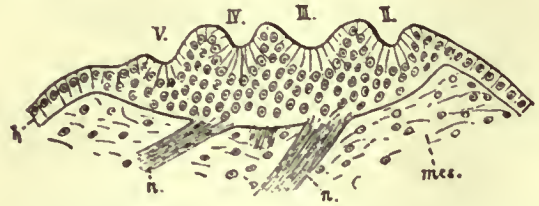


FIG. 21.—Development of the lateral eyes of a scorpion. *h*, Epidermic cell-layer; *mes*, mesoblastic connective tissue; *n*, nerves; II, III, IV, V, depressions of the epidermis in each of which a cuticular lens will be formed.

(From Korschelt and Heider, after Laurie.)

lateral arteries and of the great median posterior arteries with the heart itself (fig. 29). The arterial system is very completely developed in both Limulus and Scorpio, branching repeatedly until minute arterioles are formed, not to be distinguished from true capillaries;

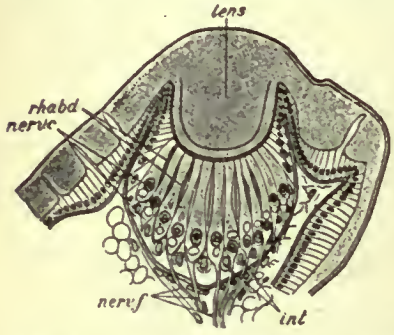


FIG. 22. — Section through the lateral eye of *Euscorpius italicus*.

lens, Cuticular lens.
nerv.c, Retinal cells (nerve-end cells).
rhabd, Rhabdomes.
nerv.f, Nerve fibres of the optic nerve.
int, Intermediate cells (lying between the bases of the retinal cells).

(After Lankester and Bourne from Parker and Haswell's *Text-book of Zoology*, Macmillan & Co.)

these open into irregular swollen vessels which are the veins or venous sinuses. A very remarkable feature in Limulus, first described by Owen, is the close accompaniment of the prosomatic nerve centres and nerves by arteries, so close indeed that the great ganglion mass and its out-running nerves are actually sunk in or invested by

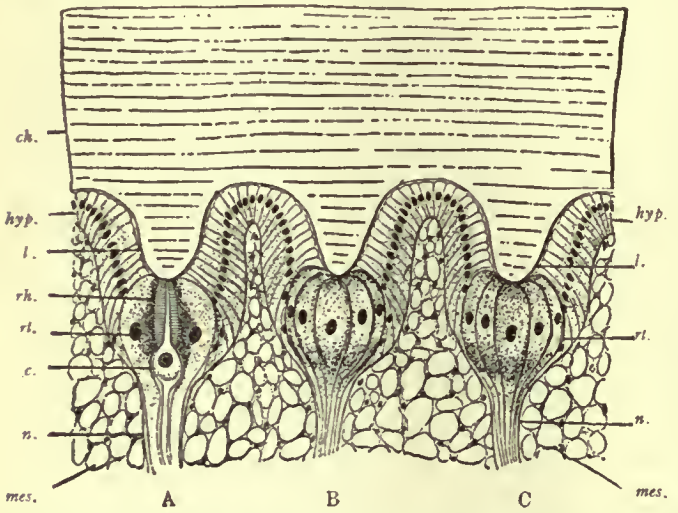


FIG. 23.—Section through a portion of the lateral eye of Limulus, showing three ommatidia—A, B and C. *hyp*, The epidermic cell-layer (so-called hypodermis), the cells of which increase in volume below each lens, *l*, and become nerve-end cells or retinula-cells, *rt*; in A, the letters *rh* point to a rhabdomere secreted by the cell *rt*; *c*, the peculiar central spherical cell; *n*, nerve fibres; *mes*, mesoblastic skeletal tissue; *ch*, chitinous cuticle.

(From Korschelt and Heider after Watase.)

arteries. The connexion is not so intimate in Scorpio, but is nevertheless a very close one, closer than we find in any other Arthropods in which the arterial system is well developed, *e.g.* the Myriapoda and some of the arthrostracous Crustacea. It seems that there is a primitive tendency in the Arthropoda for the arteries to accompany the nerve cords, and a "supra-spinal" artery—that is to say, an artery in close relation to the ventral nerve cords—has been described in several cases. On the other hand, in many Arthropods, especially those which possess tracheae, the arteries do not have a long course, but soon open into wide blood sinuses. Scorpio certainly comes nearer to Limulus in the high development of its arterial system, and the intimate relation of the anterior aorta and its branches to the nerve centres and great nerves, than does any other Arthropod.

An arrangement of great functional importance in regard to the venous system must now be described, which was shown in 1883 by Lankester to be common to Limulus and Scorpio. This arrangement has not hitherto been detected in any other class than the Arachnida, and if it should ultimately prove to be peculiar to that group, would have considerable weight as a proof of the close genetic affinity of Limulus and Scorpio.

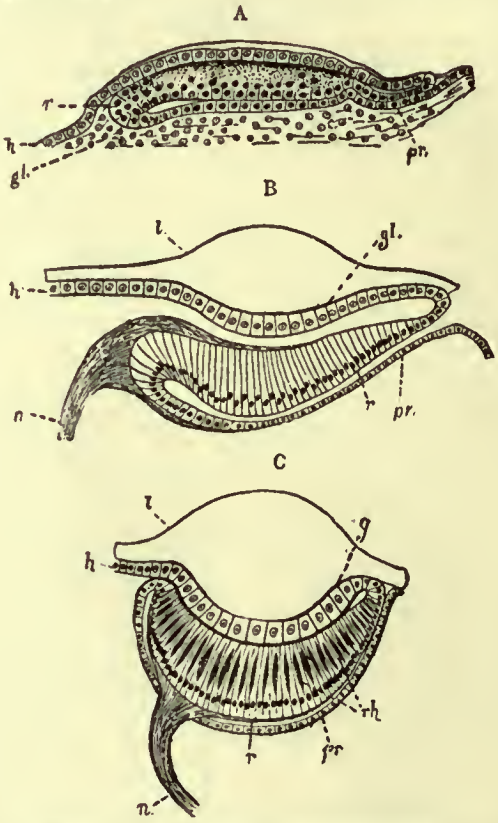


FIG. 24.—Diagrams of the development and adult structure of one of the paired central eyes of a scorpion.

A, Early condition before the lens is deposited, showing the folding of the epidermic cell-layer into three.
B, Diagram showing the nature of this infolding.
C, Section through the fully formed eye.
h, Epidermic cell-layer.
r, The retinal portion of the same which, owing to the infolding, lies between *gl*, the corneagen or lens-forming portion, and *pr*, the post-retinal or capsular portion or fold.
l, Cuticular lens.
g, Line separating lens from the lens-forming or corneagen cells of the epidermis.
n, Nerve fibres.
rh, Rhabdomeres.

[How the inversion of the nerve-end-cells and their connexion with the nerve-fibres is to be reconciled with the condition found in the adult, or with that of the monostichous eye, has not hitherto been explained.]

(From Korschelt and Heider.)

The great pericardial sinus is strongly developed in both animals. Its walls are fibrous and complete, and it holds a considerable volume of blood when the heart itself is contracted. Opening in pairs in each somite, right and left into the pericardial sinus are large veins, which bring the blood respectively from the gill-books and the lung-books to that chamber, whence it passes by the ostia into the heart. The blood is brought to the respiratory organs in both cases by a great venous collecting sinus having a ventral median position. In both animals *the wall of the pericardial sinus is connected by vertical muscular bands to the wall of the ventral venous sinus* (its lateral expansions around the lung-books in Scorpio) in each somite through which the pericardium passes. There are seven pairs of these *veno-pericardiac vertical muscles* in Scorpio, and eight in Limulus (see figs. 30, 31, 32). It is obvious that the contraction of these muscles

must cause a depression of the floor of the pericardium and a rising of the roof of the ventral blood sinus, and a consequent increase of volume and flow of blood to each. Whether the pericardium and the ventral sinus are made to expand simultaneously or all the movement is made by one only of the surfaces concerned, must depend on conditions of tension. In any case it is clear that we have in these muscles an apparatus for causing the blood to flow differentially in increased volume into either the pericardium, through the veins leading from the respiratory organs, or from the body generally into the great sinuses which bring the blood to the respiratory organs. These muscles act so as to pump the blood through the respiratory organs.

It is not surprising that with so highly developed an arterial system Limulus and Scorpio should have a highly developed mechanism for determining the flow of blood to the respiratory organs. That this is, so to speak, a need of animals with localized respiratory

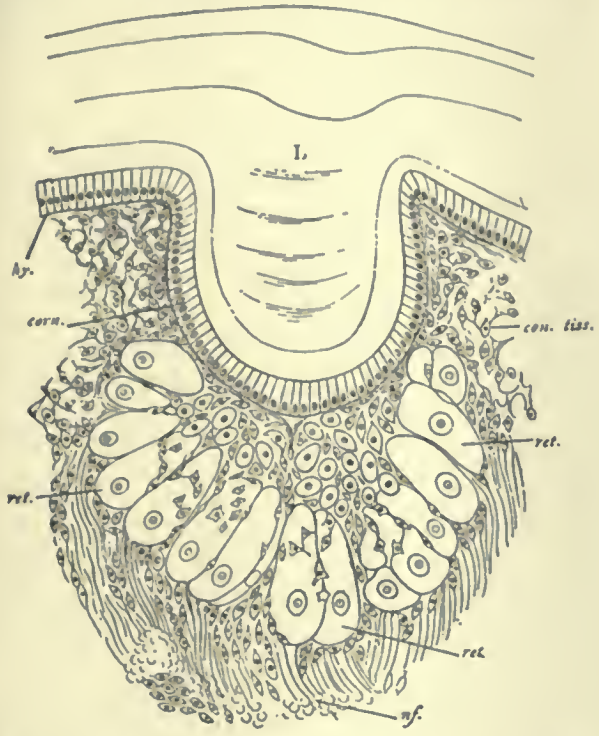


FIG. 25.—Section through one of the central eyes of a young Limulus.

L, Cuticular or corneous lens.
hy, Epidermic cell-layer.
corn, Its corneagen portion immediately underlying the lens.
ret, Retinula cells.
nf, Nerve fibres.
con. tiss, Connective tissue (mesoblastic skeletal tissue).

(After Lankester and Bourne, *Q. J. Mic. Sci.*, 1883.)

organs is seen by the existence of provisions serving a similar purpose in other animals, *e.g.* the branchial hearts of the Cephalopoda.

The veno-pericardiac muscles of Scorpio were seen and figured by Newport but not described by him. Those of Limulus were described and figured by Alphonse Milne-Edwards, but he called them merely "transparent ligaments," and did not discover their muscular structure. They are figured and their importance for the first time recognized in the memoir on the muscular and skeletal systems of Limulus and Scorpio by Lankester, Beck and Bourne (4).

6. *Alimentary Canal and Gastric Glands.*—The alimentary canal in Scorpio, as in Limulus, is provided with a powerful suctorial pharynx, in the working of which extrinsic muscles take a part. The mouth is relatively smaller in Scorpio than in Limulus—in fact is minute, as it is in all the terrestrial Arachnida which suck the juices of either animals or plants. In both, the alimentary canal takes a straight course from the pharynx (which bends under it downwards and backwards towards the mouth in Limulus) to the anus, and is a simple, narrow, cylindrical tube (fig. 33). The only point in which the gut of Limulus resembles that of Scorpio rather than that of any of the Crustacea, is in possessing more than a single pair of ducts or lateral outgrowths connected with ramified gastric glands or gastric caeca. Limulus has two pairs of these, Scorpio as many as six pairs. The Crustacea never have more than one pair. The minute microscopic structure of the gastric glands in the two animals is practically identical. The functions of these gastric diverticula have never been carefully investigated. It is very probable that in Scorpio they do not serve merely to secrete a digestive fluid (shown in other Arthropoda to resemble the pancreatic fluid), but that they also become distended by the juices of the prey sucked in by the scorpion—as certainly must occur in the case of the simple unbranched gastric caeca of the spiders.

The most important difference which exists between the structure of Limulus and that of Scorpio is found in the hinder region of the alimentary canal. Scorpio is here provided with a single or double pair of renal excretory tubes, which have been identified by earlier authors with the Malpighian tubes of the Hexapod and Myriapod insects. Limulus is devoid of any such tubes. We shall revert to this subject below.

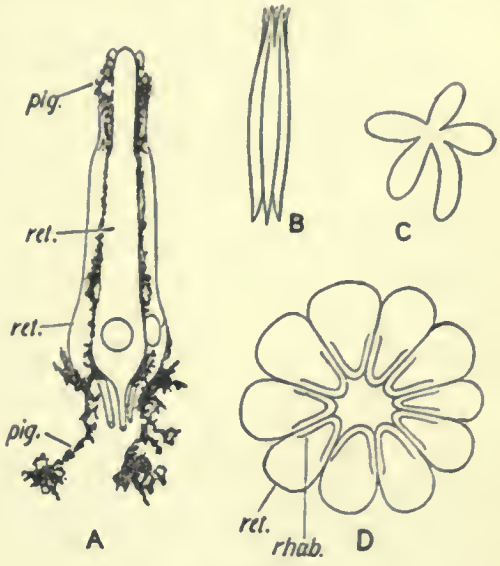


FIG. 26.

A, Diagram of a retinula of the central eye of a scorpion consisting of five retina-cells (*ret*), with adherent branched pigment cells (*pig*).
B, Rhabdom of the same, consisting of five confluent rhabdomeres.
C, Transverse section of the rhabdom of a retinula of the scorpion's central eye, showing its five constituent rhabdomeres as rays of a star.
D, Transverse section of a retinula of the lateral eye of Limulus, showing ten retinula cells (*ret*), each bearing a rhabdomere (*rhab*).

(After Lankester.)

7. *Ovaries and Spermaries: Gonocoels and Gonoducts.*—The scorpion is remarkable for having the specialized portion of coelom from the walls of which egg-cells or sperm-cells are developed according to sex, in the form of a simple but extensive network. It is not a pair of simple tubes, nor of dendriform tubes, but a closed network. The same fact is true of Limulus, as was shown by Owen (7)

FIG. 27.—Diagram showing the position of the coxal glands of a scorpion, *Buthus australis*, Lin., in relation to the legs, diaphragm (entosternal flap), and the gastric caeca.
1 to 6, The bases of the six prosomatic limbs.
A, prosomatic gastric gland (sometimes called salivary).
B, Coxal gland.
C, Diaphragm of Newport = fibrous flap of the entosternum.
D, Mesosomatic gastric caeca (so-called liver).
E, Alimentary canal.

(From Lankester, *Q. J. Mic. Sci.*, vol. xxiv. N.S. p. 152.)

in regard to the ovary, and by Benham (14) in regard to the testis. This is a very definite and remarkable agreement, since such a reticular gonocoel is not found in Crustacea (except in the male Apus). Moreover, there is a significant agreement in the character of the spermatozoa of Limulus and Scorpio. The Crustacea are—with the exception of the Cirrhipedia—remarkable for having stiff, motionless spermatozoids. In Limulus Lankester found (15) the spermatozoa to possess active flagelliform "tails," and to resemble very closely those of Scorpio which, as are those of most terrestrial Arthropoda, are actively motile. This is a microscopic point of agreement, but is none the less significant.

In regard to the important structures concerned with the fertilization of the egg, Limulus and Scorpio differ entirely from one another.

The eggs of Limulus are fertilized in the sea after they have been laid. Scorpio, being a terrestrial animal, fertilizes by copulation. The male possesses elaborate copulatory structures of a chitinous nature, and the eggs are fertilized in the female without even quitting the place where they are formed on the wall of the reticular gonocoel. The female scorpion is viviparous, and the young are produced in a highly developed condition as fully formed scorpions.

Differences between Limulus and Scorpio.—We have now passed in review the principal structural features in which Limulus agrees with Scorpio and differs from other Arthropoda. There remains for consideration the one important structural difference between the two animals. Limulus agrees with the majority of the Crustacea in being destitute of renal excretory caeca or tubes opening into the hinder part of the gut. Scorpio, on the other hand, in common

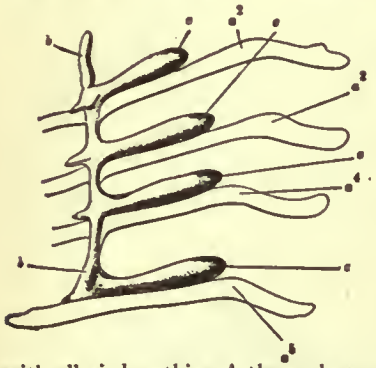


FIG. 28.—The right coxal gland of *Limulus polyphemus*, Latr.
a^2 to a^5, Posterior borders of the chitinous bases of the coxae of the second, third, fourth and fifth prosomatic limbs.
b, Longitudinal lobe or stolon of the coxal gland.
c. Its four transverse lobes or outgrowths corresponding to the four coxae.
(From Lankester, *loc. cit.*, after Packard.)

with all air-breathing Arthropoda except Peripatus, possesses these tubules, which are often called Malpighian tubes. A great deal has been made of this difference by some writers. It has been considered by them as proving that Limulus, in spite of all its special agreements with Scorpio (which, however, have scarcely been appreciated by the writers in question), really belongs to the Crustacean line of descent, whilst Scorpio, by possessing Malpighian tubes, is declared to be unmistakably tied together with the other Arachnida to the tracheate Arthropods, the Hexapods, Diplopods, and Chilopods, which all possess Malpighian tubes.

It must be pointed out that the presence or absence of such renal excretory tubes opening into the intestine appears to be a question

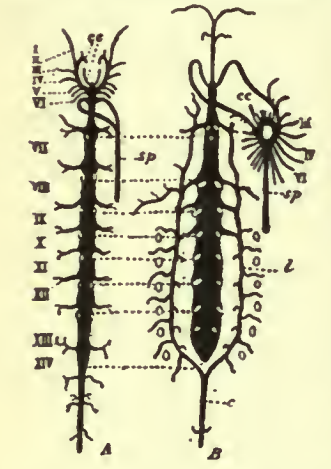


FIG. 29.—Diagram of the arterial system of A, Scorpio, and B, Limulus. The Roman numerals indicate the body somites and the two figures are adjusted for comparison. *ce*, Cerebral arteries; *sp*, supra-spinal or medullary artery; *c*, caudal artery; *l*, lateral anastomotic artery of Limulus. The figure B also shows the peculiar neural investiture formed by the cerebral arteries in Limulus and the derivation from this of the arteries to the limbs, III, IV, VI, whereas in Scorpio the latter have a separate origin from the anterior aorta.
(From Lankester, "Limulus an Arachnid.)

of adaptation to the changed physiological conditions of respiration, and not of morphological significance, since a pair of renal excretory tubes of this nature is found in certain Amphipod Crustacea (Talorchestia, &c.) which have abandoned a purely aquatic life. This view has been accepted and supported by Professors Korschelt and Heider (16). An important fact in its favour was discovered by Laurie (17), who investigated the embryology of two species of Scorpio under Lankester's direction. It appears that the Malpighian tubes of Scorpio are developed from the mesenteron, viz. that portion of the gut which is formed by the hypoblast, whereas in Hexapod insects the similar caecal tubes are developed from the proctodaeum or in-pushed portion of the gut which is formed from epiblast. In fact it is not possible to maintain that the renal excretory tubes of the gut are of one common origin in the Arthropoda. They have appeared independently in connexion with a change in the excretion of nitrogenous waste in Arachnids, Crustacea, and the other classes of Arthropoda when aerial, as opposed to aquatic, respiration has been established—and they have been formed in some cases from the mesenteron, in other cases from the proctodaeum. Their appearance in the air-breathing Arachnids does not separate those forms from the water-breathing Arachnids which are devoid of them, any more than does their appearance in certain Amphipoda separate those Crustaceans from the other members of the class.

Further, it is pointed out by Korschelt and Heider that the hinder portion of the gut frequently acts in Arthropoda as an organ of nitrogenous excretion in the absence of any special excretory tubules, and that the production of such caeca from its surface in separate lines of descent does not involve any elaborate or unlikely process of growth. In other words, the Malpighian tubes of the terrestrial Arachnida are *homoplastic* with those of Hexapoda and Myriapoda, and not *homogenetic* with them. We are compelled to take a similar view of the agreement between the tracheal air-tubes of Arachnida and other tracheate Arthropods. They are homoplasts (see 18) one of another, and do not owe their existence in the various classes compared to a common inheritance of an ancestral tracheal system.

Conclusions arising from the Close Affinity of Limulus and Scorpio.—When we consider the relationships of the various classes of Arthropoda, having accepted and established the fact of the close genetic affinity of Limulus and Scorpio, we are led to important conclusions. In such a consideration we have to make use not only of the fact just mentioned, but of three important generalizations which serve as it were as implements for the proper estimation of the relationships of any series of organic forms. First of all there is the generalization that the relationships of the various forms of animals (or of plants) to one another is that of the ultimate twigs of a much-branching genealogical tree. Secondly, identity of structure in two organisms does not necessarily indicate that the identical structure has been inherited from an ancestor common to the two organisms compared (homogeny), but may be due to independent development of a like structure in two different lines of descent (homoplasy). Thirdly, those members of a group which, whilst exhibiting undoubted structural characters indicative of their proper assignment to that group, yet are simpler than and inferior in elaboration of their organization to other members of the group, are not necessarily representatives of the earlier and primitive phases in the development of the group—but are very often examples of retrogressive change or degeneration. The second and third implements of analysis above cited are of the nature of cautions or checks. Agreements are not *necessarily* due to common inheritance; simplicity is not *necessarily* primitive and ancestral.

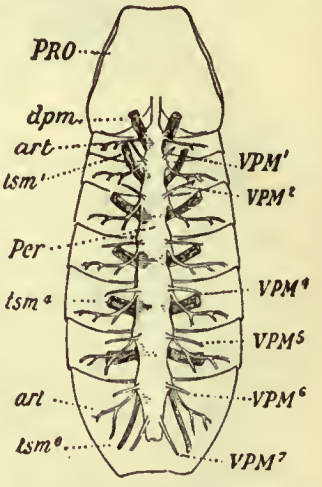


FIG. 30.—View from below of a scorpion (*Buthus occitanus*) opened and dissected so as to show the pericardium with its muscles, the lateral arteries, and the tergo-sternal muscles.
PRO, Prosoma.
dpm, Dorso-plastral muscle.
art, Lateral artery.
*tsm*¹, Tergo-sternal muscle (labelled *dv* in fig. 31) of the second (pectiniferous) mesosomatic somite; this is the most anterior pair of the series of six, none are present in the genital somite.
*tsm*⁴, Tergo-sternal muscle of the fifth mesosomatic somite.
*tsm*⁶, Tergo-sternal muscle of the enlarged first metasomatic somite.
Per, Pericardium.
VPM¹ to VPM⁷, The series of seven pairs of veno-pericardiac muscles (labelled *pv* in fig. 31).
There is some reason to admit the existence of another more anterior pair of these muscles in Scorpio; this would make the number exactly correspond with the number in Limulus.
(After Lankester, *Trans. Zool. Soc.* vol. xi., 1883.)

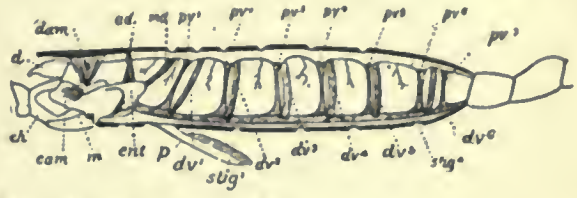
On the other hand, we must not rashly set down agreements as due to "homoplasy" or "convergence of development" if we find two or three or more concurrent agreements. The probability is against agreement being due to homoplasy when the agreement involves a number of really separate (not correlated) coincidences. Whilst the chances are in favour of some *one* homoplastic coincidence or structural agreement occurring between some member or other of a large group *a* and some member or other of a large group *b*, the matter is very different

when by such an initial coincidence the two members have been particularized. The chances against these two selected members exhibiting *another* really independent homoplastic agreement are enormous: let us say 10,000 to 1. The chances against yet another coincidence are a hundred million to one, and against yet one more "coincidence" they are the square of a hundred million to one. Homoplasy can only be assumed when the coincidence is of a simple nature, and is such as may be reasonably supposed to have arisen by the action of like selective conditions upon like material in two separate lines of descent.[1]

So, too, degeneration is not to be lightly assumed as the explanation of a simplicity of structure. There is a very definite criterion of the simplicity due to degeneration, which can in most cases be applied. Degenerative simplicity is never uniformly distributed over all the structures of the organism. It affects many or nearly all the structures of the body, but leaves some, it may be only one, at a high level of elaboration and complexity. Ancestral simplicity is more uniform, and does not co-exist with specialization and elaboration of a single organ. Further: degeneration cannot be inferred safely by the examination of an isolated case; usually we obtain a series of forms indicating the steps of a change in structure—and what we have to decide is whether the movement has been from the simple to the more complex, or from the more complex to the simple. The feathers of a peacock afford a convenient example of primitive and degenerative simplicity. The highest point of elaboration in colour, pattern and form is shown by the great eye-painted tail feathers. From these we can pass by gradual transitions in two directions, viz. either to the simple lateral tail feathers with a few rami only, developed only on one side of the shaft and of uniform metallic coloration—or to the simple contour feathers of small size, with the usual symmetrical series of numerous rami right and left of the shaft and no remarkable colouring. The one-sided specialization and the peculiar metallic colouring of the lateral tail feathers mark them as the extreme terms of a degenerative series, whilst the symmetry, likeness of constituent parts *inter se*, and absence of specialized pigment, as well as the fact that they differ little from any average feather of birds in general, mark the contour feather as primitively simple, and as the starting-point from which the highly elaborated eye-painted tail feather has gradually evolved.

Applying these principles to the consideration of the Arachnida, we arrive at the conclusion that the smaller and simpler Arachnids are not the more primitive, but that the Acari or mites are, in fact, a degenerate group. This was maintained by Lankester in 1878 (**19**), again in 1881 (**20**); it was subsequently announced as a novelty by Claus in 1885 (**21**). Though the aquatic members of a class of animals are in some instances derived from terrestrial forms, the usual transition is from an aquatic ancestry to more recent land-living forms. There is no doubt, from a consideration of the facts of structure, that the aquatic water-breathing Arachnids, represented in the past by the Eurypterines and to-day by the sole survivor Limulus, have preceded the terrestrial air-breathing forms of that group. Hence we see at once that the better-known Arachnida form a series, leading from Limulus-like aquatic creatures through scorpions, spiders and harvest-men, to the degenerate Acari or mites. The spiders are specialized and reduced in apparent complexity, as compared with the scorpions, but they cannot be regarded as degenerate since the concentration of structure which occurs in them results in greater efficiency and power than are exhibited by the scorpion. The determination of the relative degree of perfection of organization attained by two animals compared is difficult when we introduce, as seems inevitable, the question of efficiency and power, and do not confine the question to the perfection of morphological development. We have no measure of the degree of power manifested by various animals—though it would be possible to arrive at some conclusions as to how that "power" should be estimated. It is not possible here to discuss that matter further. We must be content to point out that it seems that the spiders, the pedipalps, and other large Arachnids have not been derived from the scorpions directly, but have independently developed from aquatic ancestors, and from one of these independent groups—probably through the harvest-men from the spiders—the Acari have finally resulted.

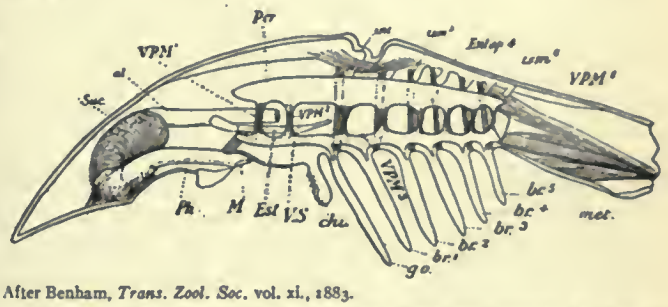
[1] A great deal of superfluous hypothesis has lately been put forward in the name of "the principle of convergence of characters" by a certain school of palaeontologists. The horse is supposed by these writers to have originated by separate lines of descent in the Old World and the New, from five-toed ancestors! And the important consequences following from the demonstration of the identity in structure of Limulus and Scorpio are evaded by arbitrary and even phantastic invocations of a mysterious transcendental force which brings about "convergence" irrespective of heredity and selection. Morphology becomes a farce when such assumptions are made. (E. R. L.)



After Beck, *Trans. Zool. Soc.* vol. xi., 1883.

FIG. 31.—Diagram of a lateral view of a longitudinal section of a scorpion.

d, Chelicera.
ch, Chela.
cam, Camerostome.
m, Mouth.
ent, Entosternum.
p, Pecten.
*stig*¹, First pulmonary aperture.
*stig*⁴, Fourth pulmonary aperture.
dam, Muscle from carapace to a praeoral entosclerite.
ad, Muscle from carapace to entosternum.
md, Muscle from tergite of genital somite to entosternum (same as *dpm* in fig. 30).
*dv*¹ to *dv*⁶, Dorso-ventral muscles (same as the series labelled *tsm* in fig. 30).
*pv*¹ to *pv*⁷, The seven veno-pericardiac muscles of the right side (labelled VPM in fig. 30).



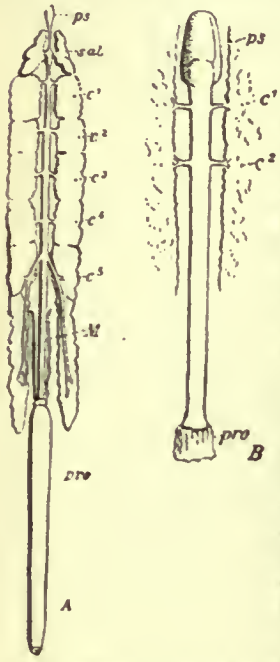
After Benham, *Trans. Zool. Soc.* vol. xi., 1883.

FIG. 32.—Diagram of a lateral view of a longitudinal section of Limulus.

Suc, Suctorial pharynx.
al, Alimentary canal.
Ph, Pharynx.
M, Mouth.
Est, Entosternum.
VS, Ventral venous sinus.
chi, Chilaria.
go, Genital operculum.
*br*¹ to *br*⁸, Branchial appendages.
met, Unsegmented metasoma.
*Entap*⁴, Fourth dorsal entapophysis of left side.
tsm, Tergo-sternal muscles, six pairs as in Scorpio (labelled *dv* in fig. 31).
VPM¹ to VPM⁸, The eight pairs of veno-pericardiac muscles (labelled *pv* in fig. 31). VPM¹ is probably represented in Scorpio, though not marked in figs. 30 and 31.

Leaving that question for consideration in connexion with the systematic statement of the characters of the various groups of Arachnida which follows on p. 475, it is well now to consider the following question, viz., seeing that Limulus and Scorpio are such highly developed and specialized forms, and that they seem to constitute as it were the first and second steps in the series of recognized Arachnida—what do we know, or what are we led to suppose with regard to the more primitive Arachnida from which the Eurypterines and Limulus and Scorpio have sprung? Do we know in the recent or fossil condition any such primitive Arachnids? Such a question is not only legitimate, but prompted by the analogy of at least one other great class of Arthropods. The great Arthropod class, the Crustacea, presents to the zoologist at the present day an immense range of forms,

comprising the primitive phyllopods, the minute copepods, the parasitic cirrhipedes and the powerful crabs and lobsters, and the highly elaborated sand-hoppers and slaters. It has been insisted, by those who accepted Lankester's original doctrine of the direct or genetic affinity of the Chaetopoda and Arthropoda, that Apus and Branchipus really come very near to the ancestral forms which connected those two great branches of Appendiculate (Parapodiate) animals. On the other hand, the land crabs are at an immense distance from these simple forms. The record of the Crustacean family-tree is, in fact, a fairly complete one—the lower primitive members of the group are still represented by living forms in great abundance. In the case of the Arachnida, if we have to start their genealogical history with Limulus and Scorpio, we are much in the same position as we should be in dealing with the Crustacea, were the whole of the Entomostraca and the whole of the Arthrostraca wiped out of existence and record. There is no possibility of doubt that the series of forms corresponding in the Arachnidan line of descent, to the forms distinguished in the Crustacean line of descent as the lower grade—the Entomostraca—have ceased to exist, and not only so, but have left little evidence in the form of fossils as to their former existence and nature. It must, however, be admitted as probable that we should find some evidence, in ancient rocks or in the deep sea, of the early more primitive Arachnids. And it must be remembered that such forms must be expected to exhibit, when found, differences from Limulus and Scorpio as great as those which separate Apus and Cancer. The existing Arachnida, like the higher Crustacea, are "nomomeristic," that is to say, have a fixed typical number of somites to the body. Further, they are like the higher Crustacea, "somatotagmic," that is to say, they have this limited set of somites grouped in three (or more) "tagmata" or regions of a fixed number of similarly modified somites—each tagma differing in the modification of its fixed number of somites from that characterizing a neighbouring "tagma." The most primitive among the lower Crustacea, on the other hand, for example, the Phyllopoda, have not a fixed number of somites, some genera—even allied species—have more, some less, within wide limits; they are "anomomeristic." They also, as is generally the case with anomomeristic animals, do not exhibit any conformity to a fixed plan of "tagmatism" or division of the somites of the body into regions sharply marked off from one another; the head or prosomatic tagma is followed by a trunk consisting of somites which either graduate in character as we pass along the series or exhibit a large variety in different genera, families and orders, of grouping of the somites. They are anomotagmic, as well as anomomeristic.



From Lankester, "Limulus an Arachnid."

FIG. 33.—The alimentary canal and gastric glands of a scorpion (A) and of Limulus (B).

ps, Muscular suctorial enlargement of the pharynx.
sal, Prosomatic pair of gastric caeca in Scorpio, called salivary glands by some writers.
c^1, and c^2, The anterior two pairs of gastric caeca and ducts of the mesosomatic region.
c^3, c^4 and c^5, Caeca and ducts of Scorpio not represented in Limulus.
M, The Malpighian or renal caecal diverticula of Scorpio.
pro, The proctodaeum or portion of gut leading to anus and formed embryologically by an inversion of the epiblast at that orifice.

When it is admitted—as seems to be reasonable—that the primitive Arachnida would, like the primitive Crustacea, be anomomeristic and anomotagmic, we shall not demand of claimants for the rank of primitive Arachnids agreement with Limulus and Scorpio in respect of the exact number of their somites and the exact grouping of those somites; and when we see how diverse are the modifications of the branches of the appendages both in Arachnida and in other classes of Arthropoda (*q.v.*), we shall not over-estimate a difference in the form of this or that appendage exhibited by the claimant as compared with the higher Arachnids. With those considerations in mind, the claim of the extinct group of the trilobites to be considered as representatives of the lower and more primitive steps in the Arachnidan genealogy must, it seems, receive a favourable judgment. They differ from the Crustacea in that they have only a single pair of prae-oral appendages, the second pair being definitely developed as mandibles. This fact renders their association with the Crustacea impossible, if classification is to be the expression of genetic affinity inferred from structural coincidence. On the contrary, this particular point is one in which they agree with the higher Arachnida. But little is known of the structure of these extinct animals; we are therefore compelled to deal with such special points of resemblance and difference as their remains still exhibit. They had lateral eyes[1] which resemble no known eyes so closely as the lateral eyes of Limulus. The general form and structure of their prosomatic carapace are in many striking features identical with that of Limulus. The trilobation of the head and body—due to the expansion and flattening of the sides or "pleura" of the tegumentary skeleton—is so closely repeated in the young of Limulus that the latter has been called "the trilobite stage" of Limulus (fig. 42 compared with fig. 41). No Crustacean exhibits this trilobite form. But most important of the evidences presented by the trilobites of affinity with Limulus, and therefore with the Arachnida, is the tendency less marked in some, strongly carried out in others, to form a pygidial or telsonic shield—a fusion of the posterior somites of the body, which is precisely identical in character with the metasomatic carapace of Limulus. When to this is added the fact that a post-anal spine is developed to a large size in some trilobites (fig. 38), like that of Limulus and Scorpio, and that lateral spines on the pleura of the somites are frequent as in Limulus, and that neither metasomatic fusion of somites nor post-anal spine, nor lateral pleural spines are found in any Crustacean, nor all three together in any Arthropod besides the trilobites and Limulus—the claim of the trilobites to be considered as representing one order of a lower grade of Arachnida, comparable to the grade Entomostraca of the Crustacea, seems to be established.

The fact that the single pair of prae-oral appendages of trilobites, known only as yet in one genus, is in that particular case a pair of uni-ramose antennae—does not render the association of trilobites and Arachnids improbable. Although the prae-oral pair of appendages in the higher Arachnida is usually chelate, it is not always so; in spiders it is not so; nor in many Acari. The bi-ramose structure of the post-oral limbs, demonstrated by Beecher in the trilobite Triarthrus, is no more inconsistent with its claim to be a primitive Arachnid than is the foliaceous modification of the limbs in Phyllopods inconsistent with their relationship to the Arthrostracous Crustaceans such as Gammarus and Oniscus.

Thus, then, it seems that we have in the trilobites the representatives of the lower phases of the Arachnidan pedigree. The simple anomomeristic trilobite, with its equi-formal somites and equi-formal appendages, is one term of the series which ends in the even more simple but degenerate Acari. Between the two and at the highest point of the arc, so far as morphological differentiation is concerned, stands the scorpion; near to it in the trilobite's direction (that is, on the ascending side) are Limulus and the Eurypterines—with a long gap, due to obliteration of the record, separating them from the trilobite. On the

[1] A pair of round tubercles on the labrum (camerostome or hypostoma) of several species of Trilobites has been described and held to be a pair of eyes (**22**). Sense-organs in a similar position were discovered in Limulus by Patten (**42**) in 1894.

other side—tending downwards from the scorpion towards the Acari—are the Pedipalpi, the spiders, the book-scorpions, the harvest-men and the water-mites.

The strange nobody-crabs or Pycnogonids occupy a place on the ascending half of the arc below the Eurypterines and Limulus. They are strangely modified and degenerate, but seem to be (as explained in the systematic review) the remnant of an Arachnidan group holding the same relation to the scorpions which the Laemodipoda hold to the Podophthalmate Crustacea.

We have now to offer a classification of the Arachnida and to pass in review the larger groups, with a brief statement of their structural characteristics.

In the bibliography at the close of this article (referred to by leaded arabic numerals in brackets throughout these pages), the titles of works are given which contain detailed information as to the genera and species of each order or sub-order, their geographical distribution and their habits and economy so far as they have been ascertained. The limits of space do not permit of a fuller treatment of those matters here.

TABULAR CLASSIFICATION[1] OF THE ARACHNIDA.

CLASS. ARACHNIDA.

Grade A. ANOMOMERISTICA.
- **Sub-Class. TRILOBITAE.**
  - Orders. Not satisfactorily determined.

Grade B. NOMOMERISTICA.
- **Sub-Class I. PANTOPODA.**
  - **Order 1. Nymphonomorpha.**
  - **" 2. Ascorhynchomorpha.**
  - **" 3. Pycnogonomorpha.**
- **Sub-Class II. EU-ARACHNIDA.**
  - Grade *a*. DELOBRANCHIA, Lankester (*vel* HYDROPNEUSTEA, Pocock).
  - **Order 1. Xiphosura.**
  - **" 2. Gigantostraca.**
  - Grade *b*. EMBOLOBRANCHIA, Lankester (*vel* AEROPNEUSTEA, Pocock).
  - *Section α. Pectinifera.*
  - **Order 1. Scorpionidea.**
    - Sub-order *a*. Apoxypoda.
    - " *b*. Dionychopoda.
  - *Section β. Epectinata.*
  - **Order 2. Pedipalpi.**
    - Sub-order *a*. Uropygi.
      - Tribe 1. Urotricha.
      - " 2. Tartarides.
    - Sub-order *b*. Amblypygi.
  - **Order 3. Araneae.**
    - Sub-order *a*. Mesothelae.
    - " *b*. Opisthothelae.
      - Tribe 1. Mygalomorphae.
      - " 2. Arachnomorphae.
  - **Order 4. Palpigradi (=Microthelyphonidae).**
  - **Order 5. Solifugae (=Mycetophorae).**
  - **Order 6. Pseudoscorpiones (=Chelonethi).**
    - Sub-order *a*. Panctenodactyli.
    - " *b*. Hemictenodactyli.
  - **Order 7. Podogona (=Ricinulei).**
  - **Order 8. Opiliones.**
    - Sub-order *a*. Laniatores.
    - " *b*. Palpatores.
    - " *c*. Anepignathi.
  - **Order 9. Rhynchostomi (=Acari).**
    - Sub-order *a*. Notostigmata.
    - " *b*. Cryptostigmata.
    - " *c*. Metastigmata.
    - " *d*. Prostigmata.
    - " *e*. Astigmata.
    - " *f*. Vermiformia.
    - " *g*. Tetrapoda.

CLASS. ARACHNIDA.—Euarthropoda having two prosthomeres (somites which have passed from a post-oral to a prae-oral position), the appendages of the first represented by eyes, of the second by solitary rami which are rarely antenniform, more usually chelate. A tendency is exhibited to the formation of a metasomatic as well as a prosomatic carapace by fusion of the tergal surfaces of the somites. Intermediate somites forming a mesosoma occur, but tend to fuse superficially with the metasomatic carapace or to become co-ordinated with the somites of the metasoma, whether fused or distinct to form one region, the opisthosoma (abdomen of authors). In the most highly developed forms the two anterior divisions (tagmata) of the body, prosoma and mesosoma, each exhibit six pairs of limbs, pediform and plate-like respectively, whilst the metasoma consists of six limbless somites and a post-anal spine. The genital apertures are placed in the first somite following the prosoma, excepting where a praegenital somite, usually suppressed, is retained. Little is known of the form of the appendages in the lowest archaic Arachnida, but the tendency of those of the prosomatic somites has been (as in the Crustacea) to pass from a generalized bi-ramose or multi-ramose form to that of uni-ramose antennae, chelae and walking legs.

The Arachnida are divisible into two grades of structure—according to the fixity or non-fixity of the number of somites building up the body:—

Grade A (of the Arachnida). ANOMOMERISTICA.—Extinct archaic Arachnida, in which (as in the Entomostracous Crustacea) the number of well-developed somites may be more or less than eighteen and may be grouped only as head (prosoma) and trunk or may be further differentiated. A telsonic tergal shield of greater or less size is always present, which may be imperfectly divided into well-marked but immovable tergites indicating incompletely differentiated somites. The single pair of palpiform appendages in front of the mouth has been found in one instance to be antenniform, whilst the numerous post-oral appendages in the same genus were bi-ramose. The position of the genital apertures is not known. Compound lateral eyes present; median eyes wanting. The body and head have the two pleural regions of each somite flattened and expanded on either side of the true gut-holding body-axis. Hence the name of the sub-class signifying tri-lobed, a condition realized also in the Xiphosurous Arachnids. The members of this group, whilst resembling the lower Crustacea (as all lower groups of a branching genealogical tree must do), differ from them essentially in that the head exhibits only one prosthomere (in addition to the eye-bearing prosthomere) with palpiform appendages (as in all Arachnida) instead of two. The Anomomeristic Arachnida form a single sub-class, of which only imperfect fossil remains are known.

Sub-class (of the Anomomeristica). TRILOBITAE.—The single sub-class Trilobitae constitutes the grade Anomomeristica. It has been variously divided into orders by a number of writers. The greater or less evolution and specialization of the metasomatic carapace appears to be the most important basis for classification—but this has not been made use of in the latest attempts at drawing up a system of the Trilobites. The form of the middle and lateral regions of the prosomatic shield has been used, and an excessive importance attached to the demarcation of certain areas in that structure. Sutures are stated to mark off some of these pieces, but in the proper sense of that term as applied to the skeletal structures of the Vertebrata, no sutures exist in the chitinous cuticle of Arthropoda. That any partial fusion of originally distinct chitinous plates takes place in the cephalic shield of Trilobites, comparable to the partial fusion of bony pieces by suture in Vertebrata, is a suggestion contrary to fact.

The Trilobites are known only as fossils, mostly Silurian and prae-Silurian; a few are found in Carboniferous and Permian strata. As many as two thousand species are known. Genera with small metasomatic carapace, consisting of three to six fused segments distinctly marked though not separated by soft membrane, are *Harpes*, *Paradoxides* and *Triarthrus* (fig. 34). In *Calymene*, *Homalonotus* and *Phacops* (fig. 38) from six to sixteen segments are clearly marked by ridges and grooves in the metasomatic tagma, whilst in *Illaenus* the shield so formed is large but no somites are marked out on its surface. In this genus ten free somites (mesosoma) occur between the prosomatic and metasomatic carapaces. *Asaphus* and *Megalaspis* (fig. 39) are similarly constituted. In *Agnostus* (fig. 40) the anterior and posterior carapaces constitute almost the entire body, the two carapaces being connected by a mid-region of only two free somites. It has been held that the forms with a small number of somites marked in the posterior carapace and numerous free somites between the anterior and posterior carapace, must be considered as anterior to those in which a great number of posterior somites are traceable in the metasomatic carapace, and that those in which the traces of distinct somites in the posterior or metasomatic carapace are most completely absent must be regarded as derived from those in which somites are well marked in the posterior

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[1] The writer is indebted to R. I. Pocock, assistant in the Natural History departments of the British Museum, for valuable assistance in the preparation of this article and for the classification and definition of the groups of Eu-arachnida here given. The general scheme and some of the details have been brought by the writer into agreement with the views maintained in this article. Pocock accepts those views in all essential points and has, as a special student of the Arachnida, given to them valuable expansion and confirmation. The writer also desires to express his thanks to Messrs. Macmillan & Co. for permission to use figs. 22, 43, 44 and 45, which are taken from Parker and Haswell's *Text-book of Zoology*; and to Messrs. Swan Sonnenschein & Co. for the loan of several figures from the translations published by them of the admirable treatise on *Embryology* by Professors Korschelt and Heider; also to the publishers of the treatise on *Palaeontology* by Professor Zittel, Herr Oldenbourg and The Macmillan Co., New York, for several cuts of extinct forms.

carapace and similar in appearance to the free somites. The genus *Agnostus*, which belongs to the last category, occurs abundantly in Cambrian strata and is one of the earliest forms known. This would lead to the supposition that the great development of metasomatic carapace is a primitive and not a late character, were it not for the fact that *Paradoxides* and *Atops*, with an inconspicuous telsonic carapace and numerous free somites, are also Cambrian in age, the latter indeed anterior in horizon to *Agnostus*.

On the other hand, it may well be doubted whether the pygidial or posterior carapace is primarily due to a fusion of the tergites of somites which were previously movable and well developed. The posterior carapace of the Trilobites and of *Limulus* is probably enough in origin a telsonic carapace—that is to say, is the tergum of the last segment of the body which carries the anus. From the front of this region new segments are produced in the first instance, and are added during growth to the existing series. This telson may enlarge, it may possibly even become internally and sternally developed as partially separate somites, and the tergum may remain without trace of somite formation, or, as appears to be the case in *Limulus*, the telson gives rise to a few well-marked somites (mesosoma and two others) and then enlarges without further trace of segmentation, whilst the chitinous integument which develops in increasing thickness on the terga as growth advances welds together the unsegmented telson and the somites in front of it, which were previously marked by separate tergal thickenings. It must always be remembered that we are liable (especially in the case of fossilized integuments) to attach an unwarranted interpretation to the mere discontinuity or continuity of the thickened plates of chitinous cuticle on the back of an Arthropod. These plates may fuse, and yet the somites to which they belong may remain distinct, and each have its pair of appendages well developed. On the other hand, an unusually large tergal plate, whether terminal or in the series, is not always due to fusion of the dorsal plates of once-separate somites, but is often a case of growth and enlargement of a single somite without formation of any trace of a new somite. For the literature of Trilobites see (22*).

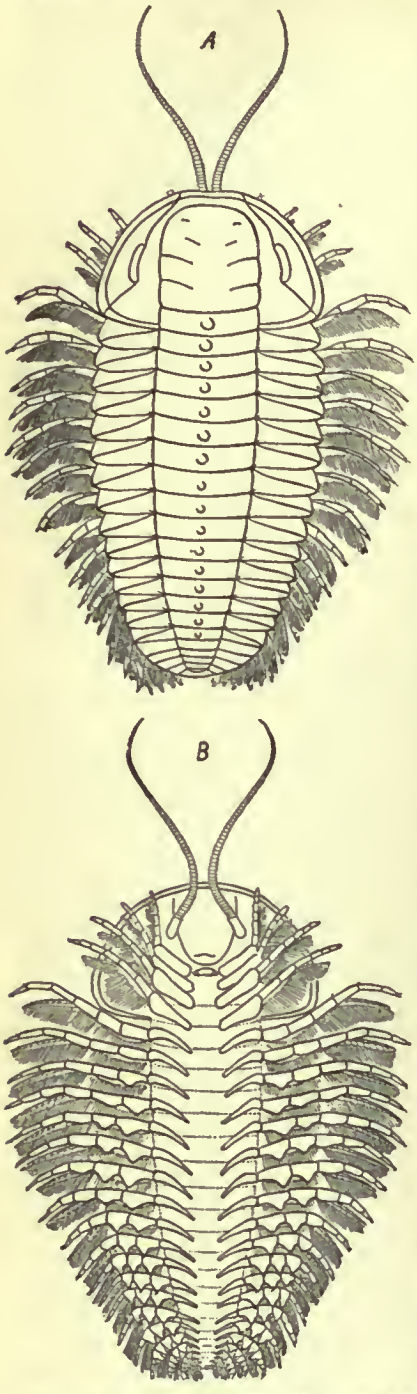


FIG. 34.—Restoration of *Triarthrus Becki*, Green, as determined by Beecher from specimens obtained from the Utica Slates (Ordovician), New York. A, dorsal; B, ventral surface. In the latter the single pair of antennae springing up from each side of the camerostome or hypostome or upper lip-lobe are seen. Four pairs of appendages besides these are seen to belong to the cephalic tergum. All the appendages are pediform and bi-ramose; all have a prominent gnathobase, and in all the exopodite carries a comb-like series of secondary processes.
(After Beecher, from Zittel.)

Grade B (of the Arachnida) NOMOMERISTICA.—Arachnida in which, excluding from consideration the eye-bearing prosthomere, the somites are primarily (that is to say, in the common

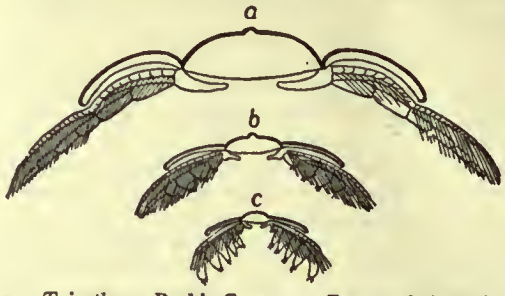


FIG. 35.—*Triarthrus Becki*, Green. *a*, Restored thoracic limbs in transverse section of the animal; *b*, section across a posterior somite; *c*, section across one of the sub-terminal somites.
(After Beecher.)

ancestor of the grade) grouped in three regions of six—(*a*) the "prosoma" with palpiform appendages, (*b*) the "mesosoma" with plate-like appendages, and (*c*) the "metasoma" with suppressed

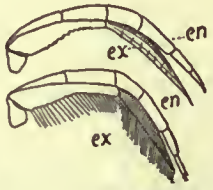


FIG. 36.—*Triarthrus Becki*, Green. Dorsal view of second thoracic leg with and without setae. *en*, Inner ramus; *ex*, Outer ramus.
(After Beecher.)

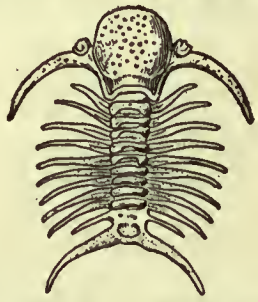


FIG. 37.—*Deiphon Forbesii*, Barr. One of the Cheiruridae. Silurian Bohemia.
(From Zittel's *Palaeontology*.)

appendages. A somite placed between the prosoma and mesosoma—the prae-genital somite—appears to have belonged originally to the prosomatic series (which with its ocular prosthomere and palpi-

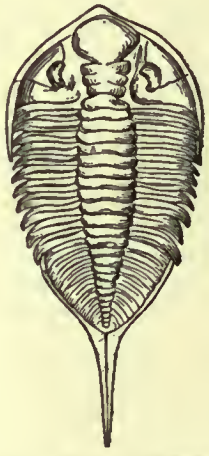


FIG. 38.—*Dalmanites limulurus*, Green. One of the *Phacopidae*, from the Silurian, New York.
(From Zittel.)

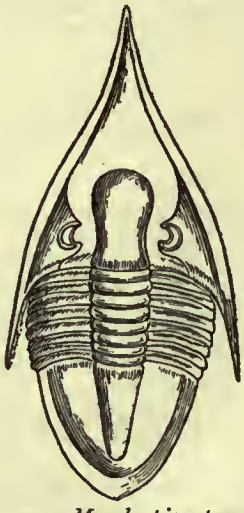


FIG. 39.—*Megalaspis extenuatus*. One of the *Asaphidae* allied to *Illaenus*, from the Ordovician of East Gothland, Sweden.
(From Zittel).

form limbs [Pantopoda], would thus consist of eight somites), but to have been gradually reduced. In living Arachnids, excepting the Pantopoda, it is either fused (with loss of its appendages) with the prosoma (*Limulus*,[1] *Scorpio*), after embryonic appearance, or is

[1] Pocock suggests that the area marked vii. in the outline figure of the dorsal view of *Limulus* (fig. 7) may be the tergum of the suppressed prae-genital somite. Embryological evidence must settle whether this is so or not.

retained as a rudimentary, separate, detached somite in front of the mesosoma, or disappears altogether (excalation). The atrophy and total disappearance of ancestrally well-marked somites frequently take place (as in all Arthropoda) at the posterior extremity of the body, whilst excalation of somites may occur at the constricted areas which often separate adjacent "regions," though there are very few instances in which it has been recognized. Concentration of the organ-systems by fusion of neighbouring regions (prosoma, mesosoma, metasoma), previously distinct, has frequently occurred, together with obliteration of the muscular and chitinous structures indicative of distinct somites. This concentration and obliteration of somites, often accompanied by dislocation of important segmental structures (such as appendages and nerve-ganglia), may lead to highly developed specialization (individuation, H. Spencer), as in the Araneae and Opiliones, and, on the other hand, may terminate in simplification and degeneration, as in the Acari.

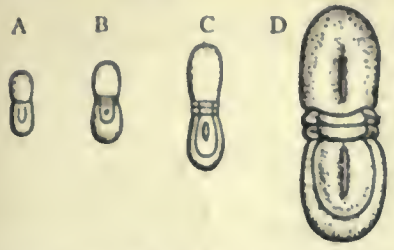
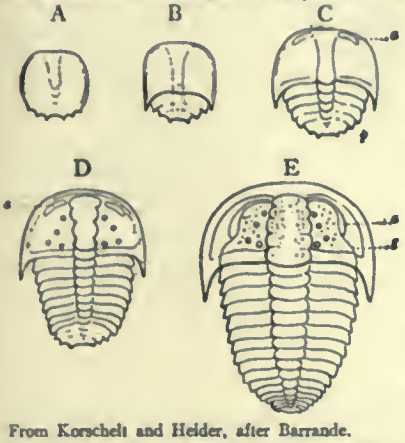


FIG. 40.—Four stages in the development of the trilobite *Agnostus nudus*. A, Youngest stage with no mesosomatic somites; B and C, stages with two mesosomatic somites between the prosomatic and telsonic carapaces; D, adult condition, still with only two free mesosomatic somites.

(From Korschelt and Heider.)



From Korschelt and Heider, after Barrande.

FIG. 41.—Five stages in the development of the trilobite *Sao hirsuta*.

A, Youngest stage.
B, Older stage with distinct pygidial carapace.
C, Stage with two free mesosomatic somites between the prosomatic and telsonic carapaces.
D, Stage with seven free intermediate somites.
E, Stage with twelve free somites; the telsonic carapace has not increased in size.
a, Lateral eye.
g, So-called facial "suture" (not really a suture).
p, Telsonic carapace.

The most important general change which has affected the structure of the nomomeristic Arachnida in the course of their historic development is the transition from an aquatic to a terrestrial life. This has been accompanied by the conversion of the lamelliform gill-plates into lamelliform lung-plates, and later the development from the lung-chambers, and at independent sites, of tracheae or air-tubes (by adaptation of the vasifactive tissue of the blood-vessels) similar to those independently developed in *Peripatus*, Diplopoda, Hexapoda and Chilopoda. Probably tracheae have developed independently by the same process in several groups of tracheate Arachnids. The nomomeristic Arachnids comprise two sub-classes—one a very small degenerate offshoot from early ancestors; the other, the great bulk of the class.

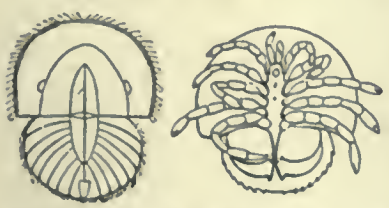
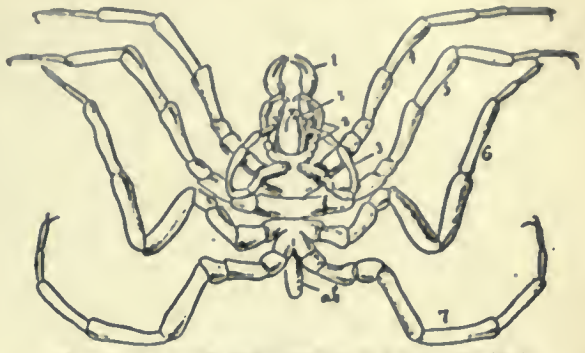


FIG. 42. — So-called "trilobite stage" of *Limulus polyphemus*. A, Dorsal; B, ventral view.

(From Korschelt and Heider, after Leuckart.)

Sub-Class I. (of the Nomomeristica). PANTOPODA.—Nomomeristic Arachnids, in which the somites corresponding to mesosoma and metasoma have entirely aborted. The seventh, and sometimes the eighth, leg-bearing somite is present and has its leg-like appendages fully developed. Monomeniscous eyes with a double (really triple) cell-layer formed by invagination, as in the Eu-arachnida, are present. The Pantopoda stand in the same relation to *Limulus* and *Scorpio* that *Cyamus* holds to the thoracostracous Crustacea. The reduction of the organism to seven leg-bearing somites, of which the first pair, as in so many Eu-arachnida, are chelate, is a form of degeneration connected with a peculiar quasi-parasitic habit resembling that of the crustacean Laemodipoda. The genital pores are situate at the base of the 7th pair of limbs, and may be repeated on the 4th, 5th, and 6th. In all known Pantopoda the size of the body is quite minute as compared with that of the limbs: the alimentary canal sends a long caecum into each leg (cf. the Araneae) and the genital products are developed in gonocoels also placed in the legs.



From Parker and Haswell's *Text-book of Zoology*, after Hoek.

FIG. 43.—One of the Nymphonomorphous Pantopoda, *Nymphon hispidum*, showing the seven pairs of appendages 1 to 7; *ab*, the rudimentary opisthosoma; *s*, the mouth-bearing proboscis.

The Pantopoda are divided into three orders, the characters of which are dependent on variation in the presence of the full number of legs.

Order 1 (of the Pantopoda). Nymphonomorpha, Pocock (nov.) (fig. 43).—In primitive forms belonging to the family *Nymphonidae* the full complement of appendages is retained—the 1st (mandibular), the 2nd (palpiform), and the 3rd (ovigerous) pairs being well developed in both sexes. In certain derivative forms constituting the family *Pallenidae*, however, the appendages of the 2nd pair are either rudimentary or atrophied altogether.

Two families: 1. Nymphonidae (genus *Nymphon*), and 2. Pallenidae (genus *Pallene*).

Order 2. Ascorhynchomorpha, Pocock (nov.).—Appendages of the 2nd and 3rd pairs retained and developed, as in the more primitive types of Nymphonomorpha; but those of the 1st pair are either rudimentary, as in the *Ascorhynchidae*, or atrophied, as in the *Colossendeidae*. In the latter a further specialization is shown in the fusion of the body segments.

Two families: 1. Ascorhynchidae (genera *Ascorhynchus* and *Ammothea*); 2. Colossendeidae (genera *Colossendeis* and *Discoarachne*).

Order 3. Pycnogonomorpha, Pocock (nov.).—Derivative forms in which the reduction in number of the anterior appendages is carried farther than in the other orders, reaching its extreme in the *Pycnogonidae*, where the 1st and 2nd pairs are absent in both sexes, and the 3rd pair also are absent in the female. In the *Hannoniidae*, however, which resemble the *Pycnogonidae* in the absence of the 3rd pair in the female and of the 2nd pair in both sexes, the 1st pair are retained in both sexes.

Two families: 1. Hannoniidae (genus *Hannonia*); 2. Pycnogonidae (genera *Pycnogonum* and *Phoxichilus*).

Remarks.—The Pantopoda are not known in the fossil condition. They are entirely marine, and are not uncommon in the coralline zone of the sea-coast. The species are few, not more than fifty (23). Some large species of peculiar genera are taken at great depths. Their movements are extremely sluggish. They are especially remarkable for the small size of the body and the extension of viscera into the legs. Their structure is eminently that of degenerate forms. Many frequent growths of coralline Algae and hydroid polyps, upon the juices of which they feed, and in some cases a species of gall is produced in hydroids by the penetration of the larval Pantopod into the tissues of the polyp.

Sub-Class II. (of the Nomomeristic Arachnida). EU-ARACHNIDA.—These start from highly developed and specialized aquatic branchiferous forms, exhibiting a prosoma with six pediform pairs of appendages, an intermediate prae-genital somite, a mesosoma of six somites bearing lamelliform pairs of appendages, and a metasoma of six somites devoid of appendages, and the last provided with a post-anal spine. Median eyes are present, which are monomeniscous, with distinct retinal and corneagenous cell-layers, and placed centrally on the prosoma. Lateral eyes also may be present, arranged in lateral groups, and having a single or double cell-layer beneath the lens. The first pair of limbs is often chelate or prehensile, rarely antenniform; whilst the second, third and fourth may also be chelate, or may be simple palps or walking legs.

An internal skeletal plate, the so-called "entosternite" of fibro-cartilaginous tissue, to which many muscles are attached, is placed between the nerve-cords and the alimentary tract in the prosoma of the larger forms (*Limulus*, *Scorpio*, *Mygale*). In the same and other leading forms a pair of much-coiled glandular tubes, the coxal glands (coelomocoels in origin), is found with a duct opening on the coxa of the fifth pair of appendages of the prosoma. The vascular system is highly developed (in the non-degenerate forms); large arterial branches closely accompany or envelop the chief nerves; capillaries are well developed. The blood-corpuscles are large amoebiform cells, and the blood-plasma is coloured blue by haemocyanin.

The alimentary canal is uncoiled and cylindrical, and gives rise laterally to large gastric glands, which are more than a single pair in number (two to six pairs), and may assume the form of simple caeca. The mouth is minute and the pharynx is always suctorial, never gizzard-like. The gonadial tubes (gonocoels or gonadial coelom) are originally reticular and paired, though they may be reduced to a simpler condition. They open on the first somite of the mesosoma. In the numerous degenerate forms simplification occurs by obliteration of the demarcations of somites and the fusion of body-regions, together with a gradual suppression of the lamelliferous respiratory organs and the substitution for them of tracheae, which, in their turn, in the smaller and most reduced members of the group, may also disappear.

The Eu-arachnida are divided into two grades with reference to the condition of the respiratory organs as adapted to aquatic or terrestrial life.

Grade *a* (of the Eu-arachnida). DELOBRANCHIA (Hydropneustea).

Mesosomatic segments furnished with large plate-like appendages, the 1st pair acting as the genital operculum, the remaining pairs being provided with branchial lamellae fitted for breathing oxygen dissolved in water. The prae-genital somite partially or wholly obliterated in the adult. The mouth lying far back, so that the basal segments of all the prosomatic appendages, excepting those of the 1st pair, are capable of acting as masticatory organs. Lateral eyes consisting of a densely packed group of eye-units ("compound" eyes).

Order 1. Xiphosura.—The prae-genital somite fuses in the embryo with the prosoma and disappears (see fig. 19). Not free-swimming, none of the prosomatic appendages modified to act as paddles; segments of the mesosoma and metasoma (=opisthosoma) not more than ten in number, distinct or coalesced.

Family—Limulidae (*Limulus*).
,, *Belinuridae (*Belinurus*, *Aglaspis*, *Prestwichia*).
,, *Hemiaspidae (*Hemiaspis*, *Bunodes*).

Remarks.—The Xiphosura are marine in habit, frequenting the shore. They are represented at the present day by the single genus *Limulus* (figs. 44 and 45; also figs. 7, 9, 11, to 15 and 20), often termed the king-crab, which occurs on the American coast of the Atlantic Ocean, but not on its eastern coasts, and on the Asiatic coast of the Pacific. The Atlantic species (*L. polyphemus*) is common on the coasts of the United States, and is known as the king-crab or horse-shoe crab. A single specimen was found in the harbour of Copenhagen in the 18th century, having presumably been carried over by a ship to which it clung.

A species of *Limulus* is found in the Buntersandstein of the Vosges; *L. Walchi* is abundant in the Oolitic lithographic slates of Bavaria.

The genera *Belinurus*, *Aglaspis*, *Prestwichia*, *Hemiaspis* and *Bunodes* consist of small forms which occur in Palaeozoic rocks.

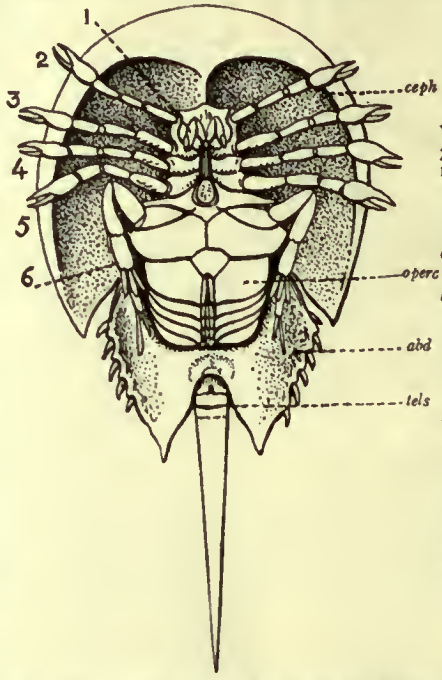


FIG. 45. — Ventral view of *Limulus polyphemus*, one-fourth the natural size, linear.
1 to 6, The six prosomatic pairs of appendages.
abd, the solid opisthosomatic carapace.
tels, the post-anal spine (*not* the telson as the lettering would seem to imply, but only its post-anal portion).
operc, the fused first pair of mesosomatic appendages forming the genital operculum.

(From Parker and Haswell, *Text-book of Zoology*, after Leuckart.)

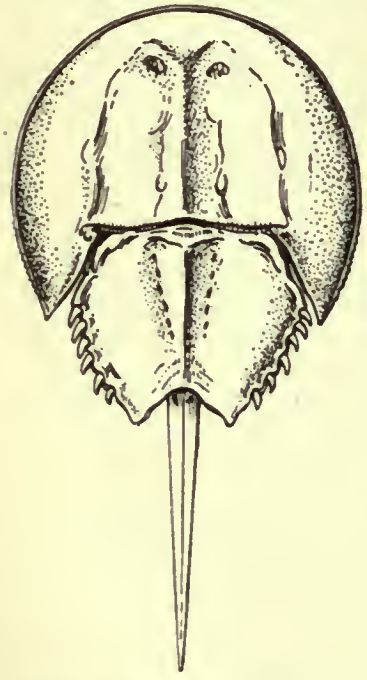


FIG. 44.—Dorsal view of *Limulus polyphemus*, Latr. One-fourth the natural size, linear.

(From Parker and Haswell, *Text-book of Zoology*, after Leuckart.)

In none of them are the appendages known, but in the form of the two carapaces and the presence of free somites they are distinctly intermediate between *Limulus* and the Trilobitae. The young form of *Limulus* itself (fig. 40) is also similar to a Trilobite so far as its segmentation and trilobation are concerned. The lateral eyes of *Limulus* appear to be identical in structure and position with those of certain Trilobitae.

Order 2. Gigantostraca (figs. 46, 47).—Free-swimming forms, with the appendages of the 6th or 5th and 6th pairs flattened or lengthened to act as oars; segments of mesosoma and metasoma (=opisthosoma), twelve in number.

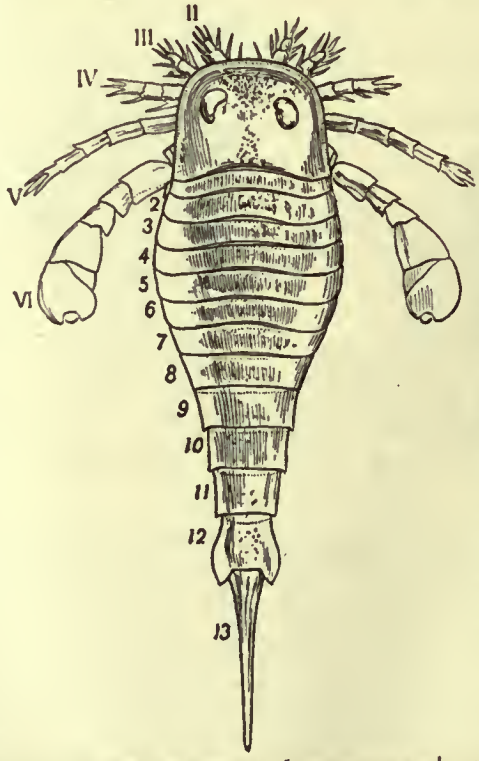
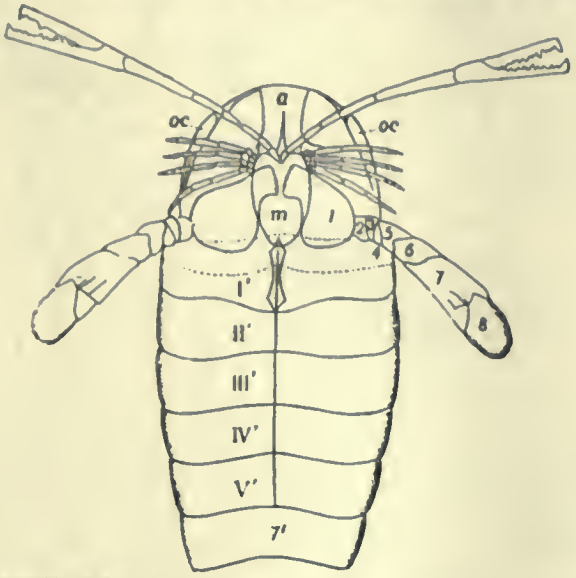


FIG. 46.—*Eurypterus Fischeri*, Eichwald. Silurian of Rootzikil. Restoration after Schmidt, half the size of nature. The dorsal aspect is presented showing the prosomatic shield with paired compound eyes and the prosomatic appendages II. to VI. The small first pair of appendages is concealed from view by the carapace. 1 to 12 are the somites of the opisthosoma; 13, the post-anal spine.

(From Zittel's *Text-book of Palaeontology*. The Macmillan Co., New York, 1896.)

Appendages of anterior pair very large and chelate.
Sub-order Pterygotomorpha, Pterygotidae (*Pterygotus*).
Appendages of anterior pair minute and chelate.
Sub-order Eurypteromorpha { Stylonuridae (*Stylonurus*). Eurypteridae (*Eurypterus*, *Slimonia*).

Remarks.—The Gigantostraca are frequently spoken of as "the Eurypterines." Not more than thirty species are known. They became extinct in Palaeozoic times, and are chiefly found in the Upper Silurian, though extending upwards as far as the Carboniferous. They may be regarded as "macrourous" Xiphosura; that is to say, Xiphosura in which the nomomeristic number of eighteen



From Zittel's *Palaeontology*.

FIG. 47.—*Pterygotus osiliensis*, Schmidt. Silurian of Rootzikil. Restoration of the ventral surface, one-third the natural size, after Schmidt.

a, Camerostome or epistoma.
m, Chilarium or metasternite of the prosoma (so-called metastoma).
oc, The compound eyes.
1 to 8, Segments of the sixth prosomatic appendage.
I' to V', First five opisthosomatic somites.
7', Sixth opisthosomatic somite.

[Observe the powerful gnathobases of the sixth pair of prosomatic limbs and the median plates behind *m*. The dotted line on somite I indicates the position of the genital operculum which was probably provided with branchial lamellae.]

well-developed somites is present and the posterior ones form a long tail-like region of the body. There still appears to be some doubt whether in the sub-order Eurypteromorpha the first pair of prosomatic appendages (fig. 46) is atrophied, or whether, if present, it has the form of a pair of tactile palps or of minute chelae. Though there are indications of lamelliform respiratory appendages on mesosomatic somites following that bearing the genital operculum, we cannot be said to have any proper knowledge as to such appendages, and further evidence with regard to them is much to be desired. (For literature see Zittel, **22***.)

Grade *b* (of the Eu-arachnida). EMBOLOBRANCHIA (Aeropneustea).

In primitive forms the respiratory lamellae of the appendages of the 3rd, 4th, 5th and 6th, or of the 1st and 2nd mesosomatic somites are sunk beneath the surface of the body, and become adapted to breathe atmospheric oxygen, forming the leaves of the so-called lung-books. In specialized forms these pulmonary sacs are wholly or partly replaced by tracheal tubes. The appendages of the mesosoma generally suppressed; in the more primitive forms one or two pairs may be retained as organs subservient to reproduction or silk-spinning. Mouth situated more forwards than in Delobranchia, no share in mastication being taken by the basal segments of the 5th and 6th pairs of prosomatic appendages. Lateral eyes, when present, represented by separate ocelli.

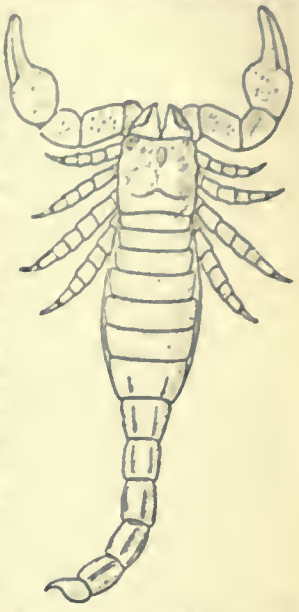
The prae-genital somite, after appearing in the embryo, either is obliterated (*Scorpio*, *Galeodes*, *Opilio* and others) or is retained as a reduced narrow region of the body, the "waist," between prosoma and mesosoma. It is represented by a full-sized tergal plate in the Pseudo-scorpiones.

Section *a*. *Pectinifera*.—The primitive distinction between the mesosoma and the metasoma retained, the latter consisting of six somites and the former of six somites in the adult, each of which is furnished during growth with a pair of appendages. Including the prae-genital somite (fig. 16), which is suppressed in the adult, there are thirteen somites behind the prosoma. The appendages of the 1st and 2nd mesosomatic somites persisting as the genital operculum and pectones respectively, those of the 3rd, 4th, 5th and 6th somites (? in *Palaeophonus*) sinking below the surface during growth in connexion with the formation of the four pairs of pulmonary sacs (see fig. 17). Lateral eyes monostichous.

Order 1. Scorpiones.—Prosoma covered by a single dorsal shield, bearing typically median and lateral eyes; its sternal elements reduced to a single plate lodged between or behind the basal segments of the 5th and 6th pairs of appendages. Appendages of 1st pair tri-segmented, chelate; of 2nd pair chelate, with their basal segments subserving mastication; of 3rd, 4th, 5th and 6th pairs similar in form and function, except that in recent and Carboniferous forms the basal segments of the 3rd and 4th are provided with sterno-coxal (maxillary) lobes, those of the 4th pair meeting in the middle line and underlying the mouth. The five posterior somites of the metasoma constricted to form a "tail," the post-anal sclerite persisting as a weapon of offence and provided with a pair of poison glands (see figs. 8, 10, 12, 13, 14, 15, 21 and 22).

Sub-order Apoxypoda.—The 3rd, 4th, 5th and 6th pairs of appendages short, stout, tapering, the segments about as wide as long, except the apical, which is distally slender, pointed, slightly curved, and without distinct movable claws.

Family—Palaeophonidae, *Palaeophonus* (figs. 48 and 49).



Restored after Thorell's indications by R. I. Pocock.

FIG. 48.—Dorsal view of a restoration of *Palaeophonus nuncius*, Thorell. The Silurian scorpion from Gothland.

Sub-order Dionychopoda.—The 3rd, 4th, 5th and 6th pairs of appendages slender, not evenly tapering, the segments longer than wide; the apical segment short, distally truncate, and provided with a pair of movable claws. Basal segments of the 5th and 6th pairs of appendages abutting against the sternum of the prosoma (see fig. 10 and figs. 51, 52 and 53).

Family—Pandinidae (*Pandinus*, *Opisthophthalmus*, *Urodacus*).
,, Vejovidae (*Vaejovis*, *Jurus*, *Euscorpius*, *Broteas*).
,, Bothriuridae (*Bothriurus*, *Cercophonius*).
,, Buthidae (*Buthus*, *Centrurus*).
,, *Cyclophthalmidae (*Cyclophthalmus*) { Carboniferous.
,, *Eoscorpiidae (*Eoscorpius*, *Centromachus*) { Carboniferous.

Remarks on the Order Scorpiones.—The Scorpion is one of the great animals of ancient lore and tradition. It and the crab are

FIG. 49.—Ventral view of a restoration of *Palaeophonus Hunteri*, Pocock, the Silurian scorpion from Lesmahagow, Scotland. Restored by R. I. Pocock. The meeting of the coxae of all the prosomatic limbs in front of the pentagonal sternum; the space for a genital operculum; the pair of pectens, and the absence of any evidence of pulmonary stigmata are noticeable in this specimen.

(See Pocock, *Quart. Jour. Micr. Sci.*, 1901.)

the only two invertebrates which had impressed the minds of early men sufficiently to be raised to the dignity of astronomical representation. It is all the more remarkable that the scorpion proves to be the oldest animal form of high elaboration which has persisted to the present day. In the Upper Silurian two specimens of a scorpion have been found (figs. 48, 49), one in Gothland and one in Scotland,

which would be recognized at once as true scorpions by a child or a savage. The Silurian scorpion *Palaeophonus*, differs, so far as obvious points are concerned, from a modern scorpion only in the thickness of its legs and in their terminating in strong spike-like joints, instead of being slight and provided with a pair of terminal claws. The legs of the modern scorpion (fig. 10: fig. 51) are those of a terrestrial Arthropod, such as a beetle; whilst those of the Silurian scorpion are the legs of an aquatic Arthropod, such as a crab or lobster. It is probable that the Silurian scorpion was an aquatic animal, and that its respiratory lamellae were still projecting from the surface of the body to serve as branchiae. No trace of "stigmata," the orifices of the lung-chambers of modern scorpions, can be found in the Scottish specimen of *Palaeophonus*, which presents the ventral surface of the animal to view. On the other hand, no trace of respiratory appendages excepting the pectens can be detected in the specimen (see fig. 49).

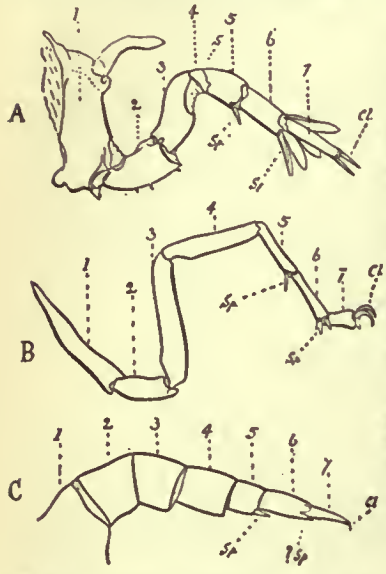
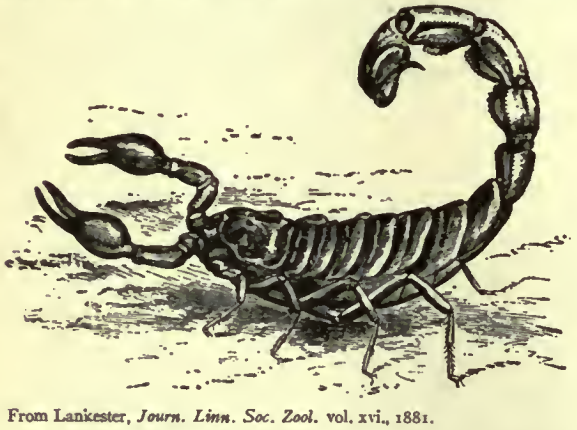


FIG. 50.—Comparison of the sixth prosomatic limb of a recent scorpion (B), of Palaeophonus (C), and of Limulus (A), showing their agreement in the number of segments; in the existence of a movable spine, Sp, at the distal border of the fifth segment; in the correspondence of the two claws at the free end of the limb of Scorpio with two spines similarly placed in Limulus; and, lastly, in the correspondence of the three talon-like spines carried on the distal margin of segment six of recent scorpions with the four larger but similarly situated spines on the leg of Limulus; *s*, groove dividing the ankylosed segments 4 and 5 of the Limulus leg into two. (After Pocock, *Q. J. Mic. Sci.*, 1901.)

Fossil scorpions of the modern type are found in the Coal Measures. At the present day scorpions of various genera are found in all the warm regions of the world. In Europe they occur as far north as Bavaria and the south of France. The largest species measure 9 in. from the front of the head to the end of the sting, and occur in tropical India and Africa. Between 200 and 300 species are known.



From Lankester, *Journ. Linn. Soc. Zool.* vol. xvi., 1881.

FIG. 51.—Drawing from life of the desert scorpion, *Buthus australis*, Lin., from Biskra, N. Africa.

The scorpions use their large chelae for seizing prey and for fighting with one another. They never use the sting when (as frequently happens) they attack another scorpion, because, as was ascertained by A. G. Bourne (24), the poison exuded by the sting has no injurious effect on another scorpion nor on the scorpion itself. The stories of a scorpion stinging itself to death when placed in a circle of burning coals are due to erroneous observation. When placed in such a position the scorpion faints and becomes inert. It is found (Bourne, 24) that some species of scorpion faint at a temperature of 40° Cent. They recover on being removed to cooler conditions. A scorpion having seized its prey (usually a large insect, or small reptile or mammal) with the large chelae brings its tail over its head, and deliberately punctures the struggling victim twice with its sting (fig. 52). The poison of the sting is similar to snake-poison (Calmette), and rapidly paralyses animals which are not immune to it. It is probably only sickly adults or young children of the human race who can be actually killed by a scorpion's sting. When the scorpion has paralysed its prey in this way, the two short chelicerae are brought into play (fig. 53). By the crushing action of their pincers, and an alternate backward and forward movement, they bring the soft blood-holding tissues of the victim close to the minute pin-hole aperture which is the scorpion's mouth. The muscles acting on the bulb-like pharynx now set up a pumping action (see Huxley, 26); and the juices—but no solid matter, excepting such as is reduced to powder—are sucked into the scorpion's alimentary canal. A scorpion appears to prefer for its food another scorpion, and will suck out the juices of an individual as large as itself. When this has taken place, the gorged scorpion becomes distended and tense in the mesosomatic region. It is certain that the absorbed juices do not occupy the alimentary canal alone, but pass also into its caecal off-sets which are the ducts of the gastric glands (see fig. 33).

From Lankester, *Journ. Linn. Soc.*

FIG. 52.—Drawing from life of the Italian scorpion *Euscorpius italicus*, Herbst, holding a blue-bottle fly with its left chela, and carefully piercing it between head and thorax with its sting. Two insertions of the sting are effected and the fly is instantly paralysed by the poison so introduced into its body.

From Lankester, *Journ. Linn. Soc.*

FIG. 53.—The same scorpion carrying the now paralysed fly held in its chelicerae, the chelae liberated for attack and defence. Drawn from life.

All Arachnida, including *Limulus*, feed by suctorial action in essentially the same way as *Scorpio*.

Scorpions of various species have been observed to make a hissing noise when disturbed, or even when not disturbed. The sound is produced by stridulating organs developed on the basal joints of the limbs, which differ in position and character in different genera (see Pocock, 27). Scorpions copulate with the ventral surfaces in contact. The eggs are fertilized, practically in the ovary, and develop *in situ*. The young are born fully formed and are carried by the mother on her back. As many as thirty have been counted in a brood. For information as to the embryology of scorpions, the reader is referred to the works named in the bibliography below. Scorpions do not possess spinning organs nor form either snares or nests, so far as is known. But some species inhabiting sandy deserts form extensive burrows. The fifth pair of prosomatic appendages is used by these scorpions when burrowing, to kick back the sand as the burrow is excavated by the great chelae.

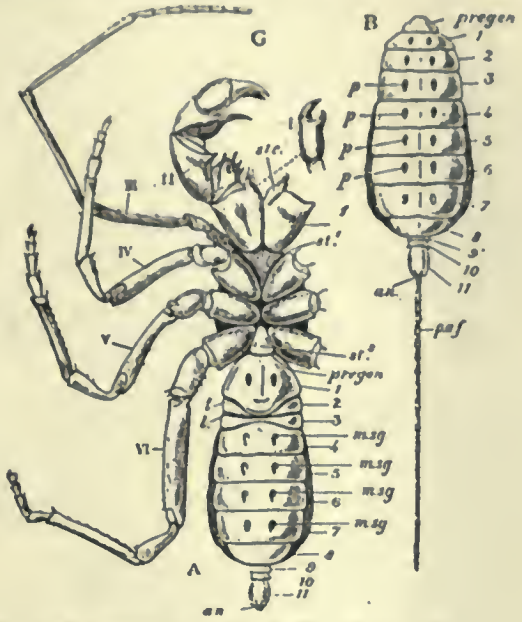
References to works dealing with the taxonomy and geographical distribution of scorpions are given at the end of this article (28).

Section *β*. *Epectinata*.—The primitive distinction between the mesosoma and the metasoma wholly or almost wholly obliterated, the two regions uniting to form an opisthosoma, which never consists of more than twelve somites and never bears appendages or breathing-organs behind the 4th somite. The breathing-organs of the opisthosoma, when present, represented by two pairs of stigmata, opening either upon the 1st and 2nd (Pedipalpi) or the 2nd and 3rd somites (Solifugae, Pseudo-scorpiones), or by a single pair upon the 3rd (? 2nd) somite (Opiliones) of the opisthosoma, there being rarely an additional stigma on the 4th (some Solifugae). The appendages of the 2nd somite of the opisthosoma absent, rarely minute and bud-like (some Amblypygi), never pectiniform. A prae-genital somite is often present either in a reduced condition forming a waist (Pedipalpi, Araneae, Palpigradi) or as a full-sized tergal plate (Pseudo-scorpiones); in some it is entirely atrophied (Solifugae, Holosomata, and Rhynchostomi). Lateral eyes when present diplostichous.

Remarks.—The Epectinate Arachnids do not stand so close to the aquatic ancestors of the Embolobranchia as do the Pectiniferous scorpions. At the same time we are not justified in supposing that the scorpions stand in any way as an intermediate grade between any of the existing Epectinata and the Delobranchia. It is probable that the Pedipalpi, Araneae, and Podogona have been separately evolved as distinct lines of descent from the ancient aquatic Arachnida. The Holosomata and Rhynchostomi are probably offshoots from the stem of the Araneae, and it is not unlikely (in view of the structure of the prosomatic somites of the Tartarides) that the Solifugae are connected in origin with the Pedipalpi. The appearance of tracheae in place of lung-sacs cannot be regarded as a starting-point for a new line of descent comprising all the tracheate forms;

tracheae seem to have developed independently in different lines of descent. On the whole, the Epectinata are highly specialized and degenerate forms, though there are few, if any, animals which surpass the spiders in rapidity of movement, deadliness of attack and constructive instincts.

Order 2. Pedipalpi (figs. 54 to 59).—Appendages of 1st pair bisegmented, without poison gland; of 2nd pair prehensile, their basal segments underlying the proboscis, and furnished with sterno-coxal (maxillary) process, the apical segment tipped with a single movable or immovable claw; appendages of 3rd pair different from the remainder, tactile in function, with at least the apical segment many-jointed and clawless. The ventral surface of the prosoma bears prosternal, metasternal and usually mesosternal chitine-plates (fig. 55). A narrow prae-genital somite is present between opisthosoma and prosoma (figs. 55, 57). Opisthosoma consisting of eleven somites, almost wholly without visible appendages. Intromittent organ of male beneath the genital operculum (=sternum of the 1st somite of opisthosoma).



From Lankester, *Q. J. Mic. Sci.* N.S. vol. xxi., 1881.

FIG. 54.—*Thelyphonus*, one of the Pedipalpi.

A, Ventral view.
I, Chelicera (detached).
II, Chelae.
III, Palpiform limb.
IV to VI, The walking legs.
stc, Sterno-coxal process (gnathobase) of the chelae.
st¹, Anterior sternal plate of the prosoma.
st², Posterior sternal plate of the prosoma.
pregen, Position of the prae-genital somite (not seen).
l, *l*, Position of the two pulmonary sacs of the right side.
1 to 11, Somites of the opisthosoma (mesosoma plus metasoma).
msg, Stigmata of the tergo-sternal muscles.
an, Anus.
B, Dorsal view of the opisthosoma of the same.
pregen, The prae-genital somite.
p, The tergal stigmata of the tergo-sternal muscles.
paf, Post-anal segmented filament corresponding to the post-anal spine of Limulus.

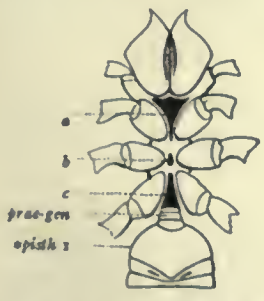


FIG. 55.—*Thelyphonus sp.* Ventral view of the anterior portion of the body to show the three prosomatic sternal plates *a*, *b*, *c*, and the rudimentary sternal element of the prae-genital somite; *opisth* 1, first somite of the opisthosoma.

(From a drawing made by Pickard-Cambridge, under the direction of R. I. Pocock.)

Note.—The possibility of another interpretation of the anterior somites of the mesosoma and the prae-genital somite must be borne in mind. Possibly, though not probably, the somites carrying the two lung-sacs correspond to the first two lung-bearing somites of *Scorpio*, and it is the genital opening which has shifted. The same caution applies in the case of the Araneae. Excalation of one or of two anterior mesosomatic somites, besides the prae-genital somite, would then have to be supposed to have occurred also.

Sub-order *a*. Uropygi.—Prosoma longer than wide, its sternal area very narrow, furnished with a large prosternal and metasternal plate, and often with a small mesosternal sclerite. Appendages of 2nd pair with their basal segments united in the middle line and incapable of lateral movement; appendages of 3rd pair with only the apical segment many-jointed. Opisthosoma without trace of appendages; its posterior somites narrowed to form a movable tail for the support of the post-anal sclerite, which has no poison glands.

Tribe 1. Urotricha.—Dorsal area of prosoma covered with a single shield (? two in *Geralinura*), bearing median and lateral eyes. Post-anal sclerite modified as a long, many-jointed feeler.

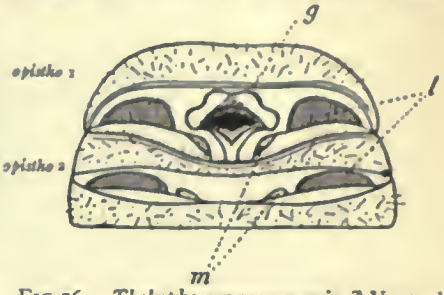


FIG. 56.—*Thelyphonus assamensis* ♂. Ventral surface of the anterior region of the opisthosoma, the first somite being pushed upwards and forwards so as to expose the subjacent structures. *opistho* 1, First somite of the opisthosoma; *opistho* 2, second do.; *g*, genital aperture; *l*, edges of the lamellae of the lung-books; *m*, stigmata of tergo-sternal muscles.

(Original drawing by Pocock.)

Appendages of 2nd pair folding in a horizontal plane, completely chelate, the claw immovably united to the sixth segment. Respiratory organs present in the form of pulmonary sacs.

Family—Thelyphonidae (*Thelyphonus* (fig. 54), *Hypoctonus*, **Geralinura*).

Tribe 2. Tartarides.—Small degenerate forms with the dorsal area of the prosoma furnished with two shields, a larger in front covering the anterior four somites, and a smaller behind covering the 5th and 6th somites; the latter generally subdivided into a right and left portion. There is also a pair of narrow tergal sclerites interposed between the anterior and posterior shields. Eyes evanescent or absent. Appendages of 2nd pair folding in a vertical plane, not chelate, the claw long and movable. Post-anal sclerite short and undivided. No distinct respiratory stigmata behind the sterna of the 1st and 2nd somites of the opisthosoma.

Family—Hubbardiidae (*Schizomus*, *Hubbardia*) (figs. 57-59).

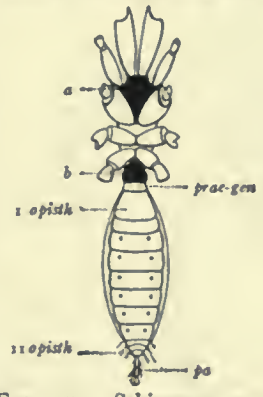


FIG. 57.—*Schizomus crassicaudatus*, one of the Tartarid Pedipalpi. Ventral view of a female with the appendages cut short near the base.

a, Prosternum of prosoma.
b, Metasternum of prosoma.
prae-gen, The prae-genital somite.
1 *opisth*, First somite of the opisthosoma.
11 *opisth*, Eleventh somite of the opisthosoma.
pa, Post-anal lobe of the female (compare the jointed filament in *Thelyphonus*, fig. 54).

(Original drawing by Pickard-Cambridge, directed by Pocock.)

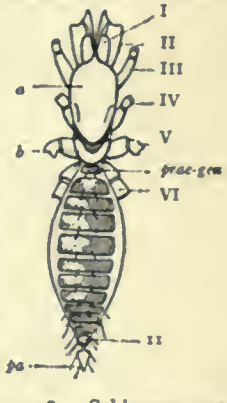


FIG. 58.—*Schizomus crassicaudatus*, a Tartarid Pedipalp. Dorsal view of a male with the appendages cut short.

I to VI. The prosomatic appendages.
a, Anterior plate.
b, Posterior plate of the prosomatic carapace.
prae-gen, Tergum of the prae-genital somite.
11, The eleventh somite of the opisthosoma.
pa, Post-anal lobe of the male—a conical body with narrow basal stalk.

(Original as preceding.)

Sub-order *b*. Amblypygi.—Prosoma wider than long, covered above by a single shield bearing median and lateral eyes, which have diplostichous ommatea. Sternal area broad, with prosternal, two mesosternal, and metasternal plates, the prosternum projecting forwards beneath the coxae of the 2nd pair of appendages. Appendages of 2nd pair folding in a horizontal plane; their basal segments

freely movable; claw free or fused; basal segments of 4th and 5th pairs widely separated by the sternal area; appendages of 3rd pair with all the segments except the proximal three, forming a many-jointed flagellum. Opisthosoma without post-anal sclerite and posterior caudal elongation: with frequently a pair of small lobate

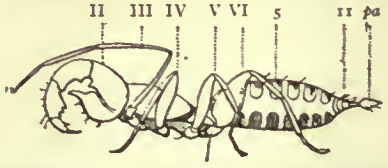


FIG. 59.—*Schizomus crassicaudatus*, one of the Pedipalpi. Lateral view of a male. II to VI, the prosomatic appendages, the first being concealed (see fig. 58); 5, the fifth, and 11, the eleventh tergites of the opisthosoma; *pa*, the conical post-anal lobe.
(Original as preceding.)

appendages on the sternum of the 3rd somite. Respiratory organs, as in Urotricha.

Family—Phrynichidae (*Phrynichus*, *Damon*).
,, Admetidae (*Admetus*, *Heterophrynus*).
,, Charontidae (*Charon*, *Sarax*).
(Family ?)—**Graeophonus*.

Remarks.—The Pedipalpi are confined to the tropics and warmer temperate regions of both hemispheres. Fossil forms occur in the Carboniferous. The small forms known as *Schizomus* and *Hubbardia* are of special interest from a morphological point of view. The Pedipalpi have no poison glands. (Reference to literature (29).)

Order 3. Araneae (figs. 60 to 64).—Prosoma covered with a single shield and typically furnished with median and lateral eyes of diplostichous structure, as in the Amblypygi. The sternal surface wide, continuously chitinized, but with prosternal and metasternal

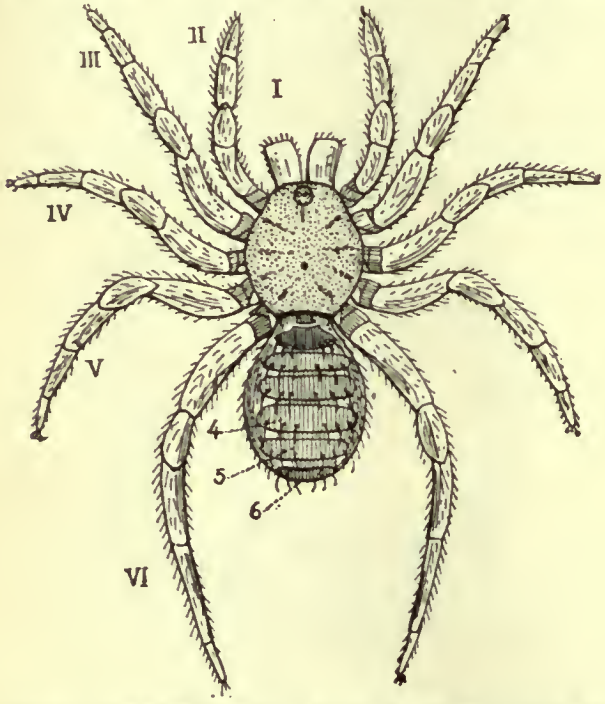


FIG. 60.—*Liphistius desultor*, Schiödte, one of the Araneae Mesothelae. Dorsal view. I to VI, the prosomatic appendages; 4, 5, 6, the fourth, fifth and sixth tergites of the opisthosoma. Between the bases of the sixth pair of limbs and behind the prosomatic carapace is seen the tergite of the small prae-genital somite.
(Original by Pickard-Cambridge and Pocock.)

elements generally distinguishable at the anterior and posterior ends respectively of the large mesosternum. Prosternum underlying the proboscis. Appendages of 1st pair have two segments, as in Pedipalpi, but are furnished with poison gland, and are retroverts. Appendages of 2nd pair not underlying the mouth, but freely movable and, except in primitive forms, furnished with a maxillary lobe; the rest of the limb like the legs, tipped with a single claw and quite unmodified (except in ♂). Remaining pairs of appendages similar in form and function, each tipped with two or three claws. Opisthosoma when segmented showing the same number of somites as in the Pedipalpi; usually unsegmented, the prae-genital somite constricted to form the waist; the appendages of its 3rd and 4th somites retained as spinning mammillae. Respiratory organs (see fig. 63, *stg*), as in the Amblypygi, or with the posterior pair, rarely the anterior pair as well, replaced by tracheal tubes. Intromittent organ of male in the apical segment of the 2nd prosomatic appendage.

Sub-order *a*. Mesothelae (see figs. 60 to 62).—Opisthosoma distinctly segmented, furnished with 11 tergal plates, as in the Amblypygi; the ventral surface of the 1st and 2nd somites with large sternal plates, covering the genital aperture and the two pairs of

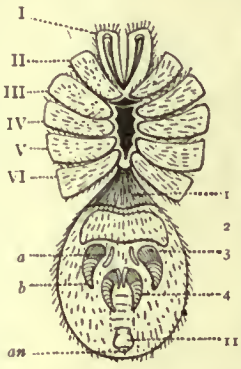


FIG. 61.—*Liphistius desultor*. Ventral view with the prosomatic appendages cut short excepting the chelicerae (I) whose sharp retroverts are seen. Between the bases of the prosomatic limbs an anterior and a posterior sternal plate (black) are seen. 1, The sternum of the first opisthosomatic or genital somite covering the genital aperture and the first pair of lung-sacs. In front of it the narrow waist is formed by the soft sternal area of the praegenital somite; 2, the sternite of the second opisthosomatic somite covering the posterior pair of lung-sacs; 3 and 4, the spinning appendages (limbs) of the opisthosoma; *a*, inner, *b*, outer ramus of the appendage; 11, sternite of the eleventh somite of the opisthosoma: in front of it other rudimentary sternites; *an*, anus.
(Original as above.)

pulmonary sacs, the sternal plates from the 6th to the 11th somites represented by integumental ridges, weakly chitinized in the middle. The two pairs of spinning appendages retain their primitive position in the middle of the lower surface of the opisthosoma far in advance of the anus on the 3rd and 4th somites, each appendage consisting of a stout, many-jointed outer branch and a slender, unsegmented inner branch. Prosoma as in the Mygalomorphae, except that the mesosternal area is long and narrow.

Family—Liphistiidae (*Liphistius*, **Arthrolycosa*).

Sub-order *b*. Opisthothelae (see fig. 63).—Opisthosoma without trace of separate terga and sterna, the segmentation merely represented posteriorly by slight integumental folds and the sterna of the 1st and 2nd somites by the opercular plates of the pulmonary sacs. The spinning appendages migrate to the posterior end of the opisthosoma and take up a position close to the anus; the inner branches of the anterior pair either atrophy or are represented homogenetically by a plate, the cribellum, or by an undivided membranous lobe, the colulus.

Tribe 1. Mygalomorphae.—The plane of the articulation of the appendages of the 1st pair to the prosoma (the retrovert) vertical, the basal segment projecting straight forwards at its proximal end, the distal segment or fang closing backwards in a direction subparallel to the long axis of the body. Two pairs of pulmonary sacs.

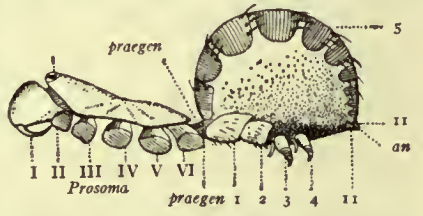


FIG. 62.—*Liphistius desultor*. Lateral view.
I to VI, Appendages of the prosoma cut off at the base.
o, Ocular tubercle.
praegen, The prae-genital somite.
1 and 2, Sternites of the first and second opisthosomatic somites.
3 and 4, Appendages of the third and fourth opisthosomatic somites, which are the spinning organs, and in this genus occupy their primitive position instead of migrating to the anal region as in other spiders.
5, Tergite of the fifth opisthosomatic somite.
11, Eleventh opisthosomatic somite; *an*, Anus.
(Original.)

Families—Theraphosidae (*Avicularia*, *Poecilotheria*). Barychelidae (*Barychelus*, *Plagiobothrus*). Dipluridae (*Diplura*, *Macrothele*). Ctenizidae (*Cteniza*, *Nemesia*). Atypidae (*Atypus*, *Calommata*).

Tribe 2. Arachnomorphae.—The plane of the articulation of the appendages of the 1st pair to the prosoma horizontal, the basal segment projecting vertically downwards, at least at its proximal end, the distal segment or fang closing inwards nearly or quite at right angles to the long axis of the body. The posterior pulmonary sacs (except in *Hypochilus*) replaced by tracheal tubes; the anterior and posterior pairs replaced by tracheal tubes in the Caponiidae.

Principal families—Hypochilidae (*Hypochilus*). Dysderidae (*Dysdera*, *Segestria*). Caponiidae (*Caponia*, *Nops*). Filistatidae (*Filistata*). Uloboridae (*Uloborus*, *Dinopis*). Argiapidae (*Nephila*, *Gasteracantha*). Pholcidae (*Pholcus*, *Artema*). Agelenidae (*Tegenaria*). Lycosidae (*Lycosa*). Clubionidae (*Clubiona*, *Olios*, *Sparassus*) Gnaphosidae (*Gnaphosa*, *Hemiclaea*). Thomisidae (*Thomisus*). Attidae (*Salticus*). Urocteidae (*Uroctea*). Eresidae (*Eresus*).

Remarks on the Araneae.—The Spiders are the most numerous

and diversified group of the Arachnida; about 2000 species are known. No noteworthy fossil spiders are known; the best-preserved are in amber of Oligocene age. *Protolycosa* and *Arthrolycosa* occur in the Carboniferous. Morphologically, the spiders are remarkable for the concentration and specialization of their structure, which is accompanied with high physiological efficiency. The larger species of Bird's Nest Spiders (*Avicularia*), the opisthosoma of which is as large as a bantam's egg, undoubtedly attack young birds, and M'Cook gives an account of the capture in its web by an ordinary house spider of a small mouse. The "retrovert" or bent-back

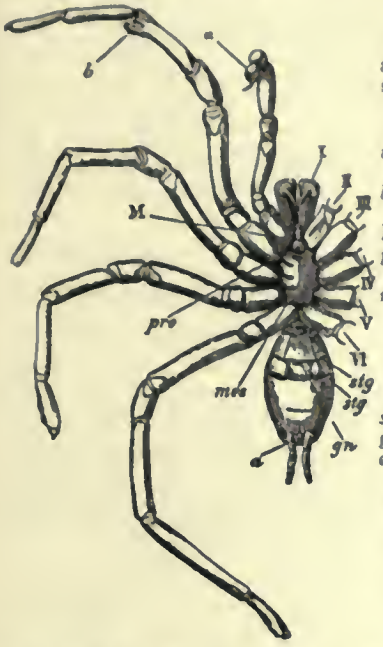


FIG. 63.—Ventral view of a male mygalomorphous spider.
I to VI, The six pairs of prosomatic appendages.
a, Copulatory apparatus of the second appendage.
b, Process of the fifth joint of the third appendage.
M, Mouth.
pro, Prosternite of the prosoma.
mes, Mesosternite of the prosoma: observe the contact of the coxae of the sixth pair of limbs behind it; compare *Liphistius* (fig. 61) where this does not occur.
stg, Lung aperture.
gn, Genital aperture.
a, Anus with a pair of backwardly migrated spinning appendages on each side of it; compare the position of these appendages in *Liphistius* (fig. 61).
(From Lankester, "Limulus an Arachnid.")

first pair of appendages is provided with a poison gland opening on the fang or terminal segment. Spiders form at least two kinds of constructions—snares for the capture of prey and nests for the preservation of the young. The latter are only formed by the female, which is a larger and more powerful animal than the male. Like the scorpions the spiders have a special tendency to cannibalism, and accordingly the male, in approaching the female for the purpose of fertilizing her, is liable to be fallen upon and sucked dry by the object of his attentions. The sperm is removed by the male from the genital aperture into a special receptacle on the terminal segment

FIG. 64.—*Liphistius desultor*. Under side of the uplifted genital or first opisthosomatic somite of the female; *g*, genital aperture; *p*, pitted plate, probably a gland for the secretion of adhesive material for the eggs; *l*, the edges of the lamellae of the lung-books of the first pair.
(Original drawing by Pocock.)

of the 2nd prosomatic appendage. Thus held out at some distance from the body, it is cautiously advanced by the male spider to the genital aperture of the female.

For an account of the courtship and dancing of spiders, of their webs and floating lines, the reader is referred to the works of M'Cook (**30**) and the Peckhams (**31**), whilst an excellent account of the nests of trap-door spiders is given by Moggridge (**32**). References to systematic works will also be found at the end of this article (**33**).

Order 4. Palpigradi = Microthelyphonidae (see fig. 65).—Prosoma covered above by three plates, a larger representing the dorsal elements of the first four somites, and two smaller representing the dorsal elements of the 5th and 6th.

Its ventral surface provided with one prosternal, two mesosternal and one metasternal plate. Appendages of 1st pair consisting of three segments, completely chelate, without poison gland; of 2nd pair slender, leg-like, tipped with three claws, the basal segment without sterno-coxal process taking no share in mastication, and widely separated from its fellow of the opposite side; 3rd, 4th, 5th and 6th appendages similar in form to the 2nd and to each other.

Proboscis free, not supported from below by either the prosternum or the basal segments of the appendages of the 2nd pair.

Opisthosoma consisting of only ten somites, which have no tergal and sternal elements, the prae-genital somite contracted to form a "waist," as in the Pedipalpi; the last three narrowed to form a

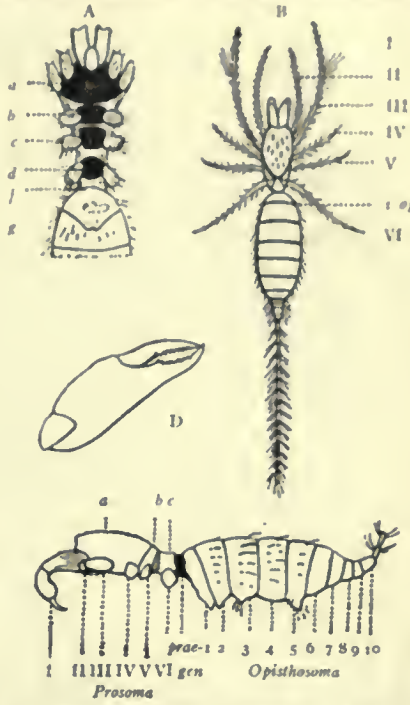


FIG. 65.—*Koenenia mirabilis*, Grassi, one of the Palpigradi.
A, Ventral view of prosoma and of anterior region of opisthosoma with the appendages cut off near the base; *a* and *b*, prosternites; *c*, mesosternite; and *d*, metasternite of the prosoma; *f*, ventral surface of the prae-genital somite; *g*, sternite of the genital somite (first opisthosomatic somite).
B, Dorsal view. I to VI, prosomatic appendages; 1 *opisth*, genital somite (first opisthosomatic somite).
C, Lateral view, I to VI, prosomatic appendages; *a*,*b*,*c*, the three tergal plates of the prosoma; *prae-gen*, the prae-genital somite; 1 to 10, the ten somites of the opisthosoma.
D, Chelicera.
(Original drawing by Pocock and Pickard-Cambridge, after Hansen and Sörensen.)

caudal support for the many-jointed flagelliform telson, as in the Urotricha. Respiratory organs atrophied.

Family—Koeneniidae (*Koenenia*).

Remarks.—An extremely remarkable minute form originally described by Grassi (**34**) from Sicily, and since further described by Hansen (**35**). Recently the genus has been found in Texas, U.S.A. Only one genus of the order is known.

Order 5. Solifugae = Mycetophorae (see figs. 66 to 69).—Dorsal area of prosoma covered with three distinct plates, two smaller representing the terga of the 5th and 6th somites, and a larger representing those of the anterior four somites, although the reduced terga of the 3rd and 4th are traceable behind the larger plate. The latter bears a pair of median eyes and obsolete lateral eyes on each side. Sternal elements of prosoma almost entirely absent, traces of a prosternum and metasternum alone remaining. Rostrum free, not supported by either the prosternum or the basal segments of the appendages. Appendages of 1st pair large, chelate, bisegmented, articulated to the sides of the head-shield; appendages of 2nd pair simple, pediform, with protrusible (? suctorial) organ, and no claws at the tip; their basal segments united in the middle line and furnished with sterno-coxal process. Remaining pairs of appendages with their basal segments immovably fixed to the sternal surface, similar in form, the posterior three pairs furnished with two claws supported on long stalks; the basal segments of the 6th pair bearing five pairs of tactile sensory organs or malleoli. The prae-genital somite is suppressed. Opisthosoma composed of ten somites. Respiratory organs tracheal, opening upon the ventral surface of the 2nd and 3rd, and sometimes also of the 4th somite of the opisthosoma. A supplementary pair of tracheae opening behind the basal segment of the 4th appendage of the prosoma.

(? Intromittent organ of male lodged on the dorsal side of the 1st pair of prosomatic appendages.)

Families—Hexisopodidae (*Hexisopus*). Solpugidae (*Solpuga*, *Rhagodes*). Galeodidae (*Galeodes*).

Remarks.—These most strange-looking Arachnids occur in warmer temperate, and tropical regions of Asia, Africa and America. Their anatomy has not been studied, as yet, by means of freshly-killed material, and is imperfectly known, though the presence of the coxal glands was determined by Macleod in 1884. The proportionately enormous chelae (chelicerae) of the first pair of appendages are not provided with poison glands; their bite is not venomous.

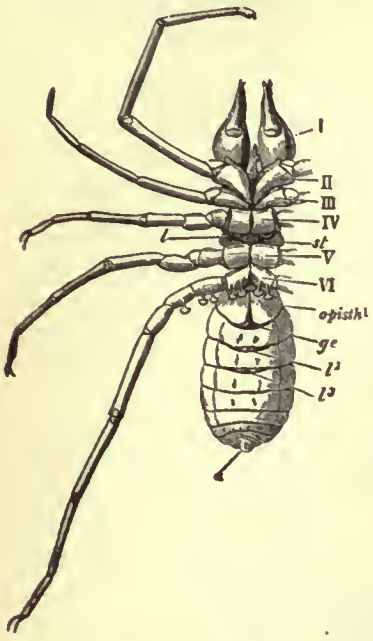


FIG. 66.—*Galeodes sp.*, one of the Solifugae. Ventral view to show legs and somites.
I to VI, The six leg-bearing somites of the prosoma.
opisth 1, First or genital somite of the opisthosoma.
ge, Site of the genital aperture.
st, Thoracic tracheal aperture.
l^1, Anterior tracheal aperture of the opisthosoma in somite 2 of the opisthosoma.
l^2, Tracheal aperture in somite 3 of the opisthosoma.
a, Anus.
(From Lankester, "Limulus and Arachnid.")

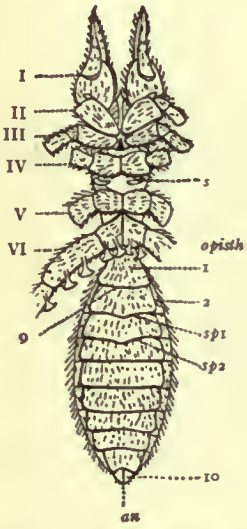


FIG. 67.—*Galeodes sp.*, one of the Solifugae. Ventral view with the appendages cut off at the base.
I to VI, Prosomatic appendages.
s, Prosomatic stigma or aperture of the tracheal system.
1, First opisthosomatic sternite covering the genital aperture *g*.
2, Second opisthosomatic sternite covering the second pair of tracheal apertures *sp*1.
*sp*2, The third pair of tracheal apertures.
10, The tenth opisthosomatic somite.
an, The anal aperture.
(Original by Pickard-Cambridge and Pocock.)

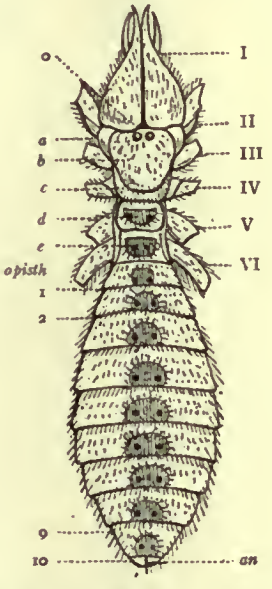


FIG. 68.—*Galeodes sp.*, one of the Solifugae. Dorsal view.
I to VI, Bases of the prosomatic appendages.
o, Eyes.
a, Lateral region of the cephalic plate to which the first pair of appendages are articulated.
b, Cephalic plate with median eye.
c, Dorsal element of somites bearing third and fourth pairs of appendages.
d, Second plate of the prosoma with fifth pair of appendages.
e, Third or hindermost plate of the prosoma beneath which the sixth pair of legs is articulated.
1, 2, 9, 10, First, second, ninth and tenth somites of the opisthosoma.
an, Anus.
(Original.)

Galeodes has been made the means of a comparison between the structure of the Arachnida and Hexapod insects by Haeckel and other writers, and it was at one time suggested that there was a genetic affinity between the two groups—through *Galeodes*, or extinct forms similar to it. The segmentation of the prosoma and the form of the appendages bear a homoplastic similarity to the head, pro-, meso-, and meta-thorax of a Hexapod with mandibles, maxillary palps and three pairs of walking legs; while the opisthosoma agrees in form and number of somites with the abdomen of a Hexapod, and the tracheal stigmata present certain agreements in the two cases. Reference to literature (36).

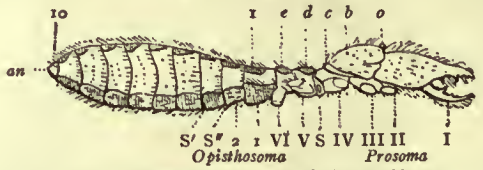


FIG. 69.—*Galeodes sp.*, one of the Solifugae.
I to VI, The six prosomatic limbs cut short.
o, The eyes.
b, *c*, Demarcated areae of the cephalic or first prosomatic plate corresponding respectively to appendages I, II, III, and to appendage IV (see fig. 68).
d, Second plate of the prosoma-carrying appendage V.
e, Third plate of the prosoma-carrying appendage VI. The prae-genital somite is absent.
1, First somite of the opisthosoma.
2, Second do.
S, Prosomatic tracheal aperture between legs IV and V.
S′ and S″, Opisthosomatic tracheal apertures.
10, Tenth opisthosomatic somite.
an, Anus.
(Original.)

Order 6. Pseudoscorpiones = Chelonethi, also called Chernetidia (see figs. 70, 71, 72).—Prosoma covered by a single dorsal shield, at most furnished with one or two diplostichous lateral eyes; sternal elements obliterated or almost obliterated. Appendages of the 1st pair bisegmented completely chelate, furnished with peculiar organs, the *serrula* and the *lamina*. Appendages of 2nd pair very large and completely chelate, their basal segments meeting in the middle line, as in the Uropygi, and provided in front with membranous lip-like processes underlying the proboscis. Appendages of the 3rd, 4th, 5th and 6th pairs similar in form and function, tipped with two claws, their basal segments in contact in the median ventral line. The prae-genital somite wide, not constricted, with large tergal plate, but with its sternal plate small or inconspicuous. Opisthosoma

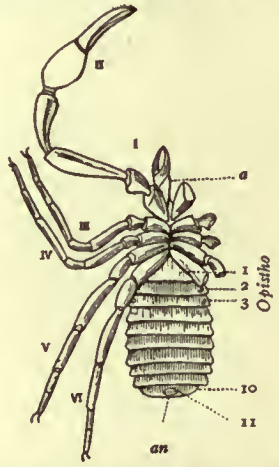


FIG. 70.—*Garypus litoralis*, one of the Pseudoscorpiones. Ventral view.
I to VI, Prosomatic appendages.
o, Sterno-coxal process of the basal segment of the second appendage.
1, Sternite of the genital or first opisthosomatic somite; the prae-genital somite, though represented by a tergum, has no separate sternal plate.
2 and 3, Sternites of the second and third somites of the opisthosoma, each showing a tracheal stigma.
10 and 11, Sternites of the tenth and eleventh somites of the opisthosoma.
an, Anus.
(Original by Pocock and Pickard-Cambridge.)

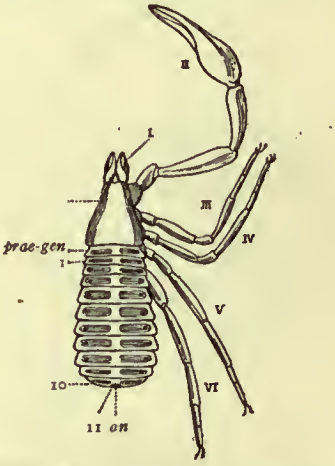


FIG. 71.—*Garypus litoralis*, one of the Pseudoscorpiones. Dorsal view.
I to VI, The prosomatic appendages.
o, Eyes.
prae-gen, Prae-genital somite.
1, Tergite of the genital or first opisthosomatic somite.
10, Tergite of the tenth somite of the opisthosoma.
11, The evanescent eleventh somite of the opisthosoma.
an, Anus.
(Original.)

composed, at least in many cases, of eleven somites, the 11th somite very small, often hidden within the 10th. Respiratory organs in the form of tracheal tubes opening by a pair of stigmata in the 2nd and 3rd somites of the opisthosoma. Intromittent organ of male beneath sternum of the 1st somite of the opisthosoma.

Sub-order *a*. Panctenodactyli.—Dorsal plate of prosoma (carapace) narrowed in front; the appendages of the 1st pair small, much narrower, taken together, than the posterior border of the carapace. Serrula on movable digit of appendages of 1st pair fixed throughout its length, and broader at its proximal than at its distal end; the immovable digit with an external process.

Family—Cheliferidae (*Chelifer* (figs. 70, 71, 72), *Chiridium*).
" Garypidae (*Garypus*).

Sub-order *b*. Hemictenodactyli.—Dorsal plate of prosoma scarcely narrowed in front; the appendages of the 1st pair large, not much narrower, taken together, than the posterior border of the carapace.

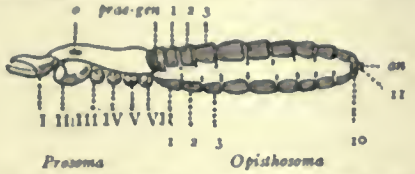


FIG. 72.—*Garypus litoralis*, one of the Pseudoscorpiones. Lateral view.

I to VI, Basal segments of the six prosomatic appendages.
o, Eyes.
prae-gen, Tergite of the prae-genital somite.
1, Genital or first opisthosomatic somite.
2, 3, 10, The second, third and tenth somites of the opisthosoma.
11, The minute eleventh somite; *an*, The anus.

(Original.)

The serrula or the movable digit free at its distal end, narrowed at the base; no external lamina on the immovable digit.

Family—Obisiidae (*Obisium*, *Pseudobisium*).
" Chthoniidae (*Chthonius*, *Tridenchthonius*).

Remarks.—The book-scorpions—so called because they were, in old times, found not unfrequently in libraries—are found in rotten wood and under stones. The similarity of the form of their appendages to those of the scorpions suggests that they are a degenerate group derived from the latter, but the large size of the prae-genital somite in them would indicate a connexion with forms preceding the scorpions. Reference to literature (37).

Order 7. Podogona = Ricinulei (see figs. 73 to 76).—Dorsal area of prosoma furnished with two shields, a larger behind representing, probably, the tergal elements of the somites, and a smaller in front, which is freely articulated to the former and folds over the

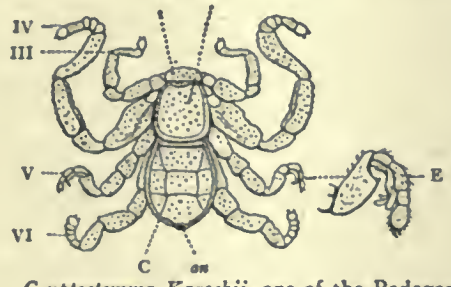


FIG. 73.—*Cryptostemma Karschii*, one of the Podogona. Dorsal view of male, enlarged five times linear.

III to VI, The third, fourth, fifth and sixth appendages of the prosoma.
a, Movable (hinged) sclerite (so-called hood) overhanging the first pair of appendages.
b, Fused terga of the prosoma followed by the opisthosoma of four visible somites.
an, Orifice within which the caudal segments are withdrawn.
E, Extremity of the fifth appendage of the male modified to subserve copulation.

(Original drawing by Pocock and Pickard-Cambridge.)

appendages of the 1st pair. Ventral area without distinct sternal plates. Appendages of 1st pair, bi-segmented, completely chelate. Appendages of 2nd pair, with their basal segments uniting in the middle line below the mouth, weakly chelate at apex. Appendages of 3rd, 4th, 5th and 6th pairs similar in form; their basal segments in contact in the middle line and immovably welded, except those of the 3rd pair, which have been pushed aside so that the bases of the 2nd and 4th pairs are in contact with each other. A movable membranous joint between the prosoma and the opisthosoma, the generative aperture opening upon the ventral side of the membrane. Prae-genital somite suppressed; the opisthosoma consisting of nine segments, whereof the first and second are almost suppressed and concealed within the joint between the prosoma and the opisthosoma; the following four large and manifest, and the remaining three minute and forming a slender generally-retracted tail like that of *Thelyphonus*. Respiratory organs tracheal, opening by a pair of spiracles in the prosoma above the base of the fifth appendage on each side. Intromittent organ of male placed at the distal end of the appendage of the 5th pair.

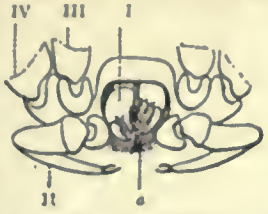


FIG. 74.—*Cryptostemma Karschii*. anterior aspect of the prosoma with the " hood " removed. I to IV, first to fourth appendages of the prosoma; *a*, basal segment of the second pair of appendages meeting its fellow in the middle line (see fig. 75).

(Original drawing by Pocock and Pickard-Cambridge.)

Family—Cryptostemmidae (*Cryptostemma*, *Poliochera*), Carboniferous.

Remarks on the Podogona.—The name given to this small but remarkable group has reference to the position of the male intromittent organ (fig. 73, E). They are small degenerate animals with a relatively firm integument. Not more than four species and twice that number of specimens are known. They have been found in West Africa and South America. A fact of special interest in regard to them is that the genus Poliochera, from the Coal Measures, appears to be a member of the same group. The name Cryptostemma, given to the first-known genus of the order, described by Guérin-Méneville, refers to the supposed concealment of the eyes by the movable cephalic sclerite. Reference to literature (38).

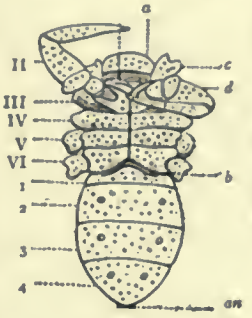


FIG. 75.—*Cryptostemma Karschii*, one of the Podogona. Ventral view.

I to VI, The six pairs of appendages of the prosoma, the last three cut short.
1, 2, 3, 4, The four somites of the opisthosoma.
a, Visible hood overhanging the first pair of appendages.
b, Position of the genital orifice.
c, Part of 3rd appendage.
d, Fourth segment of 2nd appendage. Observe that the basal segment of appendage III does *not* meet its fellow in the middle line.

(Original drawing by Pocock and Pickard-Cambridge.)

Order 8. Opiliones (see fig. 77).—Dorsal area of prosoma covered by a single shield usually bearing a pair of eyes. Sternal elements much reduced. Appendages of 1st pair large, three segmented and completely chelate; of 2nd pair either simple and pediform, or prehensile and subchelate; of remaining four pairs, similar in form, ambulatory in function; the basal segment of the 2nd, 3rd and sometimes of the 4th pairs of appendages furnished with sterno-coxal (maxillary) lobe. Opisthosoma confluent throughout its breadth with the prosoma, with the dorsal plate of which its anterior tergal plates are more or less fused; at most ten opisthosomatic somites traceable; the generative aperture thrust far forwards between the basal segments of the 6th appendages. Prae-genital somite suppressed. Respiratory organs tracheal, opening by a pair of stigmata situated immediately behind the basal segments of the 6th pair of appendages on what is probably the sternum of the 2nd opisthosomatic somite and also in some cases upon the 5th segment of the legs.

FIG. 76.—*Cryptostemma Karschii*. Extremity of the fifth pair of appendages of the female for comparison with that of the male E in fig. 73.

Intromittent organ of male lying within the genital orifice.

Sub-order *a*. Laniatores.—Orifice of foetid glands opening above the coxa of the 4th appendage, not raised upon a tubercle. Orifice of coxal gland situated just behind that of the foetid gland. Sternal plate of prosoma long and narrow, with a distinct prosternal element underlying the mouth. Coxae of 4th, 5th and 6th appendages immovable. Appendages of 2nd pair, strong, usually prehensile and spiny. Genital orifice covered by an operculum.

Families—Gonoleptidae (*Gonoleptes*, *Goniasoma*).
Biantidae (*Biantes*).
Oncopodidae (*Oncopus*, *Pelitnus*).
Trioenonychidae (*Trioenonyx*, *Acumontia*).

Sub-order *b*. Palpatores.—Orifice of foetid glands opening above the coxa of the 3rd appendage, not raised upon a tubercle. Orifice of coxal gland situated between the coxae of the 5th and 6th appendages. Sternal plate of prosoma usually short and wide, rarely longer than broad; with a larger or smaller prosternal element underlying the mouth. Coxae of 3rd, 4th, 5th and 6th appendages movable

or immovable. Appendages of 2nd pair weak, pediform not prehensile. Genital orifice covered by an operculum.

Families—Phalangiidae (*Phalangium, Gagrella*).
Ischyropsalidae (*Ischyropsalis, Taracus*).
Nemastomidae (*Nemastoma*).
Trogulidae (*Trogulus, Anelasmocephalus*).

Sub-order *c. Cyphophthalmi* (*Anepignathi*).—Orifice of foetid glands opening on a tubercle situated near the lateral border of the carapace above the base of the 5th appendage. Orifice of coxal gland probably situated at base of coxa of 5th appendage; sternal plate of prosoma minute or absent; no prosternal element underlying the mouth. Coxae of 5th and 6th, and usually also of 4th appendages immovable. Appendages of 2nd pair weak, pediform, not prehensile. Genital orifice not covered by an operculum.

Families—Sironidae (*Siro, Pettalus*).
Stylocellidae (*Stylocellus*).

Remarks on the Opiliones.—These include the harvest-men, sometimes called also daddy-long-legs, with round undivided bodies and very long, easily-detached legs. The intromittent organs of the male are remarkable for their complexity and elaboration. The confluence of the regions of the body and the dislocation of apertures from their typical position are results of degeneration. The Opiliones seem to lead on from the Spiders to the Mites. Reference to literature (39).

Apparently related to the Opiliones are two extinct groups, the Anthracomarti and Phalangiotarbi, which are not known to have survived the Carboniferous period. In the Anthracomarti the

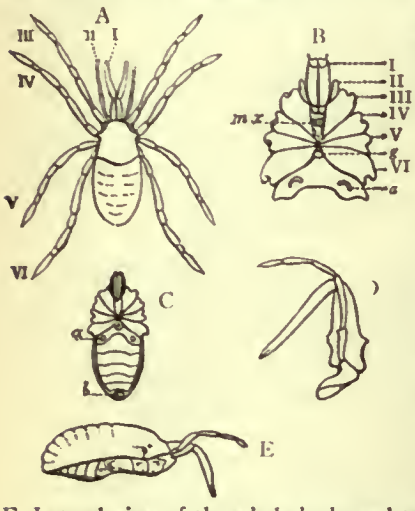


FIG. 77.—*Stylocellus sumatranus*, one of the Opiliones; after Thorell. Enlarged.
A, Dorsal view; I to VI, the six prosomatic appendages.
B, Ventral view of the prosoma and of the first somite of the opisthosoma, with the appendages I to VI cut off at the base; *a*, tracheal stigma; *mx*, maxillary processes of the coxae of the 3rd pair of appendages; *g*, genital aperture.
C, Ventral surface of the prosoma and opisthosoma; *a*, tracheal stigma; *b*, last somite.
D, Lateral view of the 1st and 2nd pair of appendages.
E, Lateral view of the whole body and two 1st appendages, showing the fusion of the dorsal elements of the prosoma into a single plate, and of those of the opisthosoma into an imperfectly segmented plate continuous with that of the prosoma.

opisthosoma was movably articulated to the prosoma, and consisted of from eight to ten segments furnished with movable lateral plates, the anal segment being overlapped dorsally by a laminate expansion of the preceding segment. The carapace of the prosoma was unsegmented and often bore a pair of eyes. The appendages of the 2nd pair were slender and pediform; those of the 3rd, 4th, 5th and 6th pairs were similar in form and ambulatory in function with their basal segments arranged round a sternal area as in the order Araneae. The best-known genera were *Anthracomartus* and *Eophognus*.

In the Phalangiotarbi the appendages resembled those of the Anthracomarti, except that the basal segments of the last four pairs were usually approximated in the middle line leaving a long and narrow sternal area between; and the carapace of the prosoma was unsegmented. The prosoma and opisthosoma were broadly confluent and probably immovably welded together. The opisthosoma consisted of eight or nine segments, whereof the anterior five or six were very short in the dorsal region, and the posterior three exceptionally large with the anal orifice terminal.

Several genera have been established, the best-characterized being *Geraphognus* and *Architarbus*.

Order 9. Rhynchostomi = Acari (see fig. 78).—Degenerate Arachnids resembling the Opiliones in many structural points, but chiefly distinguishable from them by the following features:—The basal segments of the appendages of the 2nd pair are united in the middle line behind the mouth, those of the 3rd, 4th, 5th and 6th pairs are widely separated and not provided with sterno-coxal (maxillary) lobes, and take no share in mastication; the respiratory stigmata, when present, belong to the prosoma, and the primitive segmentation of the opisthosoma has entirely or almost entirely disappeared.

Sub-order *a. Notostigmata.*—Opisthosoma consisting of ten segments defined by integumental grooves, each of the anterior four of these furnished with a single pair of dorsally-placed spiracles or tracheal stigmata.

Family—Opilioacaridae (*Opilioacarus*).

Sub-order *b. Cryptostigmata.*—Integument hard, strengthened by a continuously chitinized dorsal and ventral sclerite. Tracheae typically opening by stigmata situated in the articular sockets (acetabula) of the 3rd, 4th, 5th and 6th pairs of appendages.

Family—Oribatidae (*Oribata, Nothrus, Hoplophora*).

Sub-order *c. Metastigmata.*—Integument mostly like that of the Cryptostigmata. Tracheae opening by a pair of stigmata situated above and behind the base of the 4th or 5th or 6th pair of appendages.

Families—Gamasidae (*Gamasus, Pteroptus*).
Argasidae (*Argas, Ornithodoros*).
Ixodidae (*Ixodes, Rhipicephalus*).

Sub-order *d. Prostigmata.*—Integument soft, strengthened by special sclerites, those on the ventral surface of the prosoma apparently representing the basal segments of the legs embedded in the skin. Tracheae, except in the aquatic species in which they are atrophied, opening by a pair of stigmata situated close to or above the base of the appendages of the 1st pair (mandibles).

Families—Trombidiidae (*Trombidium, Tetranychus*).
Hydrachnidae (*Hydrachna, Atax*).
Halacaridae (*Halacarus, Leptognathus*).
Bdellidae (*Bdella, Eupodes*).

Sub-order *e. Astigmata.*—Degenerate, mostly parasitic forms approaching the Prostigmata in the development of integumental

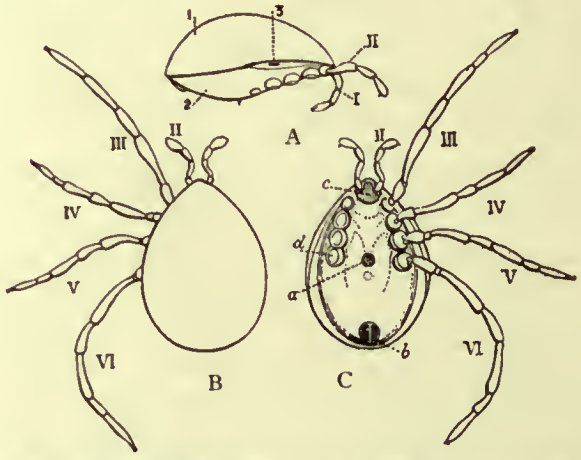


FIG. 78.—*Holothyrus nitidissimus*, one of the Acari; after Thorell. Enlarged fifteen times linear.
A, Lateral view with appendages III to VI removed; 1, plate covering the whole dorsal area, representing the fused tergal sclerites of the prosoma and opisthosoma; 2, similarly-formed ventral plate; 3, tracheal stigma.
B, Dorsal view of the same animal; II to VI, 2nd to 6th pairs of appendages. The 1st pair of appendages both in this and in C are retracted.
C, Ventral view of the same; II to VI as in B; *a*, genital orifice; *b*, anus; *c*, united basal segments of the second pair of appendages; *d*, basal segment of the 6th prosomatic appendage of the right side. The rest of the appendage, as also of app. III, IV and V, has been cut away.

sclerites and the softness of the skin, but with the respiratory system absent.

Families—Tyroglyphidae (*Tyroglyphus, Rhizoglyphus*).
Sarcoptidae (*Sarcoptes, Analges*).

Sub-order *f. Vermiformia.*—Degenerate atracheate parasitic forms with the body produced posteriorly into an annulated caudal prolongation, and the 3rd, 4th, 5th and 6th pairs of appendages short and only three-jointed.

Family—Demodicidae (*Demodex*).

Sub-order *g. Tetrapoda.*—Degenerate atracheate gall-mites in which the body is produced posteriorly and annulated, as in *Demodex*, but in which the appendages of the 3rd and 4th pairs are long and normally segmented and those of the 5th and 6th pairs entirely absent.

Family—Eriophyidae (*Eriophyes, Phyllocoptes*).

Remarks on the Rhynchostomi.—The Acari include a number of forms which are of importance and special interest on account of their parasitic habits. The ticks (*Ixodes*) are not only injurious as blood-suckers, but are now credited with carrying the germs of Texas cattle-fever, just as mosquitoes carry those of malaria. The itch-insect (*Sarcoptes scabiei*) is a well-known human parasite, so minute that it was not discovered until the end of the 18th century, and "the itch" was treated medicinally as a rash. The female burrows in the epidermis much as the female trap-door spider burrows in turf in order to make a nest in which to rear her young. The male does not burrow, but wanders freely on the surface of the skin. *Demodex folliculorum* is also a common parasite of the sebaceous

glands of the skin of the face in man, and is frequent in the skin of the dog. Many Acari are parasitic on marine and freshwater molluscs, and others are found on the feathers of birds and the hair of mammals. Others have a special faculty of consuming dry, powdery vegetable and animal refuse, and are liable to multiply in manufactured products of this nature, such as mouldy cheese. A species of Acarus is recorded as infesting a store of powdered strychnine and feeding on that drug, so poisonous to larger organisms. Reference to literature (40).

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ARAD, or **Ó-ARAD**, a town of Hungary, capital of the county of the same name, 159 m. S.E. of Budapest by rail. Pop. (1900) 53,903. It is situated on the right bank of the river Maros, and consists of the inner town and five suburbs. Arad is a modern-built town, and contains many handsome private and public buildings, including a cathedral. It is the seat of a Greek-Orthodox bishop, and possesses a Greek-Orthodox theological seminary, two training schools for teachers—one Hungarian, and the other Rumanian—and a conservatoire for music. The town played an important part in the Hungarian revolution of 1848–49, and possesses a museum containing relics of this war of independence. One of the public squares contains a martyrs' monument, erected in memory of the thirteen Hungarian generals shot here on the 6th of October 1849, by order of the Austrian general Haynau. It consists of a colossal figure of

Hungary, with four allegorical groups, and medallions of the executed generals. Arad is an important railway junction, and has become the largest industrial and commercial centre of south-eastern Hungary. Its principal industries are: distilling, milling, machinery-making, leather-working and saw-milling. A large trade is carried on in grain, flour, alcohol, cattle and wood. Arad was a fortified place, and was captured by the Turks during the wars of the 17th century, and kept by them till the end of that century. The new fortress, built in 1763, although small, was formidable, and played a great rôle during the Hungarian struggle for independence in 1849. Bravely defended by the Austrian general Berger until the 1st of July 1849, it was then captured by the Hungarian rebels, who made it their headquarters during the latter part of the insurrection. It was from it that Kossuth issued his famous proclamation (11th August 1849), and it was here that he handed over the supreme military and civil power to Görgei. The fortress was recaptured shortly after the surrender of Görgei to the Russians at Világos. The fortress is now used as an ammunition depot.

The town of Uj-Arad, *i.e.* New Arad (pop. 6124), situated on the opposite bank of the Maros, is practically a suburb of Arad, with which it is connected by a bridge. The town was founded during the Turkish wars of the 17th century. The works erected by the Turks for the capture of the fortress of Arad formed the nucleus of the new town.

Világos, the town where the famous capitulation of Görgei to the Russians took place on the 13th of August 1849, lies 21 m. by rail north-east of Arad.

ARAEOSTYLE (Gr. *ἀραιός*, weak or widely spaced, and *στῦλος*, column), an architectural term for the intercolumniation (*q.v.*) given to those temples where the columns had only timber architraves to carry.

ARAEOSYSTYLE (Gr. *ἀραιός*, widely spaced, and *σύστυλος*, with columns set close together), an architectural term applied to a colonnade, in which the intercolumniation (*q.v.*) is alternately wide and narrow, as in the case of the western porch of St Paul's cathedral and the east front of the Louvre by Perrault.

ARAGO, DOMINIQUE FRANÇOIS JEAN (1786–1853), French physicist, was born on the 26th of February 1786, at Estagel, a small village near Perpignan, in the department of the eastern Pyrenees. He was the eldest of four brothers. Jean (1788–1836) emigrated to America and became a general in the Mexican army. Jacques Étienne Victor (1799–1855) took part in L. C. de S. de Freycinet's exploring voyage in the "Uranie" from 1817 to 1821, and on his return to France devoted himself to journalism and the drama. The fourth brother, Étienne Vincent (1802–1892), is said to have collaborated with H. de Balzac in the *Héritière de Birague*, and from 1822 to 1847 wrote a great number of light dramatic pieces, mostly in collaboration. A strong republican, he was obliged to leave France in 1849, but returned after the amnesty of 1859. In 1879 he was nominated director of the Luxembourg museum.

Showing decided military tastes François Arago was sent to the municipal college of Perpignan, where he began to study mathematics in preparation for the entrance examination of the polytechnic school. Within two years and a half he had mastered all the subjects prescribed for examination, and a great deal more, and, on going up for examination at Toulouse, he astounded his examiner by his knowledge of Lagrange. Towards the close of 1803 he entered the polytechnic school, with the artillery service as the aim of his ambition, and in 1804, through the advice and recommendation of S. D. Poisson, he received the appointment of secretary to the Observatory of Paris. He now became acquainted with Laplace, and through his influence was commissioned, with J. B. Biot, to complete the meridional measurements which had been begun by J. B. J. Delambre, and interrupted since the death of P. F. A. Méchain (1744–1804). The two left Paris in 1806 and began operations among the mountains of Spain, but Biot returned to Paris after they had determined the latitude of Formentera, the southernmost point to which they were to carry the survey, leaving Arago to make the geodetical connexion of Majorca with Ivica and with Formentera.

The adventures and difficulties of the latter were now only beginning. The political ferment caused by the entrance of the French into Spain extended to these islands, and the ignorant populace began to suspect that Arago's movements and his blazing fires on the top of Mount Galatzo were telegraphic signals to the invading army. Ultimately they became so infuriated that he was obliged to cause himself to be incarcerated in the fortress of Belver in June 1808. On the 28th of July he managed to escape from the island in a fishing-boat, and after an adventurous voyage he reached Algiers on the 3rd of August. Thence he procured a passage in a vessel bound for Marseilles, but on the 16th of August, just as the vessel was nearing Marseilles, it fell into the hands of a Spanish corsair. With the rest of the crew, Arago was taken to Rosas, and imprisoned first in a windmill, and afterwards in the fortress of that seaport, until the town fell into the hands of the French, when the prisoners were transferred to Palamos. After fully three months' imprisonment they were released on the demand of the dey of Algiers, and again set sail for Marseilles on the 28th of November, but when within sight of their port they were driven back by a northerly wind to Bougie on the coast of Africa. Transport to Algiers by sea from this place would have occasioned a weary stay of three months; Arago, therefore, set out for it by land under conduct of a Mahommedan priest, and reached it on Christmas day. After six months' stay in Algiers he once again, on the 21st of June 1809, set sail for Marseilles, where he had to undergo a monotonous and inhospitable quarantine in the lazaretto, before his difficulties were over. The first letter he received, while in the lazaretto, was from A. von Humboldt; and this was the origin of a connexion which, in Arago's words, "lasted over forty years without a single cloud ever having troubled it."

Through all these vicissitudes Arago had succeeded in preserving the records of his survey; and his first act on his return home was to deposit them in the Bureau des Longitudes at Paris. As a reward for his adventurous conduct in the cause of science, he was in September 1809 elected a member of the Academy of Sciences, in room of J. B. L. Lalande, at the remarkably early age of twenty-three, and before the close of the same year he was chosen by the council of the polytechnic school to succeed G. Monge in the chair of analytical geometry. About the same time he was named by the emperor one of the astronomers of the Royal Observatory, which was accordingly his residence till his death, and it was in this capacity that he delivered his remarkably successful series of popular lectures on astronomy, which were continued from 1812 to 1845.

In 1816, along with Gay-Lussac, he started the *Annales de chimie et de physique*, and in 1818 or 1819 he proceeded along with Biot to execute geodetic operations on the coasts of France, England and Scotland. They measured the length of the seconds-pendulum at Leith, and in Unst, one of the Shetland isles, the results of the observations being published in 1821, along with those made in Spain. Arago was elected a member of the Board of Longitude immediately afterwards, and contributed to each of its *Annuals*, for about twenty-two years, important scientific notices on astronomy and meteorology and occasionally on civil engineering, as well as interesting memoirs of members of the Academy.

In 1830, Arago, who always professed liberal opinions of the extreme republican type, was elected a member of the chamber of deputies for the Lower Seine, and he employed his splendid gifts of eloquence and scientific knowledge in all questions connected with public education, the rewards of inventors, and the encouragement of the mechanical and practical sciences. Many of the most creditable national enterprises, dating from this period, are due to his advocacy—such as the reward to L. J. M. Daguerre for the invention of photography, the grant for the publication of the works of P. Fermat and Laplace, the acquisition of the museum of Cluny, the development of railways and electric telegraphs, the improvement of the

navigation of the Seine, and the boring of the artesian wells at Grenelle.

In the year 1830 also he was appointed director of the Observatory, and as a member of the chamber of deputies he was able to obtain grants of money for rebuilding it in part, and for the addition of magnificent instruments. In the same year, too, he was chosen perpetual secretary of the Academy of Sciences, in room of J. B. J. Fourier. Arago threw his whole soul into its service, and by his faculty of making friends he gained at once for it and for himself a world-wide reputation. As perpetual secretary it fell to him to pronounce historical *éloges* on deceased members; and for this duty his rapidity and facility of thought, his happy piquancy of style, and his extensive knowledge peculiarly adapted him.

In 1834 he again visited England, to attend the meeting of the British Association at Edinburgh. From this time till 1848 he led a life of comparative quiet—not the quiet of inactivity, however, for his incessant labours within the Academy and the Observatory produced a multitude of contributions to all departments of physical science,—but on the fall of Louis Philippe he left his laboratory to join in forming the provisional government. He was entrusted with the discharge of two important functions, that had never before been united in one person, viz. the ministry of war and of marine; and in the latter capacity he effected some salutary reforms, such as the improvement of rations in the navy and the abolition of flogging. He also abolished political oaths of all kinds, and, against an array of moneyed interests, succeeded in procuring the abolition of negro slavery in the French colonies.

In the beginning of May 1852, when the government of Louis Napoleon required an oath of allegiance from all its functionaries, Arago peremptorily refused, and sent in his resignation of his post as astronomer at the Bureau des Longitudes. This, however, the prince president, to his credit, declined to accept, and made "an exception in favour of a *savant* whose works had thrown lustre on France, and whose existence his government would regret to embitter." But the tenure of office thus granted did not prove of long duration. Arago was now on his death-bed, under a complication of diseases, induced, no doubt, by the hardships and labours of his earlier years. In the summer of 1853 he was advised by his physicians to try the effect of his native air, and he accordingly set out for the eastern Pyrenees. But the change was unavailing, and after a lingering illness, in which he suffered first from diabetes, then from Bright's disease, complicated by dropsy, he died in Paris on the 2nd of October 1853.

Arago's fame as an experimenter and discoverer rests mainly on his contributions to magnetism and still more to optics. He found that a magnetic needle, made to oscillate over non-ferruginous surfaces, such as water, glass, copper, &c., falls more rapidly in the extent of its oscillations according as it is more or less approached to the surface. This discovery, which gained him the Copley medal of the Royal Society in 1825, was followed by another, that a rotating plate of copper tends to communicate its motion to a magnetic needle suspended over it ("magnetism of rotation"). Arago is also fairly entitled to be regarded as having proved the long-suspected connexion between the aurora borealis and the variations of the magnetic elements.

In optics we owe to him not only important optical discoveries of his own, but the credit of stimulating the genius of A. J. Fresnel, with whose history, as well as with that of E. L. Malus and of Thomas Young, this part of his life is closely interwoven. Shortly after the beginning of the 19th century the labours of these three philosophers were shaping the modern doctrine of the undulatory theory of light. Fresnel's arguments in favour of that theory found little favour with Laplace, Poisson and Biot, the champions of the emission theory; but they were ardently espoused by Humboldt and by Arago, who had been appointed by the Academy to report on the paper. This was the foundation of an intimate friendship between Arago and Fresnel, and of a determination to carry on together further researches in this subject, which led to the enunciation of the fundamental laws of the polarization of light known by their names (see POLARIZATION). As a result of this work Arago constructed a *polariscope*, which he used for some interesting observations on the polarization of the light of the sky. To him is also due the discovery of the power of *rotatory polarization* exhibited by quartz, and last of all, among his many contributions to the support of the undulatory hypothesis, comes the *experimentum crucis* which he proposed to carry out for comparing directly the velocity of light in air and in water or glass. On the emission theory the velocity should be accelerated by an increase of density in the medium; on the wave theory, it should be retarded. In 1838 he communicated to the Academy the details of his apparatus, which utilized the revolving mirrors employed by Sir C. Wheatstone in 1835 for measuring the velocity of the electric discharge; but owing to the great care required in the carrying out of the project, and to the interruption to his labours caused by the revolution of 1848, it was the spring of 1850 before he was ready to put his idea to the test; and then his eyesight suddenly gave way. Before his death, however, the retardation of light in denser media was demonstrated by the experiments of H. L. Fizeau and J. B. L. Foucault, which, with improvements in detail, were based on the plan proposed by him.

Arago's *Œuvres* were published after his death under the direction of J. A. Barral, in 17 vols., 8vo, 1854–1862; also separately his *Astronomie populaire*, in 4 vols.; *Notices biographiques*, in 3 vols.; *Notices scientifiques*, in 5 vols.; *Voyages scientifiques*, in 1 vol.; *Mémoires scientifiques*, in 2 vols.; *Mélanges*, in 1 vol.; and *Tables analytiques et documents importants* (with portrait), in 1 vol. English translations of the following portions of his works have appeared:—*Treatise on Comets*, by C. Gold, C.B. (London, 1833); also translated by Smyth and Grant (London, 1861); *Hist. éloge of James Watt*, by James Muirhead (London, 1839); also translated, with notes, by Lord Brougham; *Popular Lectures on Astronomy*, by Walter Kelly and Rev. L. Tomlinson (London, 1854); also translated by Dr W. H. Smyth and Prof. R. Grant, 2 vols. (London, 1855); *Arago's Autobiography*, translated by the Rev. Baden Powell (London, 1855, 1858); *Arago's Meteorological Essays*, with introduction by Humboldt, translated under the superintendence of Colonel Sabine (London, 1855), and *Arago's Biographies of Scientific Men*, translated by Smyth, Powell and Grant, 8vo (London, 1857).

ARAGON, or ARRAGON (in Span. *Aragón*), a captaincy-general, and formerly a kingdom of Spain; bounded on the N. by the Pyrenees, which separate it from France, on the E. by Catalonia and Valencia, S. by Valencia, and W. by the two Castiles and Navarre. Pop. (1900) 912,711; area, 18,294 sq. m. Aragon was divided in 1833 into the provinces of Huesca, Teruel and Saragossa; an account of its modern condition is therefore given under these names, which have not, however, superseded the older designation in popular usage.

Aragon consists of a central plain, edged by mountain ranges. On the south, east and west, these ranges, though wild and rugged, are of no great elevation, but on the north the Pyrenees attain their greatest altitude in the peaks of Aneto (11,168 ft.) and Monte Perdido (10,998 ft.)—also known as Las Tres Sorores, and, in French, as Mont Perdu. The central pass over the Pyrenees is the Port de Canfranc, on the line between Saragossa and Pau. Aragon is divided by the river Ebro (*q.v.*), which flows through it in a south-easterly direction, into two nearly equal parts, known as Trans-ibero and Cis-ibero. The Ebro is the principal river, and receives from the north, in its passage through the province, the Arba, the Gallego and the united waters of the Cinca, Esera, Noguera Ribagorzana, Noguera Pallaresa and Segre—the last three belonging to Catalonia. From the south it receives the Jalon and Jiloca (or *Xalon* and *Xiloca*) and the Guadalope. The Imperial Canal of Aragon, which was begun by the emperor Charles V. in 1529, but remained unfinished for nearly two hundred years, extends from Tudela to El Burgo de Ebro, a distance of 80 m.; it has a depth of 9 ft., and an average breadth of 69, and is navigable for vessels of about 80 tons. The Royal Canal of Tauste, which lies along the north side of the Ebro, was cut for purposes of irrigation, and gives fertility to the district. Two leagues north-north-east of Albarracin is the remarkable fountain called Cella, 3700 ft. above the

sea, which forms the source of the Jiloca; and between this river and the Sierra Molina is an extensive lake called Gallocanta, covering about 6000 acres. The climate is characterized by extreme heat in the summer and cold in the winter; among the mountains the snowfall is heavy, and thunderstorms are frequent, but there is comparatively little rain.

Within a recent geological period, central Aragon was undoubtedly submerged by the sea, and the parched chalky soil remains saturated with salt, while many of the smaller streams run brackish. As the mountains of Valencia and Catalonia effectually bar out the fertilizing moisture of the sea-winds, much of the province is a sheer wilderness, stony, ash-coloured, scarred with dry watercourses, and destitute of any vegetation except thin grass and heaths. In contrast with the splendid fertility of Valencia or the south of France, the landscape of this region, like the rest of central Spain, seems almost a continuation of the north African desert area. There are, however, extensive oak, pine and beech forests in the highlands, and many beautiful oases in the deeply sunk valleys, and along the rivers, especially beside the Ebro, which is, therefore, often called the "Nile of Aragon." In such oases the flora is exceedingly rich. Wheat, maize, rice, oil, flax and hemp, of fine quality, are grown in considerable quantities; as well as saffron, madder, liquorice, sumach, and a variety of fruits. Merino wool is one of the chief products.

In purity of race the Aragonese are probably equal to the Castilians, to whom, rather than to the Catalans or Valencians, they are also allied in character. The dress of the women is less distinctive than that of the men, who wear a picturesque black and white costume, with knee-breeches, a brilliantly coloured sash, black hempen sandals, and a handkerchief wound round the head.

Three counties—Sobrarbe, situated near the headwaters of the Cinca, Aragon, to the west, and Ribagorza or Ribagorça, to the east—are indicated by tradition and the earliest chronicles as the cradle of the Aragonese monarchy. These districts were never wholly subdued when the Moors overran the country (711–713). Sobrarbe especially was for a time the headquarters of the Christian defence in eastern Spain. About 1035, Sancho III. the Great, ruler of the newly established kingdom of Navarre, which included the three counties above mentioned, bequeathed them to Gonzalez and Ramiro, his sons. Ramiro soon rid himself of his rival, and welded Sobrarbe, Ribagorza and Aragon into a single kingdom, which thenceforward grew rapidly in size and power and shared with Castile the chief part in the struggle against the Moors. The history of this period, which was terminated by the union of Castile and Aragon under Ferdinand and Isabella in 1479, is given, along with a full account of the very interesting constitution of Aragon, under SPAIN (*q.v.*). At the height of its power under James I. (1213–1276), the kingdom included Valencia, Catalonia, the Balearic Islands and the considerable territory of Montpellier in France; while Peter III. (1276–1285) added Sicily to his dominions.

The literature relating to Aragon is very extensive. See, in addition to the works cited in the article SPAIN (section *History*), "Les Archives d'Aragon et de Navarre," by L. Cadier, in *Bibliothèque de l'École des Chartes*, 49 (Paris, 1888). Among the more important original authorities, the following may be selected:— for general history, *Anales de la corona de Aragón*, by G. Çurita, 3rd ed. in 7 folio volumes (Saragossa, 1668–1671; 1st ed. 1562–1580);—for ecclesiastical history, *Teatro histórico de las iglesias de Aragón* (Pamplona, 1770–1807); for economic history, *História de la economia politica de Aragón*, by I. J. de Asso y del Rio (Saragossa, 1798). For the constitution and laws of Aragon, see *Orígines del Justicia de Aragón*, &c., by J. Ribera Tarrago (Saragossa, 1897), and *Instituciones y reyes de Aragón*, by V. Balaguér (Madrid, 1896). The topography, inhabitants, art, products, &c., of the kingdom are described in a volume of the series *España* entitled *Aragón*, by J. M. Quadrado (Barcelona, 1886).

ARAGONITE, one of the mineral forms of calcium carbonate ($CaCO_3$), the other form being the more common mineral calcite. It crystallizes in the orthorhombic system, and the crystals are either prismatic or acicular in habit. Simple crystals are, however, rare; twinning on the prism planes (*M* in the figures) being a characteristic feature of the mineral (fig. 1). This twinning is usually often repeated on the same plane (fig. 2), and gives rise to striations on the terminal faces (*k*) of the crystals; often, also, three crystals are twinned together on two of the prism planes of one of them, producing an apparently hexagonal prism. The mineral is colourless, white or yellowish, transparent or translucent, has a vitreous lustre, and, in fact, is not unlike calcite in general appearance. It may, however, always be readily distinguished from calcite by the absence of any marked cleavage, and by its greater hardness (H. $= 3\frac{1}{2}-4$) and specific gravity (2·93); further, it is optically biaxial, whilst calcite is uniaxial. It is brittle and has a subconchoidal fracture; on a fractured surface the lustre is decidedly resinous in character.

The mineral was first found, as reddish twinned crystals with the form of six-sided prisms, at Molina in Aragon, Spain, where it occurs with gypsum and small crystals of ferruginous quartz in a red clay. It is from this locality that the mineral takes its name, which was originally spelt arragonite. Fine groups of crystals of the same habit are found in the sulphur deposits of Girgenti in Sicily; also at Herrengrund near Neusohl in Hungary. At many other localities the mineral takes the form of radiating groups of acicular crystals, such as those from the haematite mines of west Cumberland: beautiful feathery forms have been found in a limestone cave in the Transvaal. Fibrous forms are also common. A peculiar coralloidal variety known as *flosferri* ("flower of iron") consists of radially arranged fibres: magnificent snow-white specimens of this variety have long been known from the iron mines of Eisenerz in Styria. The calcareous secretions of many groups of invertebrate animals consist of aragonite (calcite is also common); pearls may be specially cited as an example.

FIG. 1.

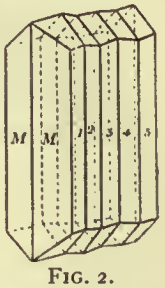


FIG. 2.

Aragonite is a member of the isomorphous group of minerals comprising witherite ($BaCO_3$), strontianite ($SrCO_3$), cerussite ($PbCO_3$) and bromlite ($(Ba, Ca)CO_3$); and crystals of aragonite sometimes contain small amounts of strontium or lead. A variety known as tarnowitzite, from Tarnowitz in Silesia, contains about 5% of lead carbonate.

Aragonite is the more unstable of the two modifications of calcium carbonate. A crystal of aragonite when heated becomes converted into a granular aggregate of calcite individuals: altered crystals of this kind (paramorphs) are not infrequently met with in nature, whilst in fossil shells the original nacreous layer of aragonite has invariably been altered to calcite. From a solution of calcium carbonate in water containing carbon dioxide crystals of calcite are deposited at the ordinary temperature, but from a warm solution aragonite crystallizes out. The thermal springs of Carlsbad deposit spherical concretions of aragonite, forming masses known as pisolite or *Sprudelstein*. (L. J. S.)

ARAGUA, one of the smaller states of Venezuela under the redivision of 1904, lying principally within the parallel ranges of the Venezuelan Cordillera, and comprising some of the most fertile and healthful valleys of the republic. It is bounded E. by the Federal District and Maturin, S. by Guárico and W. by Zamora and Carabobo. Pop. (1905, est.) 152,364. Aragua has a short coast-line on the Caribbean west of the Federal District, but has no port of consequence. Cattle, swine and goats are raised, and the state produces coffee, sugar, cacao, beans, cereals and cheese. The climate of the higher valleys is subtropical, the mean annual temperature ranging from 74° to 80° F. The capital, La Victoria (pop. 7800), is situated in the fertile Aragua valley, 1558 ft. above sea-level and 36 m. south-west of Carácas. Other important towns are Barbacoas (pop. 13,109) on the left bank of the Guárico in a highly fertile region, Ciudad de Cura and Maracay (pop. 7500), 56 m. west-south-west of

Carácas near the north-east shore of Lake Valencia. The last two towns are on the railway between Carácas and Valencia.

ARAGUAYA, ARAGUAY or ARAGUIA, a river of Brazil and principal affluent of the Tocantins, rising in the Serra do Cayapó, where it is known as the Rio Grande, and flowing in a north by east direction to a junction with the Tocantins at São João do Araguaya, or São João das Duas Barras. Its upper course forms the boundary line between Goyaz and Matto Grosso. The river divides into two branches at about 13° 20′ S. lat., and unites again at 10° 30′, forming the large island of Santa Anna or Bananal. The eastern branch, called the Furo, is the one used by boats, as the main channel is obstructed by rapids. Its principal affluent is the Rio das Mortes, which rises in the Serra de São Jeronymo, near Cuyabá, Matto Grosso, and is utilized by boatmen going to Pará. Of other affluents, the Bonito, Garças, Cristallino and Tapirapé on the west, and the Pitombas, Claro, Vermelho, Tucupá and Chavante on the east, nothing definite is known as the country is still largely unexplored. The Araguaya has a course of 1080 m., considerable stretches of which are navigable for small river steamers, but as the river below Santa Anna Island is interrupted by reefs and rapids in two places—one having a fall of 85 ft. in 18 m., and the other a fall of 50 ft. in 12 m.—it affords no practicable outlet for the products of the state. It was explored in part by Henri Coudreau in 1897.

See Coudreau's *Voyage au Tocantins-Araguaya* (Paris, 1897).

ARAKAN, a division of Lower Burma. It consists of a strip of country running along the eastern seaboard of the Bay of Bengal, from the Naaf estuary, on the borders of Chittagong, to Cape Negrais. Length from northern extremity to Cape Negrais, about 400 m.; greatest breadth in the northern part, 90 m., gradually diminishing towards the south, as it is hemmed in by the Arakan Yoma mountains, until, in the extreme south, it tapers away to a narrow strip not more than 15 m. across. The coast is studded with islands, the most important of which are Cheduba, Ramree and Shahpura. The division has its headquarters at Akyab and consists of four districts—namely, Akyab, Northern Arakan Hill Tracts, Sandoway and Kyaukpyu, formerly called Ramree. Its area is 18,540 sq. m. The population at the time of the British occupation in 1826 did not exceed 100,000. In 1831 it amounted to 173,000; in 1839 to 248,000, and in 1901 to 762,102.

The principal rivers of Arakan are—(1) the Naaf estuary, in the north, which forms the boundary between the division and Chittagong; (2) the Myu river, an arm of the sea, running a course almost parallel with the coast for about 50 m.; (3) the Koladaing river, rising near the Blue mountain, in the extreme north-east, and falling into the Bay of Bengal a few miles south of the Myu river, navigable by vessels of from 300 to 400 tons burden for a distance of 40 m. inland; and (4) the Lemyu river, a considerable stream falling into the bay a few miles south of the Koladaing. Farther to the south, owing to the nearness of the range which bounds Arakan on the east, the rivers are of but little importance. These are the Talak and the Aeng, navigable by boats; and the Sandoway, the Taungup and the Gwa streams, the latter of which alone has any importance, owing to its mouth forming a good port of call or haven for vessels of from 9 to 10 ft. draught. There are several passes over the Yoma mountains, the easiest being that called the Aeng route, leading from the village of that name into Upper Burma. The staple crop of the province is rice, along with cotton, tobacco, sugar, hemp and indigo. The forests produce abundance of excellent oak and teak timber.

The natives of Arakan trace their history as far back as 2666 B.C., and give a lineal succession of 227 native princes down to modern times. According to them, their empire had at one period far wider limits, and extended over Ava, part of China, and a portion of Bengal. This extension of their empire is not, however, corroborated by known facts in history. At different times the Moguls and Pegus carried their arms into the heart of the country. The Portuguese, during the era of their greatness in Asia, gained a temporary establishment in Arakan; but in 1782 the province was finally conquered by the Burmese, from which period until its cession to the British in 1826, under the treaty of Yandaboo, its history forms part of that of Burma. The old city of Arakan, formerly the capital of the province, is situated on an inferior branch of the Koladaing river. Its remoteness from the ports and harbours of the country, combined with the extreme unhealthiness of its situation, have led to its gradual decay subsequently to the formation of the comparatively recent settlement of Akyab, which place is now the chief town of the province. The old city (now Myohaung) lies 50 m. north-east of Akyab. The Maghs, who form nearly the whole population of the province, follow the Buddhist doctrines, which are universally professed throughout Burma. The priests are selected from all classes of men, and one of their chief employments is the education of children. Instruction is consequently widely diffused, and few persons, it is said, can be found in the province who are unable to read. The qualifications for entering into the priestly order are good conduct and a fair measure of learning—such conduct at least as is good according to Buddhist tenets, and such learning as is esteemed among their votaries.

The Arakanese are of Burmese origin, but separated from the parent stock by the Arakan Yoma mountains, and they have a dialect and customs of their own. Though conquered by the Burmese, they have remained distinct from their conquerors.

The Northern Arakan Hill Tracts district is under a superintendent, who is usually a police officer, with headquarters at Paletwa. The area of the Hill Tracts is 5233 sq. m.; pop. (1901) 20,682. (J. G. Sc.)

ARAKCHEEV, ALEKSYEI ANDREEVICH, COUNT (1769–1834), Russian soldier and statesman, was descended from an ancient family of Great Novgorod. From his mother, Elizabeth Vitlitsaya, he inherited most of his characteristics, an insatiable love of work, an almost pedantic love of order and the most rigorous sense of duty. In 1788 he entered the corps of noble cadets in the artillery and engineering department, where his ability, especially in mathematics, soon attracted attention. In July 1791 he was made an adjutant on the staff of Count N. I. Saltuikov, who (September 1792) recommended him to the cesarevich Paul Petrovich as the artillery officer most capable of reorganizing the army corps maintained by the prince at Gatchina. Arakcheev speedily won the entire confidence of Paul by his scrupulous zeal and undeniable technical ability. His inexorable discipline (magnified into cruelty by later legends) soon made the Gatchina corps a model for the rest of the Russian army. On the accession of Paul to the throne Arakcheev was promptly summoned to St Petersburg, appointed military commandant in the capital, and major-general in the grenadier battalion of the Preobrazhenskoe Guard. On the 12th of December 1796, he received the ribbon of St Anne and a rich estate at Gruzina in the government of Novgorod, the only substantial gift ever accepted by him during the whole of his career. At the coronation (5th of April 1797) Paul created him a baron, and he was subsequently made quartermaster-general and colonel of the whole Preobrazhenskoe Guard. It was to Arakcheev that Paul entrusted the reorganization of the army, which during the latter days of Catherine had fallen into a state of disorder and demoralization. Arakcheev remorselessly applied the iron Gatchina discipline to the whole of the imperial forces, beginning with the Guards. He soon became generally detested by the army, but pursued his course unflinchingly and introduced many indispensable hygienic reforms. "Clean barracks are healthy barracks," was his motto. Nevertheless, the opposition of the officers proved too strong for him, and on the 18th of March 1798 he was dismissed from all his appointments. Arakcheev's first disgrace only lasted six months. On the 11th of August he was received back into favour, speedily reinstated in all his former offices, and on the 5th of May 1799 was created a count, the emperor himself selecting the motto: "Devoted, not servile." Five months later he was again in disgrace, the emperor dismissing him on the strength of a denunciation subsequently proved to be false. It was a fatal step on Paul's part, for everything goes to prove that he would never have been assassinated had Arakcheev continued by his

side. During the earlier years of Alexander, Arakcheev was completely overlooked. Only on the 27th of April 1803, was the count recalled to St Petersburg, and employed as inspector-general of the artillery. His wise and thorough reorganization of the whole department contributed essentially to the victories of the Russians during the Napoleonic wars. All critics agree, indeed, that the Arakcheev administration was the golden era of the Russian artillery. The activity of the inexhaustible inspector knew no bounds, and he neglected nothing which could possibly improve this arm. His principal reforms were the subdivision of the artillery divisions into separate independent units, the formation of artillery brigades, the establishment of a committee of instruction (1808), and the publishing of an *Artillery Journal*. At Austerlitz he had the satisfaction of witnessing the actual results of his artillery reforms. The commissariat scandals which came to light after the peace of Tilsit convinced the emperor that nothing short of the stern and incorruptible energy of Arakcheev could reach the sources of the evil, and in January 1808 he was appointed inspector-general and war minister. When, on the outbreak of the Swedish war of 1809, the emperor ordered the army to take advantage of an unusually severe frost and cross the ice of the Gulf of Finland, it was only the presence of Arakcheev that compelled an unwilling general and a semi-mutinous army to begin a campaign which ended in the conquest of Finland. On the institution of the "Imperial Council" (1st of January 1810), Arakcheev was made a member of the council of ministers and a senator, while still retaining the war office. Subsequently Alexander was alienated from him owing to the intrigues of the count's enemies, who hated him for his severity and regarded him as a dangerous reactionary. The alienation was not, however, for long. It is true, Arakcheev took no active part in the war of 1812, but all the correspondence and despatches relating to it passed through his hands, and he was the emperor's inseparable companion during the whole course of it. At Paris (31st of March 1814) Alexander, with his own hand, wrote the *ukaz* appointing him a field-marshal, but he refused the dignity, accepting, instead, a miniature portrait of his master. From this time Alexander's confidence in Arakcheev steadily increased, and the emperor imparted to him, first of all, his many projects of reform, especially his project of military colonies, the carrying out of the details of which was committed to Arakcheev (1824). The failure of the scheme was due not to any fault of the count, but to the inefficiency and insubordination of the district officers. In Alexander's last years Arakcheev was not merely his chief counsellor, but his dearest friend, to whom he submitted all his projects for consideration and revision. The most interesting of these projects was the plan for the emancipation of the peasantry (1818). On the accession of Nicholas I., Arakcheev, thoroughly broken in health, gradually restricted his immense sphere of activity, and on the 26th of April 1826, resigned all his offices and retired to Carlsbad. The 50,000 roubles presented to him by the emperor as a parting gift he at once handed to the Pavlovsk Institute for the education of the daughters of poor gentlemen. His last days he spent on his estate at Gruzina, carefully collecting all his memorials of Alexander, whose memory he most piously cherished. He also set aside 25,000 roubles for the author of the best biography of his imperial friend. Arakcheev died on the 21st of April 1834, with his eyes fixed to the last on the late emperor's portrait. "I have now done everything," he said, "so I can go and make my report to the emperor Alexander." In 1806 he had married Natalia Khomutova, but they lived apart, and he had no children by her.

See Vasily Ratch, *Memorials of Count Arakcheev* (Rus.) (St Petersburg, 1864); Mikhail Ivanovich Semevsky, *Count Arakcheev and the Military Colonies* (Rus.) (St Petersburg, 1871); Theodor Schiemann, *Gesch. Russland's unter Kaiser Nikolaus I.*, vol. i., *Alexander I.*, &c. (Berlin, 1904). (R. N. B.)

ARAL, a lake or inland sea in the west of Asia, situated between lat. 43° 30′ and 46° 51′ N., and long. 58° 13′ and 61° 56′ E. It was known to the ancient Arab and Persian geographers as the Sea of Khwārizm or Kharezm, from the neighbouring district of the Chorasmians, and derives its present name from the Kirghiz designation of Aral-denghiz, or Sea of Islands. In virtue of its area (26,233 sq.m.) it is the fourth largest inland sea of the world. It has nearly the same length as width, namely about 170 m., if its northern gulf (Kichkineh-denghiz) is left out of account. Its depth is insignificant, the maximum being 220 ft. in a depression in the north-west, and the mean depth only 50 ft., so that notwithstanding its area it contains only eleven times as much water as the Lake of Geneva. Its altitude is 242½ ft. above the Caspian, *i.e.* about 155 ft. above the ocean. The lake is surrounded on the north by steppes; on the west by the rocky plateau of Ust-Urt, which separates it from the Caspian; on the south by the alluvial district of Khiva; and on the east by the Kyzyl-kum, or Red Sand Desert. On the north the shores are comparatively low, and the coast-line is broken by a number of irregular bays, of which the most important are those of Sary-chaganak and Paskevich. On the west an almost unbroken wall of rock extends from Chernychev Bay southwards, rising towards the middle to 500 ft. The southern coast is occupied by the delta of the Oxus (Jīhūn, Amu-darya), one of the arms of which, the Laudan, forms a swamp, 80 m. long and 20 broad, before it discharges into the sea. The only other tributary of any size that the sea receives is the Jaxartes (Sihūn, Syr-darya) which enters towards the northern extremity of the east coast, and is suspected to be shifting its embouchure more and more to the north. This river, as well as the Amu, conveys vast quantities of sediment into the lake; the delta of the Syr-darya increased by 13¾ sq. m. between 1847 and 1900. The eastern coast is fringed with multitudes of small islands, and other islands, some of considerable size, are situated in the open towards the north and west. Kug-Aral, the largest, lies opposite the mouth of the Syr-darya, cutting off the Kichkineh-denghiz or Little Sea. The next largest island is the Nikolai, nearly in the middle. Navigation is dangerous owing to the frequency and violence of the storms, and the almost total absence of shelter. The north-east wind is the most prevalent, and sometimes blows for months together. The only other craft, except the steamships of the Russians, that venture on the waters, are the flat-bottomed boats of the Kirghiz.

In regard to the period of the formation of the Aral there were formerly two theories. According to Sir H. C. Rawlinson (*Proc. Roy. Geog. Soc.*, March 1867) the disturbances which produced the present lake took place in the course of the middle ages; while Sir Roderick Murchison contended (*Journ. of Roy. Geog. Soc.*, 1867, p. cxliv. &c.) that the Caspian and Aral existed as separate seas before and during all the historic period, and that the main course of the rivers Jaxartes and Oxus was determined in a prehistoric era. The former based his opinion largely on historical evidence, and the latter trusted principally to geological data. There is no doubt that in recent historical times Lake Aral had a much greater extension than it has at the present time, and that its area is now diminishing. This is, of course, due to the excess of evaporation over the amount of water supplied by its two feeders, the Amu-darya and the Syr-darya, both of which are seriously drawn upon for irrigation in all the oases they flow through. Old shore lines and other indications point to the level of the lake having once been 50 ft. above the existing level. Nevertheless the general desiccation is subject to temporary fluctuations, which appear to correspond to the periods recently suggested by Eduard Brückner (b. 1862); for, whereas the lake diminished and shrank during 1850–1880, since the latter year it has been rising again. Islands which were formerly connected with the shore are now some distance away from it and entirely surrounded by water. Moreover, on a graduated level, put down in 1874, there was a permanent rise of nearly 4 ft. by 1901. The temperature at the bottom was found (1900–1902) by Emil Berg to be 33·8° Fahr., while that of the surface varied from 44·5° to 80·5° between May and September; the mean surface temperature for July was 75°. The salinity of the water is much less than that of the ocean, containing only 1·05% of salt, and the lake freezes every year for a great distance from its shores. The opinion that Lake Aral periodically disappeared, which was for a long

time countenanced by Western geographers, loses more and more probability now that it is evident that at a relatively recent period the Caspian Sea extended much farther eastward than it does now, and that Lake Aral communicated with it through the Sary-kamysh depression. The present writer is even inclined to think that, besides this southern communication with the Caspian, Lake Aral may have been, even in historical times, connected with the Mortvyi Kultuk (Tsarevich) Gulf of the Caspian, discharging part of its water into that sea through a depression of the Ust-Urt plateau, which is marked by a chain of lakes (Chumyshty, Asmantai). In this case it might have been easily confounded with a gulf of the Caspian (as by Jenkinson). That the level of Lake Aral was much higher in post-Pliocene times is proved by the discovery of shells of its characteristic species of *Pecten* and *Mytilus* in the Kara-kum Desert, 33 m. south of the lake and at an altitude of 70 ft. above its present level, and perhaps even up to 200 ft. (by Syevertsov).

The fish of Lake Aral belong to fresh-water species, and in some of its rapid tributaries the interesting *Scaphirhynchus*, which represents a survival from the Tertiary epoch, is found. The fishing is very productive, the fish being exported to Turkestan, Merv and Russia. The shores of the lake are uninhabited; the nearest settlements are Kazala, 55 m. east, on the Syr, and Chimbai and Kungrad in the delta of the Amu.

AUTHORITIES.— Makshéev's "Description of Lake Aral," and Kaulbars' "Delta of the Amu," in *Zapiski of Russ. Geogr. Soc.*, 1st series, v., and new series, ix.; Grimm's *Studies of the Aral-Caspian Expedition*; Nikolsky's "Fishing in Lake Aral," in *Izvestia, Russ. Geogr. Soc.*, 1887; Prof. Mushketov, *Turkestan*, vol. i. (1886), which contains bibliographical references; Rösler, *Die Aralseefrage* (1873); Wood, *The Shores of the Aral Lake* (1876); and Berg in *Izvestia, Turkestan Branch of Russian Geog. Soc.* (vol. iii., Tashkent, 1902). (P. A. K.)

ARAM, EUGENE (1704–1759), English scholar, but more famous as the murderer celebrated by Hood in his ballad, the *Dream of Eugene Aram*, and by Bulwer Lytton in his romance of *Eugene Aram*, was born of humble parents at Ramsgill, Yorkshire, in 1704. He received little education at school, but manifested an intense desire for learning. While still young, he married and settled as a schoolmaster at Netherdale, and during the years he spent there, he taught himself both Latin and Greek. In 1734 he removed to Knaresborough, where he remained as schoolmaster till 1745. In that year a man named Daniel Clark, an intimate friend of Aram, after obtaining a considerable quantity of goods from some of the tradesmen in the town, suddenly disappeared. Suspicions of being concerned in this swindling transaction fell upon Aram. His garden was searched, and some of the goods found there. As, however, there was not evidence sufficient to convict him of any crime, he was discharged, and soon after set out for London, leaving his wife behind. For several years he travelled through parts of England, acting as usher in a number of schools, and settled finally at Lynn, in Norfolk. During his travels he had amassed considerable materials for a work he had projected on etymology, to be entitled a *Comparative Lexicon of the English, Latin, Greek, Hebrew and Celtic Languages*. He was undoubtedly an original philologist, who realized, what was then not yet admitted by scholars, the affinity of the Celtic language to the other languages of Europe, and could dispute the then accepted belief that Latin was derived from Greek. Aram's writings show that he had grasped the right idea on the subject of the Indo-European character of the Celtic language, which was not established till J. C. Prichard published his book, *Eastern Origin of the Celtic Nations*, in 1831. But he was not destined to live in history as the pioneer of a new philology. In February 1758 a skeleton was dug up at Knaresborough, and some suspicion arose that it might be Clark's. Aram's wife had more than once hinted that her husband and a man named Houseman knew the secret of Clark's disappearance. Houseman was at once arrested and confronted with the bones that had been found. He affirmed his innocence, and, taking up one of the bones, said, "This is no more Dan Clark's bone than it is mine." His manner in saying this roused suspicion that he knew more of Clark's disappearance than he was willing to admit. He was again examined, and confessed that he had been present at the murder of Clark by Aram and another man, Terry, of whom nothing further is heard. He also gave information as to the place where the body had been buried in St Robert's Cave, a well-known spot near Knaresborough. A skeleton was dug up here, and Aram was immediately arrested, and sent to York for trial. Houseman was admitted as evidence against him. Aram conducted his own defence, and did not attempt to overthrow Houseman's evidence, although there were some discrepancies in that; but made a skilful attack on the fallibility of circumstantial evidence in general, and particularly of evidence drawn from the discovery of bones. He brought forward several instances where bones had been found in caves, and tried to show that the bones found in St Robert's Cave were probably those of some hermit who had taken up his abode there. He was found guilty, and condemned to be executed on the 6th of August 1759, three days after his trial. While in his cell he confessed his guilt, and threw some light on the motives for his crime, by asserting that he had discovered a criminal intimacy between Clark and his own wife. On the night before his execution he made an unsuccessful attempt at suicide by opening the veins in his arm.

ARAMAIC LANGUAGES, a class of languages so called from Aram, a geographical term, which in old Semitic usage designates nearly the same districts as the Greek word Syria. Aram, however, does not include Palestine, while it comprehends Mesopotamia (Heb. Aram of two rivers), a region which the Greeks frequently distinguish from Syria proper. Thus the Aramaic languages may be geographically defined as the Semitic dialects originally current in Mesopotamia and the regions extending south-west from the Euphrates to Palestine. (See SEMITIC LANGUAGES; SYRIAC; TARGUM.)

ARANDA, PEDRO PABLO ABARCA DE BOLEA, COUNT OF (1719–1798), Spanish minister and general, was born at the castle of Siétamo, a lordship of his family near Huesca in Aragon, on the 1st of August 1719. The house of Abarca was very ancient, a fact of which Don Pedro, who never forgot that he was a "rico hombre" (noble) of Aragon, was deeply conscious. He was educated partly at Bologna and partly at the military school of Parma. In 1740 he entered the army as captain in the regiment "Castilla," of which his father was proprietary colonel. On the death of his father he became colonel, and served in the Italian campaigns of the War of the Austrian Succession. In 1749 he married Doña Ana, daughter of the 9th duke of Hijar, by whom he had one son, who died young, and a daughter. During the following years he travelled and visited the camp of Frederick the Great, whose system of drill he admired and afterwards introduced into the Spanish army. After a short period of diplomatic service in Portugal, where his exacting temper made it impossible for him to agree with the premier, Pombal, he returned to Madrid, was made a knight of the Golden Fleece, and director-general of artillery—a post which he threw up, together with his rank of lieutenant-general, because he was not allowed to punish certain fraudulent contractors. The king, Ferdinand VI., exiled him to his estates, but Charles III. on his accession took him into favour. He was again employed in diplomacy, and then appointed to command an army against Portugal in 1763. In 1764 he was made governor of Valencia. When in 1766 the king was driven from his capital in a riot, he summoned Aranda to Madrid and made him president of the council, and captain-general of New Castile. Until 1773 Aranda was the most important minister in Spain. He restored order and aided the king most materially in his work of administrative reform. But his great achievements, which gave him a high reputation throughout Europe with the philosophical and anti-clerical parties, were his expulsion of the Jesuits, whom the king considered responsible for the riot of 1766, and the active part he took in the suppression of the order. Aranda had come much under foreign influence by his education and his travels, and had acquired the reputation of being a confirmed sceptic. By Voltaire and the Encyclopaedists he was erected into a hero from whom great things were expected. His ability, his

remarkable capacity for work, and his popularity made him indispensable to the king. But he was a trying servant, for his temper was captious and his tongue sarcastic, while his aristocratic arrogance led him to display an offensive contempt for the *golillas* (the stiff collars), as he called the lawyers and public servants whom the king preferred to choose as ministers, and he permitted himself an amazing freedom of language with his sovereign. At last Charles III. sent him as ambassador to Paris in a disguised disgrace. Aranda held this position till 1787, but in Paris he was chiefly known for his oddities of manner and for perpetual wrangling with the French on small points of etiquette. He resigned his post for private reasons. In the reign of Charles IV., with whom he had been on familiar terms during the life of the old king, he was for a very short time prime minister in 1792. In reality he was merely used as a screen by the queen Maria Louisa and her favourite Godoy. His open sympathy with the French Revolution brought him into collision with the violent reaction produced in Spain by the excesses of the Jacobins, while his temper, which had become perfectly uncontrollable with age, made him insufferable to the king. After his removal from office he was imprisoned for a short time at Granada, and was threatened with a trial by the Inquisition. The proceedings did not go beyond the preliminary stage, and Aranda died at Epila on the 9th of January 1798.

See Don Jacobo de la Pezuela in the *Revista de España*, vol. xxv. (1872); Don Antonio Mª. Fabié, in the *Diccionario general de política y administracion* of Don E. Suarez Inclan (Madrid, 1868), vol. i.; M. Morel Fatio, *Études sur l'Espagne* (2nd series, Paris, 1890). (D. H.)

ARAN ISLANDS, or South Aran, three islands lying across Galway Bay, on the west coast of Ireland, in a south-easterly direction, forming a kind of natural breakwater. They belong to the county Galway, and their population in 1901 was 2863. They are called respectively—beginning with the northernmost—Inishmore (or Aranmore), the Great Island; Inishmaan, the Middle Island; and Inisheer, the Eastern Island. The first has an elevation of 354 ft., the second of 259, and the third of 202. Their formation is carboniferous limestone. These islands are remarkable for a number of architectural remains of a very early date. In Inishmore there stand, on a cliff 220 ft. high, large remains of a circular cyclopean tower, called Dun-Aengus, ascribed to the Fir-bolg or Belgae; or, individually, to the first of three brothers, Aengus, Conchobar and Nil, who reached Aran Islands from Scotland in the 1st century A.D. There are seven other similar structures in the group. Inishmore also bears the name of *Aran-na-naomh*, Aran-of-the-Saints, from the number of religious recluses who took up their abode in it, and gave a celebrity to the holy wells, altars and shrines, to which many are still attracted. No less, indeed, than twenty buildings of ecclesiastical or monastic character have been enumerated in the three islands. On Inishmore are remains of the abbey of Killenda. Christianity was introduced in the 5th century, and Aran soon became one of the most famous island-resorts of religious teachers and ascetics. The extraordinary fame of the foundations here has been inferred from the inscription "VII. Romani" on a stone in the church Teampull Brecain on Inishmore, attributed to disciples from Rome. The total area of the islands is 11,579 acres. The Congested Districts Board made many efforts to improve the condition of the inhabitants, especially by introducing better methods of fishing. A curing station is established at Killeany, the harbour of Inishmore.

ARANJUEZ (perhaps the ancient *Ara Jovis*), a town of central Spain, in the province of Madrid, 30 m. S. of Madrid, on the left bank of the river Tagus, at the junction of the main southern railways to Madrid, and at the western terminus of the Aranjuez-Cuenca railway. Pop. (1900) 12,670. Aranjuez occupies part of a wide valley, about 1500 ft. above the sea. Its formal, straight streets, crossing one another regularly at right angles, and its uniform, two-storeyed houses were built in imitation of the Dutch style, under the direction of Jerónimo, marquis de Grimaldi (1716–1788), ambassador of Charles III. at the Hague. A rapid in the Tagus, artificially converted into a weir, renders irrigation easy, and has thus created an oasis in the midst of the barren plateau of New Castile. On every side the town is surrounded by royal parks and woods of sycamores, plane-trees and elms, often of extraordinary size. The prevalence of the dark English elms, first introduced into the country and planted here by order of Philip II. (1527–1598), gives to the Aranjuez district a character wholly distinct from that of other Spanish landscapes; and at an early period, despite the unhealthy climate, and especially the oppressive summer heat, which often approaches 100° F., Aranjuez became a favourite residence of the Spanish court. In the 14th and 15th centuries, the master of the Order of Santiago had a country seat here, which passed, along with the mastership, into the possession of the crown of Spain in 1522. Its successive occupants, from the emperor Charles V. (1500–1558) down to Ferdinand VII. (1784–1833), modified it according to their respective tastes. The larger palace was built by Pedro Caro for Philip V. (1683–1746), in the French style of the period. It overlooks the Jardin de la Isla, a beautiful garden laid out for Philip II. on an island in the Tagus, which forms the scene of Schiller's famous drama *Don Carlos*. The Casa del Labrador, or Labourer's Cottage, as it is called, is a smaller palace built by Charles IV. in 1803, and full of elaborate ornamentation. The chief local industry is farming, and an annual fair is held in September for the sale of live stock. Great attention is given to the rearing of horses and mules, and the royal stud used to be remarkable for the beauty of its cream-coloured breed. The treaty of 1772 between France and Spain was concluded at Aranjuez, which afterwards suffered severely from the French during the Peninsular War. Here, also, in 1808, the insurrection broke out which ended in the abdication of Charles IV.

For a fuller description of Aranjuez see D.S. Viñas y Rey, *Aranjuez* (Madrid, 1890); F. Nard, *Guia de Aranjuez, su historia y descripcion* (Madrid, 1851), (illustrated); Alvarez de Quindos, *Descripcion historica del real bosque y casa de Aranjuez* (Madrid, 1804).

ARANY, JÁNOS (1817–1882), the greatest poet of Hungary after Petöfi, was born at Nagy-Szalontá on the 2nd of March 1817, the son of György Arany and Sara Mégyeri; his people were small Calvinist yeomen of noble origin, whose property consisted of a rush-thatched cottage and a tiny plot of land. An only son, late born, seeing no companions of his own age, hearing nothing but the voices of his parents and the hymns and prayers in the little Calvinist chapel, Arany grew up a grave and gentle, but by no means an ignorant child. His precocity was remarkable. At six years of age he went to school at Szalontá, where he read everything he could lay his hands upon in Hungarian and Latin. From 1832 to 1836 Arany was a preceptor at Kis-Ujszállás and Debreczen, still a voracious reader with a wider field before him, for he had by this time taught himself French and German. Tiring of the monotony of a scholastic life, he joined a troupe of travelling actors. The hardships he suffered were as nothing compared with the pangs of conscience which plagued him when he thought of the despair of his father, who had meant to make a pastor of this prodigal son, to whom both church and college now seemed for ever closed. At last he borrowed sixpence from the stage-manager and returned home, carrying all his property tied up in a handkerchief. Shortly after his home-coming his mother died and his father became stone-blind. Arany at once resolved that it was his duty never to leave his father again, and a conrectorship which he obtained at this time enabled them to live in modest comfort. In 1840 he obtained a notaryship also, and the same year married Juliana Ercsey, the penniless orphan daughter of an advocate. The next few happy years were devoted to his profession and a good deal of miscellaneous reading, especially of Shakespeare (he learnt English in order to compare the original with his well-thumbed German version) and Homer. Meanwhile the reactionaries of Vienna were goading the Magyar Liberals into revolt, and Arany found a safety-valve for his growing indignation by composing a satirical poem in hexameters, entitled "The Lost Constitution." The Kisfaludy Society, the great literary association of Hungary, about this time happened to advertise a prize for the best satire on current

events. Arany sent in his work, and shortly afterwards was awarded the 25-gulden prize (7th of February 1846) by the society, which then advertised another prize for the best Magyar epic poem. Arany won this also with his *Toldi* (the first part of the present trilogy), and immediately found himself famous. All eyes were instantly turned towards the poor country notary, and Petöfi was the first to greet him as a brother. In February of the following year Arany was elected a member of the Kisfaludy Society. In the memorable year 1848 the people of Szalontá elected him their deputy to the Hungarian parliament. But neither now nor subsequently (1861, 1869) would he accept a parliamentary mandate. He wrote many articles, however, in the gazette *Népbarátja*, an organ of the Magyar government, and served in the field as a national guard for eight or ten weeks. In 1849 he was in the civil service of the revolutionary government, and after the final catastrophe returned to his native place, living as best he could on his small savings till 1850, when Lajos Tisza, the father of Kálmán Tisza, the future prime minister, invited him to his castle at Geszt to teach his son Domokos the art of poetry. In the following year Arany was elected professor of Hungarian literature and language at the Nagy-Körös gymnasium. He also attempted to write another epic poem, but the time was not favourable for such an undertaking. The miserable condition of his country, and his own very precarious situation, weighed heavily upon his sensitive soul, and he suffered severely both in mind and body. On the other hand reflection on past events made clear to him not only the sufferings but the defects and follies of the national heroes, and from henceforth, for the first time, we notice a bitterly humorous vein in his writings. Thus *Bolond Istók*, the first canto of which he completed in 1850, is full of sub-acrid merriment. During his nine years' residence at Nagy-Körös, Arany first seriously turned his attention to the Magyar ballad, and not only composed some of the most beautiful ballads in the language, but wrote two priceless dissertations on the technique of the ballad in general: "Something concerning assonance" (1854), and "On Hungarian National Versification" (1856).

When the Hungarian Academy opened its doors again after a ten years' cessation, Arany was elected a member (15th of December 1858). On the 15th of July 1860 he was elected director of the revived Kisfaludy Society, and went to Pest. In November, the same year, he started *Szépirodalmi Figyelö*, a monthly review better known by its later name, *Koszeru*, which did much for Magyar criticism and literature. He also edited the principal publications of the society, including its notable translation of *Shakespeare's Dramatic Works*, to which he contributed the *Midsummer Night's Dream* (1864), *Hamlet* and *King John* (1867). The same year he won the Nádasdy prize of the Academy with his poem "Death of Buda." From 1865 to 1879 he was the secretary of the Hungarian Academy.

Domestic affliction, ill-health and his official duties made these years comparatively unproductive, but he issued an edition of his collected poems in 1867, and in 1880 won the Karácsonyi prize with his translation of the *Comedies of Aristophanes* (1880). In 1879 he completed his epic trilogy by publishing *The Love of Toldi* and *Toldi's Evening*, which were received with universal enthusiasm. He died suddenly on the 24th of October 1882. The first edition of his collected works, in 8 volumes, was published in 1884–1885.

Arany reformed Hungarian literature. Hitherto classical and romantic successively, like other European literatures, he first gave it a national direction. He compelled the poetry of art to draw nearer to life and nature, extended its boundaries and made it more generally intelligible and popular. He wrote not for one class or school but for the whole nation. He introduced the popular element into literature, but at the same time elevated and ennobled it. What Petöfi had done for lyrical he did for epic poetry. Yet there were great differences between them. Petöfi was more subjective, more individual; Arany was more objective and national. As a lyric poet Petöfi naturally gave expression to present moods and feelings; as an epic poet Arany plunged into the past. He took his standpoint on tradition. His art was essentially rooted in the character of the whole nation and its glorious history. His genius was unusually rich and versatile; his artistic conscience always alert and sober. His taste was extraordinarily developed and absolutely sure. To say nothing of his other great qualities, he is certainly the most artistic of all the Magyar poets.

See *Posthumous Writings and Correspondence of Arany*, edited by László Arany (Hung.), (Budapest, 1887–1889); article "Arany," in *A Pallas Nagy Lexikona*, Köt 2 (Budapest, 1893); Mór Gaal, *Life of János Arany* (Hung.), (Budapest, 1898); L. Gyöngyösy, *János Arany's Life and Works* (Hung.), (Budapest, 1901). Translations from Arany: *The Legend of the Wondrous Hunt* (canto 6 of *Buda's Death*), by D. Butler (London, 1881); *Toldi, poème en 12 chants* (Paris, 1895); *Dichtungen* (Leipzig, 1880); *König Buda's Tod* (Leipzig, 1879); *Balladen* (Vienna, 1886). (R. N. B.)

ARAPAHO (possibly from the Pawnee for "trader"), a tribe of North American Indians of Algonquian stock. They formerly ranged over the central portion of the plains between the Platte and Arkansas. They were a brave, warlike, predatory tribe. With the Sioux and Cheyennes they waged unremitting warfare upon the Utes. The southern divisions of the tribe were placed (1867) on a reservation in the west of Indian Territory (now Oklahoma), while the northern are in western Wyoming. The southern section sold their reservations in 1892 and became American citizens. The Arapahos number in all some 2000.

See INDIANS, NORTH AMERICAN; H. R. Schoolcraft, *History of the Indian Tribes of the United States* (1851–1857, 6 vols.); *Handbook of American Indians*, ed. F. W. Hodge (Washington, 1907).

ARARAT (Armen. *Massis*, Turk. *Egri Dagh*, *i.e.* "Painful Mountain," Pers. *Koh-i-Nuh*, *i.e.* "Mountain of Noah,"), the name given to the culminating point of the Armenian plateau which rises to a height of 17,000 ft. above the sea. The *massif* of Ararat rises on the north and east out of the alluvial plain of the Aras, here from 2500 ft. to 3000 ft. above the sea, and on the south-west sinks into the plateau of Bayezid, about 4500 ft. It is thus isolated on all sides but the north-west, where a *col* about 6900 ft. high connects it with a long ridge of volcanic mountains. Out of the *massif* rise two peaks, "their bases confluent at a height of 8800 ft., their summits about 7 m. apart." The higher, Great Ararat, is "a huge broad-shouldered mass, more of a dome than a cone"; the lower, Little Ararat, 12,840 ft. on which the territories of the tsar, the sultan, and the shah meet, is "an elegant cone or pyramid, rising with steep, smooth, regular sides into a comparatively sharp peak" (Bryce). On the north and west the slopes of Great Ararat are covered with glittering fields of unbroken *névé*. The only true glacier is on the north-east side, at the bottom of a large chasm which runs into the heart of the mountain. The great height of the snow-line, 14,000 ft., is due to the small rainfall and the upward rush of dry air from the plain of the Araxes. The middle zone of Ararat, 5000–11,500 ft., is covered with good pasture, the upper and lower zones are for the most part sterile. Whether the tradition which makes Ararat the resting-place of Noah's Ark is of any historical value or not, there is at least poetical fitness in the hypothesis, inasmuch as this mountain is about equally distant from the Black Sea and the Caspian, from the Mediterranean and the Persian Gulf. Another tradition—accepted by the Kurds, Syrians and Nestorians—fixes on Mount Judi, in the south of Armenia, on the left bank of the Tigris, near Jezire, as the Ark's resting-place. There so-called genuine relics of the ark were exhibited, and a monastery and mosque of commemoration were built; but the monastery was destroyed by lightning in 776 A.D., and the tradition has declined in credit. Round Mount Ararat, however, gather many traditions connected with the Deluge. The garden of Eden is placed in the valley of the Araxes; Marand is the burial-place of Noah's wife; at Arghuri, a village near the great chasm, was the spot where Noah planted the first vineyard, and here were shown Noah's vine and the monastery of St James, until village and monastery were overwhelmed by a fall of rock, ice and snow, shaken down by an earthquake in 1840. According to the Babylonian account, the resting-place of the Ark was "on the Mountain of Nizir," which some writers have identified with Mount Rowanduz, and others with Mount Elburz, near Teheran.

From the Armenian plateau, Ararat rises in a graceful isolated cone far into the region of perennial snow. It was long believed by the Armenian monks that no one was permitted to reach the "secret top" of Ararat with its sacred remains, but on the 27th of September 1829, Dr. Johann Jacob Parrot (1792–1840) of Dorpat, a German in the employment of Russia, set foot on the "dome of eternal ice." Ararat has since been ascended by S. Aftonomov (1834 and 1843); M. Wagner and W. H. Abich (1845); J. Chodzko, N. W. Chanykov, P. H. Moritz and a party of Cossacks in the service of the Russian government (1850); Stuart (1856); Monteith (1856); D. W. Freshfield (1868); James Bryce (1876); A. V. Markov (1888); P. Pashtukhov and H. B. Lynch (1893). Mr Freshfield thus described the mountain:—"It stands perfectly isolated from all the other ranges, with the still more perfect cone of Little Ararat (a typical volcano) at its side. Seen thus early in the season (May), with at least 9000 ft. of snow on its slopes, from a distance and height well calculated to permit the eye to take in its true proportions, we agreed that no single mountain we know presented such a magnificent and impressive appearance as the Armenian Giant." There are a number of glaciers in the upper portion, and the climate of the whole district is very severe. The greater part of the mountain is destitute of trees, but the lower Ararat is clothed with birches. The fauna and flora are both comparatively meagre.

Both Great and Little Ararat consist entirely of volcanic rocks, chiefly andesites and pyroxene andesites, with some obsidian. No crater now exists at the summit of either, but well-formed parasitic cones occur upon their flanks. There are no certain historic records of any eruption. The earthquake and fall of rock which destroyed the village of Arghuri in 1840 may have been caused by a volcanic explosion, but the evidence is unsatisfactory.

The name of Ararat also applies to the Assyrian *Urardhu*, the country in which the Ark rested after the Deluge (Gen. viii. 4), and to which the murderers of Sennacherib fled (2 Kings xix. 37; Isaiah xxxvii. 38). The name Urardhu, originally that of a principality which included Mount Ararat and the plain of the Araxes, is given in Assyrian inscriptions from the 9th century B.C. downwards to a kingdom that at one time included the greater part of the later Armenia. The native name of the kingdom was *Biainas*, and its capital was *Dhuspas*, now Van. The first king, Sarduris I. (*c.* 833 B.C.), subdued the country of the Upper Euphrates and Tigris. His inscriptions are written in cuneiform, in Assyrian, whilst those of his successors are in cuneiform, in their own language, which is neither Aryan nor Semitic. The kings of Biainas extended their kingdom eastward and westward, and defeated the Assyrians and Hittites. But Sarduris II. was overthrown by Tiglath Pileser III. (743 B.C.), and driven north of the Araxes, where he made Armavir, *Armauria*, his capital. Interesting specimens of Biainian art have been found on the site of the palace of Rusas II., near Van. Shortly after 645 B.C. the kingdom fell, possibly conquered by Cyaxares, and a way was thus opened for the immigration of the Aryan Armenians. The name Ararat is unknown to the Armenians of the present day. The limits of the Biblical Ararat are not known, but they must have included the lofty Armenian plateau which overlooks the plain of the Araxes on the north, and that of Mesopotamia on the south. It is only natural that the highest and most striking mountain in the district should have been regarded as that upon which the Ark rested, and that the old name of the country should have been transferred to it.

See also H. B. Lynch, *Armenia* (1901); Sayce, "Cuneiform Inscriptions of Lake Van," in *Journal of Royal Asiatic Society*, vols. xiv., xx. and xxvi.; Maspero, *Histoire ancienne des peuples de l'Orient classique*, tome iii., *Les Empires* (Paris, 1899); J. Bryce, *Transcaucasia and Ararat* (4th ed., 1896); D. W. Freshfield, *Travels in the Central Caucasus and Bashan* (1869); Parrot, *Reise zum Ararat* (1834); Wagner, *Reise nach dem Ararat* (1848); Abich, *Die Besteigung des Ararat* (1849); articles "Ararat," in Hastings' *Dictionary of the Bible*, and the *Encyclopaedia Biblica*. (C. W. W.)

ARARAT, a municipal town of Ripon county, Victoria, Australia, 130 m. by rail W.N.W. of Melbourne. Pop. (1901) 3580. It lies at an elevation of 1028 ft. towards the western extremity of the Great Dividing range. It is the commercial centre of the north-western grain and wool-producing district and is also noted for its quartz and alluvial gold-mines. Excellent wine is made, and flour-milling, leather-working, brick and candle making and soap-boiling are the chief industries. The district also yields the best timber in great quantity. Granite, bluestone, limestone and slate abound in the neighbourhood.

ARAROBA POWDER, a drug occurring in the form of a yellowish-brown powder, varying considerably in tint, which derives an alternative name—Goa powder—from the Portuguese colony of Goa, where it appears to have been introduced about the year 1852. The tree which yields it is the *Andira Araroba* of the natural order Leguminosae. It is met with in great abundance in certain forests in the province of Bahia, preferring as a rule low and humid spots. The tree is from 80 to 100 ft. high and has large imparipinnate leaves, the leaflets of which are oblong, about 1½ in. long and ¾ in. broad, and somewhat truncate at the apex. The flowers are papilionaceous, of a purple colour and arranged in panicles. The Goa powder or araroba is contained in the trunk, filling crevices in the heartwood. It is a morbid product in the tree, and yields to hot chloroform 50% of a substance known officially as chrysarobin, which has a definite therapeutic value and is contained in most modern pharmacopoeias. It occurs as a micro-crystalline, odourless, tasteless powder, very slightly soluble in either water or alcohol; it also occurs in rhubarb root. This complex mixture contains pure chrysarobin ($C_{15}H_{12}O_3$), di-chrysarobin methylether ($C_{30}H_{23}O_7 \cdot OCH_3$), di-chrysarobin ($C_{30}H_{24}O_7$). Chrysarobin is a methyl trioxyanthracene and exists as a glucoside in the plant, but is gradually oxidized to chrysophanic acid (a dioxy-methyl anthraquinone) and glucose. This strikes a blood-red colour in alkaline solutions, and may therefore cause much alarm if administered to a patient whose urine is alkaline. The British pharmacopoeia has an ointment containing one part of chrysarobin and 24 of benzoated lard.

Both internally and externally the drug is a powerful irritant. The general practice amongst modern dermatologists is to use only chrysophanic acid, which may be applied externally and given by the mouth in doses of about one grain in cases of psoriasis and chronic eczema. The drug is a feeble parasiticide, and has been used locally in the treatment of ringworm. It stains the skin—and linen—a deep yellow or brown, a coloration which may be removed by caustic alkali in weak solution.

ARAS, the anc. *Araxes*, and the *Phasis* of Xenophon (Turk. and Arab. *Ras*, Armen. *Yerash*, Georg. *Rashki*), a river which rises south of Erzerum, in the Bingeul-dagh, and flows east through the province of Erzerum, across the Pasin plateau, and then through Russian Armenia, passing between Mount Ararat and Erivan, and forming the Russo-Persian frontier. Its course is about 600 m. long; its principal tributary is the Zanga, which flows by Erivan and drains Lake Gokcha or Sevanga. It is a rapid and muddy stream, dangerous to cross when swollen by the melting of the snows in Armenia, but fordable in its ordinary state. It formerly joined the Kura; but in 1897 it changed its lower course, and now runs direct to the Kizil-agach Bay of the Caspian. On an island in its bed stood Artaxata, the capital of Armenia from 180 B.C. to A.D. 50.

ARASON, JON (1484–1551), Icelandic bishop and poet, became a priest about 1504, and having attracted the notice of Gottskalk, bishop of Holar, was sent by that prelate on two missions to Norway. In 1522 he succeeded Gottskalk in the see of Holar, but he was soon driven out by the other Icelandic bishop, Ogmund of Skalholt. His exile, however, was brief, and some years after his return he became involved in a dispute with his sovereign, Christian III., king of Denmark, because he refused to further the progress of Lutheranism in the island. Then in 1548, when a large number of the islanders had accepted the reformed doctrines, Arason and Ogmund joined their forces and attacked the Lutherans. Civil war broke out, and in 1551 the bishop of Holar and two of his sons were captured and executed. Arason, who was the last Roman Catholic bishop in Iceland, is celebrated as a poet, and as the man who introduced printing into the island.

ARATOR, of Liguria, a Christian poet, who lived during the 6th century. He was an orphan, and owed his early education to Laurentius, archbishop of Milan, and Ennodius, bishop of Pavia, who took great interest in him. After completing his studies, he practised with success as an advocate, and was appointed to an influential post at the court of Athalaric, king of the Ostrogoths. About 540, he quitted the service of the state, took orders and was elected sub-deacon of the Roman Church. He gained the favour of Pope Vigilius, to whom he dedicated his *De Actibus Apostolorum* (written about 544), which was much admired in the middle ages. The poem, consisting of some 2500 hexameters, is of little merit, being full of mystical and allegorical interpretations and long-winded digressions; the versification, except for certain eccentricities in prosody, is generally correct.

Text by Hübner, 1850. See Leimbach, "Der Dichter Arator," in *Theologische Studien und Kritik* (1873); Manitius, *Geschichte der christlich-lateinischen Poesie* (1891).

ARATUS, Greek statesman, was born at Sicyon in 271 B.C., and educated at Argos after the death of his father, at the hands of Abantidas, tyrant of Sicyon. When twenty years old Aratus delivered Sicyon from its tyrant by a bold *coup de main*. By enrolling it in the Achaean League (*q.v.*) he secured it against Macedonia, and with funds received from Ptolemy Philadelphus he pacified the returned exiles. Ever anxious to extend the league, in which after 245 he was general almost every second year, Aratus took Corinth by surprise (243), and with mingled threats and persuasion won over other cities, notably Megalopolis (233) and Argos (229), whose tyrants abdicated voluntarily. He fought successfully against the Aetolians (241), and in 228 induced the Macedonian commander to evacuate Attica. But when Cleomenes III. (*q.v.*) opened hostilities, Aratus sustained several reverses, and was badly defeated near Dyme (226 or 225). Rather than admit Cleomenes as chief of the league, where he might have upset the existing timocracy, Aratus opposed all attempts at mediation. As plenipotentiary in 224 he called in Antigonus Doson of Macedonia, and helped to recover Corinth and Argos and to crush Cleomenes at Sellasia, but at the same time sacrificed the independence of the league. In 220–219 the Aetolians defeated him in Arcadia and harried the Peloponnese unchecked. When Philip V. of Macedon came to expel these marauders, Aratus became the king's adviser, and averted a treacherous attack on Messene (215); before long, however, he lost favour and in 213 was poisoned. The Sicyonians accorded him hero-worship as a "son of Asclepius." To Aratus is due the credit of having made the Achaean League an effective instrument against tyrants and foreign enemies. But his military incapacity and his blind hatred of democratic reform went far to undo his work.

Polybius (ii.-viii.) follows the *Memoirs* which Aratus wrote to justify his statesmanship,—Plutarch (*Aratus* and *Cleomenes*) used this same source and the hostile account of Phylarchus; Paus. ii. 10; see Neumeyer, *Aratos von Sikyon* (Leipzig, 1886).

(M. O. B. C.)

ARATUS, of Soli in Cilicia, Greek didactic poet, a contemporary of Callimachus and Theocritus, was born about 315 B.C. He was invited (about 276) to the court of Antigonus Gonatas of Macedonia, where he wrote his most famous poem, Φαινόμενα (Appearances, or Phenomena). He then spent some time with Antiochus I. of Syria; but subsequently returned to Macedonia, where he died about 245. Aratus's only extant works are two short poems, or two fragments of his one poem, written in hexameters; an imitation of a prose work on astronomy by Eudoxus of Cnidus, and Διοσημεῖα (on weather signs), chiefly from Theophrastus. The work has all the characteristics of the Alexandrian school of poetry. Although Aratus was ignorant of astronomy, his poem attracted the favourable notice of distinguished specialists, such as Hipparchus, who wrote commentaries upon it. Amongst the Romans it enjoyed a high reputation (Ovid, *Amores*, i. 15, 16). Cicero, Caesar Germanicus and Avienus translated it; the two last versions and fragments of Cicero's are still extant. Quintilian (*Instit.* x. 1, 55) is less enthusiastic. Virgil has imitated the *Prognostica* to some extent in the *Georgics*. One verse from the opening invocation to Zeus has become famous from being quoted by St Paul (Acts xvii. 28). Several accounts of his life are extant, by anonymous Greek writers.

Editio princeps, 1499; Buhle, 1793; Maass, 1893; *Aratea* (1892), *Commentariorum in Aratum Reliquiae* (1898), by the same. English translations: Lamb, 1848; Poste, 1880; R. Brown, 1885; Prince, 1895. On recently discovered fragments, see H. I. Bell, in *Classical Quarterly*, April 1907; also *Berliner Klassikertexte*, Heft v. 1, pp. 47-54.

ARAUCANIA, the name of a large territory of Chile, South America, S. of the Bio-bio river, belonging to the Araucanian Indians (see below) at the time of their independence of Spanish and Chilean authority. The loss of their political independence has been followed by that of the greater part of their territory, which has been divided up into the Chilean provinces of Arauco, Bio-bio, Malleco and Cautin, and the Indians, much reduced in number, now live in the wooded recesses of the three provinces last named.

ARAUCANIANS (or AUCA), a tribal group of South American Indians in southern Chile (see above). Physically a fine race, their hardiness and bravery enabled them successfully to resist the Incas in the 15th century. Their government was by four *toquis* or princes, independent of one another, but confederates against foreign enemies. Each tetrarchy was divided into five provinces, ruled by five chiefs called *apo-ulmen*; and each province into nine districts, governed by as many *ulmen*, who were subject to the apo-ulmen, as the latter were to the toquis. These various chiefs (who all bore the title of ulmen) composed the aristocracy of the country. They held their dignities by hereditary descent in the male line, and in the order of primogeniture. The supreme power of each tetrarchy resided in a council of the ulmen, who assembled annually in a large plain. The resolutions of this council were subject to popular assent. The chiefs, indeed, were little more than leaders in war; for the right of private revenge limited their authority in judicial matters; and they received no taxes. Their laws were merely traditional customs. War was declared by the council, messengers bearing arrows dipped in blood being sent to all parts of the country to summon the men to arms. From the time of the first Spanish invasion (1535) the Araucanians made a vigorous resistance, and after worsting the best soldiers and the best generals of Spain for two centuries obtained an acknowledgment of their independence. Their success was due as much to their readiness in adopting their enemy's methods of warfare as to their bravery. Realizing the inefficiency of their old missiles when opposed to musket balls, they laid aside their bows, and armed themselves with spears, swords or other weapons fitted for close combat. Their practice was to advance rapidly within such a distance of the Spaniards as would not leave the latter time to reload after firing. Here they received without shrinking a volley, which was certain to destroy a number of them, and then rushing forward in close order, fought their enemies hand to hand.

The Araucanians believe in a supreme being, and in many subordinate spirits, good and bad. They believe also in omens and divination, but they have neither temples nor idols, nor religious rites. Very few have become Roman Catholics. They believe in a future state, and have a confused tradition respecting a deluge, from which some persons were saved on a high mountain. They divide the year into twelve months of thirty days, and add five days by intercalation. They esteem poetry and eloquence, but can scarcely be induced to learn reading or writing.

The tribal divisions have little or no organization. Some 50,000 in number, they spend a nomad existence wandering from pasture to pasture, living in low skin tents, their herds providing their food. They still preserve their warlike nature, though in 1870 they formally recognized Chilean rule. In 1861 Antoine de Tounens (1820–1878), a French adventurer in Chile, proclaimed himself king of Araucania under the title of Orélie Antoine I., and tried to obtain subscriptions from France to support his enterprise. But his pretensions were ludicrous; he was quickly captured by the Chileans and sent back to France (1862) as a madman; and though he made one more abortive effort in 1874

to recover his " kingdom," and occupied his pen in magnifying his achievements, nobody took him seriously except a few of the deluded Indians.

See Domeyko, *Araucania y sus habitantes* (Santiago, 1846); de Ginoux, " Le Chili et les Araucans," in *Bull. de la soc. de géogr.* (1852); E. R. Smith, *Araucanians* (New York, 1855); J. T. Medina, *Los aborjenes de Chile* (Santiago, 1882); A. Polakowsky, *Die heutigen Araukanen*, Globus No. 74 (Brunswick, 1898).

ARAUCARIA, a genus of coniferous trees included in the tribe *Araucarineae*. They are magnificent evergreen trees, with apparently whorled branches, and stiff, flattened, pointed leaves, found in Brazil and Chile, Polynesia and Australia. The name of the genus is derived from Arauco, the name of the district in southern Chile where the trees were first discovered. *Araucaria imbricata*, the Chile pine, or " monkey puzzle," was introduced into Britain in 1796. It is largely cultivated, and usually stands the winter of Britain; but in some years, when the temperature fell very low, the trees have suffered much. Care should be taken in planting to select a spot somewhat elevated and well drained. The tree grows to the height of 150 ft. in the Cordilleras of Chile. The cones are from 8 to 8½ in. broad, and 7 to 7½ in. long. The wood of the tree is hard and durable. This is the only species which can be cultivated in the open air in Britain. *Araucaria brasiliana*, the Brazil pine, is a native of the mountains of southern Brazil, and was introduced into Britain in 1819. It is not so hardy as *A. imbricata*, and requires protection during winter. It is grown in conservatories for half-hardy plants. *Araucaria excelsa*, the Norfolk Island pine, a native of Norfolk Island and New Caledonia, was discovered during Captain Cook's second voyage, and introduced into Britain by Sir Joseph Banks in 1793. It cannot be grown in the open air in Britain, as it requires protection from frost, and is more tender than the Brazilian pine. It is a majestic tree, sometimes attaining a height of more than 220 ft. The scales of its cones are winged, and have a hook at the apex. *Araucaria Cunninghami*, the Moreton Bay pine, is a tall tree abundant on the shores of Moreton Bay, Australia, and found through the littoral region of Queensland to Cape York Peninsula, also in New Guinea. It requires protection in England during the winter. *Araucaria Bidwilli*, the Bunya-Bunya pine, found on the mountains of southern Queensland, between the rivers Brisbane and Burnett, at 27° S. lat., is a noble tree, attaining a height of 100 to 150 ft., with a straight trunk and white wood. It bears cones as large as a man's head. Its seeds are very large, and are used as food by the natives. *Araucaria Rulei*, which is a tree of New Caledonia, attains a height of 50 or 60 ft. *Araucaria Cookii*, also a native of New Caledonia, attains a height of 150 ft. It is found also in the Isle of Pines, and in the New Hebrides. The tree has a remarkable appearance, due to shedding its primary branches for about five-sixths of its height and replacing them by a small bushy growth, the whole resembling a tall column crowned with foliage, suggesting to its discoverer, Captain Cook, a tall column of basalt.

ARAUCO, a coast province of southern Chile, bounded N., E. and S. by the provinces of Concepción, Bio-bio, Malleco and Cautin. Area, 2458 sq. m.; pop. (est. 1902) 70,635. The province originally covered the once independent Indian territory of Araucania (*q.v.*), but this was afterwards divided into four provinces. It is devoted largely to agricultural pursuits. The capital Lebú (pop. in 1902, 3178) is situated on the coast about 55 m. south of Concepción, with which it is connected by rail.

ARAVALLI HILLS, a range of mountains in India, running for 300 m. in a north-easterly direction, through the Rajputana states and the British district of Ajmere-Merwara, situated between 24° and 27° 10′ N. lat., and between 72° and 75° E. long. They consist of a series of ridges and peaks, with a breadth varying from 6 to 60 m. and an elevation of 1000 to 3000 ft., the highest point being Mount Abu, rising to 5653 ft., near the south-western extremity of the range. Geologically they belong to the primitive formation—granite, compact dark blue slate, gneiss and syenite. The dazzling white effect of their peaks is produced, not by snow, as among the Himalayas, but by enormous masses of vitreous rose-coloured quartz. On the north their drainage forms the Luni and Sakhi rivers, which fall into the Gulf of Cutch. To the south, their drainage supplies two distinct river systems, one of which debouches in comparatively small streams on the Gulf of Cambay, while the other unites to form the Chambal river, a great southern tributary of the Jumna, flowing thence via the Ganges, into the Bay of Bengal on the other side of India. The Aravalli hills are for the most part bare of cultivation, and even of jungle. Many of them are mere heaps of sand and stone; others consist of huge masses of quartz. The valleys between the ridges are generally sandy deserts, with an occasional oasis of cultivation. At long intervals, however, a fertile tract marks some great natural line of drainage, and among such valleys Ajmere city, with its lake, stands conspicuous. The hills are inhabited by a very sparse population of Mhairs, an aboriginal race. For long these people formed a difficult problem to the British government. Previously to the British occupation of India they had been accustomed to live, almost destitute of clothing, by the produce of their herds, by the chase and by plunder. But Ajmere having been ceded to the East India Company in 1818, the Mhair country was soon afterwards brought under British influence, and the predatory instincts of the people were at the same time controlled and utilized by forming them into a Merwara battalion. As the peaceful results of British rule developed, and the old feuds between the Mhairs and their Rajput neighbours died out, the Mhair battalion was transformed into a police force. The Aravalli mountaineers strongly objected to this change, and pleaded a long period of loyal usefulness to the state. They were accordingly again erected into a military battalion and brought upon the roll of the British army. Under Lord Kitchener's scheme of 1903 they were entitled the 50th Merwara Infantry. The Aravalli hills send off rocky ridges in a north-easterly direction through the states of Alwar and Jaipur, which from time to time reappear in the form of isolated hills and broken rocky elevations to near Delhi.

ARAWAK (" meal-eaters," in reference to cassava, their staple food), a tribe of South American Indians of Dutch and British Guiana. The Arawaks have given their name to a linguistic stock of South America, the Arawakan, which includes many once powerful tribes. The Arawakans were once numerous, their tribes stretching from southern Brazil and Bolivia to Central America, occupying the whole of the West Indies and having settlements on the Florida seaboard. They were found by the Spaniards in Haiti and possibly in the Bahamas, but the Caribs had expelled them from most of the islands. The Arawaks proper were physically an undersized, weakly people, peaceable agriculturists, by far the most civilized of all Guiana peoples, being skilful weavers and workers in stone and gold. The chief tribes which may be called Arawakan are the Anti, Arawak, Barre, Goajiro, Guana, Manaos, Maneteneri, Maipuri, Maranho, Moxo, Passé, Piro and Taruma.

See Everard F. im Thurn, *Among the Indians of Guiana* (London, 1883).

ARBACES, according to Ctesias (Diodor. ii. 24 ff. 32), one of the generals of Sardanapalus, king of Assyria and founder of the Median empire about 830 B.C. But Ctesias's whole history of the Assyrian and Median empires is absolutely fabulous; his Arbaces and his successors are not historical personages. From the inscriptions of Sargon of Assyria we know one " Arbaku Dynast of Arnashia " as one of forty-five chiefs of Median districts who paid tribute to Sargon in 713 B.C. See MEDIA. (ED. M.)

ARBE (Serbo-Croatian *Rab*), an island in the Adriatic Sea, forming the northernmost point of Dalmatia, Austria. Pop. (1900) 4441. Arbe is 13 m. long; its greatest breadth is 5 m. The capital, which bears the same name, is a walled town, remarkable, even among the Dalmatian cities, for its beauty. It occupies a steep ridge jutting out from the west coast. At the seaward end of this promontory is the 13th-century cathedral; behind which the belfries of four churches, at least as ancient, rise in a row along the crest of the ridge; while behind these, again, are the castle and a background of desolate hills. Many of the houses are roofless and untenanted;

for, after five centuries of prosperity under Venetian or Hungarian rule, an outbreak of plague in 1456 swept away the majority of the townsfolk, and ruined the survivors. Some of the old palaces are, nevertheless, of considerable interest; one especially as the birthplace of the celebrated philosopher, Marc Antonio de Dominis. Fishing and agriculture constitute the chief resources of the islanders, whose ancient silk industry is still maintained. In 1018 the yearly tribute due to Venice was fixed at ten pounds of silk or five pounds of gold.

ARBELA (ARBA'IL, *i.e.* "Four-god-city"), an ancient town in Adiabene, the capital in Assyrian and pre-Assyrian times of the country between the greater and lesser Zab, and seat of an important cult of Ishtar. The battle in which Alexander overthrew Darius in 331 B.C., though named in the old books after Arbela, was probably fought at Gaugamela, some 60 m. away (Yorck von Wartenburg, *Kurze Übersicht der Feldzüge A. des Gr.*). The modern town of Erbil or Arbil, in the vilayet of Mosul, is about 40 m. from Mosul on the road to Bagdad. The greater part of the town, which seems at one time to have been very large, is situated on an artificial mound about 150 ft. high. It became the seat of the Ayyūbite sultan Saladin in 1184; was bequeathed in 1233 to the caliphs of Bagdad; was plundered by the Mongols in 1236 and in 1393 by Timur, and was taken in 1732 by the Persians under Nadir Shah. In the 14th century the Christians were almost exterminated. The population, which varies from 2000 to 6000, is chiefly composed of Kurds.

The ruins of another ARBELA (Irbid, Beth-Arbel) in Palestine, situated near the west shore of the Sea of Galilee, a little north of its centre, are not in themselves of high interest, but the site is noteworthy through its connexion with the neighbouring caves in the lofty flank of the Wadi Hamam, above which Arbela stood. These caves (called by the Arabs Kulat ibn Ma'an) are apparently natural, but were enlarged and fortified. They were used by the inhabitants of Arbela as a place of refuge from the army of Bacchides, general of Demetrius III., king of Syria, and were the resort of bandits in the reign of Herod the Great. He laid siege to them, and his men could only gain access to the caves by being let down from above. The caves were also fortified against the Romans by Josephus.

ARBER, EDWARD (1836–), English man of letters, was born in London on the 4th of December 1836. From 1854 to 1878 he was a clerk in the admiralty; from 1878 to 1881 lecturer on English, under Prof. H. Morley, at University College; and from 1881 to 1894 professor of English at Mason College, Birmingham. From 1894 he lived in London as emeritus professor, being also a fellow of King's College. In 1905 he received the honorary degree of D. Litt. at Oxford. He married in 1869, and had two sons, one of them, E. A. N. Arber, becoming demonstrator in palaeobotany at Cambridge. As a scholarly editor Professor Arber's services to English literature are memorable. His name is associated particularly with the series of "English Reprints" (1868–1880), by which an accurate text of the works of many English authors, formerly only accessible in rare or expensive editions, was placed within reach of the general public. Among the thirty volumes of the series were Gosson's *School of Abuse*, Ascham's *Toxophilus*, *Tottel's Miscellany*, Naunton's *Fragmenta Regalia*, &c. It was followed by the "English Scholar's Library" (16 vols.) which included the *Works* (1884) of Captain John Smith, governor of Virginia, and the *Poems* (1882) of Richard Barnfield. In his *English Garner* (8 vols. 1877–1896) he made an admirable collection of rare old tracts and poems; in 1899–1901 he issued *British Anthologies* (10 vols.), and in 1907 began a series called *A Christian Library*. He also accomplished single-handed the editing of two vast, and invaluable, English bibliographies: *A Transcript of the Registers of the Stationers' Company, 1553–1640* (1875–1894), and *The Term Catalogues, 1668–1709; with a number for Easter Term 1711* (1904–1906), edited from the quarterly lists of the booksellers.

ARBITRAGE, the term applied to the system of equalizing prices in different commercial centres by buying in the cheaper market and selling in the dearer. These transactions, or their converse, are mainly confined to stocks and shares, foreign exchanges and bullion; and are for the most part carried on between London and other European capitals and largely with New York. When prices in London are affected by financial or political causes, all other markets are sooner or later influenced, as London is the banking and financial centre for the commerce of the world. It may, however, also occur that some local event of importance initiates a rise or fall in a particular market which must ultimately affect other countries. For instance, a crisis in France would immediately depress all French securities, and by exciting the fears of capitalists would stimulate transfers of funds and raise all the exchanges against France.

In ordinary times those engaged in arbitrage operate with a very small margin of profit. The great improvement in postal, telegraphic and telephonic communication enables operators to close transactions with amazing rapidity, while competition reduces the margin of profit to a minimum. Operations in American stocks and shares are carried on between London and New York on a vast scale, while transactions in African mining shares are undertaken to a considerable extent between London and Paris. The frequent fluctuations in the prices of the latter securities offer a large and fruitful field to bold operators possessed of large resources, while those who have small means often succumb in a commercial crisis. As regards foreign exchange and bullion, arbitrage operators stand on a fairly safe foundation, the fluctuations being slight and involving little or no risk, although they yield a very small margin of profit. Arbitrage operations are for these reasons resorted to frequently by one country in supplying the requirements of another. The slightest advantage in any market is put to profit, and as the margin in ordinary exchange transactions is minute, the ability to operate in this cross fashion renders business possible, which would otherwise be impracticable. To give concrete instances of the working of arbitrage the following may be cited:—

On the 21st of May 1906 the exchange on London in Vienna was telegraphed from that city 24 kronen 4¾ cents; London, requiring to purchase remittances, found that Antwerp had some Vienna to sell, and arranged to buy there. The transactions worked out as follows:—The direct exchange in Antwerp on London being 25·25½, and Antwerp's selling price of Vienna being 105 francs for 100 kronen, on dividing 25·25½ by 105 an exchange of 24·05¼ was obtained or ¼ cent cheaper than the direct exchange between Vienna and London.

Again a portion of the proceeds of the Russian loan of 1906 had to be remitted to Berlin from Paris. Having exhausted local balances in Berlin, Paris on one side, and Berlin on the other, sought to prevent gold shipments from Berlin, and thus cause stringency in that money market. On the 21st of May 1906 Berlin was therefore seeking to sell Paris in London at 81·35 marks for 100 francs, and draw on London for the proceeds at 20·50. This transaction produced a parity between the exchanges of 25·20, which left a small margin in London.

Two instances of arbitrage of stocks are the following:—On the 24th of March 1906, Japanese exchequer bonds, series 2 and 3, were bought in Tokio at 93¼ and were paid for by telegraphic transfer at 24⅜ pence per yen, and were sold in London the same day at 94 for payment on arrival of bonds. It took five weeks for the transmission of the bonds to London, where they were dealt in on the fixed basis of exchange, namely 24½ pence per yen. The London price works out thus:

$$\frac{93{\cdot}25 \times 24{\cdot}375}{24{\cdot}50} = 92{\cdot}77,$$

to which must be added the loss of interest, as the firm in London paid cash on the 24th of March for the telegraphic transfer, and did not recover payment until the arrival of the bonds from Tokio five weeks later. The following is a computation of the transaction:—

London price	92·77
Five weeks at 5 %	·45
English stamp ½ % on nominal amount	·50
Insurance ⅛ %	·12
	93·84

This sum represents the net cost to the arbitrage house in London, and the money paid on the 28th of April left a profit of about $\frac{3}{16}$%. The bonds being "to bearer" insurance was necessary for the safety in this, as in all similar transactions.

In the next example, however, this expense was unnecessary, the bonds being "inscribed." On the 21st of May 1906 American Steel common shares were sold for cash in New York at $41\frac{3}{16}$ dollars per share, and were bought in London at $42\frac{7}{32}$ for the account day, May 31st. These figures are explained by the fact that transactions in the United States stocks and shares are on the fixed basis of five dollars per pound sterling, while as regards payments in New York the exchange varies daily. Railway shares are generally 100 dollars each. In the London market, however, five shares of 100 dollars would be £100 nominal. These shares, therefore, cost in London, at the purchase price of $42\frac{7}{32}$, £42: 4: 5. The money realized in New York for five shares at $41\frac{3}{16}$ was 205·93 dollars. A cheque on London was bought at 4 dollars $85\frac{1}{4}$ cents, realizing £42 : 8 : 9. It should be noted that the shares in these cases are generally lent by the New York correspondent, thus saving loss of interest. The resulting profit in this particular instance was 4s. 4d. for each five shares, divided between the London and New York arbitrage firms. Arbitrage operations with distant countries such as India are large and mainly profitable. Arbitrage with India consists chiefly in buying bills of exchange in London, such as India Council rupee bills amounting to about 16 millions sterling annually, and commercial bills drawn against goods exported to India. The counter-operation consists in purchasing in India, for short or long delivery, sterling bills drawn against exports to Great Britain of Indian produce, such as cotton, tea, indigo, jute and wheat. These operations greatly facilitate trade and the moving of produce from the interior of India to the seaports. Without this assistance Great Britain's enormous trade could not be carried on, and she would have to revert to the primitive system of barter. The same advantages are afforded to her vast trade with China and Japan, with the material difference that the supply of government council bills is confined to the Indian trade. The balance of trade with all countries is generally settled by specie shipments; hence, with the Far East, silver and gold play an important part in arbitrage.

It will thus be seen that arbitrage fills a useful place in commerce; the profits are small because the competition is great; nevertheless huge transactions employing thousands of clerks result from this system.

The literature of the subject is extremely meagre. Lord Goschen's *Theory of Foreign Exchanges* (London, 1866) is general and theoretical, but throws great light upon particular aspects of the philosophy of arbitrage, without touching specially on the details of the subject itself. The principal other works are: Kelly's *Cambist* (1811, 1835); Otto Swoboda, *Die kaufmännische Arbitrage* (Berlin, 1873), and *Börse und Actien* (Cologne, 1869); Coquelin et Guillaumin, *Dictionnaire de l'économie politique* (Paris, 1851–1853); Ottomar Haupt, *London Arbitrageur* (London, 1870); Charles le Touzé, *Traité théorique et pratique du change* (Paris, 1868); Tate, *Modern Cambist* (London, 1868); Simon Spitzer, *Ueber Münz- und Arbitragenrechnung* (Vienna, 1872); J. W. Gilbart, *Principles and Practice of Banking* (London, 1871); G. Clare, *The A B C of Foreign Exchanges* (2nd ed., 1895); *Money Market Primer and Key to the Exchanges* (2nd ed., 1900); J. Pallain, *Les Changes étrangers et les prix* (Paris, 1905).

(Sw.)

ARBITRATION (Lat. *arbitrari*, to examine or judge), a term derived from the nomenclature of Roman law, and applied to an arrangement for taking, and abiding by, the judgment of a selected person in some disputed matter, instead of carrying it to the established courts of justice. In disputes between states, arbitration has long played an important part (see ARBITRATION, INTERNATIONAL). The present article is restricted to arbitration under municipal law; but a separate article is also devoted to the use of arbitration in labour disputes (see ARBITRATION AND CONCILIATION).

Roman Law.—Arrangements for avoiding the delay and expense of litigation, and referring a dispute to friends or neutral persons, are a natural practice, of which traces may be found in any state of society; but it is from Roman Law that we derive arbitration as a system which has found its way into the practice of European nations in general, and has even evaded the dislike of the English common lawyers to the civil law. The praetor, who had the arrangement of all trials or private suits and the formal appointment of judges for them, referred the great majority of such cases for decision to a judge who was styled usually *judex* but sometimes *arbiter*. The phrase *judex arbiterve* frequently occurs. The *judex* and the *arbiter* had the same functions, and apparently the only express basis for the distinction between the two words is that there might be several *arbitri* but never more than one *judex* in a cause. The term *arbiter* seems, however, to have been sometimes used when the referee had a certain degree of latitude, and was entitled to give weight to equitable considerations (Roby, *Inst. Rom. Law*, i. 318; Hunter, *Roman Law* (1897), p. 48; and see Cicero *pro Rosc. Com.* 4, ss. 10-13; Gaius, *Inst.* iv. s. 163). Apart from this system of compulsory reference by the praetor, Roman law recognized a voluntary reference (*compromissum*) to an *arbiter* or arbitrator by the parties themselves. The arbitrator *ex compromisso sumptus* had no coercive jurisdiction, and in order to make his award effective, the agreement of reference was confirmed by a stipulation and usually provided a penalty (*poena, pecunia compromissa*) in case of disobedience. The sum agreed on by way of penalty might be either specific or unliquidated, *e.g.* "whatever the matter may be worth" (*Dig.* iv., tit. 8, s. 28). The arbitrator *ex compromisso sumptus*, like the judicial *arbiter*, was expected to take account of equitable considerations in coming to a decision. If three arbitrators were appointed, a majority could decide; in case of two being appointed and not agreeing, the praetor would compel them to choose a third (Roby, *ubi sup.*, i. 320, 321; *Dig.* iv., tit. 8, s. 17). As in English law, it was necessary that the award should cover all the points submitted (*Dig.* iv., tit. 8, s. 21).

Law of England.—The law of England as to arbitration is now practically summed up in the Arbitration Act of 1889. This statute is an express code as to proceedings in all arbitration, but "criminal proceedings by the crown" cannot be referred under it (ss. 13, 14). The statute subdivides its subject-matter into two headings. I. References by consent out of court; II. References under order of court.

References by consent out of court.

(1) Here the first matter to be dealt with is the submission. A submission is defined as a written agreement (it need not be signed by both parties) to submit present or future differences to arbitration, whether a particular arbitrator is named in it or not. The capacity of a person to agree to arbitration, or to act as arbitrator, depends on the general law of contract. A submission by an infant is not void, but is voidable at his option (see INFANT). A counsel has a general authority to deal with the conduct of an action, which includes authority to refer it to arbitration, but he has no authority to refer an action against the wishes of his client, or on terms different from those which his client has sanctioned; and if he does so, the reference may be set aside, although the limit put by the client on his counsel's authority is not made known to the other side when the reference is agreed upon (*Neale* v. *Gordon Lennox*, 1902, A.C. 465). The committee of a lunatic, with the sanction of the judge in lunacy, may refer disputes to arbitration. As an arbitrator is chosen by the parties themselves the question of his eligibility is of comparatively minor importance; and where an arbitrator has been chosen by both parties, the courts are reluctant to set the appointment aside. This question has arisen chiefly in contracts for works, which frequently contain a provision that the engineer shall be the arbitrator, in any dispute between the contractor and his own employer. The practical result is to make the engineer judge in his own cause. But the courts will not in such cases prevent the engineer from acting, where the contractor was aware of the facts when he signed the contract, and there is no reason to believe that the engineer will be unfair (*Ives and Barker* v. *Willans*, 1894, 2 Ch. 478). Even the fact that he has expressed an opinion on matters in dispute will not of itself disqualify him (*Halliday* v. *Hamilton's Trustees*, 1903, 5 Fraser, 800). So, too, where a barrister was appointed arbitrator, the

court refused to stop the arbitration on the mere ground that he was the client of a firm of solicitors, the conduct of one of whom was in question (*Bright* v. *River Plate Construction Co.*, 1900, 2 Ch. 835).

Under the law prior to the act of 1889 (*a*) an agreement to refer disputes generally, without naming the arbitrators, was always irrevocable, and an action lay for the breach of it, although the court could not compel either of the parties to proceed under it; (*b*) an agreement to refer to a particular arbitrator was revocable, and if one of the parties revoked that particular arbitrator's authority he could not be compelled to submit to it; (*c*) when, however, the parties had got their tribunal fixed, and were proceeding to carry out the agreement to refer, the act 9 and 10 Will. III. c. 15 provided that the submission might be made a rule of court, a provision which gave the court power to assist the parties in the trial of the case, and to enforce the award of the arbitrators; (*d*) the statute 3 and 4 Will. IV. c. 42 (s. 39) put an end to the power to revoke the authority of a particular arbitrator after the reference to him had been made a rule of court; and—a liability which existed also under the act of 9 and 10 Will. III. c. 15—any person revoking the appointment of an arbitrator after the submission had been made a rule of court might be attached. The Arbitration Act 1889 provides that a submission, unless a contrary intention is expressed in it, is irrevocable except by leave of the court or a judge, and is to have the same effect in all respects as if it had been made an order of court. The object of this enactment was to save the expense of making a submission a rule of court by treating it as having been so made, and it leaves the law in this position, that while the authority of an arbitrator, once appointed, is irrevocable, there is no power—any more than there was under the old law—to compel an unwilling party to proceed to a reference, except in cases specially provided for by sections 5 and 6 of the act of 1889. The former of these sections deals with the power of the court, the latter with the power of the parties to a reference, to appoint an arbitrator in certain circumstances. Section 5 provides that where a reference is to be to a single arbitrator, and all the parties do not concur in appointing one, or an appointed arbitrator refuses to act or becomes incapable of acting, or where the parties or two arbitrators fail, when necessary, to appoint an umpire or third arbitrator, or such umpire or arbitrator when appointed refuses to act, or becomes incapable of acting, and the default is not rectified after seven clear days' notice, the court may supply the vacancy. Under section 6, where a reference is to two arbitrators, one to be appointed by each party, and either the appointed arbitrator refuses to act, or becomes incapable of acting, and the party appointing him fails, after seven clear days' notice, to supply the vacancy, or such party fails, after similar notice, to make an original appointment, a binding appointment (subject to the power of the court to set it aside) may be made by the other party to the reference. The court may compel parties to carry out an arbitration, not only in the above cases by directly appointing an arbitrator, &c., or by allowing one appointed by a party to proceed alone with the reference, but also indirectly by staying any proceedings before the legal tribunals to determine matters which come within the scope of the arbitration. Where the agreement to refer stipulates that the submission of a dispute to arbitration shall be a condition precedent to the right to bring an action in regard to it, an action does not lie until the arbitration has been held and an award made, and it is usual in such cases not to apply for a stay of proceedings, but to plead the agreement as a bar to the action (*Viney* v. *Bignold*, 1887, 20 Q.B.D. 172). The court will refuse to stay proceedings where the subject-matter of the litigation falls outside the scope of the reference, or there is some serious objection to the fitness of the arbitrator, or some other good reason of the kind exists.

An arbitrator is not liable to be sued for want of skill or for negligence in conducting the arbitration (*Pappa* v. *Rose*, 1872, L.R. 7 C.P. 525). When a building contract provides that a certificate of the architect, showing the final balance due to the contractor, shall be conclusive evidence of the works having been duly completed, the architect occupies the position of an arbitrator, and enjoys the same immunity from liability for negligence in the discharge of his functions (*Chambers* v. *Goldthorpe*, 1901, 1 Q.B. 624). An arbitrator cannot be compelled to act unless he is a party to the submission.

An arbitrator (and the following observations apply *mutatis mutandis* to an umpire after he has entered on his duties) has power to administer oaths to, or take the affirmations of, the parties and their witnesses; and any person who wilfully and corruptly gives false evidence before him may be prosecuted and punished for perjury (Arbitration Act 1889, sched. i. and s. 22). At any stage in the reference he may, and shall if he be required by the court, state in the form of a special case for the opinion of the court any question of law arising in the arbitration. The arbitrator may also state his award in whole or in part as a special case (*ib.* s. 19), and may correct in an award any clerical mistake or error arising from an accidental slip or omission. The costs of the reference and the award—which, under sched. i. of the act, must be in writing, unless the submission otherwise provides—are in the arbitrator's discretion, and he has a lien on the award and the submission for his fees, for which—if there is an express or implied promise to pay them—he can also sue (*Crampton* v. *Ridley*, 1887, 20 Q.B.D. 48). An arbitrator or umpire ought not, however, to state his award in such a way as to deprive the parties of their right to challenge the amount charged by him for his services; and accordingly where an umpire fixed for his award a lump sum as costs, including therein his own and the arbitrators' fees, the award was remitted back to him to state how much he allotted to himself and how much to the arbitrators (in *Re Gilbert* v. *Wright*, 1904, 20 *Times* L.R. 164). But in the absence of evidence to show that the fees charged by arbitrators or umpire are extortionate, or unfair and unreasonable, the courts will not interfere with them (*Llandrindod Wells Water Co.* v. *Hawksley*, 1904, 20 *Times* L.R. 241).

If there is no express provision on the point in the submission, an award under the Arbitration Act 1889 must be made within three months after the arbitrator has entered on the reference, or been called upon to act by notice in writing from any party to the submission. The time may, however, be extended by the arbitrator or by the court. An umpire is required to make his award within one month after the original or extended time appointed for making the award of the arbitrators has expired, or any later day to which he may enlarge it. The court may by order remit an award to the arbitrators or umpire for reconsideration, in which case the reconsidered award must be made within three months after the date of the order.

An award must be *intra vires*: it must dispose of all the points referred; and it must be final, except as regards certain matters of valuation, &c. (see in *Re Stringer and Riley Brothers*, 1901, 1 K.B. 105). An award may, however, be set aside where the arbitrator has misconducted himself (an arbitrator may also be removed by the court on the ground of misconduct), or where it is *ultra vires*, or lacks any of the other requisites—above mentioned—of a valid award, or where the arbitrator has been wilfully deceived by one of the parties, or some such state of things exists. An award may, by leave of the court, be enforced in the same manner as a judgment or decree to the same effect. Under the Revenue Act 1906, s. 9, a uniform duty of ten shillings is payable on awards in England or Ireland, and on decrees arbitral in Scotland.

Provisions for the arbitration of special classes of disputes are contained in many acts of parliament, *e.g.* the Local Government Acts 1888, 1894, the Agricultural Holdings (England) Acts 1883 to 1906, the Small Holdings and Allotments Act 1907, the Light Railways Act 1896, the Housing of the Working Classes Act 1890, the Workmen's Compensation Act 1906, &c.

The Conciliation Act 1896 provides machinery for the prevention and settlement of trade disputes, and in 1892 a chamber of arbitration for business disputes was established by the joint action of the corporation of the city of London and the London chamber of commerce. At the time when the London chamber of arbitration

was established, there was considerable dissatisfaction among the mercantile community with the delays that occurred in the disposal of commercial cases before the ordinary tribunals. But the special provision made by the judges in 1895 for the prompt trial of commercial causes to a large extent destroyed the *raison d'être* of the chamber of arbitration, and it did not attain any great measure of success.

(2) The court or a judge may refer any question arising in any cause or matter to an official or special referee, whose report may be enforced like a judgment or order to the same effect. This power may be exercised whether the parties desire it or not. The official referees are salaried officers of court. The remuneration of special referees is determined by the court or judge. An entire action may be referred, if all parties consent, or if it involves any prolonged examination of documents, or scientific or local examination, or consists wholly or partly of matters of account.

References under order of court.

Scots Law.—The Arbitration (Scotland) Act 1894, unlike the English Arbitration Act 1889, did not codify the previously existing law, and it becomes necessary, therefore, to deal with that law in some detail. It differs in important particulars from the law of England. Although (as in England apart from the Arbitration Act 1889) there is nothing to prevent a verbal reference, submissions are generally not merely written but are effected by deed. The deed of submission first defines the terms of the reference, the name or names of the arbiters or arbitrators, and the "oversman" or umpire, whose decision in the event of the arbiters differing in opinion is to be final. Formerly, where no oversman was named in the submission, and no power given to the arbiters to name one, the proceedings were abortive if the arbiters disagreed, unless the parties consented to a nomination. But under the Arbitration (Scotland) Act 1894, s. 4, where arbiters differ in opinion, they, or, if they fail to agree on the point, the court, on the application of either party, may nominate an oversman whose decision is to be final. The deed of submission next gives to the arbiters the necessary powers for disposing of the matters referred (*e.g.* powers to summon witnesses, to administer oaths and to award expenses), and specifies the time within which the "decreet arbitral" is to be pronounced. If this date is left blank, practice has limited the arbiter's power of deciding to a year and a day, unless, having express or clearly implied power in the submission, he exercises this power, or the parties expressly or tacitly agree to its prorogation. The deed of submission then goes on to provide that the parties bind themselves, under a stipulated penalty to abide by the decreet arbitral, that, in the event of the death of either of them, the submission shall continue in force against their heirs and representatives, and that they consent to the registration, for preservation and execution, both of the deed itself and of the decreet arbitral. The power to enforce the award depends on this last provision. Under the common law of Scotland, a submission of future disputes or differences to an arbiter, or arbiters, unnamed, was ineffectual except where the agreement to refer did not contemplate the decision of proper disputes between the parties but the adjustment of some condition, or the liquidation of some obligation, contained in the contract of which the agreement to submit formed a part. And by the Arbitration (Scotland) Act 1894, s. 1, an agreement to refer to arbitration is not invalid by reason of the reference being to a person not named, or to be named by another, or to a person merely described as the holder for the time being of any office or appointment. An arbiter who has accepted office may be compelled by an action in court of session to proceed with his duty unless he has sufficient cause, such as ill-health or supervening interest, for renouncing. The court may name a sole arbiter, where provision is made for one only and the parties cannot agree (Arbitration [Scotland] Act 1894, s. 2); and may name an arbiter where a party having the right or duty to nominate one of two arbiters will not exercise it (*ib.* s. 3). Scots law as to the requisites of a valid award is practically identical with the law of England. The grounds of reduction of a decreet arbitral are "corruption," "bribery," "false hold" (Scots Act of Regulations 1695, s. 25). An attempt was made to include, under the expression "constructive corruption," among these statutory grounds of reduction, irregular conduct on the part of an arbitrator, with no suggestion of any corrupt motive. But it was definitely overruled by the House of Lords (*Adams* v. *Great North of Scotland Railway Co.*, 1891, A.C. 31). The statutory definition of the grounds of reduction was intended, however, merely to put an end to the practice which had previously obtained of reviewing awards on their merits, and it does not prevent the courts from setting aside an award where the arbitrator has exceeded his jurisdiction, or disregarded any one of the expressed conditions of the submission, or been guilty of misconduct. A private arbiter cannot demand remuneration except in virtue of contract, or by implication from the nature of the work done, or if the reference is in pursuance of some statutory enactment (*e.g.* the Lands Clauses [Scotland] Act 1845, s. 32).

Judicial References have been long known to the law of Scotland. When an action is in court the parties may at any stage withdraw it from judicial determination, and refer it to arbitration. This is done by minute of reference to which the court interpones its authority. When the award is issued it becomes the judgment of the court. The court has no power to compel parties to enter into a reference of this kind, and it is doubtful whether counsel can bind their clients in such a matter. A judicial reference falls like the other by the elapse of a year; and the court cannot review the award on the ground of miscarriage. By the Court of Session Act 1850, s. 50, a provision is introduced whereby parties to an action in the supreme court may refer judicially any issue for trial to one, three, five or seven persons, who shall sit as a jury, and decide by a majority.

Law of Ireland.—The Common Law Procedure Act (Ireland) 1856, which is incorporated by s. 60 of the Supreme Court of Judicature Act (Ireland) 1877, and thereby made applicable to all divisions of the High Court of Justice, provides, on the lines of the English Common Law Procedure Act 1854, for the conduct of arbitrations and the enforcement of awards. Irish statute law, like that of England and Scotland, contains numerous provisions for arbitration under special enactments.

Indian and Colonial Law.—The provisions of the English Arbitration Act 1889 have in substance been adopted by the Indian Legislature (see Act ix. of 1899), and by many of the colonies (see, *e.g.*, Act No. 13 of 1895, Western Australia; No. 24 of 1898, Natal; c. 20 of 1899, Bahamas; No. 10 of 1895, Gibraltar; No. 29 of 1898, Cape of Good Hope: s. 7 of this last statute excludes from submission to arbitration criminal cases, so far as prosecution and punishment are concerned, and, without the special leave of the court, matters relating to status, matrimonial causes, and matters affecting minors or other perons under legal disability; Trinidad and Tobago, No. 35 of 1898).

United States.—The common law and statute law of the United States as to arbitration bear a general resemblance to the law of England.

All controversies of a civil nature, and any question of personal injury on which a suit for damages will lie, although it may also be indictable, may be referred to arbitration; but crimes, and perhaps actions on penal statutes by common informers may not. The submission may be effected sometimes by parol, sometimes by written instrument, sometimes by deed or deed poll. Capacity to refer depends on the general law of contractual capacity. The law of England as to the capacity to act as an arbitrator and as to objections to an arbitrator on the ground of interest has been closely followed by the American courts. The same observation applies as to the requisites of an award, the mode of its enforcement and the grounds on which it will be set aside. The arbitrator has a lien on the award for his fees; and—a point of difference from the English law—he may sue for them without an express promise to pay (cf. *Goodall* v. *Cooley*, 1854, 29 New Hamp. 48). At common law, a submission is generally revocable at any time before award; and it is also, in the absence of stipulation to the contrary, revoked by the death of one of the parties. Provision has been made in Pennsylvania for compulsory arbitration by an act of the 16th of June 1836 (see Pepper and Lewis, *Pennsylvania Digest*, *tit.* "arbitration").

Voluntary submissions.

The rules of court also of many of the states of the United States provide for reference through the intervention of the court at any stage in the progress of a litigation. Such submissions are usually declared irrevocable by the rules providing for them.

References by rule of court.

In addition to voluntary submissions and references by rules of court there are in America, as in the United Kingdom, various statutes which provide for arbitration in particular cases. Most of these statutes are founded on the 9 and 10 Will. III., c. 15, and 3 and 4 Will. IV. c. 42, s. 49, "by which it is allowed to refer a matter in dispute (not then in court) to arbitrators, and agree that the submission be made a rule of court. This agreement, being proved on the oath of one of the witnesses thereto, is enforced as if it had been made at first a rule of court" (Bouvier, *Law Dict.* s.v. "Arbitration").

Statutory arbitrations.

Ample provision is made in America for the arbitration of labour disputes.

Law of France.—Voluntary arbitration has always been recognized in France. In cases of mercantile partnerships, arbitration was formerly compulsory; but in 1856 (law of the 17th of July 1856) jurisdiction in disputes between parties was conferred on the Tribunals of Commerce (as to which see *Code de Commerce*, arts.

615 et seq.), and arbitration at the present time is purely voluntary. The subject is very fully dealt with in the *Code de Procédure Civile* (arts. 1003-1028).. The submission to arbitration (*compromis*) must, on pain of nullity, be acted upon within three months from its date (art. 1007). The submission terminates (i.) by the death, refusal, resignation or inability to act of one of the arbitrators; (ii.) by the expiration of the period agreed upon, or of three months if no time had been fixed; (iii.) by the disagreement of two arbitrators, unless power be reserved to them to appoint an umpire (art. 1012). An arbitrator cannot resign if he has once commenced to act, and can only be relieved on some ground arising subsequently to the submission (art. 1014). Each party to the arbitration is required to produce his evidence at least fifteen days before the expiration of the period fixed by the submission (art. 1016). If the arbitrators, differing in opinion, cannot agree upon an umpire (*tiers arbitre*), the president of the Tribunal of Commerce will appoint one, on the application of either party (art. 1017). The umpire is required to give his decision within one month of his acceptance of the appointment; before making his award, he must confer with the previous arbitrators who disagreed (art. 1018). Arbitrators and umpire must proceed according to the ordinary rules of law, unless they are specially empowered by the submission to proceed as *amiables compositeurs* (art. 1019). The award is rendered executory by an order of the president of the Civil Tribunal of First Instance (art. 1020). Awards cannot be set up against third parties (art. 1022), or attacked by way of opposition. An appeal against an award lies to the Civil Tribunal of First Instance, or to the court of appeal, according as the subject-matter, in the absence of arbitration, would have been within the jurisdiction of the justice of the peace, or of the Civil Tribunal of First Instance (art. 1023). In the manufacturing towns of France, there are also boards of umpires (*Conseils de Prud'hommes*) to deal with trade disputes between masters and workmen belonging to certain specified trades.

Other Foreign Laws.—The provisions of French law as to arbitration are in force in Belgium (*Code de Proc. Civ.*, arts. 1003 et seq.); and a convention (8th of July 1899) between France and Belgium regulates, *inter alia*, the mutual enforcement of awards. The law of France has also been reproduced in substance in the Netherlands (Code of Civil Procedure, arts. 620 et seq.). The German Imperial Code of Procedure did not create any system of arbitration in civil cases. But this omission was supplied in Prussia by a law of the 29th of March 1879, which provided for the appointment, in each commune, of an arbitrator (*Schiedsmann*) before whom conciliation proceedings in contentious matters might be conducted. The procedure was gratuitous and voluntary; and the functions of the arbitrator were not judicial; he merely recorded the arrangement arrived at, or the refusal of conciliation. This law was followed in Brunswick by a law of the 2nd of July 1896, and in Baden by a law of the 16th of April 1886. In Luxemburg, compulsory arbitration in matters affecting commercial partnerships was abolished in 1879 (law of the 16th of April 1879). A system of conciliation, similar to the Prussian, exists in Italy (laws of the 16th of June 1892, and the 26th of December 1892) and in some of the Swiss cantons (law of the 29th of April 1883). Spain (Code of Civil Proc., arts. 1003-1028; Civil Code, arts. 1820-1821) and Sweden and Norway (law of the 28th of October 1887) have followed the French law. In Portugal, provision has been made for the creation in important industrial centres, on the application of the administrative corporations, of boards of conciliation (decrees of the 14th of August 1889, and the 18th of May 1893).

AUTHORITIES.—Russell, *Arbitration* (London, 1906); *Annual Practice* (London, yearly); Redman, *Arbitration* (London, 1897); Crewe, *Arbitration Act of 1889* (London, 1898); Pollock, *On Arbitrators* (London, 1906). As to Scots law: Bell, *On Arbitration* (2nd ed., Edinburgh, 1877); Erskine, *Principles* (20th ed., Edinburgh, 1903). As to American law: Morse, *Law of Arbitration* (Boston, 1872). As to foreign law generally: the texts of the laws cited, and the *Annuaire de législation étrangère*. (A. W. R.)

ARBITRATION, INTERNATIONAL. International arbitration is a proceeding in which two nations refer their differences to one or more selected persons, who, after affording to each party an opportunity of being heard, pronounce judgment on the matters at issue. It is understood, unless otherwise expressed, that the judgment shall be in accordance with the law by which civilized nations have agreed to be bound, whenever such law is applicable. Some authorities, notably the eminent Swiss jurist, J. K. Bluntschli, consider that unless this tacit condition is complied with, the award may be set aside. This would, however, be highly inconvenient since international law has never been codified. A fresh arbitration might have to be entered on to decide (1) what the law was, (2) whether it applied to the matter in hand. Arbitration differs from Mediation (*q.v.*) in so far as it is a judicial act, whereas Mediation involves no decision, but merely advice and suggestions to those who invoke its aid.

Arbitral Tribunals.—An international arbitrator may be the chief of a friendly power, or he may be a private individual. When he is an emperor, a king, or a president of a republic, it is not expected that he will act personally; he may appoint a delegate or delegates to act on his behalf, and avail himself of their labours and views, the ultimate decision being his only in name. In this respect international arbitration differs from civil arbitration, since a private arbitrator cannot delegate his office without express authority. The analogy between the two fails to hold good in another respect also. In civil arbitration, the decision or award may be made a rule of court, after which it becomes enforceable by writ of execution against person or property. An international award cannot be enforced directly; in other words it has no legal sanction behind it. Its obligation rests on the good faith of the parties to the reference, and on the fact that, with the help of a world-wide press, public opinion can always be brought to bear on any state that seeks to evade its moral duty. The obligation of an ordinary treaty rests on precisely the same foundations. Where there are two or any other even number of arbitrators, provision is usually made for an umpire (French *sur-arbitre*). The umpire may be chosen by the arbitrators themselves or nominated by a neutral power. In the "Alabama" arbitration five arbitrators were nominated by the president of the United States, the queen of England, the king of Italy, the president of the Swiss Confederation, and the emperor of Brazil respectively. In the Bering Sea arbitration there were seven arbitrators, two nominated by Great Britain, two by the United States, and the remaining three by the president of the French Republic, the king of Italy, and the king of Sweden and Norway respectively. In neither of these cases was there an umpire; nor was any necessary, since the decision, if not unanimous, lay with the majority. (See separate articles on BERING SEA ARBITRATION and "ALABAMA" ARBITRATION.)

Arbitral tribunals may have to deal with questions either of law or fact, or of both combined. When they have to deal with law only, that is to say, to lay down a principle or decide a question of liability, their functions are judicial or quasi-judicial, and the result is arbitration proper. Where they have to deal with facts only, *e.g.* the evaluation of pecuniary claims, their functions are administrative rather than judicial, and the term commission is applied to them. "Mixed commissions," so called because they are composed of representatives of the parties in difference, have been frequently resorted to for delimitation of frontiers, and for settling the indemnities to be paid to the subjects of neutral powers in respect of losses sustained by non-combatants in times of war or civil insurrection. The two earliest of these were nominated in 1794 under the treaty negotiated by Lord Grenville with Mr John Jay, commonly called the "Jay Treaty," their tasks being (1) to define the boundary between Canada and the United States which had been agreed to by the treaty signed at Paris in 1783; (2) to estimate the amount to be paid by Great Britain and the United States to each other in respect of illegal captures or condemnation of vessels during the war of the American Revolution.

Although arbitrations proper may be thus distinguished from "mixed commissions," it must not be supposed that any hard or fast theoretical line can be drawn between them. Arbitrators strictly so called may (as in the "Alabama" case) proceed to award damages after they have decided the question of liability; whilst "mixed commissions," before awarding damages, usually have to decide whether the pecuniary claims made are or are not well founded.

Awards.—International awards, as already pointed out, differ from civil awards in having no legal sanction by which they can be enforced. On the other hand, they resemble civil awards in that they may be set aside, *i.e.* ignored, for sufficient reason, as, for example, if the tribunal has not acted in good faith, or has not given to each party an opportunity of being heard, or has exceeded its jurisdiction. An instance under the last head occurred in 1831, when it was referred to the king of the Netherlands as sole arbitrator to fix the north-eastern boundary of the state of Maine. The king's representatives

were unable to draw the frontier line by reason of the imperfection of the maps then in existence, and he therefore directed a further survey. This direction was beyond the terms of the reference, and the award, when made, was repudiated by the United States as void for excess. The point in dispute was only finally disposed of by the Webster-Ashburton treaty of 1842.

Subject-matter.—The history of international arbitration is dealt with in the article PEACE, where treaties of general arbitration are discussed, both those which embrace all future differences thereafter to arise between the contracting parties, and also those more limited conventions which aim at the settlement of all future differences in regard to particular subjects, *e.g.* commerce or navigation. The rapid growth of international arbitration in recent times may be gathered from the following figures. Between 1820 and 1840, there were eight such instances; between 1840 and 1860, there were thirty; between 1860 and 1880, forty-four; between 1880 and 1900, ninety. Of the governments which were parties in these several cases Great Britain heads the list in point of numbers, the United States of America being a good second. France, Portugal, Spain and the Netherlands are the European states next in order. The present article is concerned exclusively with arbitration in regard to such existing differences as are capable of precise statement and of prompt adjustment. These differences may be arranged in two main groups:—

(*a*) Those which have arisen between state and state in their sovereign capacities;

(*b*) Those in which one state has made a demand upon another state, ostensibly in its sovereign capacity, but really on behalf of some individual, or set of individuals, whose interests it was bound to protect.

To group (*a*) belong territorial differences in regard to ownership of land and rights of fishing at sea; to group (*b*) belong pecuniary claims in respect of acts wrongfully done to one or more subjects of one state by, or with the authority of, another state. To enumerate even a tenth part of the successful arbitrations in recent times would occupy too much space. Some prominent examples (dealt with elsewhere under their appropriate titles) are the dispute between the United States and Great Britain respecting the "Alabama" and other vessels employed by the Confederate government during the American Civil War (award in 1872); that between the same powers respecting the fur-seal fishery in Bering Sea (award in 1893); that between Great Britain and Venezuela respecting the boundary of British Guiana (award in 1899); that between Great Britain, the United States and Portugal respecting the Delagoa railway (award in 1900); that between Great Britain and the United States respecting the boundary of Alaska (award in 1903). The long-standing Newfoundland fishery dispute with France (finally settled in 1904) is dealt with under Newfoundland. Other examples are shortly noticed in the tables on p. 329, which although by no means exhaustive, sufficiently indicate the scope and trend of arbitration during the years covered. The cases decided by the permanent tribunal at the Hague established in 1900 are not included in these tables. They are separately discussed later.

The Hague Tribunal.—The establishment of a permanent tribunal at the Hague, pursuant to the Peace convention of 1899, marks a momentous epoch in the history of international arbitration. This tribunal realized an idea put forward by Jeremy Bentham towards the close of the 18th century, advocated by James Mill in the middle of the 19th century, and worked out later by Mr Dudley Field in America, by Dr Goldschmidt in Germany, and by Sir Edmund Hornby and Mr Leone Levi in England. The credit of the realization is due, in the first place, to the tsar of Russia, who initiated the Hague Conference of 1899, and, in the second place to Lord Pauncefote (then Sir Julian Pauncefote, British ambassador at Washington), who urged before a committee of the conference the importance of organizing a permanent international court, the service of which should be called into requisition at will, and who also submitted an outline of the mode in which such a court might be formed. The result was embodied in the following articles of the Convention, signed on behalf of sixteen of the assembled powers on the 29th of July 1899.

(Art. 23). Each of the signatory powers is to designate within three months from the ratification of the convention four persons at the most, of recognized competence in international law, enjoying the highest moral consideration, and willing to accept the duties of arbitrators. Two or more powers may agree to nominate one or more members in common, or the same person may be nominated by different powers. Members of the court are to be appointed for six years and may be re-nominated. (Art. 25). The signatory powers desiring to apply to the tribunal for the settlement of a difference between them are to notify the same to the arbitrators. The arbitrators who are to determine this difference are, unless otherwise specially agreed, to be chosen from the general list of members in the following manner:—each party is to name two arbitrators, and these are to choose a chief arbitrator or umpire (*sur-arbitre*). If the votes are equally divided the selection of the chief arbitrator is to be entrusted to a third power to be named by the parties. (Art. 26). The tribunal is to sit at the Hague when practicable, unless the parties otherwise agree. (Art. 27). "The signatory powers consider it a duty in the event of an acute conflict threatening to break out between two or more of them to remind these latter that the permanent court is open to them. This action is only to be considered as an exercise of good offices." Several of the powers nominated members of the permanent court pursuant to Art. 25, quoted above, those nominated on behalf of Great Britain being Lord Pauncefote, Sir Edward Malet, Sir Edward Fry and Professor Westlake. On the death of Lord Pauncefote, Major-General Sir John C. Ardagh was appointed in his place.

Hague Cases.—(1) The first case decided by the Hague court was concerned with the "Pious Fund of the Californias." A fund bearing this name was formed in the 18th century for the purpose of converting to the Catholic faith the native Indians of Upper and Lower California, both of which then belonged to Mexico, and of maintaining a Catholic priesthood there. By a decree of 1842 this fund was transferred to the public treasury of Mexico, the Mexican government undertaking to pay interest thereon in perpetuity in furtherance of the design of the original donors. After the sale of Upper California to the United States, effected by the treaty of Guadalupe Hidalgo (1848), the Mexican government refused to pay the proportion of the interest to which Upper California was entitled. The question of liability was then referred to commissioners appointed by each state, and, on their failing to agree, to Sir Edward Thornton, British minister at Washington, who by his award, in 1875, found there was due from Mexico to Upper California, or rather to the bishops there as administrators of the fund, an arrear of interest amounting to nearly $100,000, which was directed to be paid in gold. This award was carried out, but payment of the current interest was again withheld as from the 24th of October 1868. Claim was thereupon made on Mexico by the United States on behalf of the bishops, but without success. Ultimately, in May 1902, an agreement was come to between the two governments which provided for the settlement of the dispute by the Hague tribunal. The points to be determined were (1) whether the matter was *res judicata* by reason of Sir E. Thornton's award; (2) whether, if not, the claim for the interest was just. The arbitrators selected by the United States were Sir E. Fry and Professor F. de Martens, and by Mexico, Professor Asser and Professor de Savornin Lohman, both of Amsterdam. These four (none of whom, it will be observed, was of the nationality of either party in difference) chose for their umpire Professor Matzen, of Copenhagen, president of the Landsthing there. In October 1902, the court decided both questions in the affirmative, awarding the payment by Mexico of the annual sum claimed, not in gold, but *en monnaie ayant cours légal au Mexique.* The direction to pay in gold made by Sir E. Thornton was held to be referable only to the mode of the execution of the award, and therefore not to be *chose jugée.*

The pious fund of the Californias.

(2) The second arbitration before the Hague court was more important than the first, not only because so many of the great powers were concerned in it, but also because it brought about the discontinuance of acts of war. The facts may be stated shortly thus. By three several protocols signed at Washington in February 1903, it was agreed that certain claims by Great Britain, Germany and Italy, on behalf of their respective subjects against the Venezuelan government should be referred to three mixed commissions, and that for the purpose of securing the payment of these claims 30% of the customs revenues at the ports of La Guayra and Puerto Caballo should be remitted in monthly instalments to the representative of the Bank of England at Caracas. Prior to the date of these protocols, an attempt had been made by Great Britain, Germany and Italy to enforce their claims by blockade, and a further question arose as between these three powers on the one hand, and the United States of America, France, Spain, Belgium, the Netherlands, Sweden and Norway, and Mexico (all of whom had claims against Venezuela, but had abstained from hostile action) on the other hand, as to whether the blockading powers were entitled to preferential treatment. By three several protocols signed in May

Great Britain, Germany and Italy versus Venezuela.

1903 this question was agreed to be submitted to the Hague court, three members of which were to be named as arbitrators by the tsar of Russia, but no arbitrator was to be a subject or citizen of any of the signatory or creditor powers. The arbitrators named by the tsar were M. Muraviev, minister of justice and attorney-general of the Russian empire; Professor Lammasch, member of the Upper House of the Austrian parliament; and M. de Martens, then member of the council of the ministry of foreign affairs at St Petersburg. The arbitrators by their award in February 1904 decided unanimously in favour of the blockading powers and ordered payment of their claims out of the 30% of the receipts at the two Venezuelan ports which had been set apart to meet them.

(3) The third case before the Hague court was heard in 1904–1905. A controversy not amenable to ordinary diplomatic methods arose between Great Britain, France and Germany on the one hand and Japan on the other hand as to the legality of a house-tax imposed by Japan on certain subjects of those powers who held leases in perpetuity. The question turned upon the true construction of certain treaties between the European powers and Japan which had been made a few years previously. By three protocols signed at Tokyo in August 1902 this question was agreed to be submitted to arbitrators, members of the court at the Hague, one to be chosen by each party with power to name an umpire. The arbitrators chosen were M. Renault, professor of the law faculty in Paris, and M. Montono, the Japanese envoy to the French capital. They named as their umpire and president M. Gram, ex-minister of the state of Norway. In May 1905, an award was pronounced by the majority (M. Gram and M. Renault) in favour of the European contention, M. Montono dissenting both from the conclusion of his colleagues and from the reasons on which it was based.

Great Britain, France and Germany versus Japan.

(4) Barely two months had elapsed since the date of the last award when the Hague court was again called into requisition. The scene of dispute this time was on the S.E. coast of Arabia. Muscat, the capital of the kingdom of Oman on that coast, is ruled by a sultan, whose independence both Great Britain and France had, in March 1862, "reciprocally engaged to respect." Notwithstanding this, the French republic had issued to certain native dhows, owned by subjects of the sultan, papers authorizing them to fly the French flag, not only on the Oman littoral but in the Red Sea. A question thereupon arose as to the manner in which the privileges thereby purported to be conferred affected the jurisdiction of the sultan over such dhows, the masters of which, as was alleged, used their immunity from search for the purpose of carrying on contraband trade in slaves, arms and ammunition. In October 1904 the two governments agreed to refer this question to the Hague court. Chief Justice Melville W. Fuller, of the Supreme Court of the United States, was named as arbitrator on the part of Great Britain, M. de Savornin Lohman, who had acted in the case of the Californias (No. 1), as arbitrator on the part of France. The choice of an umpire was entrusted to the king of Italy. He named Professor Lammasch, who, as we have seen, had acted in the arbitration with Venezuela in 1903.

Great Britain and the French flag at Muscat.

A unanimous award was made in August 1905. It was held that although generally speaking every sovereign may decide to whom he will accord the right to fly his flag, yet in this case such right was limited by the general act of the Brussels conference of July 1890 relative to the African slave trade, an act which was ratified by France on the 2nd of June 1892; that accordingly the owners and master of dhows who had been authorized by France to fly the French flag before the last-named date retained this authorization

TABLE I.

Territorial Disputes (Ownership).

Dates of agreement to refer.	Parties.	Arbitrating Authority.	Subject-Matter.	Date of award.
1857	Holland and Venezuela	Queen of Spain	Island of Aves in Venezuela	1865
1869	Great Britain and Portugal	President of United States	Island of Bulama on West Coast of Africa	1870
1872	Great Britain and Portugal	President of French Republic	Delagoa Bay (part of), Inyack and Elephant Is., S.E. Africa	1875
1876	Argentine Republic and Paraguay	President of United States	Territory between the Verde and the Pilcomayo river of Paraguay	1878
1885	Great Britain and Germany	Mixed Commission	Islets and guano deposits on S.W. Coast of Africa	1886
1886	Bulgaria and Servia	Mixed Commission	Territory near the village of Bregovo	1887
1902	Austria and Hungary	Mixed Commission (with President of Swiss Federal tribunal as umpire)	Territory in the district of Upper Tatra	1902

TABLE II.

Delimitation of Frontiers.

1869	Great Britain and the Transvaal	Lieutenant Governor of Natal	The southern boundary of the S. African Republic	1870
1871	Great Britain and the United States	The German Emperor	The San Juan water boundary	1872
1873	Italy and Switzerland	Mixed Commission (with U.S. Minister at Rome as umpire)	The Canton of Ticino	1874
1885	Great Britain and Russia	Mixed Commission	North-western Afghanistan	1887
1890	France and Holland	Tsar of Russia	French Guiana and Dutch Guiana	1891
1895	Great Britain and Portugal	President of the Italian Court of Appeal	Manicaland	1897
1897	France and Brazil	President of the Swiss Confederation	River Yapoc named in the Treaty of Utrecht 1813	1900
1901	Great Britain and Brazil	King of Italy	British Guiana	1904
1903	Great Britain and Portugal	King of Italy	Barotseland	1905

TABLE III.

Pecuniary Claims in respect of Seizures and Arrests.

1851	United States and Portugal	President of French Republic	Seizure of the American privateer "General Armistrong"	1852
1863	Great Britain and Brazil	King of the Belgians	Arrest of three British officers of the ship "La Forte"	1863
1863	Great Britain and Peru	Senate of Hamburg	Arrest at Callao of Capt. Melville White, a British subject	1864
1870	United States and Spain	Mixed Commission	The American S.S. "Col. Lloyd Aspinwall"	1870
1873	Japan and Peru	Tsar of Russia	The Peruvian barque "Maria Luz"	1875
1874	United States and Colombia	Mixed Commission	The American S.S. "Montijo"	1875
1879	France and Nicaragua	French Court of Cassation	The French ship "Le Phare"	1880
1885	United States and Spain	Italian Minister at Madrid	The American S.S. "The Masonic"	1885
1888	United States and Denmark	British Minister at Athens	The S.S. "Benjamin Franklin" and the barque "Catherine Augusta"	1890
1895	Great Britain and the Netherlands	Tsar of Russia, who delegated his duties to Professor F. de Martens	Arrest of the master of the "Costa Rica" packet (a British subject)	1897

so long as France chose to renew it, but that after that date such authorization was improper unless the guarantees could establish that they had been treated by France as her protégés within the meaning of that term as explained in a treaty of 1863 between France and Morocco. A further point decided was that the owners or master of dhows duly authorized to fly the French flag within the ruling of the first point, did not enjoy, in consequence of that fact, any such right of extra-territoriality as would exempt them from the sovereignty and jurisdiction of the sultan. Such exemption would be contrary to the engagement to respect the independence of the sultan solemnly made in 1862.

Arbitral Procedure.—Not the least of the benefits of the Hague convention of 1899 (strengthened by that of 1907) is that it contains rules of procedure which furnish a guide for all arbitrations whether conducted before the Hague court or not. These may be summarized as follows:—The initial step is the making by the parties of a special agreement clearly defining the subject of the dispute. The next is the choice of the arbitrators and of an umpire if the number of arbitrators is even. Each party then by its agents prepares and presents its case in a narrative or argumentative form, annexing thereto all relevant documents. The cases so presented are interchanged by transmission to the opposite party. The hearing consists in the discussion of the matters contained in the several cases, and is conducted under the direction of the president who is either the umpire, or, if there is no umpire, one of the arbitrators. The members of the tribunal have the right of putting questions to the counsel and agents of the parties and to demand from them explanation of doubtful points. The arbitral judgment is read out at a public sitting of the tribunal, the counsel and agents having been duly summoned to hear it. Any application for a revision of the award must be based on the discovery of new evidence of such a nature as to exercise a decisive influence on the judgment and unknown up to the time when the hearing was closed, both to the tribunal itself and to the party asking for the revision. These general rules are universally applicable, but each case may require that special rules should be added to them. These each tribunal must make for itself.

One special and necessary rule is in regard to the language to be employed. This rule must vary according to convenience and is therefore made *ad hoc*. In case No. 1 noted above, the court allowed English or French to be spoken according to the nationality of the counsel engaged. The judgment was delivered in French only. In case No. 2 it was agreed that the written and printed memoranda should be in English but might be accompanied by a translation into the language of the power on whose behalf they were put in. The oral discussion was either in English or French as happened to be convenient. The judgment was drawn up in both languages. In case No. 3 French was the official language throughout, but the parties were allowed to make any communication to the tribunal, in French, English, German or Japanese. In case No. 4 French was again the official language, but the counsel and agents of both parties were allowed to address the tribunal in English. The protocols and the judgment were drawn up in French accompanied by an official English translation.

Limits of International Arbitration.—Of the numerous treaties for general arbitration which have been made during the 20th century that between Great Britain and France (1903) is a type. This treaty contains reservations of all questions involving the vital interests, the independence or the honour of the contracting parties. The language of the reservation is open to more interpretations than one. What, for instance, is meant by the phrase "national independence" in this connexion? If it be taken in its strict acceptation of autonomous state sovereignty, the exception is somewhat of a truism. No self-respecting power would, of course, consent to submit to arbitration a question of life or death. This would be as if two men were to agree to draw lots as to which should commit suicide in order to avoid fighting a duel. On the other hand, if the exception be taken to exclude all questions which, when decided adversely to a state, impose a restraint on its freedom of action, then the exception would seem to exclude such a question as the true interpretation of an ambiguous treaty, a subject with which experience shows international arbitration is well fitted to deal. Again, we may ask, what is meant by the phrase "national honour"? It was thought at one time that the honour of a nation could only be vindicated by war, though all that had happened was the slighting of its flag, or of its accredited representative, during some sudden ebullition of local feeling. France once nearly broke off peaceful relations with Spain because her ambassador at London was assigned a place below the Spanish ambassador, and on another occasion she despatched troops into Italy because her ambassador at Rome had been insulted by the friends and partisans of the pope. The truth is that the extent to which national honour is involved depends on factors which have nothing to do with the immediate subject of complaint. So long as general good feeling subsists between two nations, neither will easily take offence at any discourteous act of the other. But when a deep-seated antagonism is concealed beneath an unruffled surface, the most trivial incident will bring it to the light of day. "Outraged national honour" is a highly elastic phrase. It may serve as a pretext for a serious quarrel whether the alleged "outrage" be great or small.

The prospects of the expansion of international arbitration will be more clearly perceived if we classify afresh all state differences under two heads:—(1) those which have a legal character, (2) those which have a political character. Under "legal differences" may be ranged such as are capable of being decided, when once the facts are ascertained, by settled, recognized rules, or by rules not settled nor recognized, but (as in the "Alabama" case) taken so to be for the purpose in hand. Boundary cases and cases of indemnity for losses sustained by non-combatants in time of war, of which several instances have already been mentioned, belong to this class. To the same class belong those cases in which the arbitrators have to adapt the provisions of an old treaty to new and altered circumstances, somewhat in the way in which English courts of justice apply the doctrine of "cy-près." "Political differences" on the other hand, are such as affect states in their external relations, or in relation to their subjects or dependants who may be in revolt against them. Some of these differences may be slight, while others may be vital, or (which amounts to the same thing) may seem to the parties to be so. All differences falling under the first of these two general heads appear to be suitable for international arbitration. Differences falling under the second general head are, for the most part, unsuitable, and may only be adjusted (if at all) through the mediation of a friendly power.

The interesting problem of the future is—are we to regard this classification as fixed or as merely transitory? The answer depends on several considerations which can only be glanced at here. It may be that, just as the usages of civilized nations have slowly crystallized into international law, so there may come a time when the political principles that govern states in relation to each other will be so clearly defined and so generally accepted as to acquire something of a legal or quasi-legal character. If they do, they will pass the line which at present separates arbitrable from non-arbitrable matter. This is the juridical aspect of the problem. But there is also an economic side to it by reason of the conditions of modern warfare. Already the nations are groaning under the burdens of militarism, and are for ever diverting energies that might be employed in the furtherance of useful productive work to purposes of an opposite character. The interruption of maritime intercourse, the stagnation of industry and trade, the rise in the price of the necessaries of life, the impossibility of adequately providing for the families of those—call them reservists, "landwehr," or what you will—who are torn away from their daily toil to serve in the tented field,—these are considerations that may well make us pause before we abandon a peaceful solution and appeal to brute force. Lastly, there is the moral aspect of the problem. In order that international arbitration may do its perfect work, it is not enough to set up a standing tribunal, whether at the Hague or elsewhere, and to equip it with elaborate rules of procedure. Tribunals and rules are, after all, only machinery. If this machinery is to act smoothly we must improve our motive power, the source of

which is human passion and sentiment. Although religious animosities between Christian nations have died out, although dynasties may now rise and fall without raising half Europe to arms, the springs of warlike enterprise are still to be found in commercial jealousies, in imperialistic ambitions and in the doctrine of the survival of the fittest which lends scientific support to both. These must one and all be cleared away before we can enter on that era of universal peace towards the attainment of which the tsar of Russia declared, in his famous circular of 1898, the efforts of all governments should be directed. Meanwhile it is legitimate to share the hope expressed by President Roosevelt in his message to Congress of December 1905 that some future Hague conference may succeed in making arbitration the customary method of settling international disputes in all save the few classes of cases indicated above, and that—to quote Mr Roosevelt's words—"these classes may themselves be as sharply defined and rigidly limited as the governmental and social development of the world will for the time being permit."

AUTHORITIES.—Among special treatises are: Kamarowsky, *Le Tribunal international* (traduit par Serge de Westman) (Paris, 1887); Rouard de Card, *Les Destinées de l'arbitrage international, depuis la sentence rendue par le tribunal de Genève* (Paris, 1892); Michel Revon, *L'Arbitrage international* (Paris, 1892); Ferdinand Dreyfus, *L'Arbitrage international* (Paris, 1894) (where the earlier authorities are collected); A. Merignhac, *Traité de l'arbitrage international* (Paris, 1895); Le Chevalier Descamps, *Essai sur l'organisation de l'arbitrage international* (Bruxelles, 1896); Feraud-Giraud, *Des Traités d'arbitrage international général et permanent, Revue de droit international* (Bruxelles, 1897); *Pasicrisie International*, by Senator H. Lafontaine (Berne, 1902); *Recueils d'actes et protocols de la cour permanente d'Arbitrage*, Langenhuysen Frères, the Hague.

Of works in English there is a singular dearth. The most important is by an American, J. B. Moore, *History of the International Arbitrations to which the United States has been a Party* (Washington, 1898). The appendices to this work (which is in six volumes) contain, with much other matter of great value, full historical notes of arbitrations between other powers. Arbitration and mediation will be found briefly noticed in Phillimore's *International Law*; in Sir Henry Maine's *Lectures*, delivered in Cambridge in 1887; in W. E. Hall's *International Law*, and more at length in an interesting paper contributed by John Westlake to the *International Journal of Ethics*, October 1896, which its author has reprinted privately. A London journal, *The Herald of Peace and International Arbitration*, issued some years ago a list of instances in which arbitration or mediation had been successfully resorted to during the 19th century. David Dudley Field, of New York, subsequently enlarged this list, which has been continued under the title *International Tribunals*, by Dr W. Evans Darby, and is published, along with the texts of several projects for general arbitration, at the offices of the Peace Society, 47 New Broad Street, London. (M. H. C.)

ARBITRATION AND CONCILIATION. The terms "arbitration and conciliation" as employed in this article, are used to describe a group of methods of settling disputes between employers and work-people or among two or more sets of work-people, of which the common feature is the intervention of some outside party not directly affected by the dispute. If the parties agree beforehand to abide by the award of the third party, the mode of settlement is described as "arbitration." If there be no such agreement, but the offices of the mediator are used to promote an amicable arrangement between the parties themselves, the process is described as "conciliation." The third party may be one or more disinterested individuals, or a joint-board representative of the parties or of other bodies or persons.

The process here termed "arbitration" is rarely an arbitration in the strict legal sense of the term (at least in the United Kingdom), because of the defective legal personality of the associations or groups of individuals who are usually parties to labour disputes, and the consequent absence in the great majority of cases of a valid legal "submission" of the difference to arbitration. Whether or not trade unions of employers or workmen in the United Kingdom are capable of entering through their agents into contracts which are legally binding on their members it is fairly certain that the great majority of the agreements actually made by the representatives of employers and workmen to submit a dispute to the decision of a third party are of no legal force except as regards the actual signatories. Broadly speaking, therefore, the provisions of the Arbitration Act 1889, which consolidated the law relating to arbitration in general, would as a rule have no application to the settlement of collective disputes between employers and workmen, even if the act had not been expressly excluded by section 3 of the Conciliation Act of 1896 in the case of disputes to which that act applies. Besides the absence of a legal "submission," labour arbitrations differ from ordinary arbitrations in the fact that the questions referred often (though by no means always) relate to the terms on which future contracts shall be made, whereas the vast majority of ordinary arbitrations relate to questions arising out of existing contracts. The defective "personality" of the parties to labour disputes also prevents the enforcement of an award by legal penalties. Since, however, difficulties of enforcement affect not only settlements arrived at by arbitration, but all agreements between bodies of employers and work-people with regard to the terms of employment, they are most appropriately considered at a later stage of this article.

The term "conciliation" is ordinarily used to cover a large number of methods of settlement, shading off in the one direction into "arbitration" and in the other into ordinary direct negotiation between the parties. In some cases conciliation only differs from arbitration in the absence of a previous agreement to accept the award. The German "*Gewerbegerichten*," when dealing with labour disputes, communicate a decision to both parties, who must notify their acceptance or otherwise (see below). Some of the state boards in America take similar action. The conciliation boards established under the New Zealand Arbitration Act of 1894 (see below) make recommendations, though either side may decline to accept them and may appeal to the court of arbitration, which in that colony has compulsory powers. Most frequently, however, in Great Britain, the mediating party abstains from pronouncing a definite judgment of his own, but confines himself to friendly suggestions with a view of removing obstacles to an agreement between the parties. On the other hand, it is not easy to define how far the "outside party" must be independent of the parties to the dispute, in order that the method of settlement may be properly described as "conciliation." There is a sense in which a friendly conversation between an employer or his manager and a deputation of aggrieved workmen is rightly described as "conciliation," but such an interview would certainly not be covered by the term as ordinarily used at the present day. Again, when the parties are represented by agents (*e.g.* the officials of an employers' association and of a trade union) the actual negotiators or some of them may not personally be affected by the particular dispute, and may often exercise some of the functions of the mediator or conciliator in a manner not clearly to be distinguished from the action of an outside party. It seems best, however, to exclude such negotiations from our purview so long as those between whom they are carried on merely act as the authorized agents for the parties affected. In the same way, a meeting arranged *ad hoc* between delegates of an employers' association and a trade union, for the purpose of arranging differences as to the terms on which the members of the association shall employ members of the union is not usually classed as "conciliation," unless the meeting is held in the presence of an independent chairman or conciliator, or in pursuance of a permanent agreement between the associations laying down the procedure for the settlement of disputes. If, however, the dispute is considered and arranged not by a casual meeting between two committees and deputations appointed *ad hoc*, but by a permanently organized "joint committee" or board with a constitution, rules of procedure and officers of its own, the process of settlement is by ordinary usage described as "conciliation," even though the board be entirely representative of the persons engaged in the industry. Such joint boards, as will be seen, play a most important part in conciliation at the present day, and they almost always have attached to them some machinery for the ultimate decision by arbitration of questions on which they fail to agree. Another form of conciliation is that in which the mediating board represents a wider group of industries than those affected by the dispute (*e.g.* the London

and other "district" boards referred to below). Moreover, in some of the most important cases of settlement of disputes by conciliation, the mediating party has not been a permanent board but a disinterested individual, *e.g.* the mayor, county court judge, government official or member of parliament. As will be seen below, the Conciliation Act now provides for the appointment of "conciliators" by the Board of Trade.

Voluntary trade boards, however (*i.e.* permanent joint boards representing employers and work-people in particular trades), are at once the most firmly established and the most important agencies in Great Britain for the prevention and settlement of labour disputes. Among the earliest of such bodies was the board of arbitration in the Macclesfield silk trade, formed in 1849, in imitation of the French "*Conseils de Prud'hommes*," but which only lasted four years. The first board, however, which attained any degree of permanent success was that established for the hosiery and glove trade in Nottingham in 1860, through the efforts of A. J. Mundella. In 1864 a board was established in the Wolverhampton building trades, with Rupert Kettle as chairman, and in 1868 boards were formed for the pottery trade, the Leicester hosiery trade and the Nottingham lace trade. In 1869 there was formed one of the most important of the still existing boards, viz. the board of arbitration and conciliation in the manufactured iron and steel trades of the north of England, with which the names of Rupert Kettle, David Dale and others are associated. In 1872 and 1873 joint committees were formed in the Durham and Northumberland coal trades to deal with local questions. The Leicester boot and shoe trade board, the first of an elaborate system of local boards in this trade, was founded in 1875. From about 1870 onwards there was a great movement for the establishment of "sliding scales" in the coal and iron and steel trades, which by regulating wages automatically rendered unnecessary the settlement of general wages by conciliation or arbitration. These sliding scales, however, usually had attached to them joint committees for dealing with disputed questions. A sliding scale arranged by David Dale was attached to the manufactured iron trade board in 1871. A sliding scale for the Cleveland blast furnacemen came into force in 1879. Sliding scales were also adopted in the coal trade in many districts, *e.g.* South Wales (1875), Durham (1877) and Northumberland (1879). The movement was, however, followed by a reaction, and several of the sliding scales in the coal trade were terminated between 1887 and 1889. In 1902 the last surviving sliding scale in the coal trade, viz. in South Wales, ceased to exist and was replaced by a conciliation board.

The formation on a large scale of conciliation boards in the coal trade to fix the rate of wages dates from the great miners' dispute of 1893, one of the terms of settlement agreed to at the conference held at the foreign office under Lord Rosebery being the formation of a conciliation board covering the districts affected. Northumberland followed in 1894, Durham in 1895, Scotland in 1900 and South Wales in 1903.

In 1907 an important scheme for the formation of conciliation boards for railway companies and their employees was adopted as the result of the action taken by the president of the Board of Trade to prevent a general strike of railway servants in that year. Under this scheme separate boards (sectional and general) were to be formed for the employees of each railway company which adhered to the scheme, with provision for reference in case of a deadlock to an umpire.

The first general district board to be formed was that established in London in 1890, through the London chamber of commerce, as a sequel to the Mansion House committee which mediated in the great London dock strike of 1889. The example was followed by several large towns, but the action taken by the boards in most of these provincial districts has been very limited.

In addition there are two boards composed of representatives of co-operators and trade-unionists for the settlement of disputes arising between co-operative societies and their employees.

The most typical form of machinery for the settlement of disputes by voluntary conciliation is a joint board consisting of equal numbers of representatives of employers and employed. The members of the board are usually elected by the associations of employers and workmen, though in some cases (*e.g.* in the manufactured iron trade board) the workmen's representatives are elected not by their trade union but by meetings of workmen employed at the various works. The chairman may be an independent person, or, more usually, a representative of the employers, the vice-chairman being a representative of the workmen. In the arbitration and conciliation boards in the boot and shoe trade, provision is made by which the chair may be occupied by representatives of the employers and workmen in alternate years. An independent chairman usually has a casting vote, which practically makes him an umpire in case of equal voting, but where there is no outside chairman there is often provision for reference of cases on which the board cannot agree to an umpire, who may either be a permanent officer of the board elected for a period of time (as in the case of several of the boards in the boot and shoe trade), or selected *ad hoc* by the board or appointed by some outside person or body. Thus the choice of the permanent chairman or umpire of the miners' conciliation board, formed in pursuance of the settlement of the coal dispute of 1893 by Lord Rosebery, was left to the speaker of the House of Commons. The nomination of umpires under the Railway Agreement of 1907 was left to the speaker and the master of the rolls. Since the passing of the Conciliation Act, several conciliation boards have provided in their rules for the appointment of umpires by the Board of Trade.

Constitution and functions of voluntary conciliation boards.

Conciliation boards constituted as described above usually have rules providing that there shall always be equality of voting as between employer and workmen, in spite of the casual absence of individuals on one side or the other. In order to expedite business it is sometimes provided that all questions shall be first considered by a sub-committee, with power to settle them by agreement before coming before the full board. Boards of conciliation and arbitration conforming more or less to the above type exist in the coal, iron and steel, boot and shoe and other industries in the United Kingdom. A somewhat different form of organization has prevailed in the cotton-spinning trade (since the dispute of 1892–1893) and in the engineering trade (since the engineering dispute of 1897–1898). In these important industries there are no permanent boards for the settlement of general questions, but elaborate agreements are in force between the employers' and workmen's organizations which among other things prescribe the mode in which questions at issue shall be dealt with and if possible settled. In the first place, if the question cannot be settled between the employer and his workmen, it is dealt with by the local associations or committees or their officials, and failing a settlement in this manner, is referred to a joint meeting of the executive committees of the two associations. In neither agreement is there any provision for the ultimate decision of unsettled questions by arbitration. The agreement in the cotton trade is known as the "Brooklands Agreement," and a large number of questions have been amicably settled under its provisions. In the building trade, it is very customary for the local "working rules," agreed to mutually by employers and employed in particular districts, to contain "conciliation rules" providing for the reference of disputed questions to a joint committee with or without an ultimate reference to arbitration. Yet another form of voluntary board is the "district board," consisting in most cases of representatives elected in equal numbers by the local chamber of commerce and trades council respectively. In the case, however, of the London Conciliation Board the workmen's representatives are elected, twelve by specially summoned meetings of trade union delegates and two by co-optation. The functions of district boards are to deal with disputes in any trade which may occur within their districts, and of course they can only take action with the consent of both parties to the dispute, in this respect differing from the majority of "trade" boards, which, as a rule, are empowered by the agreement under which they are constituted

to deal with questions on the application of either party. Another interesting type of board is that representing two or more groups of workmen and sometimes their employers, with the object of settling "demarcation" disputes between the groups of workmen (*i.e.* questions as to the limits of the work which each group may claim to perform). Examples of such boards are those representing shipwrights and joiners on the Clyde, Tyne and elsewhere. While the arrangements for voluntary conciliation and arbitration differ in this way in various industries, there is an equally wide variation in the character and range of questions which the boards are empowered to determine. For example, some boards in the coal trade (*e.g.* the conciliation boards in Northumberland and the so-called "Federated Districts") deal solely with the general rate of wages. Others, *e.g.* the "joint committee" in Northumberland and Durham, confine their attention solely to local questions not affecting the counties as a whole. The Durham conciliation board deals with any general or county questions. This distinction between "general" and "local" questions corresponds nearly, though not entirely, to the distinction often drawn between questions of the terms of future employment and of the interpretation of existing agreements. Some conciliation boards are unlimited as regards the scope of the questions which they may consider. This was formerly the case with the boards in the boot and shoe trade, but under the "terms of settlement" of the dispute in 1895 drawn up at the Board of Trade, certain classes of questions (*e.g.* the employment of particular individuals, the adoption of piece-work or time-work, &c.) were wholly or partially withdrawn from their consideration, and any decision of a board contravening the "terms of settlement" is null and void. A special feature in the procedure for conciliation and arbitration in the boot and shoe trade, is the deposit by each party of £1000 with trustees, as a financial guarantee for the performance of agreements and awards. A certain class of conciliation boards, mostly in the Midland metal trades, were attached to "alliances" of employers and employed, having for their object the regulation of production and of prices (*e.g.* the Bedstead Trade Wages Board). None of these alliances, however, have survived.

Legislation in the United Kingdom.

At all events up to the year 1896, the development of arbitration and conciliation as methods of settling labour disputes in the United Kingdom was entirely independent of any legislation. Previously to the Conciliation Act of 1896 several attempts had been made by parliament to promote arbitration and conciliation, but with little or no practical result, and the act of 1896 repealed all previous legislation on the subject, at the same time excluding the operation of the Arbitration Act of 1889 from the settlement of "any difference or dispute to which this act applies." The laws repealed by the Conciliation Act need only a few words of mention. During the 18th century the fixing of wages by magistrates under the Elizabethan legislation gradually decayed, and acts of 1745 and 1757 gave summary jurisdiction to justices of the peace to determine disputes between masters and servants in certain circumstances, although no rate of wages had been fixed that year by the justices of the peace of the shire. These and other laws, relating specially to disputes in the cotton-weaving trade, were consolidated and amended by the Arbitration Act of 1824. This act seems chiefly to have been aimed at disputes relating to piece-work in the textile trades, though applicable to other disputes arising out of a wages contract. It expressly excluded, however, the fixing of a rate of wages or price of labour or workmanship at which the workmen should in future be paid unless with the mutual consent of both master and workmen. The act gave compulsory powers of settling the disputes to which it relates on application of either party to a court of arbitrators representing employers and workmen nominated by a magistrate. The award could be enforced by distress or imprisonment. The act was subsequently amended in detail, and by the "Councils of Conciliation" Act of 1867 power was given to the home secretary to license "equitable councils of conciliation and arbitration" equally representative of masters and workmen, who should thereupon have the powers conferred by the act of 1824. The act contains provisions for the appointment of conciliation committees, and other details which are of little interest seeing that the act was never put into operation. Another amendment of the act of 1824 was made by the Arbitration (Masters and Workmen) Act of 1872, which contemplated the conclusion of agreements between employers and employed, designating some board of arbitration by which disputes included within the scope of the former acts should be determined. A master or workman should be deemed to be bound by an agreement under the act, if he accepted a printed copy of the agreement and did not repudiate it within forty-eight hours. Like the previous legislation, however, the act of 1872 was inoperative. The evidence given before the Royal Commission on Labour (1891–1894) disclosed the existence of a considerable body of opinion in favour of some further action by the state for the prevention or settlement of labour disputes, and some impetus was given to the movement by the settlement through official mediation of several important disputes, *e.g.* the great coal-miners' dispute of 1893 by a conference presided over by Lord Rosebery, the cab-drivers' dispute of 1894 by the mediation of the home secretary (H. H. Asquith), and the boot and shoe trade dispute of 1895 by a Board of Trade conference under the chairmanship of Sir Courtenay Boyle. In these, and a few other less important cases, the intervention of the Board of Trade or other department took place without any special statutory sanction. The Conciliation Act passed in 1896 was framed with a view to giving express authorization to such action in the future.

This act is of a purely voluntary character. Its most important provisions are those of section 2, empowering the Board of Trade in cases "where a difference exists or is apprehended between any employer, or any class of employers, and workmen, or between different classes of workmen," to take certain steps to promote a settlement of the difference. They may of their own initiative hold an inquiry or endeavour to arrange a meeting between the parties under a chairman mutually agreed on or appointed from the outside, and on the application of either party they may appoint a conciliator or a board of conciliation who shall communicate with the parties and endeavour to bring about a settlement and report their proceedings to the Board of Trade. On the application of both parties the Board of Trade may appoint an arbitrator. In all cases the Board of Trade has discretion as to the action to be taken, and there is no provision either for compelling the parties to accept their mediation or to abide by any agreement effected through their intervention. There are other provisions in the act providing for the registration of voluntary conciliation boards, and for the promotion by the Board of Trade of the formation of such boards in districts and trades in which they are deficient. During the first eleven years after the passage of the act the number of cases arising under section 2 (providing for action by the Board of Trade for the settlement of actual or apprehended disputes) averaged twenty-one per annum, and the number of settlements effected fifteen. In the remaining cases the Board of Trade either refused to entertain the application or failed to effect a settlement, or the disputes were settled between the parties during the negotiations. About three-quarters of the settlements were effected by arbitration and one-quarter by conciliation. A number of voluntary conciliation boards formed or reorganized since the passing of the act provide in their rules for an appeal to the Board of Trade to appoint an umpire in case of a deadlock. At least thirty-six trade boards are known to have already adopted this course. The figures given above show that the Conciliation Act of 1896 has not, like previous legislation, been a dead letter, though the number of actual disputes settled is small compared with the total number annually recorded.

Proposals for compulsion.

Arbitration and conciliation in labour disputes as practised in the United Kingdom are entirely voluntary, both as regards the initiation and conduct of the negotiations and the carrying out of the agreement resulting therefrom. In all these respects arbitration, though terminating in what is called a binding award, is on precisely the same legal footing as conciliation, which results in a mutual

agreement. Various proposals have been made (and in some cases carried into effect in certain countries) for introducing an element of compulsion into this class of proceeding. There are three stages at which compulsion may conceivably be introduced. (1) The parties may be compelled by law to submit their dispute to some tribunal or board of conciliation; (2) the board of conciliation or arbitration may have power to compel the attendance of witnesses and the production of documents; (3) the parties may be compelled to observe the award of the board of arbitration. The most far-reaching schemes of compulsory arbitration in force in any country are those in force in New Zealand and certain states in Australia. Bills have been introduced into the British House of Commons for clothing voluntary boards of conciliation and arbitration, under certain conditions, with powers to require attendance of witnesses and production of documents, without, however, compelling the parties to submit their disputes to these boards or to abide by their decisions. In the United Kingdom, however, more attention has recently been given to the question of strengthening the sanction for the carrying out of awards and agreements than of compelling the parties to enter into such arrangements. An interesting step towards the solution of the difficulty of enforcement in certain cases is perhaps afforded by the provisions of the terms of settlement of the dispute in the boot and shoe trade drawn up at the Board of Trade in 1895. Under this agreement £1000 was deposited by each party with trustees, who were directed by the trust-deed to pay over to either party, out of the money deposited by the other, any sum which might be awarded as damages by the umpire named in the deed, for the breach of the agreement or of any award made by an arbitration board in consonance with it. Very few claims for damages have been sustained under this agreement. Nevertheless it cannot be doubted that the pecuniary liability of the parties has given stability to the work of the local arbitration boards, and the satisfaction of both sides with the arrangement is shown by the fact that the trust-deed which lapsed in 1900 has been several times renewed by common agreement for successive periods of two years, and is now in force for an indefinite period subject to six months' notice from either side. Theoretically a trust-deed of this kind can only offer a guarantee up to the point at which the original deposit on one side or the other is exhausted, as it is impossible to compel either party to renew the deposit. A proposal was made by the duke of Devonshire and certain of his colleagues on the Royal Commission on Labour for empowering associations of employers and employed to acquire, if they desired it, sufficient legal personality and corporate character to enable them to sue each other or their own members for breach of agreement. This would give the association aggrieved by a breach of award the power of suing the defaulting organization to recover damages out of their corporate funds, while each association could exact penalties from its members for such a breach. For this reason the suggestion has met with a good deal of support by many interested in arbitration and conciliation, but has been steadily opposed by representatives of the trade unions.

The question is not free from difficulties. The object of the change would be to convert what are at present only morally binding understandings into legally enforceable contracts. But apart from the possibility that some of such contracts would be held by the courts to be void as being "in restraint of trade," the tendency might be to give a strict legal interpretation to working agreements which might deprive them of some of their effectiveness for the settlement of the conditions of future contracts between employers and workmen, while possibly deterring associations from entering into such agreements for fear of litigation. Individuals, moreover, could avoid liability by leaving their associations. In practice the cases of repudiation or breach of an award or agreement are not common. In countries like New Zealand, where the parties are compelled to submit their differences to arbitration, some of the above objections do not apply.

The following statistics are based on the reports of the Labour department of the Board of Trade. The number of boards of conciliation and arbitration known to be in existence in the United Kingdom is nearly 200, but a good many of these do little or no active work. Only about one-third of these boards deal with actual cases in any one year, the active boards being mainly connected with mining, iron and steel, engineering and shipbuilding, boot and shoe and building trades. During the ten years 1897–1906 the total number of cases considered by these boards averaged about 1500 annually, of which they have settled about half, the remainder having been withdrawn, referred back or otherwise settled. About three-quarters of the cases settled were determined by the boards themselves and only one-quarter by umpires. The great majority of the cases settled were purely local questions. Thus more than half the total were dealt with by the "joint committees" in the Northumberland and Durham coal trades, which confine their action to local questions, such as fixing the "hewing prices" for new seams. The great majority of the cases settled did not actually involve stoppage of work, the most useful work of these permanent boards being the prevention rather than the settlement of strikes and lock-outs. A certain number of disputes are settled every year by the mediation or arbitration of disinterested individuals, *e.g.* the local mayor or county court judge.

Statistics of existing agencies.

The extent to which the methods of arbitration and conciliation can be expected to afford a substitute for strikes and lock-outs is one on which opinions differ very widely. The difficulties arising from the impossibility of enforcing agreements or awards by legal process have already been discussed. Apart from these, however, it is evident that both methods imply that the parties, especially the work-people, are organized at least to the extent of being capable of negotiating through agents. In some industries (*e.g.* agriculture or domestic service) this preliminary condition is not satisfied; in others the men's leaders possess little more than consultative powers, and employers may hesitate to deal either directly or through a third party with individuals or committees who have so little authority over those whom they claim to represent. And even where the trade organizations are strong, some employers refuse in any way to recognize the representative character of the men's officials. The question of the "recognition" of trade unions by employers is a frequent cause of disputes (see STRIKES AND LOCK-OUTS.) It may be observed, however, that it often occurs that in cases in which both employers and employed are organized into associations which are accustomed to deal with each other, one or both parties entertain a strong objection to the intervention of any outside mediator, or to the submission of differences to an arbitrator. Thus the engineering employers in 1897 were opposed to any outside intervention, though ready to negotiate with the delegates chosen by the men. On the other hand, the cotton operatives have more than once opposed the proposal of the employers to refer the rate of wages to arbitration, and throughout the great miners' dispute of 1893 the opposition to arbitration came from the men. Naturally, the party whose organization is the stronger is usually the less inclined to admit outside intervention. But there have also been cases in which employers, who refused to deal directly with trade union officials, have been willing to negotiate with a mediator who was well known to be in communication with these officials, *e.g.* in the case of the Railway Settlement of 1907.

Future scope and limits.

Apart, however, from the disinclination of one or both parties to allow of any outside intervention, we have to consider how far the nature of the questions in dispute may in any particular case put limits to the applicability of conciliation or arbitration as a method of settlement. Since conciliation is only a general term for the action of a third party in overcoming the obstacles to the conclusion of an agreement by the parties themselves, there is no class of questions which admit of settlement by direct negotiation which may not equally be settled by this method, provided of course that there is an adequate supply of sufficiently skilful mediators. As regards arbitration the case is somewhat different, seeing that in this case the parties agree to be bound by the award of a third party. For the success

of arbitration, therefore, it is important that the general principles which should govern the settlement of the particular question at issue should be admitted by both sides. Thus in the manufactured iron trade in the north of England, it has throughout been understood that wages should depend on the prices realized, and the only question which an arbitrator has usually had to decide has been how far the state of prices at the time warranted a particular change of wage. On the other hand, there are many questions on which disputes arise (*e.g.* the employment of non-union labour, the restriction of piece-work, &c.) on which there is frequently no common agreement as to principles, and an arbitrator may be at a loss to know what considerations he is to take into account in determining his award. Generally speaking, employers are averse from submitting to a third party questions involving discipline and the management of their business, while in some trades workmen have shown themselves opposed to allowing an arbitrator to reduce wages beyond a certain point which they wish to regard as a guaranteed "minimum."

Another objection on the part of some employers and workmen to unrestricted arbitration is its alleged tendency to multiply disputes by providing an easy way of solving them without recourse to strikes or lock-outs, and so diminishing the sense of responsibility in the party advancing the claims. It is also sometimes contended that arbitrators, not being governed in their decisions by a definite code of principles, may tend to "split the difference," so as to satisfy both sides even when the demands on one side or the other are wholly unwarranted. This, it is said, encourages the formulation of demands purposely put high in order to admit of being cut down by an arbitrator. One of the chief practical difficulties in the way of the successful working of permanent boards of conciliation, consisting of equal numbers of employers and employed, with an umpire in case of deadlock, is the difficulty of inducing business men whose time is fully occupied to devote the necessary time to the work of the boards, especially when either side has it in its power to compel recourse to the umpire, and so render the work of the conciliation board fruitless. In spite of all these difficulties the practice of arranging differences by conciliation and arbitration is undoubtedly spreading, and it is to be remembered that even in cases in which theoretically a basis for arbitration can scarcely be said to exist, recourse to that method may often serve a useful purpose in putting an end to a deadlock of which both parties are tired, though neither cares to own itself beaten.

New Zealand.—The New Zealand Industrial Conciliation and Arbitration Act 1894 is important as the first practical attempt of any importance to enforce compulsory arbitration in trade disputes. The original act was amended by several subsequent measures, and the law has been more than once consolidated. The law provides for the incorporation of associations of employers or workmen under the title of industrial unions, and for the creation in each district of a joint conciliation board, elected by these industrial unions, with an impartial chairman elected by the board, to which a dispute may be referred by any party, a strike or lock-out being thenceforth illegal. If the recommendation of the conciliation board is not accepted by either party, the matter goes to a court of arbitration consisting of two persons representing employers and workmen respectively, and a judge of the supreme court. Up to 1901 disputes were ordinarily required to go first to a board of conciliation except by agreement of the parties, but now either party may carry a dispute direct to the arbitration court. The amendment was adopted because it was found in practice that the great majority of cases went ultimately to the arbitration court, and conciliation board proceedings were often mere waste of time. The award of the court is enforceable by legal process, financial penalties up to £500 being recoverable from defaulting associations or individuals. If the property of an association is insufficient to pay the penalty, its members are individually liable up to £10 each. It is the duty of factory inspectors to see that awards are obeyed. The law provides for the extension of awards to related trades, to employers entering the industry hereafter, and in some cases to a whole industry.

The above is only an outline of the principal provisions of this law, under which questions of wages, hours and the relations of employers and workmen generally in New Zealand (*q.v.*) industries became practically the subject of state regulation. The act must more properly be judged as a measure for the state regulation of industry, but as a method of putting an end to labour disputes its success has only been partial.

Australia.—The laws which are practically operative in Australia with respect to arbitration and conciliation are all based with modifications on the New Zealand system. The first compulsory arbitration act passed in Australia was the New South Wales Act of 1901. The principal points of difference between this and the New Zealand act are that the conciliation procedure is entirely omitted, the New South Wales measure being purely an arbitration act. The arbitration court has greater power over unorganized trades than in New Zealand, and the scope of its awards is greatly enlarged by its power to declare any condition of labour to be common rule of an industry, and thus binding on all existing and future employers and work-people in that industry. In Western Australia laws were passed in 1900 and 1902 which practically adopted the New Zealand legislation with certain modifications in detail.

In 1904 the commonwealth of Australia passed a compulsory arbitration law based mainly on those in force in New Zealand and New South Wales, and applicable to disputes affecting more than one Australian state. The arbitration court is empowered to require any dispute within its cognizance to be referred to it by the state authority proposing to deal with it. There are other Australian laws which, though unrepealed (*e.g.* the South Australian Act of 1894), are a dead-letter. Generally speaking, the Australasian laws on arbitration and conciliation are more stringent and far-reaching than any others in the world.

Canada.—In 1900 a conciliation act was passed by the Dominion parliament resembling the United Kingdom act in most of its features, and in 1903 the Canadian Railway Labour Disputes Act made special provision for the reference of railway disputes to a conciliation board and (failing settlement) to a court of arbitration.

This act was consolidated with the Conciliation Act 1900 during 1906 in an act respecting conciliation and labour, and in March 1907 the Industrial Disputes Investigation Act became law by which machinery is set up for the constitution of a board, on the application of either side to a dispute in mines and industries connected with public utilities, whenever a strike involving more than ten employees is threatened. The provisions of the act may be extended to other industries and railway companies, and their employees may take action under either the Conciliation and Labour Act or the Industrial Disputes Investigation Act. Under the Investigation Act it is unlawful for any employer to cause a lock-out, or for an employee to go on strike on account of any dispute prior to or during a reference of such dispute to a board constituted under the act, or prior to or during a reference under the provisions concerning railway disputes under the Conciliation and Labour Act. There is nothing, however, in the act to prevent a strike or lock-out taking place after the dispute has been investigated.

France.—The French Conciliation and Arbitration Law of December 1892 provides that either party to a labour dispute may apply to the *juge de paix* of the canton, who informs the other party of the application. If they concur within three days, a joint committee of conciliation is formed of not more than five representatives of each party, which meets in the presence of the *juge de paix*, who, however, has no vote. If no agreement results the parties are invited to appoint arbitrators. If such arbitrators are appointed and cannot agree on an umpire, the president of the civil tribunal appoints an umpire. In the case of an actual strike, in the absence of an application from either party it is the duty of the *juge de paix* to invite the parties to proceed to conciliation or arbitration. The results of the action of the *juge de paix* and of the conciliation committee are placarded by the mayors of the communes affected. The law leaves the

parties entirely free to accept or reject the services of the *juge de paix*.

During the ten years 1897–1906 the act was put in force in 1809 cases—viz. 916 on application of workmen; 49 of employers; 40 of both sides; and 804 without application. Altogether 616 disputes were settled—549 by conciliation and 67 by arbitration.

Germany.—In several continental European countries, courts or boards are established by law to settle cases arising out of existing labour contracts,—*e.g.* the French "*Conseils de Prud'-hommes*," the Italian "*Probi-Viri*," and the German "*Gewerbegerichten*,"—and some of the questions which come before these bodies are such as might be dealt with in England by voluntary boards or joint committees. The majority, however, are disputes between individuals as to wages due, &c., which would be determined in the United Kingdom by a court of summary jurisdiction. It is noteworthy, however, that the German industrial courts (*Gewerbegerichten*) are empowered under certain conditions to offer their services to mediate between the parties to an ordinary labour dispute. The main law is that of 1890 which was amended in 1901. In the case of a strike or lock-out the court must intervene on application of both parties, and may do so of its own initiative or on the invitation of one side. The conciliation board for this purpose consists under the amending law of 1901 of the president of the court and four or more representatives named by the parties in equal numbers but not concerned in the dispute. Failing appointment by the parties the president appoints them. Failing a settlement at a conference between the parties in the presence of the president and assessors of the court, the court arrives at a decision on the merits of the dispute which is communicated to the parties, who are allowed a certain time within which to notify their acceptance or rejection. The court has no power to compel the observance of its decision, but in certain cases it may fine a witness for non-attendance. In the first five years after the passage of the amending law of 1901 (viz. 1902–1906) there were 1139 applications for the intervention of the industrial courts: 492 agreements were brought about and 107 decisions were pronounced by the courts, of which 64 were accepted by both parties.

Switzerland.—The canton of Geneva enacted a law in 1900 providing for the settlement by negotiation, conciliation or arbitration of the general terms of employment in a trade, subject, however, to special arrangements between employers and workmen in particular cases. The negotiations take place between delegates chosen by the associations of employers and employed, or failing them, by meetings summoned by the council of state on sufficient applications. Failing settlement, the council of state, on application from either party, is to appoint one or more conciliators from its members, and if this fail the central committee of the *Prud'hommes*, together with the delegates of employers and workmen, is to form a board of arbitration, whose decision is binding. Any collective suspension of work is illegal during the period covered by the award or agreement. Up to the end of 1904 only seven cases occurred of application of the law to industrial differences. In Basel (town) a law providing for voluntary conciliation by means of boards of employers and workmen with an independent chairman appointed *ad hoc* by the council of state of the canton, has been in force since 1897, but it remained practically unused until 1902. In the period from January 1902 to May 1905, 18 disputes were dealt with and 10 settled under this law. A similar law was adopted in St Gall in 1902. In the three years 1902–1904, 10 disputes were dealt with and 3 settled.

Sweden.—By a law which came into force on the 1st of January 1907, Sweden was divided into seven districts and in each district a conciliator was appointed by the crown. The conciliator must reside within his district and his principal duty is to promote the settlement of disputes between employers and work-people or between members of either class among themselves. He is also on request to advise and otherwise assist employers and work-people in framing agreements affecting the conditions of labour if and so far as agreements are designed to promote good relations between the two classes and to obviate stoppages of work.

United States.—In the United States several states have legislated on the subject of conciliation and arbitration, among the first of such acts being the "Wallace" Act of 1883, in Pennsylvania, which, however, was almost inoperative. Altogether, 24 states have made constitutional or statutory provision for mediation in trade disputes, of which 17 contemplate the formation of permanent state boards. The only state laws which require notice are those of Massachusetts and New York providing for the formation of state boards of arbitration. The Massachusetts board, founded in 1886, consists of one employer, one employed and one independent person chosen by both. The New York board (1886) consists of two representatives of different political parties, and one member of a *bona fide* trade organization within the state. In both states it is the duty of the board, with or without application from the parties, to proceed to the spot where a labour dispute has occurred, and to endeavour to promote a settlement. The parties may decline its services, but the board is empowered to issue a report, and on application from either side to hold an inquiry and publish its decision, which (in Massachusetts) is binding for six months, unless sixty days' notice to the contrary is given by one side to the other. Several states, including Massachusetts and New York, provide not only for state boards, but also for local boards.

In Massachusetts, during 1906, the state board dealt with 158 disputes. Of these the board was appealed to as arbitrator in 95 cases. Awards were rendered in 80 cases, 12 cases were withdrawn and 3 cases were still pending at the end of the year. In New York the number of cases dealt with is much smaller.

Federal legislation can only touch the question of arbitration and conciliation so far as regards disputes affecting commerce between different states. Thus an act of June 1898 provides that in a dispute involving serious interruption of business on railways engaged in inter-state commerce, the chairman of the Inter-State Commerce Commission and the commissioner of labour shall, on application of either party, endeavour to effect a settlement, or to induce the parties to submit the dispute to arbitration. While an arbitration under the act is pending a strike or lock-out is unlawful.

AUTHORITIES.—For the recent development of arbitration and conciliation in the United Kingdom, see the *Annual Reports of the Labour Department of the Board of Trade on Strikes and Lock-outs* from 1888 onwards. Since 1890 these reports have contained special appendices on the work of arbitration boards. See also the *Labour Gazette* (the monthly journal of the Labour Department) from 1893 onward, and the *Report on Rules of Voluntary Conciliation and Arbitration Boards and Joint Committees*. The *Reports of the Royal Commission on Labour* (1891–1894) contain much valuable information on the subject. For the working of the Conciliation Act see the *Reports* of the Board of Trade on their proceedings under the Conciliation Act 1896. For the earlier history in the United Kingdom: Crompton, *Industrial Conciliation* (1876); Price, *Industrial Peace* (1887). For foreign and colonial developments: the third *Abstract of Foreign Labour Statistics* (1906), issued by the Board of Trade; *Report on Government Industrial Arbitration*, by L. W. Hatch (Bulletin of Bureau of Labour of United States Department of Commerce and Labour, September 1905); the report of the French *Office du Travail, De la conciliation et de l'arbitrage dans les conflits collectifs entre patrons et ouvriers en France et à l'étranger* (1893); the Annual Reports of the same Department on *Strikes, Lock-outs and Arbitration*; the *Reports of the Massachusetts and New York State Arbitration Boards*, and of the *New Zealand Department of Labour*; and the *Labour Gazette*. See also the following general works: N. P. Gilman, *Methods of Industrial Peace* (Boston, 1904); A. C. Pigou, *Principles and Methods of Industrial Peace* (1905). (X.)

ARBOGAST (d. 394), a barbarian officer in the Roman army, at the end of the 4th century. His nationality is uncertain, but Zosimus, Eunapius and Sulpicius Alexander (a Gallo-Roman historian quoted by Gregory of Tours) all refer to him as a Frank. Having served with distinction against the Goths in Thrace, he was sent by Theodosius in 388 against Maximus, who had usurped the empire of the west and had murdered Gratian. His complete success, which resulted in the destruction of Maximus and his sons and the pacification of Gaul, led Theodosius to appoint him chief minister for his young brother-in-law

Valentinian II. His rule was most energetic; but while he favoured the barbarians in the imperial service, and appointed them to high office, Valentinian, openly jealous of his minister, sought to surround himself with Romans. As an offset to this, Arbogast allied himself with the pagan element in Rome, while Valentinian was strictly orthodox. In 392 Valentinian was secretly put to death at Vienne (in Gaul), and Arbogast, naming as his successor Eugenius, a rhetorician, descended into Italy to meet the expedition which Theodosius was heading against him. He proclaimed himself the champion of the old Roman gods, and as a response to the appeal of Ambrose, is said to have threatened to stable his horses in the cathedral of Milan, and to force the monks to fight in his army. His defeat in the hard-fought battle of the Frigidus saved Italy from these dangers. Theodosius, after a two days' fight, gained the victory by the treachery of one of Arbogast's generals, sent to cut off his retreat. Eugenius was captured and executed, but Arbogast escaped to the mountains, where however he slew himself three days afterwards (8th of September 394). Although we have only most distorted narratives upon which to rely—pagan eulogy and Christian denunciation—Arbogast appears to have been one of the greatest soldiers of the later empire, and a statesman of no mean rank. His energy, and his apparent disdain for the effete civilization which he protected, but which did not affect his character, make his personality one of the most interesting of the 4th century.

See T. Hodgkin, *Italy and her Invaders* (1880), vol. i. chap. ii.

ARBOIS, a town of eastern France, in the department of Jura, on the Cuisance, 29 m. N.N.E. of Lons-le-Saunier by rail. Pop. (1906) 3454. The town is the seat of the tribunal of first instance of the arrondissement of Poligny, and has a communal college. The church of St Just, founded in the 10th century, has good wood-carving. An Ursuline convent, built in 1764, serves as hôtel de ville and law court, and a church of the 14th century is used as a market. There is an old château of the dukes of Burgundy. Arbois is well known for its red and white wines, and has saw-mills, tanneries and market gardens, and manufactures paper, oil and casks.

ARBOIS DE JUBAINVILLE, MARIE HENRI D' (1827–1910), French historian and philologist, was born at Nancy on the 5th of December 1827. In 1851 he left the École des Chartes with the degree of palaeographic archivist. He was placed in control of the departmental archives of Aube, and remained in that position until 1880, when he retired on a pension. He published several volumes of inventorial abstracts, a *Répertoire archéologique du département* in 1861; a valuable *Histoire des ducs et comtes de Champagne depuis le VIe siècle jusqu'à la fin du XIe*, which was published between 1859 and 1869 (8 vols.), and in 1880 an instructive monograph upon *Les Intendants de Champagne*. But already he had become attracted towards the study of the most ancient inhabitants of Gaul; in 1870 he brought out an *Étude sur la déclinaison des noms propres dans la langue franque à l'époque mérovingienne*; and in 1877 a learned work upon *Les Premiers Habitants de l'Europe* (2nd edition in 2 vols. 1889 and 1894). Next he concentrated his efforts upon the field of Celtic languages, literature and law, in which he soon became an authority. Appointed in 1882 to the newly founded professorial chair of Celtic at the Collège de France, he began the *Cours de littérature celtique* which in 1908 extended to twelve volumes. For this he himself edited the following works: *Introduction à l'étude de la littérature celtique* (1883); *L'Épopée celtique en Irlande* (1892); *Études sur le droit celtique* (1895); and *Les Principaux Auteurs de l'antiquité à consulter sur l'histoire des Celtes* (1902). He was among the first in France to enter upon the study of the most ancient monuments of Irish literature with a solid philological preparation and without empty prejudices. We owe to him also *Les Celtes depuis les temps les plus reculés jusqu'à l'an 100 avant notre ère* (1904), and a study of comparative law in *La Famille celtique* (1905). Numerous detailed studies upon the Gaulish names of persons and places took synthetic form in the *Recherches sur l'origine de la propriété foncière* (1890), which illumined one of the most interesting aspects of the Roman occupation of Gaul. The *Recueil de mémoires concernant la littérature et l'histoire celtiques*, made by the most notable among his disciples on the occasion of his seventy-eighth birthday (1906), was a well-deserved tribute to his persevering and fruitful industry. He died in February 1910. (C. B.*)

ARBOR DAY, the name applied in the United States of America to a day appointed for the public planting of trees (see ARBOUR). Originating, or at least being first successfully put into operation, in Nebraska in 1872 through the instrumentality of J. Sterling Morton, then president of the state Board of Agriculture, it received the official sanction of the state by the proclamation of Governor R. W. Furnas in 1874 and by the enactment in 1885 of a law establishing it as a legal holiday in Nebraska. The movement spread rapidly throughout the United States until with hardly an exception every state and territory celebrates such a day either as a legal or a school holiday. The time of celebration varies in different states—sometimes even in different localities in the same state—but April or early May is the rule in the northern states, and February, January and December are the months in various southern states. A like practice has been introduced in New Zealand.

See N. H. Egleston, *Arbor Day: Its History and Observance* (Washington, 1896), Robert W. Furnas, *Arbor Day* (Lincoln, Neb., 1888), and R. H. Schauffler (ed.), *Arbor Day* (New York, 1909).

ARBORETUM, the name given to that part of a garden or park which is reserved for the growth and display of trees. The term, in this restricted sense, was seemingly first so employed in 1838 by J. C. Loudon, in his book upon arboreta and fruit trees. Professor Bayley Balfour, F.R.S., the Regius Keeper of the Royal Botanic Garden in Edinburgh, has described an arboretum as a living collection of species and varieties of trees and shrubs arranged after some definite method—it may be properties, or uses, or some other principle—but usually after that of natural likeness. The plants are intended to be specimens showing the habit of the tree or shrub, and the collection is essentially an educational one. According to another point of view, an arboretum should be constructed with regard to picturesque beauty rather than systematically, although it is admitted that for scientific purposes a systematic arrangement is a *sine qua non*. In this more general respect, an arboretum or woodland affords shelter, improves local climate, renovates bad soils, conceals objects unpleasing to the eye, heightens the effect of what is agreeable and graceful, and adds value, artistic and other, to the landscape. What Loudon called the "gardenesque" school of landscape naturally makes particular use of trees. By common consent the arboretum in the Royal Botanical Gardens at Kew is one of the finest in the world. Its beginnings may be traced back to 1762, when, at the suggestion of Lord Bute, the duke of Argyll's trees and shrubs were removed from Whitton Place, near Hounslow, to adorn the princess of Wales's garden at Kew. The duke's collection was famous for its cedars, pines and firs. Most of the trees of that date have perished, but the survivors embrace some of the finest of their kind in the gardens. The botanical gardens at Kew were thrown open to the public in 1841 under the directorate of Sir William Hooker. Including the arboretum, their total area did not then exceed 11 acres. Four years later the pleasure grounds and gardens at Kew occupied by the king of Hanover were given to the nation and placed under the care of Sir William for the express purpose of being converted into an arboretum. Hooker rose to the occasion and, zealously reinforced by his son and successor, Sir Joseph, established a collection which rapidly grew in richness and importance. It is perhaps the largest collection of hardy trees and shrubs known, comprising some 4500 species and botanical varieties. A large proportion of the total acreage (288) of the Gardens is monopolized by the arboretum. Of the more specialized public arboreta in the United Kingdom the next to Kew are those in the Royal Botanic Garden in Edinburgh and the Glasnevin Garden in Dublin. The collection of trees in the Botanic Garden at Cambridge is also one of respectable proportions. There is a small but very select collection of trees at Oxford, the oldest botanical

garden in Great Britain, which was founded in 1632. In the United States the Arnold Arboretum at Boston ranks with Kew for size and completeness. It takes its name from its donor, the friend of Emerson. It was originally a well-timbered park, which, by later additions, now covers 222 acres. Practically, it forms part of the park system so characteristic of the city, being situated only 4 m. from the centre of population. There is a fine arboretum in the botanical gardens at Ottawa, in Canada (65 acres). On the continent of Europe the classic example is still the *Jardin des Plantes* in Paris, where, however, system lends more of formality than of beauty to the general effect. The collection of trees and shrubs at Schönbrunn, near Vienna, is an extensive one. At Dahlem near Berlin the new *Kgl. Neuer Botanischer Garten* has been laid out with a view to the accommodation of a very large collection of hardy trees and shrubs. There are now many large collections of hardy trees and shrubs in private parks and gardens throughout the British Islands, the interest taken in them by their proprietors having largely increased in recent years. Rich men collect trees, as they do paintings or books. They spare neither pains nor money in acquiring specimens, even from distant lands, to which they often send out expert collectors at their own expense. This, too, the Royal Horticultural Society was once wont to do, with valuable results, as in the case of David Douglas's remarkable expedition to North America in 1823–1824. It will be remembered that when the laird of Dumbiedikes lay dying (Scott's *Heart of Midlothian*, chap. viii.) he gave his son one bit of advice which Bacon himself could not have bettered. "Jock," said the old reprobate, "when ye hae naething else to do, ye may be aye sticking in a tree; it will be growing, Jock, when ye're sleeping." Sir Walter assures us that a Scots earl took this maxim so seriously to heart that he planted a large tract of country with trees, a practice which in these days is promoted by the English and Royal Scottish Arboricultural Societies.

ARBORICULTURE (Lat. *arbor*, a tree), the science and art of tree-cultivation. The culture of those plants which supply the food of man or nourish the domestic animals must have exclusively occupied his attention for many ages; whilst the timber employed in houses, ships and machines, or for fuel, was found in the native woods. Hence, though the culture of fruit-trees, and occasionally of ornamental trees and shrubs, was practised by the Egyptians, Greeks and Romans, the cultivation of timber-trees on a large scale only took place in modern times. In the days of Charlemagne, the greater part of France and Germany was covered with immense forests; and one of the benefits conferred on France by that prince was the rooting up of portions of these forests throughout the country, and substituting orchards or vineyards. Artificial plantations appear to have been formed in Germany sooner than in any other country, apparently as early as the 15th century. In Britain planting was begun, though sparingly, a century later. After the extensive transfers of property on the seizure of the church lands by Henry VIII., much timber was sold by the new owners, and the quantity thus thrown into the market so lowered its price, as Hollingshed informs us, that the builders of cottages, who had formerly employed willow and other cheap and common woods, now built them of the best oak. The demand for timber constantly increased, and the need of an extended surface of arable land arising at the same time, the natural forests became greatly circumscribed, till at last timber began to be imported, and the proprietors of land to think, first of protecting their native woods, afterwards of enclosing waste ground and allowing it to become covered with self-sown seedlings, and ultimately of sowing acorns and mast in such enclosures, or of filling them with young plants collected in the woods—a practice which exists in Sussex and other parts of England even now. Planting, however, was not general in England till the beginning of the 17th century, when the introduction of trees was facilitated by the interchange of plants by means of botanic gardens, which, in that century, were first established in different countries. Evelyn's *Sylva*, the first edition of which appeared in 1664, rendered an extremely important service to arboriculture; and there is no doubt that the ornamental plantations in which England surpasses all other countries are in some measure the result of his enthusiasm. In consequence of a scarcity of timber for naval purposes, and the increased expense during the Napoleonic war of obtaining foreign supplies, planting received a great stimulus in Britain in the early part of the 19th century. After the peace of 1815 the rage for planting with a view to profit subsided; but there was a growing taste for the introduction of trees and shrubs from foreign countries, and for their cultivation for ornament and use. The profusion of trees and shrubs planted around suburban villas and country mansions, as well as in town squares and public parks, shows how much arboriculture is an object of pleasure to the people. While isolated trees and old hedgerows are disappearing before steam cultivation, the advantages of shelter from well-arranged plantations are more fully appreciated; and more attention is paid to the principles of forest conservancy both at home and abroad. In all thickly peopled countries the forests have long ceased to supply the necessities of the inhabitants by natural reproduction; and it has become needful to form plantations either by government or by private enterprise, for the growth of timber, and in some cases for climatic amelioration. This subject is, however, dealt with more fully under FORESTS AND FORESTRY (*q.v.*); and the separate articles on the various sorts of tree may be consulted for details as to each.

ARBOR VITAE (Tree of Life), a name given by Clusius to species of *Thuja*. The name *Thuja*, which was adopted by Linnaeus from the *Thuya* of Tournefort, seems to be derived from the Greek word *θύος*, signifying sacrifice, probably because the resin procured from the plant was used as incense. The plants belong to the natural order Coniferae, tribe Cupressineae (Cypresses). *Thuja occidentalis* is the Western or American arbor vitae, the *Cupressus Arbor Vitae* of old authors. It is a native of North America, and ranges from Canada to the mountains of Virginia and Carolina. It is a moderate-sized tree, and was introduced into Britain before 1597, when it was mentioned in Gerard's *Herbal*. In its native country it attains a height of about 50 ft. The leaves are small and imbricate, and are borne on flattened branches, which are apt to be mistaken for the leaves. When bruised the leaves give out an aromatic odour. The flowers appear early in spring, and the fruit is ripened about the end of September. In Britain the plant is a hardy evergreen, and can only be looked upon as a large shrub or low tree. It is often cut so as to form hedges in gardens. The wood is very durable and useful for outdoor work, such as fencing, posts, etc. Another species of arbor vitae is *Thuja orientalis*, known also as *Biota orientalis*. The latter generic name is derived from the Greek adjective *βιωτός*, formed from *βίος*, life, probably in connexion with the name "tree of life." This is the Eastern or Chinese arbor vitae. It is a native of China. It was cultivated in the Chelsea Physick Garden in 1752, and was believed to have been sent to Europe by French missionaries. It has roundish cones, with numerous scales and wingless seeds. The leaves, which have a pungent aromatic odour, are said to yield a yellow dye. There are numerous varieties of this plant in cultivation, one of the most remarkable of which is the variety *pendula*, with long, flexible, hanging, cord-like branches; it was discovered in Japan about 1776 by Carl Peter Thunberg, a pupil of Linnaeus, who made valuable collections at the Cape of Good Hope, in the Dutch East Indies and in Japan. The variety *pygmaea* forms a small bush a few inches high.

Thuja gigantea, the red or canoe cedar, a native of north-western America from southern Alaska to north California, is the finest species, the trunk rising from a massive base to the height of 150 to 200 ft. It was not introduced to Britain till 1853. It is one of the handsomest of conifers, forming an elongated cone of foliage, which in some gardens has already reached 70 or 80 ft. in height. It thrives in most kinds of soils. The timber is easily worked and used for construction, especially where exposed to the weather.

ARBOS, FERNANDEZ (1863–), Spanish violinist and composer, was born in Madrid, and trained at the conservatoire there, and later at Brussels and at Berlin under Joachim. He became a professor at Hamburg and then at Madrid, becoming

famous meanwhile as one of the finest violinists of the day; and after visiting England in 1890 and establishing his reputation there, he became professor at the Royal College of Music in London. As a composer he is best known by his violin pieces, and by a comic opera, *El Centro de la Tierra* (1895).

ARBOUR, or ARBOR (originally "herber" or "erber," O. Fr. *herbier*, from Lat. *herbarium*, a collection of herbs, *herba*, grass; the word came to be spelt "arber" through its pronunciation, as in the case of Derby, and by the 16th century was written "arbour," helped by a confusion of derivation from Lat. *arbor*, a tree, and by change of meaning), a grass-plot or lawn, a herb-garden, or orchard, and a shady bower of interlaced trees, or climbing plants trained on lattice-work. The application of the word has shifted from the grass-covered ground, the proper meaning, to the covering of trees overhead. "Arbor" (from the Latin for "tree") is a term applied to the spindle of a wheel, particularly in clock-making.

ARBROATH, or ABERBROTHOCK, a royal, municipal and police burgh, and seaport of Forfarshire, Scotland. It is situated at the mouth of Brothock water, 17 m. N.E. of Dundee by the North British railway, which has a branch to Forfar, via Guthrie, on the Caledonian railway. Pop. (1891) 22,821; (1901) 22,398. The town is under the jurisdiction of a provost, bailies and council, and, with Brechin, Forfar, Inverbervie and Montrose, returns one member to parliament. The leading industries include the manufacture of sailcloth, canvas and coarse linens, tanning, boot and shoe making, and bleaching, besides engineering works, iron foundries, chemical works, shipbuilding and fisheries. The harbour, originally constructed and maintained by the abbots, by an agreement between the burgesses and John Gedy, the abbot in 1394, was replaced by one more commodious in 1725, which in turn was enlarged and improved in 1844. The older portion was converted into a wet dock in 1877, and the entrance and bar of the new harbour were deepened. A signal tower, 50 ft. high, communicates with the Bell Rock (*q.v.*) lighthouse on the Inchcape Rock, 12 m. south-east of Arbroath, celebrated in Southey's ballad. The principal public buildings are the town-hall, a somewhat ornate market house, the gildhall, the public hall, the infirmary, the antiquarian museum (including some valuable fossil remains) and the public and mechanics' libraries. The parish church dates from 1570, but has been much altered, and the spire was added in 1831. The ruins of a magnificent abbey, once one of the richest foundations in Scotland, stand in High Street. It was founded by William the Lion in 1178 for Tironesian Benedictines from Kelso, and consecrated in 1197, being dedicated to St Thomas Becket, whom the king had met at the English court. It was William's only personal foundation, and he was buried within its precincts in 1214. Its style was mainly Early English, the western gable Norman. The cruciform church measured 276 ft. long by 160 ft. wide, and was a structure of singular beauty and splendour. The remains include the vestry, the southern transept (the famous rose window of which is still entire), part of the chancel, the southern wall of the nave, part of the entrance towers and the western doorway. It was here that the parliament met which on the 6th of April 1320 addressed to the pope the notable letter, asserting the independence of their country and reciting in eloquent terms the services which their "lord and sovereign" Robert Bruce had rendered to Scotland. The last of the abbots was Cardinal Beaton, who succeeded his uncle James when the latter became archbishop of St Andrews. At the Reformation the abbey was dismantled and afterwards allowed to go to ruin. Part of the secular buildings still stand, and the abbot's house, or Abbey House as it is now called, is inhabited. Arbroath was created a royal burgh in 1186, and its charter of 1599 is preserved. King John exempted it from "toll and custom" in every part of England excepting London. Arbroath is "Fairport" of Scott's *Antiquary*, and Auchmithie, 3 m. north-east ("Musselcrag" of the same romance), is a quaint old-fashioned place, where the men earn a precarious living by fishing. On each side of the village the coast scenery is remarkably picturesque, the rugged cliffs—reaching in the promontory of Red Head, the scene of a thrilling incident in the *Antiquary*, a height of 267 ft.—containing many curiously shaped caves and archways which attract large numbers of visitors. At the 14th-century church of St Vigeans, 1 m. north of Arbroath, stands one of the most interesting of the sculptured stones of Scotland, with what is thought to be the only legible inscription in the Pictish tongue. The parish—originally called Aberbrothock and now incorporated with Arbroath for administrative purposes—takes its name from a saint or hermit whose chapel was situated at Grange of Conon, 3½ m. north-west. Two miles west by south are the quarries of Carmyllie, the terminus of a branch line from Arbroath, which was the first light railway in Scotland and was opened in 1900.

ARBUTHNOT, ALEXANDER (1538–1583), Scottish ecclesiastic and poet, educated at St Andrews and Bourges, was in 1569 elected principal of King's College, Aberdeen, which office he retained until his death. He played an active part in the stirring church politics of the period, and was twice moderator of the kirk, and a member of the commission of inquiry into the condition of the university of St Andrews (1583). The "correctness" of his attitude on all public questions won for him the commendation of Catholic writers; he is not included in Nicol Burne's list of "periurit apostatis"; but his policy and influence were misliked by James VI., who, when the Assembly had elected Arbuthnot to the charge of the church of St Andrews, ordered him to return to his duties at King's College. He had been for some time minister of Arbuthnott in Kincardineshire. His extant works are (*a*) three poems, "The Praises of Wemen" (224 lines), "On Luve" (10 lines), and "The Miseries of a Pure Scholar" (189 lines), and (*b*) a Latin account of the Arbuthnot family, *Originis et Incrementi Arbuthnoticae Familiae Descriptio Historica* (still in MS.), of which an English continuation, by the father of Dr John Arbuthnot, is preserved in the Advocates' Library, Edinburgh. The praise of the fair sex in the first poem is exceptional in the literature of his age; and its geniality may help us to understand the author's popularity with his contemporaries. Arbuthnot must not be confused with his contemporary and namesake, the Edinburgh printer, who produced the first edition of Buchanan's *History of Scotland* in 1582. Some have discovered in the publication of this work a false clue to James's resentment against the principal of King's College.

The particulars of Arbuthnot's life are found in Calderwood, Spottiswood, and other Church historians, and in Scott's *Fasti Ecclesiae Scoticanae*. The poems are printed in Pinkerton's *Ancient Scottish Poems* (1786), i. pp. 138-155.

ARBUTHNOT, JOHN (1667–1735), British physician and author, was born at Arbuthnott, Kincardineshire, and baptized on the 29th of April 1667. His father, Alexander Arbuthnot, was an episcopalian minister who was deprived of his living in 1689 by his patron, Viscount Arbuthnott, for refusing to conform to the Presbyterian system. After his death, in 1691, John went to London, where he lived in the house of a learned linen-draper, William Pate, and supported himself by teaching mathematics. In 1692 he published *Of the Laws of Chance* . . . , based on the Latin version, *De Ratociniis in ludo aleae*, of a Dutch treatise by Christiaan Huygens. In 1692 he entered University College, Oxford, as a fellow-commoner, acting as private tutor to Edward Jefferys; and in 1696 he graduated M.D. at St Andrews university. In *An Examination of Dr Woodward's Account of the Deluge* (1697) he confuted an extraordinary theory advanced by Dr William Woodward. An *Essay on the Usefulness of Mathematical Learning* followed in 1701, and in 1704 he became a fellow of the Royal Society. He had the good fortune to be called in at Epsom to prescribe for Prince George of Denmark, and in 1705 he was made physician extraordinary to Queen Anne. Four years later he became royal physician in ordinary, and in 1710 he was elected fellow of the Royal College of Physicians. Arbuthnot's ready wit and varied learning made him very valuable to the Tory party. He was a close friend of Jonathan Swift and of Alexander Pope, and Lord Chesterfield says that even the generous acknowledgment they made of his assistance fell short of their real indebtedness. He had no jealousy of his fame as an author, and his abundant imagination was always

at the service of his friends. In 1712 appeared "Law is a Bottomless Pit, Exemplify'd in the case of the Lord Strutt, John Bull, Nicholas Frog and Lewis Baboon, who spent all they had in a law-suit. Printed from a Manuscript found in the Cabinet of the famous Sir Humphrey Polesworth." This was the first of a series of five pamphlets advocating the conclusion of peace. Arbuthnot describes the confusion after the death of the Lord Strutt (Charles II. of Spain), and the quarrels between the greedy tradespeople (the allies). These put their cause into the hands of the attorney, Humphrey Hocus (the duke of Marlborough), who does all he can to prolong the struggle. The five tracts are printed in two parts as the "History of John Bull" in the *Miscellanies in Prose and Verse* (1727, preface signed by Pope and Swift). Arbuthnot fixed the popular conception of John Bull, though it is not certain that he originated the character, and the lively satire is still amusing reading. It was often asserted at the time that Swift wrote these pamphlets, but both he and Pope refer to Arbuthnot as the sole author. In the autumn of the same year he published a second satire, "Proposals for printing a very Curious Discourse in Two Volumes in Quarto, entitled, Ψευδολογία Πολιτική; or, A Treatise of the Art of Political Lying," best known by its sub-title. This ironical piece of work was not so popular as "John Bull." "'Tis very pretty," says Swift, "but not so obvious to be understood." Arbuthnot advises that a lie should not be contradicted by the truth, but by another judicious lie. "So there was not long ago a gentleman, who affirmed that the treaty with France for bringing popery and slavery into England was signed the 15th of September, to which another answered very judiciously, not by opposing truth to his lie, that there was no such treaty; but that, to his certain knowledge, there were many things in that treaty not yet adjusted."

Arbuthnot was one of the leading spirits in the Scriblerus Club, the members of which were to collaborate in a universal satire on the abuses of learning. *The Memoirs of the extraordinary Life, Works, and Discoveries of Martinus Scriblerus*, of which only the first book was finished, first printed in Pope's *Works* (1741), was chiefly the work of Arbuthnot, who is at his best in the whimsical account of the birth and education of Martin. Swift, writing on the 3rd of July 1714 to Arbuthnot, says:—"To talk of Martin in any hands but yours, is a folly. You every day give better hints than all of us together could do in a twelvemonth: and to say the truth, Pope who first thought of the hint has no genius at all to it, to my mind; Gay is too young: Parnell has some ideas of it, but is idle; I could put together, and lard, and strike out well enough, but all that relates to the sciences must be from you."

The death of Queen Anne put an end to Arbuthnot's position at court, but he still had an extensive practice, and in 1727 he delivered the Harveian oration before the Royal College of Physicians. Lord Chesterfield and William Pulteney were his patients and friends; also Mrs Howard (Lady Suffolk) and William Congreve. His friendship with Swift was constant and intimate; he was friend and adviser to Gay; and Pope wrote (2nd of August 1734) that in a friendship of twenty years he had found no one reason of complaint from him. Arbuthnot's youngest son, who had just completed his education, died in December 1731. He never quite recovered his former spirits and health after this shock. On the 17th of July 1734 he wrote to Pope: "A recovery in my case, and at my age, is impossible; the kindest wish of my friends is Euthanasia." In January 1735 was published the "Epistle to Dr Arbuthnot," which forms the prologue to Pope's satires. He died on the 27th of February 1735 at his house in Cork Street, London.

Among Arbuthnot's other works are:—*An Argument for Divine Providence, taken from the constant regularity observed in the Births of both sexes* (Phil. Trans. of the Royal Soc., 1710); "Virgilius Restauratus," printed in the second edition of Pope's *Dunciad* (1729); *An Essay concerning the Effects of Air on Human Bodies* (1733); *An Essay concerning the Nature of Ailments . . .* (1731); and a valuable *Table of Ancient Coins, Weights and Measures* (1727), which is an enlargement of an earlier treatise (1705). He had a share in the unsuccessful farce of *Three Hours after Marriage*, printed with Gay's name on the title-page (1717). Some pieces printed in *A Supplement to Dr Swift's and Mr Pope's Works . . .* (1739) are there asserted to be Arbuthnot's. *The Miscellaneous Works of the late Dr Arbuthnot* were published at Glasgow in an unauthorized edition in 1751. This includes many spurious pieces.

See *The Life and Works of John Arbuthnot* (1892), by George A. Aitken.

ARCACHON, a coast town of south-western France, in the department of Gironde, 37 m. W.S.W. of Bordeaux on the Southern railway. Pop. (1906) 9006. Arcachon is situated on the southern border of the lagoon of Arcachon at the foot of dunes covered with splendid pine-woods. It comprises two distinct parts, the summer town, extending for 2½ m. along the shore, and bordered by a firm sandy beach, frequented by bathers, and the winter town, farther inland, consisting of numerous villas scattered amongst the pines.

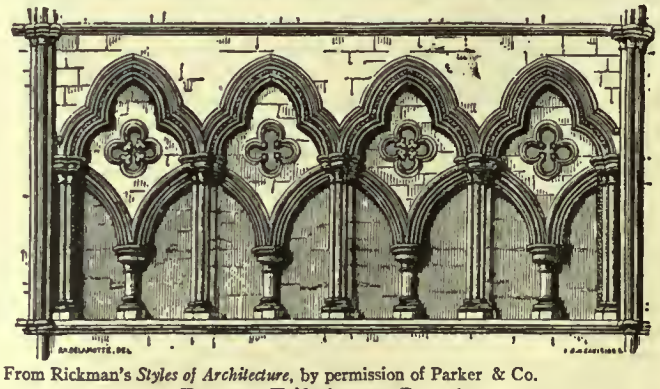
Owing to the mildness of its climate the winter town is a resort for consumptive patients. The principal industries are oyster-breeding, which is conducted on a very large scale, and fishing. The port has trade with Spain and England.

ARCADE, in architecture, a range of arches, supported either by columns or piers; isolated in the case of those separating the nave of a church from the aisles, or forming the front of a covered ambulatory, as in the cloisters in Italy and Sicily, round the Ducal Palace or the Square of St Mark's, Venice, round the courts of the palaces in Italy, or in Paris round the Palais-Royal and the Place des Vosges. The earliest examples known are those of the Tabularium, the theatre of Marcellus, and the Colosseum, in Rome. In the palace of Diocletian at Spalato the principal street had an arcade on either side, the arches of which rested direct on the capital without any intervening

FIG. 1.—Arcade, Westminster Abbey.

FIG. 2.—Arcade, St John's, Devizes.

entablature or impost block. The term is also applied to the galleries, employed decoratively, on the façades of the Italian churches, and carried round the apses where they are known as eaves-galleries. Sometimes these arcades project from the wall sufficiently to allow of a passage behind, and sometimes they are



From Rickman's *Styles of Architecture*, by permission of Parker & Co.

FIG. 3.—Triforium at Beverley.

built into and form part of the wall; in the latter case, they are known as blind or wall arcades; and they were constantly employed to decorate the lower part of the walls of the aisles and the choir-aisles in English churches. Externally, blind arcades are more often found in Italy and Sicily, but there are examples in

England at Canterbury, Ely, Peterborough, Norwich, St John's (Chester), Colchester and elsewhere. Internally, the oldest example is that of the old refectory in Westminster Abbey (fig. 1). Sometimes the design is varied with interlacing arches as in St John's, Devizes (fig. 2), and Beverley Minster (fig. 3). In Sicily and the south of Italy these interlacing arcades are the special characteristic of the Saracenic work there found, and their origin may be found in the interlaced arches of the Mosque of Cordova in Spain. In the cathedral of Palermo and at Monreale they are carried round the apses at the east end. At Caserta-Vecchia, in South Italy, they decorate the lantern over the crossing, and at Amalfi the turrets on the north-west campanile.

The term is also applied to the covered passages which form thoroughfares from one street to another, as in the Burlington Arcade, London; in Paris such an arcade is usually called *passage*, and in Italy *galleria*. (R. P. S.)

ARCADELT, or ARCHADELT, **JACOB** (*c.* 1514–*c.* 1556), a Netherlands composer, of the early part of the Golden Age. In 1539 he left a position at Florence to teach the choristers of St Peter's, Rome, and became one of the papal singers in 1540. He was a prolific church composer, but the works published in his Italian time consist entirely of madrigals, five books of which, published at Venice, probably gave a great stimulus to the beginnings of the Venetian school of composition. In 1555 he left Italy and entered the service of Cardinal Charles of Lorraine, duke of Guise, and after this published three volumes of masses, besides contributing motets to various collections. The *Ave Maria*, ascribed to him and transcribed as a pianoforte piece by Liszt, does not seem to be traced to an earlier source than its edition by Sir Henry Bishop, which has possibly the same kind of origin in Arcadelt as the hymn tune "Palestrina" has in the delicate and subtle *Gloria* of Palestrina's *Magnificat Quinti Toni*, the fifth in his first *Book of Magnificats*.

ARCADIA, a district of Greece, forming the central plateau of Peloponnesus. Shut off from the coast lands on all sides by mountain barriers, which rise in the northern peaks of Erymanthus (mod. *Olonos*) to 7400, of Cyllene (Ziria) to 7900, in the southern corner buttresses of Parthenium and Lycaeum to more than 5000 ft., this inland plateau is again divided by numerous subsidiary ranges. In eastern or "locked" Arcadia these heights run in parallel courses intersected by cross-ridges, enclosing a series of upland plains whose waters have no egress save by underground channels or *zerethra*. The western country is more open, with isolated mountain-groups and winding valleys, where the Alpheus with its tributaries the Ladon and Erymanthus drains off in a complex river-system the overflow from all Arcadia. The ancient inhabitants were a nation of shepherds and huntsmen, worshipping Pan, Hermes and Artemis, primitive nature-deities. The difficulties of communication and especially the lack of a seaboard seriously hindered intercourse with the rest of Greece. Consequently the same population, whose origins Greek tradition removed back into the world's earliest days, held the land throughout historic times, without even an admixture of Dorian immigrants. Their customs and dialect persisted, the latter maintaining a peculiar resemblance to that of the equally conservative Cypriotes. Thus Arcadia lagged behind the general development of Greece, and its political importance was small owing to chronic feuds between the townships (notably between Mantineia and Tegea) and the readiness of its youth for mercenary service abroad.

The importance of Arcadia in Greek history was due to its position between Sparta and the Isthmus. Unable to force their way through Argolis, the Lacedaemonians early set themselves to secure the passage through the central plateau. The resistance of single cities, and the temporary union of the Arcadians during the second Messenian war, did not defer the complete subjugation of the land beyond the 6th century. In later times revolts were easily stirred up among individual cities, but a united national movement was rarely concerted. Most of these rebellions were easily quelled by Sparta, though in 469 and again in 420 the disaffected cities, backed by Argos, formed a dangerous coalition and came near to establishing their independence. A more whole-hearted attempt at union in 371 after the battle of Leuctra resulted in the formation of a political league out of an old religious synod, and the foundation of a federal capital in a commanding strategic position (see MEGALOPOLIS). But a severe defeat at the hands of Sparta in 368 (the "tearless battle") and the recrudescence of internal discord soon paralysed this movement. The new fortress of Megalopolis, instead of supplying a centre of national life, merely accentuated the mutual jealousy of the cities. During the Hellenistic age Megalopolis stood staunchly by Macedonia; the rest of Arcadia rebelled against Antipater (330, 323) and Antigonus Gonatas (266). Similarly the various cities were divided in their allegiance between the Achaean and the Aetolian leagues, with the result that Arcadia became the battleground of these confederacies, or fell a prey to Sparta and Macedonia. These conflicts seem to have worn out the land, which already in Roman times had fallen into decay. An influx of Slavonic settlers in the 8th century A.D. checked the depopulation for a while, but Arcadia suffered severely from the constant quarrels of its Frankish barons (1205–1460). The succeeding centuries of Turkish rule, combined with an Albanian immigration, raised the prosperity of the land, but in the Wars of Independence the strategic importance of Arcadia once more made it a centre of conflict. In modern times the population remains sparse, and pending the complete restoration of the water conduits the soil is unproductive. The modern department of Arcadia extends to the Gulf of Nauplia with a sea-coast of about 40 m.

AUTHORITIES.—Strabo pp. 388 sq.; Pausanias viii.; W. M. Leake, *Travels in the Morea* (London, 1830), chs. iii., iv., xi.-xviii., xxiii.-xxvi.; E. Curtius, *Peloponnesos* (Gotha, 1851), i. 153-178; H. F. Tozer, *Geography of Greece* (London, 1873), pp. 287-292; E. A. Freeman, *Federal Government* (ed. 1893, London), ch. iv. § 3; B. V. Head, *Historia Numorum* (Oxford, 1887), pp. 372-373; B. Niese in *Hermes* (1899), pp. 520 f. (M. O. B. C.)

ARCADIUS (378–408), Roman emperor, the elder son of Theodosius the Great, was created Augustus in 383, and succeeded his father in 395 along with his brother Honorius. The empire was divided between them, Honorius governing the two western prefectures (Gaul and Italy), Arcadius the two eastern (the Orient and Illyricum). Both were feeble, and, in Gibbon's phrase, slumbered on their thrones, leaving the government to others. Arcadius submitted at first to the guidance of the praetorian prefect Rufinus, and, after his murder (end of 395) by the troops, to the counsels of the eunuch Eutropius (executed end of 399). His consort Eudoxia (daughter of a Frank general, Bauto), a woman of strong will, exercised great influence over him; she died in 404. In the last year of his reign, Anthemius (praetorian prefect) was the chief adviser and support of the throne. The first years of the reign were marked by the ravaging of the Greek peninsula by the West Goths under Alaric (*q.v.*) in 395–396. The movement of the Goth Gainas (who held the post of master of soldiers) in 399–400 is less famous but was more dangerous. At that time there were two rival political parties at Constantinople, the "Roman" party led by Aurelian (son of Taurus), praetorian prefect, and supported by the empress and a Germanizing and Arianizing party led by Aurelian's brother (possibly Caesarius, praetorian prefect in 400). Gainas entered into a close league with the latter; fomented a Gothic rebellion in Phrygia; and forced the emperor to put Eutropius to death. For some months he and the party which he supported were supreme in Constantinople. He was, however, finally forced to leave, and having plundered for some time in Thrace was captured and killed by the loyal Goth Fravitta. The Roman party recovered its power; Aurelian was again praetorian prefect in 402; and the Germanization which was to befall the western world was averted from the east. Another important question was decided in this reign, the relation of the patriarch of Constantinople to the emperor. The struggle between the court and the patriarch John Chrysostom (*q.v.*), who assumed an independent attitude and gravely offended the empress by his sermons against the worldliness and frivolity of the court, with open allusions to herself, resulted in his fall and exile (404). This virtually determined the subordination of the patriarch

of Constantinople to the emperor. The rivalry of the see of Alexandria with Constantinople was also displayed in the contest, Theophilus, patriarch of Alexandria, assisting the court in bringing about the fall of Chrysostom. Throughout the reign of Arcadius there was estrangement and jealousy between the two brothers or their governments. The principal ground of this hostility was probably dissatisfaction on both sides with the territorial partition. The line had been drawn east of Dalmatia. The ministers of Arcadius desired to annex Dalmatia to his portion, while the general Stilicho, who was supreme in the west, wished to wrest from the eastern realm the prefecture of Illyricum or a considerable part of it. His designs were unsuccessful, and during the reign of Theodosius II., son of Arcadius (who died in 408), Dalmatia was transferred to the dominion of the eastern ruler.

AUTHORITIES.—Ancient: Fragments of Eunapius and Olympiodorus (in Müller's *Fragmenta Historicorum Graecorum*, vol. iv.); fragments of Philostorgius, Socrates, Sozomen, Zosimus, Synesius of Cyrene (" The Egyptian "), Claudian. Modern: Gibbon's *Decline and Fall*, vol. iii., ed. Bury; J. B. Bury, *Later Roman Empire*, vol. i. (1889); T. Hodgkin, *Italy and her Invaders*, vol. i. (ed. 2, 1892); Güldenpenning, *Geschichte des oströmischen Reiches unter den Kaisern Arcadius und Theodosius II.* (1885).

ARCADIUS, of Antioch, Greek grammarian, flourished in the 2nd century A.D. According to Suidas, he wrote treatises on orthography and syntax, and an onomaticon (vocabulary), described as a wonderful production. An epitome of the great work of Herodian on general prosody in twenty books, wrongly attributed to Arcadius, is probably the work of Theodosius of Alexandria or a grammarian named Aristodemus. This epitome (Περὶ Τόνων) only includes nineteen books of the original work; the twentieth is the work of a forger of the 16th century. Although meagre and carelessly put together, it is valuable, since it preserves the order of the original and thus affords a trustworthy foundation for its reconstruction.

Text by Barker, 1823; Schmidt, 1860; see also Galland, *De Arcadii qui fertur libro de accentibus* (1882).

ARCELLA (C. G. Ehrenberg), a genus of lobose Rhizopoda, characterized by a chitinous plano-convex shell, the circular aperture central on the flat ventral face, and more than one nucleus and contractile vacuole. It can develop vacuoles, or rather fine bubbles of carbonic acid gas in its cytoplasm, to float up to the surface of the water.

ARCESILAUS (316–241 B.C.), a Greek philosopher and founder of the New, or Middle, Academy (see ACADEMY, GREEK). Born at Pitane in Aeolis, he was trained by Autolycus, the mathematician, and later at Athens by Theophrastus and Crantor, by whom he was led to join the Academy. He subsequently became intimate with Polemon and Crates, whom he succeeded as head of the school. Diogenes Laertius says that he died of excessive drinking, but the testimony of others (*e.g.* Cleanthes) and his own precepts discredit the story, and he is known to have been much respected by the Athenians. His doctrines, which must be gathered from the writings of others (Cicero, *Acad.* i. 12, iv. 24; *De Orat.* iii. 18; Diogenes Laertius iv. 28; Sextus Empiricus, *Adv. Math.* vii. 150, *Pyrrh. Hyp.* i. 233), represent an attack on the Stoic φαντασία καταληπτική (*Criterion*) and are based on the sceptical element (see SCEPTICISM) which was latent in the later writings of Plato. He held that strength of intellectual conviction cannot be regarded as valid, inasmuch as it is characteristic equally of contradictory convictions. The uncertainty of sensible *data* applies equally to the conclusions of reason, and therefore man must be content with *probability* which is sufficient as a practical guide. " We know nothing, not even our ignorance "; therefore the wise man will be content with an agnostic attitude. He made use of the Socratic method of instruction and left no writings. His arguments were marked by incisive humour and fertility of ideas.

See R. Brodeisen, *De Arcesila philosopho* (1821); Aug. Geffers, *De Arcesila* (1842); Ritter and Preller, *Hist. philos. graec.* (1898); Ed. Zeller, *Phil. d. Griech.* (iii. 1448); and general works under SCEPTICISM.

ARCH, JOSEPH (1826–), English politician, founder of the National Agricultural Labourers' Union, was born at Barford, a village in Warwickshire, on the 10th of November 1826. His parents belonged to the labouring class. He inherited a strong sentiment of independence from his mother; and his objections to the social homage expected by those whom the catechism boldly styled his " betters " made him an " agitator." Having educated himself by unremitting exertions, and acquired fluency of speech as a Methodist local preacher, he founded in 1872 the National Agricultural Labourers' Union, of which he was president. A rise then came in the wages of agricultural labourers, but this had the unforeseen effect of destroying the union; for the labourers, deeming their object gained, ceased to " agitate." Mr Arch nevertheless retained sufficient popularity to be returned to parliament for north-west Norfolk in 1885; and although defeated next year owing to his advocacy of Irish Home Rule, he regained his seat in 1892, and held it in 1895, retiring in 1900. He was deservedly respected in the House of Commons; seldom has an agitator been so little of a demagogue.

A biography written by himself or under his direction, and edited by Lady Warwick (1898), tells the story of his career.

ARCH,[1] in building, a constructional arrangement of blocks of any hard material, so disposed on the lines of some curve that they give mutual support one to the other.

The blocks, which are technically known as voussoirs, should be of a wedge shape, the centre or top block (see fig. 1, A) being the keystone A; the lower blocks B B which rest on the supporting pier are the springers, the upper surface of which is called the

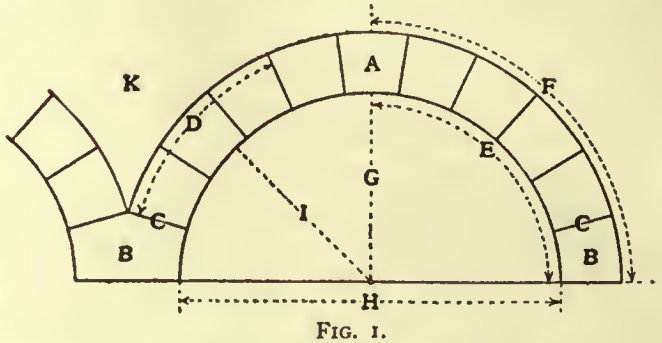


FIG. 1.

skewback, C C; the side blocks, as D, are termed the haunches. The lower surface or soffit of the arch is the intrados, E, and the upper surface the extrados, F. The rise of the arch is the distance from the springing to the soffit, G, the width between the springers is called the span, H, and the radius I. The triangular spaces between the arches are termed spandrils, K.

The arch is employed for two purposes:—(1) to span an opening in a wall and support the superstructure; (2) when continuous to form a vault known as a barrel or waggon vault.

The arch has been used from time immemorial by every nation, but owing to the tendency of the upper portion to sink, especially when bearing any superincumbent weight, it requires strong lateral support, and it is for this reason that in the earliest examples in unburnt brick at Nippur in Chaldaea, *c.* 4000 B.C., and at Rakākna (Requaqna) and Dendera in Egypt, 3500–3000 B.C., it was employed only below the level of the ground which served as an abutment on either side.

In the building of an arch, the voussoirs have to be temporarily

[1] The ultimate derivation of " arch " is the Latin *arcus*, a bow, or arch, in origin meaning something bent, from which through the French is also derived " arc," a curve. In French there are two words *arche*, one meaning a chest or coffer, from Latin *arca* (*arcere*, to keep close), hence the English " ark "; the other meaning a vaulted arch, such as that of a bridge, and derived from a Low Latin corruption of *arcus*, into *arca* (du Cange, *Glossarium*, s.v.). The word " arch," prefixed to names of offices, seen in " archbishop," " archdeacon," " archduke," &c., means " principal " or " chief," and comes from the Greek prefix ἀρχ- or ἀρχι- from ἄρχειν, to begin, lead, or rule; it is also prefixed to other words, and usually with words implying hatred or detestation, such as " arch-fiend ", " arch-scoundrel "; it is from an adaptation of this use, as seen in such expressions as " arch-rogue," extended to " arch-look," " arch-face," that the word comes to mean a mischievous, roguish expression of face or demeanour.

supported, until the keystone is inserted. This at the present day is effected by means of centreing an assemblage of timbers framed together, with its upper surface of the same form as the arch required; the voussoirs are laid on the centreing till the ring of the arch is completed. In the case of arches of small span, such as the early examples referred to, limited to about 6 ft., such centreing might be dispensed with in various ways, but it is difficult to see how the arches of the great entrance gateways, shown in the Assyrian bas-reliefs, could have been built without temporary support of some kind. In those days, when any amount of labour could be obtained, even the erection of a temporary wall might have been less costly than the employment of timber, of which there was great scarcity.

The Assyrian tradition would seem to have descended first to the Parthian builders, who in the palace of El Hadr built semicircular arches with regular voussoirs decoratively treated. The Sassanians who followed them employed the elliptical or egg-shaped arch, of which the lower part was built in horizontal courses up to about one-third of the height, which lessened the span of the arched portion.

In Europe the earliest arches were those built by the Etruscans, either over canals (see article ARCHITECTURE: *Etruscan*), or in the entrance gateways of their towns. The skew-arch in the gateway at Perugia shows great knowledge in its execution. From the Etruscans the adoption of the arch passed to the Romans, who certainly employed centreing of some kind, but always economized its use, as is clearly shown by Choisy. Although their walls from the Augustan age were built in concrete, arches of brick were always turned over their entrance doorways, sometimes in two or three rings. The Romans utilized the arch in other ways, sometimes burying it in their concrete construction, as in their vaults, and sometimes introducing it as a veneer only, as in the Pantheon. In their monumental structures in stone, the arch was sometimes built with regular voussoirs, *i.e.* with a semicircular extrados, and sometimes with the joint carried far beyond. The latter was not done in the early examples of the Tabularium and the Theatre of Marcellus, but in the Colosseum and all the arches of triumph the joints run through the spandrils, notwithstanding the recognition of the arch proper by its moulded archivolt.

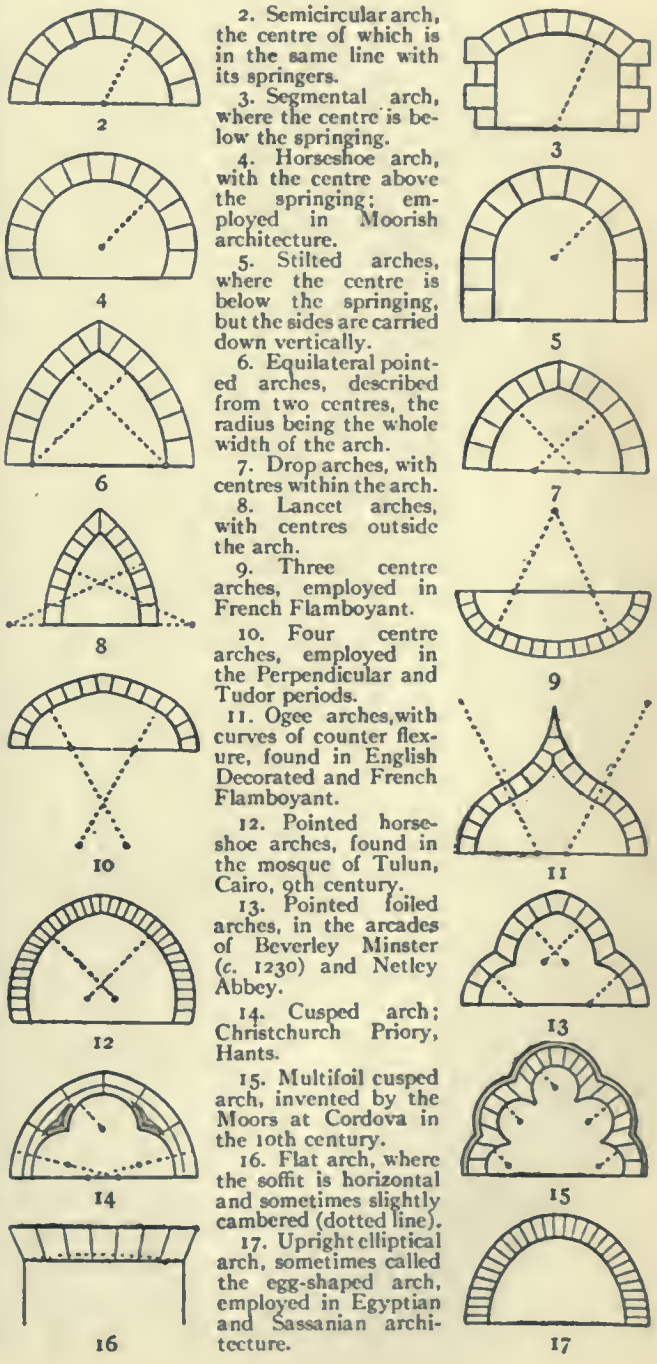
Although the value of the pointed arch as a stronger constructional feature than the semicircular (owing to the tendency to sink in the keystone of the latter) had been recognized by the Assyrian builders, who employed it in their drains, it was not used systematically as an architectural feature till the 9th century, in the mosque of Tulun at Cairo; it seems to have been regarded by the Mahommedans as an emblem of their faith, and its use spread through Syria to Persia, was brought to Sicily from Egypt, and was taken back by the Sicilian masons to Palestine and employed throughout the Crusaders' churches during the 12th century. As the pointed arch had already, for constructional reasons, been employed in Périgord from the commencement of the 11th century, it does not follow that the Crusaders brought it from Palestine, but there is no doubt that its universal employment in France early in the 12th century may have been partly due to its adoption in the Crusaders' churches. At first in Gothic work both the semicircular and pointed arches were used simultaneously in the same building, the larger arches being pointed, the smaller ones and windows being semicircular. The great value of the pointed arch in vaulting is described in the article VAULT.

We have suggested that the pointed arch became an emblem of Mahommedan faith, and it was introduced in India but not as a constructive feature, for the Hindus objected to the arch, which they say *never sleeps*, meaning that it is always exerting a thrust which tends to its destruction. In India therefore it was built in horizontal courses with vertical slabs leaning against one another to form the apex. The Moors of north Africa, however, never employed it, preferring the horseshoe arch which they brought into Spain and developed in the mosque of Cordova. In the additions made to this mosque the prayer chamber was enriched by the caliph Mansur, who, to eke out the height, raised arch upon arch. In the Alhambra it appears in the decorative plaster work, and travels northwards into the south of France, where at Le Puy and elsewhere it is found decorating doorways and windows; in England it was employed towards the end of the 12th century.

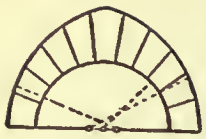
About the middle of the 14th century at Gloucester the four-centred pointed arch was introduced, which became afterwards the leading characteristic feature of the Tudor style. In France they adopted the three-centred arch in the 15th century.

The ogee arch was the natural result of the development of tracery in the commencement of the 14th century, and in Gloucester (about 1310) the foliations were run one into the other without the enclosing circles. About the middle of the 14th century, in the arcade of the first storey of the ducal palace in Venice, flowing tracery is found, from which the ogee arch there was probably derived, as throughout Venice it becomes the favourite feature in domestic architecture of that and the succeeding century.

The arches are of various forms as follows:—



2. Semicircular arch, the centre of which is in the same line with its springers.
3. Segmental arch, where the centre is below the springing.
4. Horseshoe arch, with the centre above the springing; employed in Moorish architecture.
5. Stilted arches, where the centre is below the springing, but the sides are carried down vertically.
6. Equilateral pointed arches, described from two centres, the radius being the whole width of the arch.
7. Drop arches, with centres within the arch.
8. Lancet arches, with centres outside the arch.
9. Three centre arches, employed in French Flamboyant.
10. Four centre arches, employed in the Perpendicular and Tudor periods.
11. Ogee arches, with curves of counter flexure, found in English Decorated and French Flamboyant.
12. Pointed horseshoe arches, found in the mosque of Tulun, Cairo, 9th century.
13. Pointed foiled arches, in the arcades of Beverley Minster (*c.* 1230) and Netley Abbey.
14. Cusped arch; Christchurch Priory, Hants.
15. Multifoil cusped arch, invented by the Moors at Cordova in the 10th century.
16. Flat arch, where the soffit is horizontal and sometimes slightly cambered (dotted line).
17. Upright elliptical arch, sometimes called the egg-shaped arch, employed in Egyptian and Sassanian architecture.



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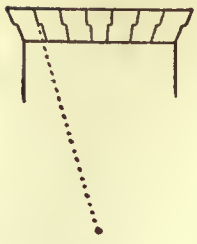
18. The Tuscan arch, where the extrados takes the form of a pointed arch.

19. The joggled arch used in medieval chimneypieces and in Mahommedan architecture.



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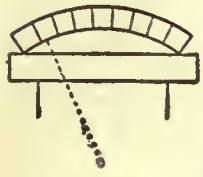
20. The discharging or relieving arch, built above the architrave or lintel to take off the weight of the superstructure.



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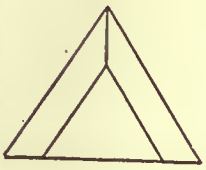
21. The relieving arch as used in Egypt, in the pyramid of Cheops; and in Saxon architecture, where it was built with Roman bricks or tiles, or consisted of two sloping slabs of stone.



21

(R. P. S.)

ARCHAEOLOGY (from Gr. ἀρχαῖα, ancient things, and λόγος, theory or science), a general term for the study of antiquities. The precise application of the term has varied from time to time with the progress of knowledge, according to the character of the subjects investigated and the purpose for which they were studied. At one time it was thought improper to use it in relation to any but the artistic remains of Greece and Rome, *i.e.* the so-called *classical archaeology* (now dealt with in this encyclopaedia under the headings of GREEK ART and ROMAN ART); but of late years it has commonly been accepted as including the whole range of ancient human activity, from the first traceable appearance of man on the earth to the middle ages. It may thus be conceived how vast a field archaeology embraces, and how intimately it is connected with the sciences of geology (*q.v.*) and anthropology (*q.v.*), while it naturally includes within its borders the consideration of all the civilizations of ancient times.

In dealing with so vast a subject, it becomes necessary to distinguish. The archaeology of zoological species constitutes the sphere of palaeontology (*q.v.*), while that of botanical species is dealt with as palaeobotany (*q.v.*); and every different science thus has its archaeological side. For practical purposes it is now convenient to separate the sphere of archaeology in its relation to the study of the purely *artistic* character of ancient remains, from that of the investigation of these remains as an instrument for arriving at conclusions as to the political and social *history* of the nations of antiquity; and in this work the former is regarded primarily as "art" and dealt with in the articles devoted to the history of art or the separate arts, while "archaeology" is particularly regarded as the study of the evidences for the history of mankind, whether or not the remains are themselves artistically and aesthetically valuable. In this sense a knowledge of the archaeology is part of the materials from which every historical article in this encyclopaedia is constructed, and in recent years no subject has been more fertile in yielding information than "archaeology," as representing the work of trained excavators and students of antiquity in all parts of the world, but notably in the countries round the Mediterranean. It is for its services in illuminating the days before those of documentary history and for checking and reinforcing the evidence of the raw material (the "unwritten history" of architecture, tombs, art-products, &c.), that recent archaeological work has been so notable. The work of the literary critic and historian has been amplified by the spade-work of the expert excavator and explorer to an extent undreamt of by former generations; and ancient remains, instead of being treated merely as interesting objects of art, have been forced to give up their secret to the historian, as evidence for the period, character and affiliations of the peoples who produced and used them. The increase of precise knowledge of the past, due to greater opportunities of topographical research, more care and observation in dealing with ancient remains and improved methods of studying them in museums (*q.v.*) and collections, has led to more accurate reading of results by a comparison of views, under the auspices of learned societies and institutions, thus raising archaeology from among the more empirical branches of learning into the region of the more exact sciences. This change has improved not only the status of archaeology but also its material, for the higher standard of work now demanded necessarily acts as a deterrent on the poorly equipped worker, and the tendency is for the general result to be of a higher quality.

The archaeological details concerning all subjects which have their "unwritten history" are dealt with in the separate articles in this work, including the ancient civilizations of Assyria, Egypt and other countries and peoples, while the articles on separate sites where excavations have been particularly noteworthy may be referred to for their special interest; see also ANTHROPOLOGY; ETHNOLOGY, &c. It remains here to deal generally with the early conditions of the prehistoric ancient world in their broader aspects, which constitute the starting-place for the archaeologist in various parts of the world at different times, and the foundations of our present understanding of the primitive epochs in the history of man.

The beginning of archaeology, as the study of pre-documentary history, may be broadly held to follow on the last of the geological periods, viz., the Quaternary, though it is claimed, and with some reason, that traces of man have been found in deposits of the preceding or Tertiary period. Although there is no valid reason against the existence of Tertiary man, it must be confessed that the evidence in favour of the belief is of a very inconclusive and unconvincing kind. The discussion has been mainly confined to the two questions (1) whether the deposit containing the relics was without doubt of Tertiary times, and (2) whether the objects found showed undoubted signs of human workmanship. Vast quantities of material have been brought forward, and endless discussions have taken place, but hitherto without carrying entire conviction to the minds of the more serious and cautious students of prehistoric archaeology. A chronic difficulty, and one which can never be entirely removed, is our ignorance of the precise methods of nature's working. It is an obvious fact, that natural forces, such as glacial action, earthquakes, landslips and the like, must crush and chip flints and break up animal remains, grinding and scratching them in masses of gravel or sand. If it were possible to determine with precision what were the peculiarities of the flint or bone, thus altered by natural agencies, it would be easy to separate them from others purposely made by man to serve some useful end. Our present knowledge, however, does not allow us to go so far in dealing with the ruder early attempts of man to fabricate weapons or implements. Even the one feature that is commonly held to determine human agency, the "bulb of percussion," cannot be considered satisfactory, without collateral evidence of some kind. Flint breaks with what is called a conchoidal fracture, as do many other substances, such as glass. Thus on the face of a flint flake, at the end where the blow was delivered to detach it from the nodule, is seen a lump or bulb, which is usually regarded as evidence of human workmanship. To produce such a bulb it is necessary to deliver a somewhat heavy blow of a peculiar kind at a particular point of a flattened surface; and the operation requires a certain amount of practice. The fulfilment of all the necessary conditions might well be a rare occurrence in nature, and the bulb of percussion has come to be regarded as the hall-mark of human manufacture; but recent investigations have shown that the intervention of man is not necessary and that natural forces frequently produce a similar result. When, therefore, it is a question whether or no a group of rude flints are of human workmanship, evidence of design or purpose in their forms must be established. If this be found, and in addition if a number of flints, all having this character of design, be found together, then and then only is it safe to admit them into the domain of archaeology. There can be no doubt that much time and energy have been wasted, and a number of intelligent workers have been fruitlessly occupied in following up archaeological will-o'-the-wisps, through neglecting this elementary precaution.

Quaternary period.

Whether or no man produced flint implements before Quaternary times, it would seem to be a necessity that he should have passed through an earlier stage, before arriving at the precision of workmanship and the fixed types found in the old Stone Age deposits known as palaeolithic. It is now claimed that this earlier and ruder stage has actually been discovered in what are known as the Plateau-gravels of Kent, in Belgium, and even in Egypt, and the name of eolithic (ἠώς, dawn, λίθος, stone) has been bestowed upon them. The controversy as to the human character has been very keen, some alleging that the fractured edges and even the definite and fairly constant types are entirely produced by natural forces. Sir Joseph Prestwich in England, and Alfred Rutot in Belgium, the latter arguing from his own discoveries in that country, have strongly supported the artificial character of the relics. On the other hand it is pointed out that the existence of these implements on the high levels of Kent furnished confirmation of Sir Joseph Prestwich's theory of the submergence of the district, and that his support was thus somewhat biassed, while the geological conditions in Belgium are not quite comparable with those of the Kent plateau; and the Belgian evidence, whatever it may be worth in itself, is of no avail as corroboration of the Kentish case. It is to be regretted that the conditions are not more convincing, for, as stated above, they agree fairly well with the evolution theory of man's handiwork, and if they could be accepted, would carry back the evidences to a more remote time when the physical features of Kent were of a very different character. The critics of coliths have brought forward some facts that at first sight would seem to be of a very damaging nature. It was observed that in the process of cement manufacture the flints that had passed through a rotary machine in which they were violently struck by its teeth or knocked against each other, possessed just those features that were claimed as indisputable proof of man's handiwork, and that even the forms were the same. These statements have, of course, been met by counter-statements equally forcible, and the matter may still be considered to be in suspense. The great struggle, therefore, is now more closely restricted to the nature of the chipping than as to the quasi-geological question, and if the solution is ever to be found, it will be by means of a closer examination and a better understanding of the difference between intentional and accidental flaking.

Eolithic.

On reaching the Palaeolithic period we come to firmer ground and to evidence that is more certain and generally accepted. This evidence is fundamentally geological, inasmuch as the age of the archaeological remains is dependent upon that of the beds in which they are found. That they were deposited at the same time is now no longer questioned. The flints are found to have the same colour and surface characteristics as the unworked nodules among which they lie, and are generally rolled and abraded in the same way. This in itself suffices to show that the worked and unworked flints were deposited in their present stratigraphical position at the same time. The remote age of the beds themselves is demonstrated by the presence of bones of animals either now extinct or found only in far distant latitudes, such as the mammoth, reindeer, rhinoceros, &c., and in some cases these bones are found in such relative positions as to prove they were deposited with the flesh still adhering to them, and also that the animal was contemporary with the makers of the flint implements. Evidence of a somewhat different kind is provided for the palaeolithic period by certain caverns that have been discovered in England and on the continent. In these limestone caves palaeolithic man has lived, slept, eaten his food and made his tools and weapons. Much of his handiwork has been left, with the bones of animals on which he lived, scattered upon the floor of the cave, and has been sealed up by the infiltration of lime-charged water, so that the deposit remains, untouched to our own day, below an impermeable bed of stalagmite. In such circumstances there can be no doubt of the contemporaneous character of the remains, natural or artificial, if found on the same level. Moreover, so far as type is a criterion of age, the flint tools found in the cave deposits tend to confirm the date assigned to those of the river-gravels.

Palaeolithic.

It is fairly certain that about the middle of the Tertiary period the northern hemisphere possessed a temperate climate, such that even the polar regions were habitable. But the physical aspect of northern Europe was very different from that of Quaternary times. North of a line drawn roughly from southern England to St Petersburg all was sea. It was during the latter half of the Tertiary period that the continent assumed its present general form, though even in Pleistocene (Quaternary) times England and Ireland formed part of it. The great change of climate from temperate to arctic conditions during the latter half of the Tertiary period has been interpreted in various ways, no one of which is yet universally accepted. There can be little doubt, however, that no single cause was responsible for so complete a change. There may have been some alteration in the relative positions of the earth and the sun, which would conceivably have produced it; but what is practically certain is that the physical geography of northern Europe was affected by considerable difference in level, and it is clear that the raising of mountain ranges and the general elevation of the continent must necessarily have reacted on the climatic conditions. If in the later Tertiary time we find that the Alps, the Carpathians and the Caucasus have come into existence, it is not surprising to find that these huge condensers have brought about a humid condition of the continent to such an extent that this phase has been called the Pluvial Age. The humidity, however, was in some ways only a secondary result of the protrusion of high mountain ranges. The primary cause of the physical conditions that we now find in the valleys and plains was the formation of glaciers. These rivers of ice descending far into the lower levels during the winter months, melted during the summer, causing enormous volumes of water to rush through the valleys and over the plains, carrying with it masses of mud and boulders which were left stranded sometimes at immense distances. The intensity and force of the rivers thus formed would depend upon two factors, first the extent of the watershed, and secondly, the height of the mountains from which the water was derived. The result of increasing cold was that in course of time the northern hemisphere was surmounted by a cap of ice, of immense thickness (about 6000 ft.) in the Scandinavian area and gradually becoming thinner towards the south, but at no time does it seem to have extended quite to the south of England. This is proved by the absence of boulder-clay (glacial mud) in the districts south of London. These arctic conditions were not, however, continuous, but alternated with periods of a much less rigorous temperature during what has been called the Ice Age. Remains both of mammals and plants have been found, under conditions that are held to prove this alternation.

Such being the natural forces at work remodelling the surface of the earth, forces of such gigantic power as to be almost inconceivable in these more placid times, it can easily be understood how, in the course of the many thousands of years before the Quaternary period, when the surface of the globe attained its present aspect, the powerful river-systems of Europe wore their beds deep into the solid rocks. In some cases in Europe the erosive power of the river has worn through its bed to such an extent that the present stream is some hundreds of feet lower than its forerunner in palaeolithic times. From various causes, however, the rivers did not always wear for themselves a deep channel, but spread themselves over a wide area. This seems to have been the case with the Thames near London: the river-bed is not of any great depth, but at various periods it has occupied the space between Clapton on the north-east and Clapham on the south-west. It must not be assumed that the whole of this area of 7 m. or more was filled by the river at any one time, but rather that during the course of the palaeolithic period the river had its bed somewhere between these two limits. For instance, it is probable that at one period the bank of the Thames was at a point nearly midway between the northern and southern limits, where Gray's Inn Road now stands. It was here that the earliest recorded palaeolithic

implement (now in the British Museum) was found towards the close of the 17th century in association with mammoth bones. But it is safe to say that the Thames was a very much wider and more imposing river in palaeolithic times than it is now, when its average width at London is under 300 yds. As, in the course of ages, it changed its bed and by degrees lessened in size and volume, it would leave, on the terraces formed on its banks, the deposits of brick-earth and gravel brought down by the stream, and it is on these terraces that the relics of palaeolithic man are found, sometimes in great quantities. It will be obvious from the nature of the case that the highest terraces, and those farthest apart, should contain the earliest implements; but it is by no means easy in the present state of the land surface and with our present knowledge, to place the remains in their relative sequence. More accurate observation, and a better understanding of the conditions under which these deposits were made, should solve many such problems. Much light has been thrown upon many points by Worthington Smith, who has excavated with great care two palaeolithic floors at Clapton and at Caddington near Dunstable. The latter discovery was of quite exceptional interest as confirming the geological evidence by that of archaeology. In this case the original level at which palaeolithic man had worked was clearly defined, and was prolific of dark-grey implements, which had evidently been made on the spot, as Smith found that many of the flakes could be replaced on the blocks or cores from which they had been struck by palaeolithic man; there were also the flint hammers that had been used in the operation. Above the floor was a layer of brick-earth, again covered by contorted drift, in which also implements occurred, but of a very different kind from those found below. In place of being sharp and unabraded, and with the refuse flakes accompanying them, they were rolled and disfigured, of an ochreous tint, and evidently had been transported in the drift from a much higher level now no longer existing, as the site where they occurred is the highest in the vicinity, about 500–600 ft. above sea-level. Here then we have a clear case of palaeolithic man being compelled to abandon his working place on the lower level by the descent of the waters containing the products of his own forerunners, probably then very remote. In this case the sequence of the various strata may be considered certain, and the remains thus accurately determined and correlated are naturally of extreme value and importance. But even this does not enable us to diagnose another discovery unless the internal evidence is equally clear and conclusive. One point of importance that may be noted is that the older abraded implements were mostly of the usual drift type, while the more recent ones from the "floor" contained forms more highly developed and elaborated, such as occur in the French caves. Explorations of this kind, carefully conducted in a strictly scientific spirit by men of training and intelligence, are the only means by which real progress will be made in this puzzling branch of archaeology.

Although many problems yet remain to be solved in England, its small area, and the relatively large number of workers, have together sufficed to put the main facts of the earlier stages of man's existence on a fairly satisfactory basis. In France, owing to the richness of the results, a great number of trained and ardent workers have made equal, if not better, progress. But unfortunately the real scientific spirit is not invariably found. Not so long ago an apparently serious writer in a well-known scientific magazine gave a detailed account of his studies in primitive methods and explained at great length his attempts at the manufacture of flint and stone implements. He found by the processes he adopted that it was much more easy for him to produce a polished implement than one merely flaked. From this fact he seriously argued that a great mistake had been made in the relative ages of the neolithic and palaeolithic periods, and that the former must necessarily be the older of the two. The evidence of geological position and of the mammalian remains accompanying the obviously older flints was entirely disregarded, just as on the other hand it was forgotten that in regard to neolithic remains the proofs were in every way in favour of a relatively modern origin. Such attempts not only bring the serious study of early man into disrepute, but tend to retard the progress of real knowledge and are therefore to be deplored and when possible discouraged.

Cave Period.

Caves (*q.v.*) have been at all periods regarded as something uncanny and mysterious, with perhaps a tinge of the supernatural. In classical times they were associated with semi-divine beings, with oracles, and even with the gods themselves, while half the legends of dwarfs and gnomes that run through the folk-lore of medieval and modern Europe are associated with caves. They have been used as shelters or habitations at all times, and in examining them it is fully as necessary to sift the evidence of age as it would be in dealing with the river-gravels. Their exploration in the first instance may well have been due to chance, but it is fairly certain that during the 16th century the search for the horn of the unicorn as an antidote to disease, was responsible for the opening up of a certain number. Among the finds were no doubt the fossil bones of Quaternary animals to which mythical names and imaginary properties were attached, and the popular belief in such amulets naturally gave a great impetus to the search. It is, however, only a little more than a century ago that these investigations took anything like a scientific turn, and even then they had only a palaeontological end in view. The idea that archaeology entered into the matter was not at all realized for some years. The remains of many extinct or migrated animals, such as the hyena, grizzly bear, reindeer and bison, were found in quantities in the now famous cave at Gailenreuth in Franconia; and later, William Buckland explored the equally well-known hyena-cave at Kirkdale in Yorkshire, where he demonstrated that these animals had lived on the spot, feeding on the mammoth, rhinoceros and other creatures that had been their prey. The remains of man, however, had not been found, nor were they even looked for. It was not until Kent's cavern, near Torquay, was examined by the Rev. J. McEnery, that man was clearly proved to have been contemporary with these extinct beasts. So contrary was this contention to the ideas prevalent in the second quarter of the 19th century, that the pioneer in this work had died (in 1841) before the immense importance of his discovery was admitted. To Godwin Austen in the first place and to W. Pengelley in the second, with the aid of the British Association, was due the vindication of McEnery's veracity and accuracy.

Several circumstances conspire to give a special interest to Kent's cavern, and not the least is the fact that the age and appearance of the various strata indicate that it has been the home or the refuge of human beings at all ages even up to medieval times, and perhaps from a period even more remote than is the case elsewhere. In the black mould that formed the uppermost layer were found fragments of medieval pottery, and relatively in close proximity were ancient British and Roman remains as well as relics of the earliest days of metallurgy, in the shape of bronze fragments. The two thousand years or more that may have separated the oldest from the most modern of these later products, is as nothing in comparison with the immense intervals that lie between the earliest of them and the infinitely more remote period when gigantic mammals first inhabited the cave. Attempts have been made from time to time to express in years what the interval must have been: but as the computations have differed by hundreds of thousands of years, according to the method adopted, it is scarcely wise to do more than speculate. Beneath the black mould, containing what may be called the recent remains, was a layer of stalagmite, some feet in thickness; and under this at one place was a great quantity of charcoal, which has been with good reason assumed to show the site of fireplaces. A quantity of implements of palaeolithic type was found, but the main layer at this level consisted of a reddish clay known as cave-earth, and in this deposit were implements both of flint and horn, as well as bones of extinct animals. The flint implements were mostly of the usual river-drift type, but some were of types generally confined to cave-deposits of this period; while the barbed harpoon

heads, and more especially a bone needle, were definitely of the cave class, so well represented in the caves of Dordogne. Again, below the cave-earth was a *breccia* formed of limestone and sandstone pebbles cemented together by a calcareous paste. In this also were found implements and bones of bears.

The succession of strata indicated above may be taken as typical of the caverns used by palaeolithic man, the breccia and stalagmite flooring being in themselves proof of a very considerable age, while the association in the former, or under the latter, of remains of human handiwork, with bones of extinct animals, may be safely taken to show contemporaneous existence.

Once the mind has fairly grasped the fact that man was living at so remote a time, it is a simple and natural conclusion that he should have provided himself with weapons and tools more or less rudely fashioned from the stones he found ready to his hand. The analogy of the recently extinct Tasmanian is sufficient to show that even the meanest savage is not without such aids. But the caves of France, of the same palaeolithic period, and used by men theoretically in the same stage of culture, bring before us a race of artists of first-rate capacity, who for accuracy of observation, and for skill in indicating the character and peculiarities of the animals around them, have never been surpassed. Such a statement sounds like a contradiction in terms. We are dealing with human beings whose intellect, to judge by their physical characters, should be on a level with that of the Fuegian or the Australian black, and far below that of the Maori or the Sandwich Islander. Yet none of these gentle and relatively cultured brown races produced anything in the nature of art that can in any sense be compared with the masterly drawings or sculptures of the cave-men of France. The best-known of the engravings, that of the mammoth on a piece of ivory, is in the Jardin des Plantes in Paris. It is evidently intended to be nothing more than a sketch, the lines of the finely curved tusks being repeated several times in the desire for accuracy. But the heavy lumbering walk of the ponderous beast, his attitude, and even the character of the hairy hide, are all shown or suggested with a skill and freedom that not only denotes daily familiarity with the thing represented, but a most complete mastery of the art of translating the idea into simple line. This mammoth-drawing is probably the most important and monumental of its class, but there are many others that possess artistic qualities not less remarkable, while they have in addition a grace and beauty of line not less astonishing. One of these, in the British Museum, the head of an ibex-like creature, is outlined with a decision and refinement that can scarcely be surpassed, and many other sketches in horn or stone in the same collection show a keen appreciation of the characteristic features of the different animals as well as a masterly deftness in the handling of the graving-tool. If we are forced to marvel at the graphic skill of the cave-men, their sculptures in the round are on a still higher plane, as may be seen in the figures of reindeer in ivory in the British Museum. While they are not highly finished, they show a complete understanding of the animal's peculiar forms and contours, which are rendered in a direct, unhesitating way that should betoken a long period of artistic training and an executive power uncommon at any time. These drawings and sculptures have always been appreciated and even regarded as being of a much more advanced style than was to be expected among men who are always classed in the lower grades of culture. But enough stress has not hitherto been laid on the artistic quality of the work, which would be considered fine at any time in the world's history. This high artistic level was attained by a race of men whom we cannot credit with any great intellectual equipment; men, moreover, who were engaged in a daily struggle for the barest necessaries of life, in a trying climate and surrounded by a fauna whose means of attack and defence were infinitely superior to their own. There are many astonishing problems in archaeology, but none so badly in need of solution. Had the discovery been confined to a single drawing or even to a single site, fraud or a misreading of the conditions might have been alleged, but the case is very different. The drawings and sculptures have been found generally enough in France to demonstrate that such artistic power was fairly common, while the question of the authenticity and period of the discoveries has long since been satisfactorily settled. It is true that the climatic conditions in pleistocene France were more favourable to man than was the case farther north, but even an agreeable climate does not necessarily produce an artistic race; if it were so, the Polynesians would probably be the greatest artists the world has ever seen. The physical remains of palaeolithic man, even when found under unquestionable conditions, are, however, so scanty, that it is unlikely that the important question of the race or races inhabiting central and northern Europe will ever be settled by their means. The evidence at present is in favour of two very different types, one dwarfish and brutal (Canstadt), the other more advanced and noble in physical character (Cro-Magnon). To the latter were due the artistic productions, and until further physical evidence is forthcoming recourse must be had to the most minute examination of the objects themselves and to accurate observation of the conditions under which they are found. So far as our present materials go, these are the only means by which more light may be thrown on the many problems of early man.

In spite of the unquestioned and unquestionable character of palaeolithic discoveries in general, it must not be assumed that there has been an absence of falsification, forgery, and what the French call "mystification"; on the contrary, such attempts to meet the demand have been common enough. Apart from Edward Simpson, who was notorious as "Flint Jack" in the middle of the 19th century, many others, both in England and on the continent of Europe, have devoted themselves to this peculiar industry. Boucher de Perthes tried to conquer the scepticism of some of his friends who doubted the human origin of the Abbeville flints, by unwisely offering his workmen a reward for the discovery of human bones in the same beds. The Moulin Quignon jaw was accordingly produced, and became the subject of much controversy; but the evidence finally showed that it had originally come from elsewhere. The cave drawings also have found their imitators in modern times. One Meillet, a man of education, took a special pleasure in the production of spurious examples, and even published an account of his pretended discoveries. But here, as in all the attempts at imitation of the cave drawings, the modern efforts were betrayed by their poor artistic quality, and a comparison of the new discoveries with the old was generally enough to disclose the forgery. Two drawings on bone of a wolf and a bear, declared to have been found in a cave at Thayingen in Switzerland, were afterwards shown to have been copied from a child's picture-book. In Switzerland also a brisk trade was carried on some years ago in false antiquities said to come from the Lake-dwellings; and fantastic types of tools and implements were placed on the market. In Italy, too, a lively discussion has taken place of late years over the authenticity of curiously shaped flint implements from the neighbourhood of Verona; while America has provided similar food for discussion in the well-known Lenapé stone and the Calaveras skull. The former bears drawings of the French cave type, while the latter if genuine would carry back the story of man in the American continent before Pliocene times.

An apparent break in the continuity of man's history in Europe occurs at the end of the palaeolithic period. Attempts have been made to bridge the gap by means of a "mesolithic" period (*μέσος*, middle); but it would not seem probable that the missing links will occur at all events so far north as Britain. We leave palaeolithic man in a cold climate, surrounded by a somewhat mixed fauna that formed his prey. We know him as a hunter and artist, but the remains show that he had no knowledge of pottery till towards the close of the period. Among the humbler arts he practised at least sewing, and lived in caves or took shelter at the base of overhanging rocks; but like the Australian, he frequently camped in the open. His successor of the later Stone Age (neolithic) we find to be a very different character and with very

Meso-lithic.

different surroundings. The configuration of the land in which he lived is practically the same as we now see it. The severe arctic conditions with the appropriate fauna had entirely disappeared, and the introduction of new arts must have radically changed his daily life. The most important of these are the training of domestic animals, agriculture, and the development of pottery. What were the burial rites of palaeolithic man we have at present no means of knowing, but for his neolithic successor we know that these were matters of great moment. The abundance of arrowheads of flint indicate the common use of the bow and arrow as a weapon, while the art of weaving marks an immense stride in the direction of comfort and civilization. Of the form and construction of his dwelling we have only a limited knowledge, derived with some uncertainty from the analogy of the dwellings for the dead (barrows) and more certainly from the remains of the villages found erected on piles on the shores of lakes.

A much-debated question arises here that cannot be passed over. The changes just mentioned are not such as would be produced by internal causes alone. Much of the evidence is in favour of neolithic man being an immigrant, coming into northern and central Europe long after palaeolithic man and his characteristic fauna had disappeared. Where did the earlier race go and who are its modern representatives, if any? The answers to this question are many. W. Boyd Dawkins is of opinion that the reindeer was followed by man in its journey to the north after the retreating glaciers, and that the modern representative of palaeolithic man is the Eskimo. His arguments are ingenious but unconvincing; they mainly consist in the similarity of the habits of both races in using harpoons and implements of similar form and make, their power of carving and drawing on bone, the absence of pottery, disregard of the dead, &c. As to the positive evidence, it is almost enough to say that the Eskimo, like the cave-men, used the material nearest to hand that served their purpose, and that nothing is more remarkable than the similarity of primitive weapons used by widely separated peoples; while the negative evidence as to the absence of pottery is of little value; their conditions of life would allow them neither to make it nor keep it. Till recently we had no evidence at all of the treatment of the dead by palaeolithic man, but this is no longer the case; the discoveries in the Grottes de Grimaldi, Monaco, show several methods of burial, near a hearth, or in rude stone cists (see Dr Verneau in *L'Anthropologie*, xvii. 291). A stronger argument would be furnished if it could be shown that by his physical character the Eskimo is an intruder in his present home, and is unrelated to his neighbours. But this has not yet been done, and the skulls of the Eskimo do not resemble any of those hitherto found in the caves. In fact, what evidence there is on the subject is rather against than in favour of the wanderings northward of the inhabitants of the caves. There are indications, on the other hand, that in the south of France, in the Pyrenees, the reindeer was in existence, with man, at a later period than that of the caves, while the type of skull is that of Cro-Magnon. Here, therefore, it may be that something like a bridging of the gap between palaeolithic and neolithic times may be forthcoming. But it still remains to be found, and for the present we must be content with uncertainty.

The neolithic period has often been loosely called the age of polished stone, from the fact that in no case has a polished or ground stone implement been found in a palaeolithic deposit. The term is not only loose but inaccurate. In the first place, there is no reason why the cave-men should not be found to have polished a stone implement on occasion, for they habitually polished their weapons of bone. Secondly, neolithic man was by no means uniform in his methods; he polished or ground the surfaces of such tools or weapons as would be improved by the process; but to take a common instance, he found that the efficacy of his arrow-point was sufficient when chipped only, and polishing is only occasionally found, as in Ireland. Many other implements also are found in neolithic times with no trace of grinding and yet with every appearance of being complete.

Neolithic.

The most trustworthy evidence with regard to this and the succeeding archaeological periods is to be found in the grave-mounds. For the earlier part of the neolithic age, however, these are by no means fruitful of relics. From their shape they are called in England "long barrows" to distinguish them from the round barrows which belong to a succeeding time, though evidence is being accumulated to show that this division is not of universal application. Long barrows are by no means of such frequent occurrence in Britain as the round variety; they are most common in Wiltshire, Gloucestershire and Dorset, and occur as far north as Caithness. Some of them contain within the mound a stone chamber, at times with a gallery leading to it, and in the chamber the interment or interments took place. Similar barrows have been found on the continent of Europe, and both in Britain and abroad have one feature in common, viz. that no metal, with possibly the exception of gold, has ever been found in them. This similarity of burial custom, though it may conceivably indicate intercourse, certainly does not prove identity of race, as has been sometimes claimed. The type of skulls found in the interment is clear evidence against such an assumption.

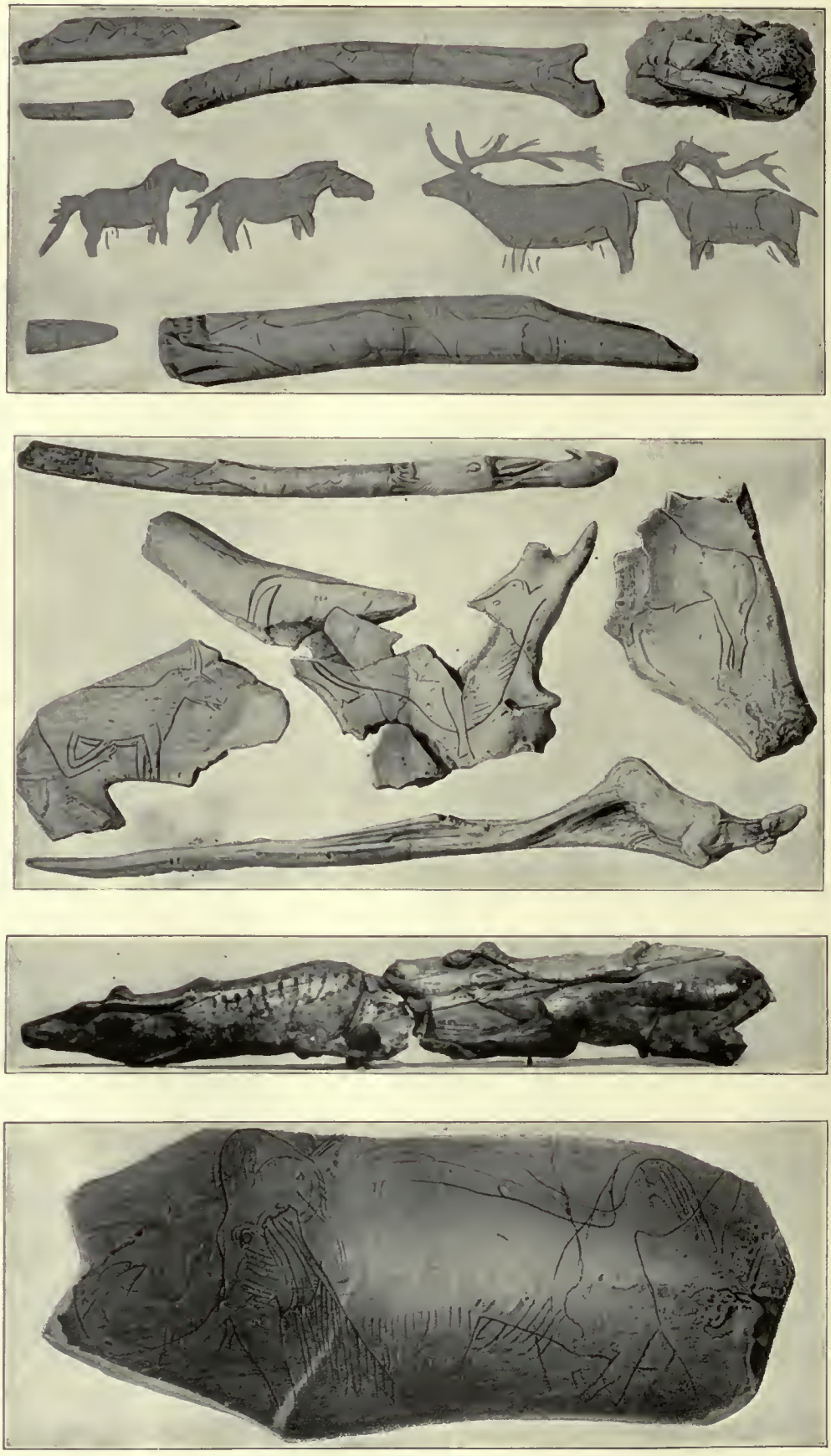
In Britain, the burials were at times by inhumation only, and occasionally a great number of bodies were interred in the same barrow: at others, cremation had preceded burial. Another remarkable feature is that in many instances it is certain from the relative position of the bones of the unburnt burials that the corpse had been allowed to decay before the burial took place. This curious practice is known among many savage tribes of the present day. Its occurrence in Britain has been adduced in favour of the prevalence of cannibalism at this time, and not altogether without reason. While metal is entirely absent in the long barrows (and in fact relics of any kind are very rarely found), it is significant that in the succeeding round barrows also metal occurs but seldom, and then always of the types attributed to the earliest part of the Bronze Age. When, therefore, the mound pottery is of a class that may well be anterior to metal, and no metal is found with the burial, it is not unreasonable to assign such barrows to the Stone Age. A similar argument may be applied to the stone implements, but in the opposite direction. Many stone implements are found either isolated, or perhaps with no other relics that serve to fix their period. The material alone is often considered sufficient evidence of their being before the age of metals; but it is at any rate quite certain that a large number of stone axes, more particularly those with a socket for the handle, belong really to the Bronze Age. This uncertainty makes any account of the neolithic age difficult, unless the material is taken as the main basis.

Neolithic man, like his forerunners, still recognized that flint and allied stones provided the best material for his cutting and piercing implements, though he made use to a great extent of other hard stones that came ready to his hand. The mining of flint was undertaken on a large scale, and great care was taken to get down to the layer containing the best quality. In Norfolk, at Grime's Graves, and in Sussex, at Cissbury near Worthing, the flint shafts have been carefully explored by William Greenwell, General Pitt-Rivers and others. The system was to sink two shafts some little distance apart and deep enough to reach the desired flint-bed, and the two shafts were then joined by a gallery at the bottom. At Grime's Graves large numbers of deer's horns were found, which had evidently been used as picks, as is proved by the marks found in the chalk walls; and the horn had been trimmed for the purpose. Cups of chalk were also found in the galleries and were believed to have been used as lamps. At Cissbury great quantities of unfinished and defective implements were found in the work, as well as horn tools, as in Norfolk. At such factories the primitive appliances correspond very closely with those in use among existing savages. The pebble was used as a hammer or an anvil, and the more delicate flaking was done by pressure with a piece of horn rather than by blows. Naturally enough the number of completed implements found in these factories is small; the finished tools would be bartered at once and carried away from the factory. All the

PALAEOLITHIC PERIOD.

1. French Drift. 2. English Drift. 3. French transition (Le Moustier). 4. French Cave Period. 5. English Cave Period.

ARCHAEOLOGY



SCULPTURE AND ENGRAVINGS OF THE CAVE PERIOD.
FROM DORDOGNE, FRANCE.

WALL-PAINTINGS OF THE CAVE PERIOD,
CAVERN OF ALTAMIRA, SANTANDER, SPAIN.

OUTLINE OF WALL-PAINTINGS, ALTAMIRA, LENGTH ABOUT 45½ FT.
(*cf.* PAINTING, Plate I.)

By permission, from *La Caverne d'Altamira* by Cartailhac and Breuil, Monaco, 1906.

ARCHAEOLOGY

NEOLITHIC PERIOD.

1. Flint and stone implements, England.
2. Flint arrow-heads, England.
3. Arrow-heads, Ireland.
4. Flint and stone implements, Denmark.
5. Flint implements, France.
6. Flint implements, Egypt.

animal remains found in these pits belong to present geological conditions, thus emphasizing what has been stated above, that the absence of polished implements is no evidence for great age. Many other factories have been found in Britain, in Ireland and on the continent of Europe: at Grovehurst in Kent, at Stourpaine near Blandford, at Whitepark Bay, county Antrim, and in Belgium at Spiennes. Among the North American Indians the method would seem to have been somewhat different. After journeying to the site of a suitable quality of stone, they did not always complete the implements on the spot, but made a number of oval chipped disks of good stone which they carried away and worked up into the required implements at their leisure. These disks bear a strong likeness to some of the ovate implements from the Drift in Europe; in fact, but for the difference of surface condition or patina, they would be identical.

While the severe climatic conditions that preceded the neolithic age restricted the presence of man to the more temperate parts of the globe, it may be assumed that in neolithic times there was nothing to prevent him from occupying the greater part of the earth's surface, short of the neighbourhood of the two poles. Thus it may be expected that an age of stone will be found, if looked for, in every part of the globe. So far as our present knowledge goes, all is in favour of the use of stone before metals, in all countries. The one material requires no special treatment before being adapted to man's use, while the other demands considerable knowledge, even if reasoning power have but little place in the process. Thus the probabilities are here borne out by the facts. In the extensive "kitchen-middens" of Japan are found great numbers of chert implements mixed with pottery of a primitive type, recalling that of European early Bronze Age barrows, while the succeeding periods of metal are equally clear. Even in the Far East, therefore, the same sequence is to be observed. In China, the conditions are more obscure. The superstitious regard for ancestors has prevented the exploration of ancient tombs in that country, and thus systematic search has been impossible, while the precise details of the discovery of such relics as have come to light are difficult to obtain. In spite of the assertion that China had no Stone Age, it is surely more probable, in the absence of exact knowledge, that she followed the normal course. Modern territorial divisions, more especially if they are independent of the natural physical conditions of the land, such as mountain ranges, great rivers and the like, have but little value in considering the race problems of remote ages. If, therefore, we find that, in the countries bordering on what is now the Chinese empire, the ancient inhabitants followed the same broad lines of culture that are evident elsewhere, it is easy to believe that China too was normal in this respect. The negroes and Bantu races of Africa also were thought to have passed direct to the use of iron, perhaps owing to the existence on the Nile of a civilization of great antiquity, which enabled them to pass over the intervening stages. Inherently improbable, this is now known not to have been the case. Stone implements, whether ground or merely chipped, have been discovered on the Congo, and more recently on the Zambezi. It is quite true that in both cases they are found in superficial deposits, and may be of any age. But here again the probabilities are greatly in favour of their having been in use before iron was known. While stone tools, such as knives or arrow-heads, may possess qualities that render them superior to bronze or copper, it is certain that once the working of iron was understood, its superiority to stone would at once be perceived, and the stone tools be discarded. There can be little doubt that investigations in Central Africa will demonstrate that the same course was followed there as elsewhere. In South Africa, in Egypt and in Somaliland large quantities of stone implements have been discovered, and of the great age of most of them there can be no doubt. Some from the banks of the Nile have even been claimed as "eolithic"; but here, as in Europe, we can only say that the case is not proven: General Pitt-Rivers did good service in Egypt by discovering among the stratified gravels near Thebes a number of rude flints bearing unmistakeable signs of human workmanship, but he described them merely as of "palaeolithic type," and deplored the absence of mammalian remains in the gravels. At the same time he pointed out that the bulk of the implements claimed as palaeolithic (and, it may be, correctly) are found on the surface, and therefore cannot be dissociated from the surface types; hence form alone cannot be trusted to determine age. Further, we are by no means well informed as to the value of patination in flints found on the surface in Egypt. The depth and intensity of the patination would no doubt have a direct relation to the age of the implement, if only it could be proved that all of them had been equally subjected to the conditions that produced the discoloration. But this is clearly impossible. Some implements may conceivably have been continuously on the surface of the desert from the time they were made, and have been acted upon by the sun and air for many thousands of years, while others, though of equal age, may have been covered by sand or otherwise protected for a large part of the intervening centuries. Patination, therefore, like form, can only claim a conditional value. It is at the best an uncertain indication of age, as great age may be possible without it. Similarly, in Somaliland, the condition of the implements is very curious, and in some respects puzzling, while their forms resemble those from the Drift in Europe. But as to the climatic conditions we know nothing, and it is therefore useless to speculate on the condition of the stones; as to the geology we know next to nothing, and no mammalian remains give us a helping hand, while the form alone is a dangerous foundation for argument.

Europe and America.

Investigations in the more remote parts of the world, though they may occasionally produce some startling novelty in the history of mankind, can scarcely be expected to furnish the same trustworthy continuous story as is to be found in the European area. Here history provides us with a fairly truthful account of what has happened for a period varying from two to three thousand years, or in some places even longer, and we are thus able to judge whether particular discoveries come into the historical stage or not. In more primitive lands where history (if there be any) partakes more of the character of mythical tradition, the task of defining the period to which particular discoveries belong is rendered much more difficult. In America, where history may be said to have begun five hundred years ago, such a feat is of course impossible, until a great deal of work on comparative lines has been accomplished. The accounts of the civilization of Mexico and Peru at the time of the Spanish conquest show a state of culture which in some respects must have put the Spaniards to shame, while in others it was primitive in the extreme. As regards internal communications, the working of gold and copper, and the manufacture and decoration of pottery, these American kingdoms were on a level with all but the most advanced nations; but of history in the true sense of the word they have none. In spite of this, it is by no means a hopeless task to disentangle the apparent confusion of their archaeology. It is now fairly well known what were the races or tribes that inhabited particular districts, and it is thus easy to make a *corpus* of the types adopted by the various peoples. This is the first certain step in the application of archaeological method. By degrees, as these types become familiar to the trained eye, it will not be difficult to arrange them in a progressive series, from the earliest in style to the latest. That this will be done by the archaeologists of the American continent, even with the present scanty materials, there can be little doubt. Numbers of young and enthusiastic workers have now had a good training in exploration in historical lands, and will usefully employ their experience on the antiquities of their own country. But if once a key be found to the ancient Mexican inscriptions, so plentifully scattered through the ancient monuments, it may be that enlightenment will come even more suddenly and more surely. The one problem that is of the greatest interest still awaits solution, viz. whether there is any relation, in culture or more remotely in race, between the inhabitants of ancient America and those of Europe or Asia. One thing is certain, that if there be any connexion, it is of

infinite remoteness. But it is at any rate noteworthy that the same designs, patterns and even games are found in ancient Mexico and in India or China; and whether these resemblances arise from relations between the peoples using them or from accident, is a problem well worth investigation.

In countries like Scandinavia or Switzerland, the story of the early ages is clear and comparatively free from complications. The one by its remoteness was left to develop with but little help from the rest of Europe up to historical times; the other, protected on so many sides by its mountain ranges, seems to have enjoyed a peaceful existence during the Stone and Bronze Ages. A community of fishermen and agriculturists, they led a calm domestic life on the edges of their many lakes where they constructed dwellings on piles with only a gangway to the shore, to prevent the attacks of predatory animals. The practice of building houses in lakes was a common one not only in Switzerland, but also in Britain and in Ireland, as in modern times among the natives of New Guinea. Besides securing the safety of the inhabitants, it had the not unimportant advantage of being more healthy; all refuse of food and other useless matter could at once be thrown into the water where it would be harmless. A similar form of dwelling is the Irish "crannog," constructed on an island or shoal in a lake, in some cases artificially heightened so as to bring it above water. These crannogs were probably inhabited in Ireland up to comparatively recent times, if one may judge by the remains found on the sites.

It must not be forgotten that although the neolithic period had many phases, yet its duration is in no way comparable to the incalculable length of the palaeolithic age. For a variety of reasons it is thought that one of the earliest stages of neolithic times is represented by the now well-known kitchen-middens (refuse-heaps) of Denmark. These heaps are often of great size, sometimes reaching 10 ft. in height, and nearly 350 yds. in length. Here along the coast line the natives of Denmark lived, apparently building their huts upon the mounds and cooking their food upon hearths of stone. The conditions of their daily life would seem to have resembled those of the natives of Tierra del Fuego. Their implements of flint seem to have been chipped only, and it is conjectured that the few polished and more highly finished implements that have been found in the middens are importations from more cultured tribes living inland. Their food was in very great part composed of shell-fish, though they evidently caught and ate various kinds of deer, boar and a variety of carnivorous animals. The race which made these mounds is believed to have been akin to the Lapps, and their dwellings can hardly have been anything more than the rudest protection from the weather. The Swiss lake-dwellers were far more advanced, even in the Stone Age; their dwellings were elaborately planned and constructed, and remains of them have been plentifully found in the various Swiss lakes. Various forms of construction were adopted: in one the foundations consisted of poles driven into the bed of the lake; in others a kind of framework simply rested on the bottom, and in a third, the substructure was formed of layers of sticks reaching from the bottom of the lake up to the surface. The walls were of wattle, closed up with clay to keep out the weather; the hearths were of stone slabs, and the floors of clay well trodden down. Practically the same type of dwelling seems to have continued through the Stone and Bronze Ages, though on some sites no metal whatever is found and it is therefore assumed that these are of the earlier period. These people cultivated the land, growing wheat and barley; they were also hunters and fishermen, capable of manufacturing pottery without the aid of the wheel, which had not yet come into use so far north; and they wove mats and garments, while ropes and netting are plentiful. Their tools and weapons were made of stone, and to a great extent of deer's horn. Human remains are hardly ever found on the sites of the lake-dwellings, and it is therefore uncertain what were the social affinities of the people; but the evidence of the sites is in favour of the same race being continuous into the Bronze Age, when their condition was more comfortable, as is shown by the abundant remains of domesticated animals.

Stone Age relics.

Among the most notable and obvious relics of pre-historic times, both in Britain and in many other countries such as Spain, Portugal, France and even India, are gigantic circles and avenues of stone and dolmens (see STONE MONUMENTS). These enduring monuments have excited the wonder of countless generations, and lent themselves to superstitious practices down to modern times. But the precise purpose for which they were erected and even the period to which they belonged, had never been definitely settled. They had been called burial places of great chiefs, and not unnaturally had been thought by others to have been temples or places of primitive worship used by the Druids, who moreover were often credited with their erection. Obviously such a question called for settlement, and the British Association in the year 1898 appointed a committee to investigate these stone circles with a view to ascertaining their age. Operations were begun at the well-known circle of Arbor Low, south of Buxton in Derbyshire; careful excavations were made through the ditch and the encircling mound and also within the circle, and although the evidence was not of the most complete kind, yet the committee came to the conclusion that the circle belonged to the end of the neolithic age. At Arbor Low all the stones are now lying on the ground (although, to judge from the other circles in England, they were certainly once upright), and the opportunities for surveying were thereby much diminished. It is a fortunate circumstance, therefore, that the fall of one of the stones at Stonehenge (*q.v.*) at the end of the 19th century, and the increasingly perilous state of some of the others, caused the owner, with the advice of the Society of Antiquaries of London, to undertake the raising of the great leaning stone in the interior of the circle. The work was superintended by W. Gowland, F.S.A., who made special investigations during the necessary digging, for the purpose of recovering any remains of man's handiwork that had been left by the builders of the monument. In this he was very successful, finding in the course of the very limited excavation at the base of the monolith, a great number of stone mauls or hammers that corresponded so nearly with the bruised surfaces of the monoliths, that there can be no doubt of their having been used to dress the standing stones.

From a review of all the evidence of an archaeological nature that was to be obtained, Gowland came to the conclusion that the construction of Stonehenge belonged to the latter part of the neolithic age. No trace of a metal implement occurred in any of the debris. This would of itself be an interesting fact, but it became infinitely more interesting from researches in quite another direction, which brought corroborative evidence of a curious kind. For many years Sir Norman Lockyer and Prof. Penrose were engaged in examining the orientation of temples in Egypt and Greece, with a view to determining on what astronomical principle, if any, the plans had been laid down. With a rectangular plan, and with portions of the interior still well defined, they were able by elaborate calculation to determine that the temples had been definitely planned with relation to the rising or setting of the sun or of a particular star. Having been successful in these investigations they proceeded to apply the test to Stonehenge. The experiment was made on the longest day in the year 1901. Owing to a gradual change in the obliquity of the earth's orbit, the point of sunrise on corresponding days of each year is not constant; and though the difference is hardly perceptible from year to year, in the course of centuries it becomes great enough for use as a measure of time. Enough remains of the monument to show the direction of sunrise at the time that Stonehenge was erected, it being always assumed that the coincidence of the main axis with the central line of the Avenue was designed with reference to sunrise on the longest day of the year. At the date of the experiment it was found that the sun had shifted nearly two diameters in the interval, and this variation gives a date of about 1680 B.C., which practically confirms the verdict of archaeology and seems to prove, moreover, that Stonehenge was a temple of the sun.

Stonehenge therefore may be taken as marking for Britain the close of the neolithic period and heralding the dawn of a new

era, in which the inhabitants of the British Isles first acquired the art of working metal.

Bronze Age.

There is reason to believe that the transition from the use of stone to that of bronze was not due to the peaceful advance of civilization, but rather to the irruption of an Aryan race from the south-east of Europe into the countries to the west and north. Of these people the Celts are to some extent the representatives at a somewhat more recent period. Here, however, we are dealing with terms the precise meaning of which is not yet generally admitted, and which, moreover, have too intimate a relation to the problems of philology to be fully discussed here (see INDO-EUROPEAN). The term Aryan (*q.v.*) itself is not free from objections. It was held by Max Müller to relate to a language and a civilization that took its rise in Central Asia, while others now contend that, although it is the mother language of the Sanskrit, Greek, Latin, Teutonic and Celtic languages, it might equally well have originated in Europe. However this may be, and even this brief statement shows how wide a field the arguments would cover, there can be little doubt that the Bronze Age Celts were of this stock, and that in course of time they gradually spread their language and culture over a large part of Europe. Whether or no the knowledge of bronze started from one or more centres, it gradually spread from the south-east of Europe until it reached Scandinavia; the dates being roughly in Crete, 3000 B.C.; in Sicily, 2500 B.C.; in central France, 2000 B.C.; in Britain and in Scandinavia 1800 B.C. The appearance of the Celts in Britain is indicated by the presence of the round barrows. They were a fairly tall, short-headed race, using cremation and also inhumation in their burials, skilful in the manufacture of pottery and of the simpler forms of bronze implements, and freely using bone, jet, and at times amber, while gold was well known and evidently greatly esteemed. In the early centuries of the Bronze Age, swords, spears and shields were apparently quite unknown, the principal metallic products being flat axes, simple knives or daggers, and small tools or ornaments. In the burial places the bodies, if unburnt, are nearly always found in a crouching position, as if in the attitude of sleep; if cremated, the burnt bones are generally enshrined in an urn under the tumulus, the burial being sometimes in a cist formed of large stones. The pottery vessels are remarkable in more ways than one. In the first place they would seem to have been specially made for the burial rites, for whenever domestic pottery has been found, it is of quite a different character, unornamented and simple in outline. It must be confessed, however, that this latter is by no means common. The sepulchral vessels are at times highly decorated, and sometimes of great size. They are invariably hand made, and though they are by no means well fired they are never sun-dried, as is often said to be the case. A common kind of decoration is produced by impressing twisted cords in the damp clay, and this is believed with some reason to have had its origin in the practice of winding cords round the unbaked vessel to prevent distortion before or during the process of firing. That operation would of course burn away the cord and leave only its impression on the urn. Other forms of ornament are also used, incised lines in rudely geometrical designs, impressions of the end of a stick, and at times rows of hollows produced by the finger or thumb. The method of the burial, beyond giving an insight into the art of the period, also helps us to realize to some extent the ideas of primitive man. The underlying reason for careful and ceremonial burial is not always readily understood, apart from a knowledge of the ritual, such as existed in ancient Egypt. But in the Bronze Age in Britain it was the custom to bury with the dead not only carefully made vessels which doubtless contained food for the journey to the lower world, but also the ornaments and weapons of the deceased. Often the bones of a pig have been found in the grave, doubtless representing part of the provender which could not conveniently be placed in the so-called food-vessel. Such practices indicate with a fair amount of certainty a belief in a future life in another world, where probably the conditions were thought to be much the same as in this. The burial of the weapons and other property of a dead man is, however, not always due to the belief that he may need them in some future state. The reason may well be that it would be thought unlucky for a survivor to use them.

Just as the neolithic age was immeasurably shorter than the palaeolithic, but was notable for great improvements in the arts of life, so the Bronze Age in its turn was shorter than the neolithic age, and again witnessed even more marked advance in culture. It is in fact an illustration of the truism that each step in knowledge renders all that follow less laborious; but it is not easy to understand how the transition from stone to metal came about, nor why bronze came to be the chosen metal rather than iron. Bronze, in the first place, is a composite metal, a mixture of copper and tin, while iron can be at once reduced from its ores; indeed, in the form of meteoric iron, it is already metallic, and needs but a hammer to produce whatever form may be wanted. From the archaeological point of view, there is, however, good reason for believing that bronze preceded iron. The forms of axes that are without doubt the earliest, are in outline much the same as the stone prototype, being only thinner in proportion. Then again, iron implements are never found on the earlier sites, and if they had been in existence some of them certainly would remain: further, at the end of the Bronze Age it is found that the forms of weapons in that metal are exactly copied in iron, as, for instance, at Hallstatt (*q.v.*) in the Salzkammergut, the famous cemetery which best illustrates the passage from the use of bronze to that of iron. It has been claimed that bronze was preceded by copper, a sequence which seems inherently probable; and whether or no it was general enough or enduring enough to constitute a period, there can be no reasonable doubt that in the Mediterranean area, and in central Europe, as well as in Ireland, great numbers of implements were made of copper alone without any appreciable admixture of tin. The casting of pure copper presents certain difficulties, in that the metal is not adapted for anything but a mould open to the air, and this would limit its utility, until the discovery that tin in a certain proportion (roughly 1:9) not only made the resulting metal much harder and better fitted for cutting-tools and weapons, but at the same time rendered possible the use of closed moulds.

There are thus two problems in connexion with the history of the Bronze Age. How was the metal discovered? And by whom or where? As to the first, it must be remembered that in some parts of the world, *e.g.* in China and in Cornwall, copper and tin are found together, and it may well be that tin was first accidentally included as an impurity, which, had it been noticed, would have been eliminated. Once it was found to produce a more useful metal, the blend would be deliberately made, and repeated trials would eventually demonstrate the most suitable proportion of one metal to the other. The question of where it was first discovered is one that is not likely to be answered with certainty, but the one essential is the presence of the two metals in one and the same locality. Tin does not exist in either Egypt or Mesopotamia, although bronze articles from the fourth and third millennium respectively B.C. have been found in these countries. The tin to produce the mere metal must have come from some foreign country, and the choice seems to be very small. Spain at the other end of the Mediterranean is unlikely, and Britain still more so; central Asia, Asia Minor, or China again seem too remote; for the spread of metallurgy from these centres would imply a trade connexion nearly 4000 B.C. In later times, later perhaps by 3000 years, Spain and Britain were undoubtedly among the chief sources of the tin supply of Europe and of the Mediterranean generally; but it will long remain a problem where bronze was first produced. There is indeed, no real necessity for confining its origin to a single locality; it is easily conceivable that the invention occurred independently in more places than one.

The history of early metallurgy has been carefully studied by W. Gowland, who communicated the results of his researches to the Society of Antiquaries of London in 1899. In his opinion the ores from which copper was first obtained by smelting were

originally found as pebbles or boulders in the beds of streams, where man in the Stone Age had been accustomed to search for stones to convert into implements; and in the same way the beds of rivers were for a long subsequent period the only sources of tin. Actual mining belongs in his opinion to a far later period, and naturally had its origin in the discovery of outcrops of the metal on the surface. By the simple application of fire, lumps of ore were reduced to a smaller size, and were then prepared for smelting by further reduction to the condition of a coarse powder. This latter process was carried out in the same way that grain was crushed between two stones; and stone-mills, doubtless used for the purpose, have been found in ancient workings in Wales. The next stage would be the furnace, and there can be little doubt that this would be of the simplest kind, merely a hole in the ground with the fire covering the metal, and with nothing but a natural draught. But Gowland holds that even with these singularly inadequate appliances, copper could be smelted from the surface ores, though the output would naturally be of the most uncertain and intermittent character, depending, as it must have done, on the wind. And until the discovery of bellows or some other method of increasing the draught of air, no progress could be made in this direction. With regard to the resulting metal, viz. copper, we have certain knowledge. From time to time there are found in the earth in Britain and elsewhere, hoards of fragmentary or imperfect bronze implements, portions of axes, swords, rings, &c., all of which have been failures in castings. These hoards are assumed to have been gathered together by the bronze founders to be recast into perfect and useful implements. Now, frequently associated with these hoards are portions of cakes of pure copper, originally circular in shape, flat on one face and convex on the other, like a lens with one flat face. The form of these cakes is in itself a fair proof of the prevalence of the method of smelting described above, as it is quite clear that the convex face of the cake followed the contour of the hole in the ground above which the fire was placed. The cakes are generally found broken up into small handy blocks. This can only be done in one way, viz. by watching the cake, after the fire and slag has been raked off it, until it is on the point of becoming solid, when it is quickly pulled out of the hole and broken up. It will be noted that while the implements in these founders' hoards are invariably of bronze, the cakes are as invariably of copper. This is at first sight puzzling, until it is realized that these founders probably carried the tin necessary for forming bronze in the form of ore, and that tin ore in its pure state is a snuff-coloured powder very easily overlooked when lying on the earth, which it might very nearly resemble in colour, though it would be much heavier. Thus it is probable that in many such discoveries the tin ore has accompanied the copper cakes and bronze fragments, but has hitherto eluded the eyes of the finder. Not only have we this conclusive evidence of the methods by which Bronze Age man produced his raw material, but the discovery of crucibles and moulds takes us a step further towards the finished implements. The crucibles are generally simple bowls of thick clay with an extension of the lip at one side to pour out the molten metal. Several of these, with plentiful traces of metal still remaining in them, were found by the brothers Siret in the Bronze Age settlement at El Argar in Murcia. In the same place also were found moulds of stone for the casting of simple triangular axes. These were of the class known as open moulds, one stone being hollowed to the desired form, the other half being simply a flat cover, with no relation to the form of the implement to be produced. From the nature of the metal, such a mould is the only kind in which the casting of an efficient copper implement would be possible; and among the objects discovered by the Sirets were articles in plenty of pure copper.

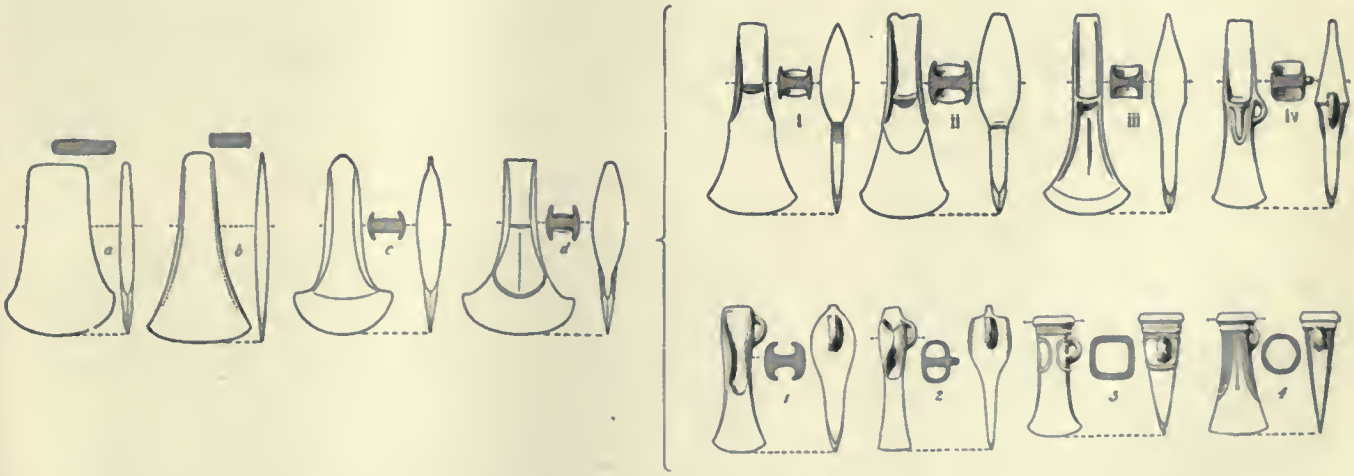
Much has been written in support of the theory that the bronze tools and implements found in this or that country must have been importations from southern and more highly civilized lands. More particularly has this been alleged with regard to Britain, which, lying as it did on the extreme limit of the ancient world, was regarded as being dependent on the continent for the more complex weapons. The constant discovery, however, of these hoards of rough metal, as well as of moulds of the highest finish for casting swords, daggers, celts, and almost every kind of ancient bronze implement and weapon known to us, provides a conclusive proof of the contrary. The occurrence of a foreign type of implement is so rare as to be a source of especial gratification to the collector who secures it; and it may be taken that, in general terms, all the bronze swords, daggers and spears found in Britain were of home manufacture. Relations with the continent, however, did exist, as is shown by the occurrence of an Irish type of gold ornament in France and Scandinavia, and by the similarity of ornamental motives in the British Isles and elsewhere. Among the continental races it is natural to find intercommunication more common, owing to the absence of natural barriers. The weapons of the Bronze Age were swords, spears, daggers and axes (celts), though the last would be equally well adapted for more peaceful purposes. The swords were usually of a narrow leaf shape, cast with the handle in one piece, the mounting of the grip and the pommel being added. For perfection of workmanship the weapons of this period have never been surpassed, and the skill of adjustment in the moulds, the fine and equal quality of the metal, and the flawless condition of the surfaces still excite wonder among the most expert of modern founders. The cutting edges of swords and "celts" were often, if not always, hammered to serve the double purpose of hardening that part of the weapon and sharpening the edge. In the case of the axe-heads (celts), this hammering had a distinct influence on the evolution of the form of the implement. The earliest celts, whether of copper or bronze, were in form, copies of their stone prototypes, and curiously enough exactly like the ordinary woodman's axe of to-day, but of course without the socket for the handle. Hammering rendered the cutting edge both broader and thinner, giving it at the same time a curved outline. This widened curve eventually became an ornamental feature, the two ends of the cutting edge becoming curved points and adding greatly to the elegance of the outline. Later, the other edges were finished by hammering also, at times in a simple ornamental fashion; and whether for greater rigidity or for some other reason, flanges were produced in the same way on those edges, which again affected the ultimate form of the celt. The early flat celt was no doubt simply fixed in a perforated wooden handle, which would naturally tend to split if wielded with any vigour. The side-flanges were in course of time utilized to prevent this, by allowing the use of a different form of handle. In place of the simple straight handle, a branch was cut with an elbow-joint, and its shorter limb then divided into two prongs, between which the metal passed, while the flanges, beaten up from the edges, overlapped the two forks; and no doubt a lashing of sinew was added to render the whole secure. This made a good serviceable tool or weapon, and prevented the splitting of the handle; but still another step was taken. The flanges on the edges met over the prong of the handle on either side, while the upper end of the celt itself eventually became a mere septum dividing the two openings. This septum was finally judged to be useless, and done away with; and the celt was cast with one hollow only for the reception of the ends of the handle; thus the flat celt became, by a natural process of evolution and improvement, a socketed celt. It is a curious fact, however, that the modern form of axe where the handle passes through a socket in the metal itself does not seem to have been much in favour in the Bronze Age, although it was a stone form that certainly survived into the succeeding period.

This and other shortcomings in what must have been the universal weapon and implement of the race, were remedied from time to time by various improvements in the form of the bronze axe-head and the method of hafting; and the various stages of development, from the flat blade of copper or bronze to the socketed implement and even to a pattern now in use, can still be traced in the Bronze Age specimens that have come down to us.

SEPULCHRAL POTTERY, BRITISH ISLES (BRONZE AGE).

1–3, Drinking cups or beakers. 4–9, Food vessels. 10–12, Cinerary urns.

SEPULCHRAL POTTERY FROM THE CONTINENT OF EUROPE (NEOLITHIC, BRONZE, AND IRON AGES).



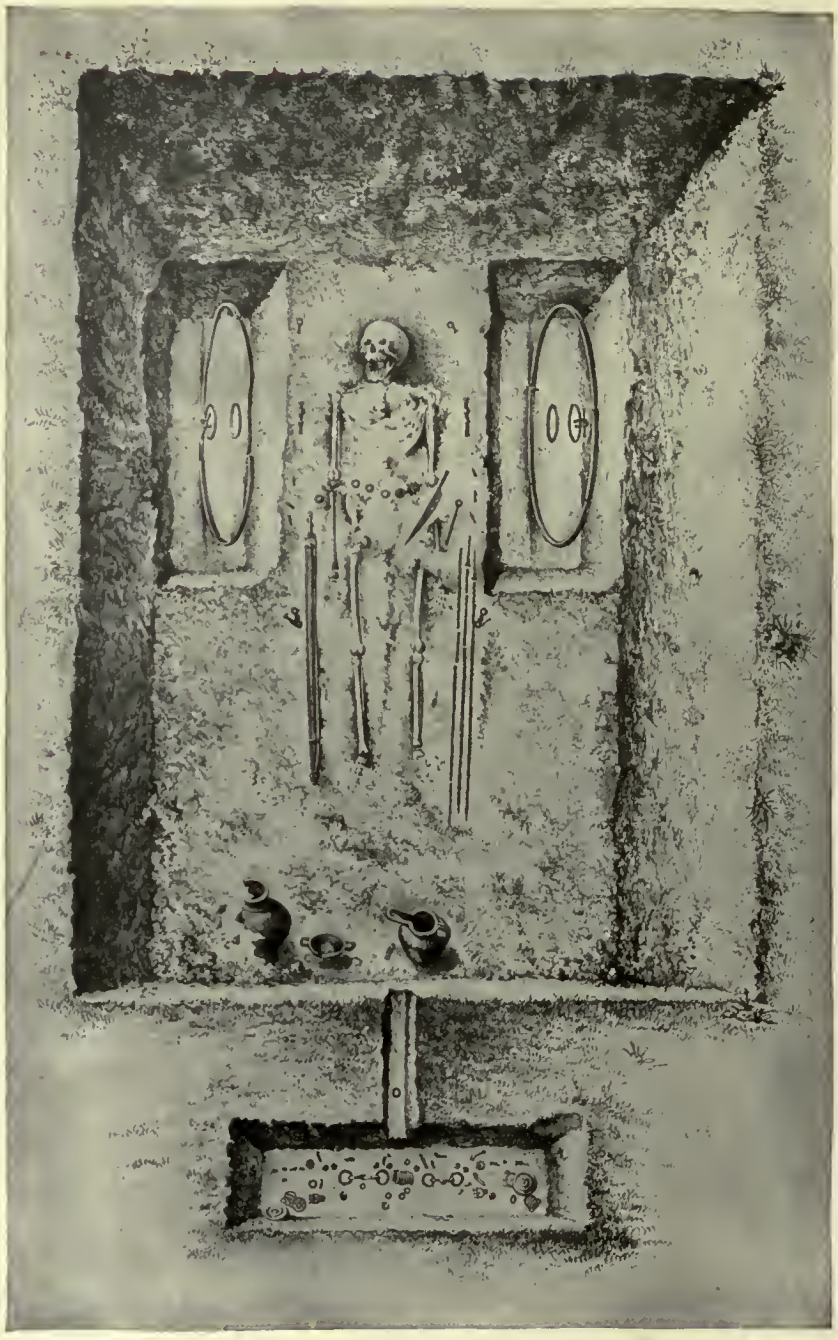
STAGES IN THE EVOLUTION OF THE CELT OR IMPLEMENT OF CHISEL FORM.

(1) From stone to metallic form. (2) Growth of the stop ridge to palstave. (3) Growth of the wings to socket-celt.

By permission, from the British Museum *Guide to the Bronze Age.*

ARCHAEOLOGY

1. Bronze shield with red enamel ornaments, found in the Thames near Battersea; about 31 in. long.



Chariot burial of a Gaulish chief, Somme Bionne, Marne, France.

Bronze mounted wooden bucket found in a pit burial at Aylesford.

Early Iron Age.
The objects here represented are all in the British Museum.

Horned bronze helmet with traces of enamel ornament, found in the Thames near Waterloo Bridge.

By permission, from the British Museum *Guide to the Early Iron Age.*

With the discovery of iron as the ideal metal for cutting implements and weapons, we enter into the millennium before the Christian era; for roughly speaking, the development of the civilization associated with the gradual substitution of iron for bronze began about 1000 B.C. Again we look towards the south-east of Europe for the earliest evidence of this great advance; from that quarter it gradually spread over the whole continent, reaching the more northern parts about five hundred years later. In Egypt, the home of a marvellous civilization at a very early time, the conditions were different, and there is reason to suppose that iron was known there long before it was in use on the northern side of the Mediterranean. Our knowledge of the dates at which iron was first known in parts of Asia is still very limited, and further discoveries must be awaited.

Iron age.

The archaeology of Ireland presents features in many respects different from those of the rest of the British Islands in the Stone and Bronze Ages. Such affinities in style as are traceable connect it rather with Scotland than with any part of the south, a fact doubtless due to proximity as well as in part to race connexions. A special feature is the astonishing quantity of gold that was produced in Ireland during the early Bronze Age. The frequent discovery of gold ornaments of this time has enriched to a surprising degree the museum of the Royal Irish Academy in Dublin, while many private and public collections both in Ireland and elsewhere contain a considerable number of similar relics. If these represented the total wealth of gold of the Bronze Age the amount would probably exceed that of any ancient period in any country, except perhaps the republic of Colombia in South America. But the known remains can only be a small proportion of the original wealth. Vast quantities must have been discovered from medieval times onwards, nearly all of which would be melted down, owing to the ignorance of the finders or to the uncertainty of ownership. Further, it may be taken as certain that there still remains in the earth a great mass of the metal which may or may not be discovered at some future time. If it were by any means possible to estimate what these united categories would amount to, the result would scarcely be credited. It is well known that gold has been, and still is, found in Ireland; but it is hard to believe that there were no richer deposits than are now known. It is at any rate certain that the rivers were worked as late as the opening centuries of our era. In the Bronze Age the most characteristic ornaments were penannular objects of all sizes from a small finger ring up to an armlet, generally known as "ring money" from the difficulty of assigning a definite use to the whole series; and the flat, crescent-shaped, diadem-like objects called "lunulae," which are perhaps even more definitely characteristic of Ireland. Such objects of gold, if ornamented at all, are, like some of the flat axe-heads, engraved with simple geometrical patterns, lozenge-shaped chequers and the like, a type of decoration in itself easily determined as being of the Bronze Age, but bearing at the same time an interesting and very curious analogy to remains of the same period from the Iberian Peninsula, more especially from Portugal. If any overland culture-relations existed between the two countries, it would be only reasonable to expect the occurrence of the objects in question in the intervening districts. But so far nothing of the kind has been discovered. Moreover, had it been an isolated instance of resemblance it might be negligible, but an equally odd similarity is found in the fact that the Irish were in the habit of grinding the faces of their flint arrow-heads, an apparently useless refinement, while the Portuguese of the early Bronze Age did the same. Again, the dolmens of Ireland bear a distinct resemblance to those of Spain and Portugal, while the French dolmens, with few exceptions in the north, have a different character. These curious points are in favour of the tradition that the original inhabitants of Ireland were of Iberian origin, and further, that they did not come overland but by sea, and there are indeed signs of extensive navigation in the Bronze Age of northern Europe. It was perhaps in the middle of our Bronze Age, say about 1000 B.C., that this Iberian race was supplanted by the Celts, who took a considerable time to emerge from their native barbarism. It is, at any rate, fairly certain that for some hundreds of years previous to this Celtic invasion, Ireland was an enormously rich country, supplying not only herself, but also Britain and part of the Atlantic seaboard with gold. The fact became eventually an ingrained tradition in the history of the country, subsisting in Irish literature for centuries after the Christian era. Such natural wealth must have produced in these early times a marked effect on the relations and culture of these Iberian Irish, and one might reasonably expect a much higher level of luxury and wealth than is indicated by the remains commonly found. With the opportunities provided by communication with the continent, and the interchange of goods, with all the chances of benefiting by ideas current among other races, it is astonishing that Ireland did not play a more prominent part in Europe, more than a thousand years before the Christian era.

Ireland.

While gold as a metal was known in Europe, even before copper, it is a curious fact that silver was almost unknown, and hardly ever used. One of the most interesting sites for the metal, at about the same period of which we have just been speaking in Ireland, was the Mediterranean coast of Spain. Here in the neighbourhood of Almeria have been found remains of a large and apparently prosperous population ranging from the Stone Age to the end of the Bronze Age, with houses and tombs, besides the fortifications rendered necessary, in the later period, by their possession of the rare and precious metal, silver. Rare it certainly was, for the quantity found was exceedingly small, tiny slender rings for the fingers or the ears, and rivets to hold the axe-blade in its handle; but nothing to compare with the lavish richness of the American mines. The interesting race who occupied these dwellings and finally were laid to rest in the adjoining graves were evidently connected more or less closely with the peoples inhabiting the eastern coasts of the Mediterranean.

Mediterranean area.

Recent discoveries in the central Mediterranean area not only furnish new and trustworthy (though none the less surprising) dates in ancient history, but may also bridge the distance between the Levant and the Pillars of Hercules. The results achieved by Arthur Evans and other distinguished explorers in Crete (*q.v.*) opened a new chapter in the history of European civilization, and may fitly be compared with the excavation of Troy, Mycenae and Tiryns by Schliemann some thirty years before. The progress of archaeology in the interval can be well tested by a comparison of the discussions to which the two series of discoveries gave rise. The mistaken attributions and unfortunate animosities in connexion with earlier excavations are almost forgotten, while the brilliant discoveries in the island of King Minos have not only themselves been made on scientific principles, but are illumined by the splendid revelation of the civilizations of the Mycenaean and the pre-Mycenaean era.

A great change indeed took place in the methods of classical study during the last decade of the 19th century, a change which affected the entire character of future classical research. It was formerly the common habit among students and professors of archaeology to confine their attention and their interests entirely to classical texts and even to classical sites, rejecting as outside the scope of their studies anything that was not manifestly beautiful as art. Whatever was primitive in its aspect, or wanting in the familiar characteristics that had for centuries been associated with Greek art, was either rejected entirely or at any rate relegated to a second place, as having but a poor claim to be classed with objects of the finer periods. The result was necessarily misleading. The uninstructed majority very naturally regarded the art of Pheidian times as a thing of supernatural growth, which had been bestowed by divine favour upon a chosen spot on the earth, without a human parentage, and almost without leaving any descendants. The evolutionary methods of other branches of science, however, were by degrees brought to bear upon the sacred precincts of pure Greek art. It was found that the crude products of the second millennium B.C., the formless images evolved by the uncultured dwellers in the Mediterranean area more than a

Classical.

thousand years before the time of Pheidias, were in truth the prototypes of the creations of himself and his contemporaries. This step being taken, the rest became easy. The most commonplace and ordinary relics were collected with as much avidity as they had formerly been rejected, in the belief that their simple forms would aid in the elucidation of their more complex and highly elaborated descendants. This minute attention, moreover, was not only given to the works of man, but even the remains of humanity received the attention they merited. It has been rightly thought, during recent years, that the question of race was a factor that deserved treatment in dealing with works of art of early times; and that natural evolution due to man's tendency to change with time, might not be sufficient to account for the differences of type observed in human remains from the same country. For this reason, not only the objects associated with the burial have been preserved, but also the skeleton itself. This has been examined, measurements taken and recorded for comparison, and inferences made, sometimes of a surprising character. For example, if a cemetery be found with a preponderance of tall, long-headed skeletons in a district where the prevailing type of skeleton is short and brachycephalic (short-headed), the observer may reasonably expect a different kind of burial-furniture, and suspect an intruding race. In this particular respect, archaeology owes a signal debt to physical anthropology and to anthropological methods in general. The combination of the two is far more likely to lead to a reasonable and satisfactory conclusion than would be possible if the one branch of science had been pursued alone.

When once the existence of abundant remains of prehistoric man had been admitted, and their study had received recognition as a branch of science, the evidence supplied by the relics themselves and by their relation to extinct or existing animals would have sufficed to give a considerable insight into the conditions of primitive life. But, fortunately, corroborative evidence of the most useful kind was at hand, and has been of the greatest service in solving what might otherwise have been insoluble problems. Though the progress of civilization, and more especially the ever increasing rapidity of communication, are rapidly changing the habits of life among the primitive peoples in various parts of the world, yet till past the middle of the 19th century, a certain number of tribes, if not races, were still in the Stone Age. Even at the present day stone-using tribes still exist, although by chance metal may be known to them. The importance of the study of their conditions of life and their technical processes, and of the collecting of their implements for the express purpose of illustrating prehistoric man, was recognized by Henry Christy (1810–1865), who had made extensive investigations and collected relics in conjunction with Edouard Lartet in the now famous caverns of the Dordogne, at a time when such explorations were somewhat of a novelty; and concurrently he formed a large collection of the productions of existing savage peoples, both collections after his death passing to the British Museum, his intention being that the one should elucidate the other. (It is only fair to his memory, however, to state here that, by his express wish, the most important of the relics that he had obtained from the Dordogne caves were returned to France where they now are. Such instances of international courtesy are rare enough to deserve mention.) The value and interest of such a series can scarcely be over-rated. Almost till the 20th century, the Indians of North America, the Australian and Tasmanian natives, as well as those of New Zealand and the many archipelagoes of the Pacific, were, if not ignorant of the use of metals, at least habitually using stone where civilized man would use metal. The Maori made his war club of jade and the pounders for preparing his food of stone. The Australian had his stone axe-blade; and low as he stands in the culture scale, his spear-heads are chipped with an exquisite precision. The Papuan of inland New Guinea is still making his weapons of stone and wood; while until quite recently the North American Indian was making his delicate stone arrow-points, and the Solomon islander his beautiful polished stone axe-blades.

Value of ethnology.

The knowledge gained by the study of a large series of such objects enables us to fill up very many gaps in the story of early man as told by his own remains. In fact, in this respect, the value of the comparison is much greater than could reasonably be expected; for, whatever may be the reason, nothing is more marked than the extraordinary similarity of stone implements at all times and over the whole world. An arrow-point made by a Patagonian Indian, one from a Japanese shell mound, and a third of the Stone Age from Ireland, are found to be practically identical. Whether it is that the same material and the same necessity naturally produce a like result, or whether there has existed throughout a continuity of type, is a question that will never be satisfactorily answered. The results, however, are of eminently practical value. The arrow-heads of neolithic man, which are found by hundreds all over Europe, may be seen fixed in their shafts in the hands of an American Indian; rude pieces of quartz, which unmounted would escape notice as implements, are seen to make excellent tools when mounted in a handle by the Australian black, while flakes of slate find a use when mounted as skinning-knives by the Eskimo.

Now that the narrower conception of archaeology as a minor branch of classical studies has been given up, the new science has gradually won its way to universal recognition; and anthropology, a still wider subject but in many points closely allied to the scientific study of ancient remains, has still more recently found favour at all the leading universities, and practical measures have been taken to establish the study on a firm and scientific basis. Apart from this official encouragement, much has been done towards the systematization and teaching of archaeology by practical excavators, whose pupils have attained considerable numbers and celebrity. Something has been done, too, in the national and provincial museums, to present the relics of past ages in an intelligible manner, so that the collections no longer consist of curiosities but of documents rich in instruction and interest even to the general visitor. The progress of photography, as well as the improvement and cheapening of methods of illustration, have also assisted enormously in the advance of archaeology; and similarly, the antiquities exhibited in museums and private collections to illustrate and amplify written records, have in the last generation received much attention on their own account, and have reacted in various ways on the teaching of ancient history. In some countries a further step in general education has been taken, and the lamentable waste of archaeological material arrested to some extent by the distribution of pictures and diagrams among schools and institutions, to call attention to the more ordinary local types, and to encourage those who are likely to discover them in the soil to save them from destruction and render them available for scientific study. A certain familiarity on the part of the young with the mere appearance of antiquities that come to light continually and are almost as often discarded or destroyed, would probably result in valuable additions being made to the available data.

Organized study.

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(C. H. Rd.)

ARCHAEOPTERYX. The name of *Archaeopteryx lithographica* was based by Hermann von Meyer upon a feather (Gr. πτέρυξ, wing) found in 1861 in the lithographic slate quarries of Solenhofen in Bavaria, the geological horizon being that of the Kimmeridge clay of the Upper Oolite or Jurassic system. In the same year and at the same place was discovered the specimen (figs. 1 and 3)

now in the British Museum, named by Andreas Wagner *Griphosaurus*. Sir R. Owen has described it as *A. macroura*. Stimulated by the high price paid by the British Museum, the quarry owners diligently searched, and in 1872 another, much finer, preserved specimen was found. This was bought by K. W.

FIG. 1.—The British Museum specimen.

v. Siemens, who presented it to the Berlin Museum. The late W. Dames has written an excellent monograph on it.

Archaeopteryx was a bird, without any doubt, but still with so many low, essentially reptilian characters that it forms a link between these two classes. About the size of a rook, its most

FIG. 2.—The specimen in the Museum für Naturkunde, Berlin. After a photograph taken from a cast.

obvious peculiarity is the long reptilian tail, composed of 20 vertebrae and not ending in a pygostyle. The last dozen vertebrae each carry a pair of well-developed typical quills. Upon these features of the tail E. Haeckel established the subclass Saururae, containing solely Archaeopteryx, in opposition to the Ornithurae, comprising all the other birds. Herein he has been followed by many zoologists. However, the fact that various recent birds possess the same kind of caudal skeleton, likewise without a pygostyle, although reduced to at least 13 vertebrae, shows that the two terms do not express a fundamental difference.

The importance of *Archaeopteryx* justifies the following descriptive detail. Vertebral column composed of about 50 vertebrae, viz. 10-11 cervical, 12-11 thoracic, 2 lumbar, 5-6 sacral, and 20 or 21 caudal, with a total caudal length of the Berlin specimen of 7 in. The cervical and thoracic vertebrae seem to be biconcave; the cervical ribs are much reduced and were apparently still movable; the thoracic ribs are devoid of uncinate processes. Paired abdominal ribs are doubtful. Scarcely anything is known of the sternum, and little of the shoulder-girdle, except the very stout furcula; scapula typically bird-like. Humerus about 2½ in. long, with a strong crista lateralis, which indicates a strongly developed great pectoral muscle and hence, by inference, the presence of a keel to the sternum. Radius and ulna typically avine, 2·1 in. in length. Carpus with two separate bones. The hand skeleton consists of 3 completely separate metacarpals, each carrying a com-

FIG. 3.—Tail of British Museum specimen.

plete, likewise free, finger; the shortened thumb with 2, the index with 3, the third with 4 phalanges; each finger with a curved claw. The whole wing is consequently, although essentially avine, still reptilian in the unfused state of the metacarpals and the numbers of the phalanges. The pelvis is imperfectly known. The preacetabular portion of the ilium is shorter than the posterior half. The hind-limb is typically avine, with intertarsal joint, distally reduced fibula, and the three elongated metatarsals which show already considerable anchylosis; reduction of the toes to four, with 2, 3, 4 and 5 phalanges; the hallux is separate, and as usual in recent birds posterior in position. Skull bird-like, except that the short bill cannot have been enclosed in a horny rhamphotheca, since the upper jaw shows a row of 13, the lower jaw 3 conical teeth, all implanted in distinct sockets.

The remiges and rectrices indicate perfect feathers, with shaft and complete vanes which were so neatly finished that they must have possessed typical radii and hooklets. Some of the quills measure fully 5 in. in length. Six or seven remiges were attached to the hand, ten to the ulna.

It is idle to speculate on the habits of this earliest of known birds. That it could fly is certain, and the feet show it to have

been well adapted to arboreal life. The clawed slender fingers did not make *Archaeopteryx* any more quadrupedal or bat-like in its habits than is a kestrel hawk, with its equally large, or even larger thumb-claw.

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ARCHAISM (adj. "archaic"; from Gr. ἀρχαῖος, old), an old-fashioned usage, or the deliberate employment of an out-of-date and ancient mode of expression.

ARCHANGEL (ARCHANGELSK), a government of European Russia, bounded N. by the White Sea and Arctic Ocean, W. by Finland and Olonets, S. by Vologda, and E. by the Ural mountains. It comprehends the islands of Novaya-Zemlya, Vaygach and Kolguev, and the peninsula of Kola. Its area is 331,505 sq. m., and its population in 1867 was 275,779 and in 1897, 349,943. The part which lies within the Arctic Circle is very desolate and sterile, consisting chiefly of sand and reindeer moss. The winter is long and severe, and even in summer the soil is frozen. The rivers (Tuloma, Onega, Dvina, Mezen and Pechora) are closed in September and scarcely thaw before July. The Kola peninsula is, however, diversified by hills exceeding 3000 ft. in altitude and by large lakes (*e.g.* Imandra), and its coast enjoys a much more genial climate. South of the Arctic Circle the greater part of the country is covered with forests, intermingled with lakes and morasses, though in places there is excellent pasturage. Here the spring is moist, with cold, frosty nights; the summer a succession of long foggy days; the autumn again moist. The rivers are closed from October to April. The inhabitants of the northern districts—nomad tribes of Samoyedes, Zyryans, Lapps, and the Finnish tribes of Karelians and Chudes—support themselves by fishing and hunting. In the southern districts hemp and flax are raised, but grain crops are little cultivated, so that the bark of trees has often to be ground up to eke out the scanty supply of flour. Potatoes are grown as far north as 65°. Shipbuilding is carried on, and the forests yield timber, pitch and tar. Excellent cattle are raised in the district of Kholmogory on the Dvina, veal being supplied to St Petersburg. Gold is found in the districts of Kola, naphtha and salt in those of Kem and Pinega, and lignite in Mezen. Sulphurous springs exist in the districts of Kholmogory and Shenkursk. The industry and commerce are noticed below in the article on the town Archangel, which is the capital. The government is divided into nine districts, the chief towns of which are—Alexandrovsk or Kola (pop. 300), Archangel (*q.v.*), Kem (1825), Kholmogory (1465), Mezen (2040), Novaya-Zemlya (island), Pechora, Pinega (1000) and Shenkursk (1308).

See A. P. Engelhardt, *A Russian Province of the North* (Eng. trans., by H. Cooke, 1899).

ARCHANGEL (ARCHANGELSK), chief town of the government of Archangel, Russia, at the head of the delta of the Dvina, on the right bank of the river, in lat. 64° 32′ N. and long. 40° 33′ E. Pop. (1867) 19,936; (1897) 20,933. As early as the 10th century, if not earlier, the Norsemen frequented this part of the world (Bjarmeland) on trading expeditions; the best-known is that made by Ottar or Othere between 880 and 900 and described (or translated) by Alfred the Great, king of England. The modern town dates, however, from the visit of the English voyager, Richard Chancellor, in 1553. An English factory was erected on the lower Dvina soon after that date, and in 1584 a fort was built, around which the town grew up. Archangel was for long the only seaport of Russia (or Muscovy). The tsar Boris Godunov (1598–1605) threw the trade open to all nations; and the chief participants in it were England, Holland and Germany. In 1668–1684 the great bazaar and trading hall was built, principally by Tatar prisoners. In 1691–1700 the exports to England averaged £112,210 annually. After Peter the Great made St Petersburg the capital of his dominions (1702), he placed Archangel under vexatious commercial disabilities, and consequently its trade declined. In 1762 it was granted the same privileges as St Petersburg, and since then it has gradually recovered its former prosperity. It is the seat of a bishop, and has a cathedral (1709–1743), a museum, the monastery of the Archangel Michael (whence the city gets its name), an ecclesiastical seminary, a school of navigation and a naval hospital. Linen, leather, canvas, cordage, mats, tallow, potash and beer are manufactured. There is a lively trade with St Petersburg, and the sea-borne exports, which consist chiefly of timber, flax, linseed, oats, flour, pitch, tar, skins and mats, amount in value to about 1½ millions sterling annually (82½ % for timber), but the imports (mostly fish) are worth only about £200,000. A fish fair is held every year on the 1st (15th) of September. Archangel communicates with the interior of Russia by river and canal, and has a railway line (522 m.) to Yaroslavl. The harbour, deepened to 18¼ ft., is about a mile below the city, and is accessible from May to October. About 12 m. lower down there are a government dockyard and merchants' warehouses. A new military harbour, Alexandrovsk or Port Catherine, has been made on Catherine (Ekaterininsk) Bay, on the Murman coast of the Kola peninsula. The shortest day at Archangel has only 3 hrs. 12 min., the longest 21 hrs. 48 min. of daylight.

ARCHBALD, a borough of Lackawanna county, Pennsylvania, U.S.A., in the N.E. part of the state, 10 m. N.E. of Scranton. Pop. (1890) 4032; (1900) 5396; (1869 foreign-born); (1910) 7194. It is served by the Delaware & Hudson, and the New York, Ontario & Western railways, and by an interurban electric line. It is about 900 ft. above sea-level; in the vicinity are extensive deposits of anthracite coal, the mining and breaking of which is the principal industry; silk throwing and weaving is another industry of the borough. At Archbald is a large glacial "pot hole," about 20 ft. in diameter and 40 ft. in depth. Archbald, named in honour of James Archbald, formerly chief engineer of the Delaware & Hudson railway, was a part of Blakely township (incorporated in 1818) until 1877, when it became a borough.

ARCHBISHOP (Lat. *archiepiscopus*, from Gr. ἀρχιεπίσκοπος), in the Christian Church, the title of a bishop of superior rank, implying usually jurisdiction over other bishops, but no superiority of order over them. The functions of the archbishop, as at present exercised, developed out of those of the metropolitan (*q.v.*); though the title of archbishop, when it first appeared, implied no metropolitan jurisdiction. Nor are the terms interchangeable now; for not all metropolitans are archbishops,[1] nor all archbishops metropolitans. The title seems to have been introduced first in the East, in the 4th century, as an honorary distinction implying no superiority of jurisdiction. Its first recorded use is by Athanasius, bishop of Alexandria, who applied it to his predecessor Alexander as a mark of respect. In the same way Gregory of Nazianzus bestowed it upon Athanasius himself. In the next century its use would seem to have been more common as the title of bishops of important sees; for several archbishops are stated to have been present at the council of Chalcedon in 451. In the Western Church the title was hardly known before the 7th century, and did not become common until the Carolingian emperors revived the right of the metropolitans to summon provincial synods. The metropolitans now commonly assumed the title of archbishop to mark their pre-eminence over the other bishops; at the same time the obligation imposed upon them, mainly at the instance of St Boniface, to receive the *pallium* (*q.v.*) from Rome, definitely marked the defeat of their claim to exercise metropolitan jurisdiction independently of the pope.

At the present day, the title of archbishop is retained in the Roman Catholic Church, the various oriental churches, the Anglican Church, and certain branches of the Lutheran (Evangelical) Church.

[1] In the Roman Church it is safe to say that all metropolitans are archbishops. In, *e.g.*, the Scottish and American episcopal churches, however, the metropolitan is the senior bishop *pro tem.*

In the Roman Catholic Church the powers of the archbishop are considerably less extensive than they were in the middle ages. According to the medieval canon law, based on the decretals, and codified in the 13th century in the *Corpus juris canonici*, by which the earlier powers of metropolitans had been greatly curtailed, the powers of the archbishop consisted in the right (1) to confirm and consecrate suffragan bishops; (2) to summon and preside over provincial synods; (3) to superintend the suffragans and visit their dioceses, as well as to censure and punish bishops in the interests of discipline, the right of deprivation, however, being reserved to the pope; (4) to act as a court of appeal from the diocesan courts; (5) to exercise the *jus devolutionis*, *i.e.* present to benefices in the gift of bishops, if these neglect their duty in this respect. These rights were greatly curtailed by the council of Trent. The confirmation and consecration of bishops (*q.v.*) is now reserved to the Holy See. The summoning of provincial synods, which was made obligatory every three years by the council, was long neglected, but is now more common wherever the political conditions, *e.g.* in the United States, Great Britain and France, are favourable. The disciplinary powers of the archbishop, on the other hand, can scarcely be said to survive. The right to hold a visitation of a suffragan's diocese or to issue censures against him was, by Sess. xxiv. c. 3 *de ref.*, of the council of Trent, made dependent upon the consent of the provincial synod after cause shown (*causa cognita et probata*); and the only two powers left to the archbishop in this respect are to watch over the diocesan seminaries and to compel the residence of the bishop in his diocese. The right of the archbishop to exercise a certain disciplinary power over the regular orders is possessed by him, not as archbishop, but as the delegate *ad hoc* of the pope. Finally, the function of the archbishop as judge in a court of appeal, though it still subsists, is of little practical importance now that the clergy, in civil matters, are universally subject to the secular courts.

Roman Catholic Church.

Besides archbishops who are metropolitans there are in the Roman Catholic Church others who have no metropolitan jurisdiction. Such are the titular archbishops *in partibus*, and certain archbishops of Italian sees who have no bishops under them. Archbishops rank immediately after patriarchs and have the same precedence as primates. The right to wear the *pallium* is confined to those archbishops who are not merely titular. It must be applied for, either in person or by proxy, at Rome by the archbishop within three months of his consecration or enthronement, and, before receiving it, he must take the oaths of fidelity and obedience to the Holy See. Until the *pallium* is granted, the archbishop is known only as archbishop-elect, and is not empowered to exercise his *potestas ordinis* in the archdiocese nor to summon the provincial synod and exercise the jurisdiction dependent upon this. He may, however, exercise his purely *episcopal* functions. The special ensign of his office is the cross, *crux erecta* or *gestatoria*, carried before him on solemn occasions (see Cross).

In the Orthodox and other churches of the East the title of archbishop is of far more common occurrence than in the West, and is less consistently associated with metropolitan functions. Thus in Greece there are eleven archbishops to thirteen bishops, the archbishop of Athens alone being metropolitan; in Cyprus, where there are four bishops and only one archbishop, all five are of metropolitan rank.

Eastern Church.

In the Protestant churches of continental Europe the title of archbishop has fallen into almost complete disuse. It is, however, still borne by the Lutheran bishop of Upsala, who is metropolitan of Sweden, and by the Lutheran bishop of Åbo in Finland. In Prussia the title has occasionally been bestowed by the king on general superintendents of the Lutheran church, as in 1829, when Frederick William III. gave it to his friend and spiritual adviser, the celebrated preacher, Ludwig Ernst Borowski (1740–1831), general superintendent of Prussia (1812) and bishop (1816).

Lutheran Church.

In the Church of England and its sister and daughter churches the position of the archbishop is defined by the medieval canon law as confirmed or modified by statute since the Reformation. It is, therefore, as regards both the *potestas ordinis* and jurisdiction, substantially the same as in the Roman Catholic Church, save as modified on the one hand by the substitution of the supremacy of the crown for that of the Holy See, and on the other by the restrictions imposed by the council of Trent.

Church of England.

The ecclesiastical government of the Church of England is divided between two archbishops—the archbishop of Canterbury, who is "primate of all England" and metropolitan of the province of Canterbury, and the archbishop of York, who is "primate of England" and metropolitan of the province of York. The jurisdiction of the archbishop of Canterbury as primate of all England extends in certain matters into the province of York. He exercised the jurisdiction of *legatus natus* of the pope throughout all England before the Reformation, and since that event he has been empowered, by 25 Hen. VIII. c. 21, to exercise certain powers of dispensation in cases formerly sued for in the court of Rome. Under this statute the archbishop continues to grant special licences to marry, which are valid in both provinces; he appoints notaries public, who may practise in both provinces; and he grants dispensations to clerks to hold more than one benefice, subject to certain restrictions which have been imposed by later statutes. The archbishop also continues to grant degrees in the faculties of theology, music and law, which are known as Lambeth degrees. His power to grant degrees in medicine, qualifying the recipients to practise, was practically restrained by the Medical Act 1858.

The archbishop of Canterbury exercises the twofold jurisdiction of a metropolitan and a diocesan bishop. As metropolitan he is the guardian of the spiritualities of every vacant see within the province, he presents to all benefices which fall vacant during the vacancy of the see, and through his special commissary exercises the ordinary jurisdiction of a bishop within the vacant diocese. He exercises also an appellate jurisdiction over each bishop, which, in cases of licensed curates, he exercises personally under the Pluralities Act 1838; but his ordinary appellate jurisdiction is exercised by the judge of the Arches court (see Arches, Court of). The archbishop had formerly exclusive jurisdiction in all causes of wills and intestacies, where parties died having personal property in more than one diocese of the province of Canterbury, and he had concurrent jurisdiction in other cases. This jurisdiction, which he exercised through the judge of the Prerogative court, was transferred to the crown by the Court of Probate Act 1857. The Arches court was also the court of appeal from the consistory courts of the bishops of the province in all testamentary and matrimonial causes. The matrimonial jurisdiction was transferred to the crown by the Matrimonial Causes Act 1857. The court of Audience, in which the archbishop presided personally, attended by his vicar-general, and sometimes by episcopal assessors, has fallen into desuetude. The vicar-general, however, exercises jurisdiction in matters of ordinary marriage licences and of institutions to benefices. The master of the faculties regulates the appointment of notaries public, and all dispensations which fall under 25 Hen. VIII. c. 21.

A right very rarely exercised by the archbishop of Canterbury, but one of great importance, is that of the visitation and deprivation of inferior bishops. Since there is no example of the archbishop of York exercising or being reputed to have such disciplinary jurisdiction over his suffragans,[1] and this right could, according to the canon law cited above, in the middle ages only be exercised normally in concert with the provincial synod, it would seem to be a survival of the special jurisdiction enjoyed by the pre-Reformation archbishop as *legatus natus* of the pope. It was somewhat freely exercised by Cranmer and his successors immediately after the Reformation; but the main precedent now relied upon is that of Dr Watson, bishop of St Davids, who was deprived in 1695 by Archbishop Tennison for simony and

[1] Unless the case of the claim of Mark, bishop of Carlisle, to be tried by his ordinary instead of by a temporal court, be a precedent (Phillimore, *Eccles. Law*, p. 74, ed. 1895).

other offences, the legality of the sentence being finally confirmed by the House of Lords on the 25th of January 1705. It was proved in the course of the long argument in this case that the archbishop of Canterbury had undoubtedly exercised such independent power of visitation both before and after the Reformation; and it was on this precedent that in 1888 the judicial committee of the privy council mainly relied in deciding that the archbishop had the right to cite before him the bishop of Lincoln (Dr Edward King), who was accused of certain irregular ritual practices. The trial began on the 12th of February 1889 before the archbishop and certain assessors, the protest of Dr King, based on the claim that he could only be tried in a provincial synod, being overruled by Archbishop Benson on the grounds above stated. The main importance of the "Lincoln Judgment," delivered on the 21st of November 1890, is that it set a new precedent for the effective jurisdiction of the archbishop, based on the ancient canon law, and so did something towards the establishment of a purely "spiritual" court, the absence of which had been one of the main grievances of a large body of the clergy.

It is the privilege of the archbishop of Canterbury to crown the kings and queens of England. He is entitled to consecrate all the bishops within his province and was formerly entitled, upon consecrating a bishop, to select a benefice within his diocese at his option for one of his chaplains, but this practice was indirectly abolished by 3 and 4 Vict. c. 111, § 42. He is entitled to nominate eight chaplains, who had formerly certain statutory privileges, which are now abolished. He is *ex officio* an ecclesiastical commissioner for England, and has by statute the right of nominating one of the salaried ecclesiastical commissioners.

The archbishop exercises the ordinary jurisdiction of a bishop over his diocese through his consistory court at Canterbury, the judge of which court is styled the commissary-general of the city and diocese of Canterbury. The archbishop holds a visitation of his diocese personally every three years, and he is the only diocesan who has kept up the triennial visitation of the dean and chapter of his cathedral.[1] The archbishop of Canterbury takes precedence immediately after princes of the blood royal and over every peer of parliament, including the lord chancellor.

The archbishop of York has immediate spiritual jurisdiction as metropolitan in the case of all vacant sees within the province of York, analogous to that which is exercised by the archbishop of Canterbury within the province of Canterbury. He has also an appellate jurisdiction of an analogous character, which he exercises through his provincial court, whilst his diocesan jurisdiction is exercised through his consistorial court, the judges of both courts being nominated by the archbishop. His ancient testamentary and matrimonial jurisdiction was transferred to the crown by the same statutes which divested the see of Canterbury of its jurisdiction in similar matters. It is the privilege of the archbishop of York to crown the queen consort and to be her perpetual chaplain. The archbishop of York takes precedence over all subjects of the crown not of royal blood, but after the lord high chancellor of England. He is *ex officio* an ecclesiastical commissioner for England (see further ENGLAND, CHURCH OF).

The Church of Ireland had at the time of the Act of Union four archbishops, who took their titles from Armagh, Dublin, Cashel and Tuam. By acts of 1833 and 1834, the metropolitans of Cashel and of Tuam were reduced to the status of diocesan bishops. The two archbishoprics of Armagh and Dublin are maintained in the disestablished Church of Ireland.

The title archbishop has been used in certain of the colonial churches, *e.g.* Australia, South Africa, Canada, and the West Indies, since 1893, when it was assumed by the metropolitans of Canada and Rupert's Land (see ANGLICAN COMMUNION). Archbishops have the title of His (or Your) Grace and Most Reverend Father in God.

[1] The court of Peculiars is no longer held, inasmuch as the peculiars have been placed by acts of parliament under the ordinary jurisdiction of the bishops of the respective dioceses in which they are situated.

See Hinschius, *System des katholischen Kirchenrechts* (Berlin, 1869), also article "Erzbischof," in Hauck, *Realencyklopädie* (1898); Phillimore, *The Ecclesiastical Law of the Church of England*, and authorities there cited. (W. A. P.)

ARCHCHANCELLOR (Lat. *Archicancellarius*; Ger. *Erzkanzler*), or chief chancellor, a title given to the highest dignitary of the Holy Roman Empire, and also used occasionally during the middle ages to denote an official who supervised the work of chancellors or notaries.

In the 9th century Hincmar, archbishop of Reims, in his work, *De ordine palatii et regni*, speaks of a *summus cancellarius*, evidently an official at the court of the Carolingian emperors and kings. A charter of the emperor Lothair I. dated 844 refers to Agilmar, archbishop of Vienne, as archchancellor, and there are several other references to archchancellors in various chronicles. This office existed in the German kingdom of Otto the Great, and about this time it appears to have become an appanage of the archbishopric of Mainz. When the Empire was restored by Otto in 962, a separate chancery seems to have been organized for Italian affairs, and early in the 11th century the office of archchancellor for the kingdom of Italy was in the hands of the archbishop of Cologne. The theory was that all the imperial business in Germany was supervised by the elector of Mainz, and for Italy by the elector of Cologne. However, the duties of archchancellor for Italy were generally discharged by deputy, and after the virtual separation of Italy and Germany, the title alone was retained by the elector. When the kingdom of Burgundy or Arles was acquired by the emperor Conrad II. in 1032 it is possible that a separate chancery was established for this kingdom. However this may be, during the 12th century the elector of Trier took the title of archchancellor for the kingdom of Arles, although it is doubtful if he ever performed any duties in connexion with this office. This threefold division of the office of imperial archchancellor was acknowledged in 1356 by the Golden Bull of the emperor Charles IV., but the duties of the office were performed by the elector of Mainz. The office in this form was part of the constitution of the Empire until 1803 when the archbishopric of Mainz was secularized. The last elector, Karl Theodor von Dalberg, however, retained the title of archchancellor until the dissolution of the Empire in 1806. H. Reincke in *Der alte Reichstag und der neue Bundesrat* (Tübingen, 1906) points out a marked resemblance between the medieval archchancellor and the German imperial chancellor of the present day.

See du Cange, *Glossarium*, s. "Archicancellarius"; and CHANCELLOR.

ARCHDEACON (Lat. *archidiaconus*, Gr. ἀρχιδιάκονος), a high official of the Christian Church. The office of archdeacon is of great antiquity. So early as the 4th century it is mentioned as an established office, and it is probable that it was in existence in the 3rd. Originally the archdeacon was, as the name implies, the chief of the deacons attached to the bishop's cathedral, his duty being, besides preaching, to supervise the deacons and their work, *i.e.* more especially the care of the sick and the arrangement of the externals of divine worship. Even thus early their close relation to the bishop and their employment in matters of episcopal administration gave them, though only in deacons' orders, great importance, which continually developed. In the East, in the 5th century, the archdeacons were already charged with the proof of the qualifications of candidates for ordination; they attended the bishops at ecclesiastical synods, and sometimes acted as their representatives; they shared in the administration of sees during a vacancy. In the West, in the 6th and 7th centuries, besides the original functions of their office, archdeacons had certain well-defined rights of visitation and supervision, being responsible for the good order of the lower clergy, the upkeep of ecclesiastical buildings and the safe-guarding of the church furniture—functions which involved a considerable disciplinary power. During the 8th and 9th centuries the office tended to become more and more exclusively purely administrative,

the archdeacon by his visitations relieving the bishop of the minutiae of government and keeping him informed in detail of the condition of his diocese. The archdeacon had thus become, on the one hand, the *oculus episcopi*, but on the other hand, armed as he was with powers of imposing penance and, in case of stubborn disobedience, of excommunicating offenders, his power tended more and more to grow at the bishop's expense. This process received a great impulse from the erection in the 11th and 12th centuries of defined territorial jurisdictions for the archdeacons, who had hitherto been itinerant representatives of the central power of the diocese. The dioceses were now mapped out into several archdeaconries (*archidiaconatus*), which corresponded with the political divisions of the countries; and these defined spheres, in accordance with the prevailing feudal tendencies of the age, gradually came to be regarded as independent centres of jurisdiction.[1] The bishops, now increasingly absorbed in secular affairs, were content with a somewhat theoretical power of control, while the archdeacons rigorously asserted an independent position which implied great power and possibilities of wealth. The custom, moreover, had grown up of bestowing the coveted office of archdeacon on the provosts, deans and canons of the cathedral churches, and the archdeacons were thus involved in the struggle of the chapters against the episcopal authority. By the 12th century the archdeacon had become practically independent of the bishop, whose consent was only required in certain specified cases.

The power of the archdeacon reached its zenith at the outset of the 13th century. Innocent III. describes him as *judex ordinarius*, and he possesses in his own right the powers of visitation, of holding courts and imposing penalties, of deciding in matrimonial causes and cases of disputed jurisdiction, of testing candidates for orders, of inducting into benefices. He has the right to certain procurations, and to appoint and depose archpriests and rural deans. And these powers he may exercise through delegated *officiales*. His jurisdiction has become, in fact, not subordinate to, but co-ordinate with that of the bishop. Yet, so far as orders were concerned, he remained a deacon; and if archdeacons were often priests, this was because priests who were members of chapters were appointed to the office.

From the 13th century onward a reaction set in. The power of the archdeacons rested upon custom and prescription, not upon the canon law; and though the bishops could not break, they could circumvent it. This they did by appointing new officials to exercise in their name the rights still reserved to them, or to which they laid claim. These were the *officiales*: the *officiales foranei*, whose jurisdiction was parallel with that of the archdeacons, and the *officiales principales* and vicars-general, who presided over the courts of appeal. The clergy having thus another authority, and one moreover more canonical, to appeal to, the power of the archdeacons gradually declined; and, so far as the Roman Catholic Church is concerned, it received its death-blow from the council of Trent (1564), which withdrew all matrimonial and criminal causes from the competence of the archdeacons, forbade them to pronounce excommunications, and allowed them only to hold visitations in connexion with those of the bishop and with his consent. These decrees were not, indeed, at once universally enforced; but the convulsions of the Revolutionary epoch and the religious reorganization that followed completed the work. In the Roman Church to-day the office of archdeacon is merely titular, his sole function being to present the candidates for ordination to the bishop. The title, indeed, hardly exists save in Italy, where the archdeacon is no more than a dignified member of a chapter, who takes rank after the bishop. The ancient functions of the archdeacon are exercised by the vicar-general. In the Lutheran church the title *Archidiakonus* is given in some places to the senior assistant pastor of a church.

[1] Archdeaconries were, indeed, sometimes treated as ordinary fiefs and were held as such by laymen. Thus Ordericus Vitalis says that " (Fulk) granted to the monks the archdeaconry which he and his predecessors held in fee of the archbishop of Rouen " (*Hist. Eccl.* iii. 12).

In the Church of England, on the other hand, the office of archdeacon, which was first introduced at the Norman conquest, survives, with many of its ancient duties and prerogatives. Since 1836 there have been at least two archdeaconries in each diocese, and in some dioceses there are four archdeacons. The archdeacons are appointed by their respective bishops, and they are, by an act of 1840, required to have been six full years in priest's orders. The functions of the archdeacon are in the present day ancillary in a general way to those of the bishop of the diocese. It is his especial duty to inspect the churches within his archdeaconry, to see that the fabrics are kept in repair, and to hold annual visitations of the clergy and churchwardens of each parish, for the purpose of ascertaining that the clergy are in residence, of admitting the newly elected churchwardens into office, and of receiving the presentments of the outgoing churchwardens. It is his privilege to present all candidates for ordination to the bishop of the diocese. It is his duty also to induct the clergy of his archdeaconry into the temporalities of their benefices after they have been instituted into the spiritualities by the bishop or his vicar-general. Every archdeacon is entitled to appoint an official to preside over his archidiaconal court, from which there is an appeal to the consistory court of the bishop. The archdeacons are *ex officio* members of the convocations of their respective provinces.

It is the privilege of the archdeacon of Canterbury to induct the archbishop and all the bishops of the province of Canterbury into their respective bishoprics, and this he does in the case of a bishop under a mandate from the archbishop of Canterbury, directing him to induct the bishop into the real, actual, and corporal possession of the bishopric, and to install and to enthrone him; and in the case of the archbishop, under an analogous mandate from the dean and chapter of Canterbury, as being guardians of the spiritualities during the vacancy of the archiepiscopal see. In the colonies there are two or more archdeacons in each diocese, and their functions correspond to those of English archdeacons. In the Episcopal church of America the office of archdeacon exists in only one or two dioceses.

See Hinschius, *Kirchenrecht*, ii., §§ 86, 87; Schröder, *Die Entwicklung des Archdiakonats bis zum 11. Jahrhundert* (Munich, 1890); Wetzer and Welte, *Kirchenlexikon* (Freiburg-im-Breisgau, 1882–1901); Herzog-Hauck, *Realencyklopädie* (ed. 1896); Phillimore, *Ecclesiastical Law*, part ii. chap. v. (London, 1895). (W. A. P.)

ARCHDUKE (Lat. *archidux*, Ger. *Erzherzog*), a title peculiar now to the Austrian royal family. According to Selden it denotes " an excellency or pre-eminence only, not a superiority or power over other dukes, as in archbishop it doth over other bishops." Yet in this latter sense it would seem to have been assumed by Bruno of Saxony, archbishop of Cologne, and duke of Lorraine (953–965), when he divided his duchy into the dukedoms of Upper and Lower Lorraine. The designation was, however, exceedingly rare during the middle ages. The title of archduke of Lorraine ceased with the circumstances which had produced it. The later dynasties of Brabant and Lorraine, when these fiefs became hereditary, bore only the title of duke. The house of Habsburg, therefore, did not acquire this title with the inheritance of the dukes of Lorraine. Nor does it occur in any of the charters granted to the dukes of Austria by the emperors; though in that creating the first duke of Austria the *archiduces palatii*, *i.e.* the principal dukes of the court, are mentioned. The " Archidux Austriae, seu Austriae inferioris " is spoken of by Abbot Rudolph (d. 1138) in his chronicles of the abbey of St Trond (*Gesta Abbatum Trudonensium*) but this is no more than a rhetorical flourish, and the title of " archduke palatine " (Pfalz-Erzherzog) was, in fact, assumed first by Duke Rudolph IV. (d. 1365), and was one of the rights and privileges included in his famous forgery of the year 1358, the *privilegium maius*, which purported to have been bestowed by the emperor Frederick I. on the dukes of Austria in extension of the genuine *privilegium minus* of 1156, granted to the margrave Henry II. Rudolph IV. used the title on his seals and charters till he was compelled to desist by the emperor Charles IV. The title was also assumed for a time, probably on the strength of the *privilegium maius*, by Duke Ernest of Styria (d. 1424); but it

did not legally belong to the house of Habsburg until 1453, when Duke Ernest's son, the emperor Frederick III. (Frederick V., duke of Styria and Carinthia, 1424–1493, of Austria, 1463–1493), confirmed the *privilegium maius* and conferred the title of archduke of Austria on his son Maximilian and his heirs. The title archduke (or archduchess) is now borne by all members of the Austrian imperial house.

See John Selden, *Titles of Honor* (1672); Antonius Matthaeus, *De nobilitate, de principibus, de ducibus, &c., libri quatuor* (Amsterdam and Leiden, 1696, lib. i. cap. 6); Pfeffel, *Abrégé chronologique de l'hist. et du droit public d'Allemagne* (Paris, 1766); Brinckmeier, *Glossarium diplomaticum, &c.* (1850–1863, 2 vols.); J. F. Joachim, "Abhandlung von dem Titel 'Erzherzog,' welchen das Haus Oesterreich führt," in *Prüfende Gesellschaft zu Halle*, 7; F. Wachter, art. "Erzherzog," in *Allgem. Encykl. der Wissenschaften u. Künste* (1842, pub. by Ersch and Gruber); A. Huber, *Ueber die Entstehungszeit der oesterreichischen Freiheitsbriefe* (Vienna, 1860); W. Erben, *Das Privilegium Friedrichs I. für das Herzogtum Österreich* (Vienna, 1902).

ARCHEAN SYSTEM (from ἀρχή, beginning), in geology. Below the lowest distinctly fossiliferous strata, that is, below those Cambrian rocks which bear the *Olenellus* fauna, there lies a great mass of stratified, metamorphic and igneous rock, to which the non-committal epithet "pre-Cambrian" is often applied; and indeed in not a few instances this general term is sufficiently precise for the present state of our knowledge.

Nevertheless there are large tracts, both in the Old World and in the New, in which a subdivision of this assemblage of ancient rocks is not only possible but desirable. It is quite clear in certain regions that there is a lowermost group with a prevailing granitoid, gneissic and schistose facies, mainly of igneous origin, above which there are one or several groups bearing a distinctly sedimentary aspect. It is to this lowermost gneissic group that the term "Archean" may be conveniently limited.

Thus, while the name "pre-Cambrian" may be used to indicate *all* these very old rocks whenever there is still any difficulty in subdividing them further, it is an advantage to have a special appellation for the oldest group where this can be distinguished.

It must be pointed out that the term "Archean" has been used as a synonym for pre-Cambrian; and that the expressions *Azoic* (from α-, privative; ζωή, life), *Eozoic* (from ἠώς, dawn), and *Fundamental Complex*, have been employed in somewhat the same sense. *Archeozoic* has been proposed by American writers to apply to the lowest pre-Cambrian rocks with the same significance as "Archean" in the restricted sense employed here; but it is perhaps safer to avoid any reference to the supposed stage of life development where all direct evidence is non-existent. The so-called "Azoic" rocks have already been made to yield evidence of life, and there is no reason to presuppose the impossibility of finding other records of still earlier organisms.

The prevailing rocks of the Archean system are igneous, with metamorphosed varieties of the same; sedimentary rocks, distinctly recognizable as such, are scarce, though highly metamorphosed rocks supposed to be sediments, in some regions, take an important place.

There are several features which are peculiarly characteristic of the Archean rocks:—(1) the extraordinary complexity of the assemblage of igneous materials; (2) the extreme metamorphism and deformation which nearly all the rocks have suffered; and (3) the inextricable intermixture of igneous rocks with those for which a sedimentary origin is postulated. Wherever the Archean rocks have been closely examined two great groups of rocks are distinguishable, an older, schistose group and a younger, granitoid and gneissic group. For many years the latter was supposed to be the older, hence the epithets "primitive" or "fundamental" were applied to it. Now, however, it has been shown, both in Europe and in North America, that in certain regions a schistose series is penetrated by a gneissose series and when this occurs the schists must be the older. But bearing in mind the difficulties of interpretation, it is not at all unreasonable to assume that there may yet be regions where the gneissose rocks are the oldest; for where no schistose series is present there may be no criterion for estimating the age of the granites and gneisses. The exceedingly great difficulties which lie in the way of every attempt to unravel the history of an Archean rock-complex cannot be too forcibly emphasized; for to be able to demonstrate the order of events and succession of rocks we should at least know whether we are dealing with sediments, flows of volcanic material, or intrusions, yet in many instances this cannot be done. In some areas the gradual passage of highly foliated and metamorphosed schists may be traced into comparatively unaltered arkoses, greywackes, conglomerates; or into volcanic lava-flows, pyro-clastic rocks or dikes; or again through a gneissose rock into a granite or a gabbro; but the districts wherein these relationships have been thoroughly worked out are very few.

This much may be said, that where the Archean system has been most carefully studied, there appears to be (1) a schistose series, of itself by no means simple but containing the foliated equivalents of sedimentary and igneous rocks; into this series a gneissose group (2) has been intruded in the form of batholites, great sheets and sills with accompanying intrusional prolongations into the schists; subsequently, into the gneisses and schists, after they had been further deformed, sheared and foliated, another set (3) of dikes or thin sheet-like intrusions penetrated. All this, namely, the formation of sediments, the outpouring of volcanic rocks, their repeated deformation by powerful dynamic agencies and then their penetration by dikes and sheets had been completed and erosion had been at work upon the hardened and exposed rocks, before the earliest pre-Cambrian sediment was deposited.

There has been much premature speculation as to the nature and origin of these very ancient rocks. The prevalence of regular foliation with layers of different mineral composition, producing a close resemblance to bedding, has led some to imagine that the gneisses and schists were themselves the product of the primeval oceans, a supposition that is no longer worthy of further discussion. Others have supposed that the gneisses were largely produced by the resorption and fusion of older sediments in the molten interior of the earth; there is no evidence that this has taken place upon an extended scale, though there is reason to believe that something of this kind has happened in places, and there is in the hypothesis nothing radically untenable. In one way the sedimentary schists have undoubtedly been incorporated within the gneissose mass, namely, by the extremely thorough and intimate penetration of the former by the latter along planes of foliation; and when a complex mass such as this has been further sheared and metamorphosed, a uniform gneiss appears to result from the intermixture.

A not uncommon cause of the apparently bedded arrangement of layers of different mineralogical composition may be traced to the original differentiation of the granitoid magma into different mineral-sheets. When these mineralogically

different layers were forced into other rocks, sometimes before the complete consolidation of the former and sometimes subsequent to it, in the generally metamorphosed condition of the whole, it is easy to see a superficial resemblance to bedding.

The Archean rocks have frequently been spoken of as the original crust of the earth; but even granting a cooling molten globe with a first-formed stony surface, it is tolerably clear that such a crust has nowhere yet been found, nor is it ever likely to be discovered. The very earliest recognizable sediments are the result of the destruction of still earlier exposures of rock; the oldest known volcanic rocks were poured upon a surface we can no longer distinguish, and as for the great granitoid masses, they could only have been formed under the pressure of superincumbent masses of material. The earliest known sediments must have been deep in the zones of shearing and rock flowage before the first pre-Cambrian denudation. The time required for these changes is difficult to conceive.

As regards the life of the Archean, or, as some call it, the "Archeozoic" period, we know nothing. The presence of carbonaceous shale and graphitic schists as well as of the altered sedimentary iron ores has been taken as indicative of vegetable life. Similarly, the occurrence of limestones suggests the existence of organic activity, but direct evidence is wanting. Much interest naturally attaches to this remote period, and when Sir William E. Logan in 1854 found the foraminifera-like *Eozoon Canadense*, high hopes of further discoveries were entertained, but the inorganic nature of this structure has since been clearly proved.

Distribution.—It is generally assumed that the Archean rocks underlie all the younger formations over the whole globe, and presumably this is the only system that does so. Naturally, the area of its outcrop is limited, for, directly or indirectly, all the younger rock groups must rest upon it.

It has been estimated that Archean rocks appear at the surface over one-fifth of the land area (omitting coverings of superficial drifts). This estimate is no more than the roughest approximation, and is liable at any time to revision as our knowledge of little-known regions is increased. It must ever be borne in mind that the presence of a gneissose or schistose complex does not in itself imply the Archean age of such a set of rocks. Local manifestations of a similar petrological facies may and do appear which are of vastly inferior geological age; and unless there is unequivocal evidence that such rocks lie beneath the oldest fossil-bearing strata, there can be no absolute certainty as to their antiquity. It is more than likely that certain occurrences of gneiss and schist, at present regarded as Archean, may prove on fuller examination to be metamorphosed representatives of younger periods.

Britain.—The most important exposure of Archean rocks in Britain is in the north-west of Scotland, where they form the mainland in Sutherland and Ross-shire, and appear also in the outer Hebrides. Their great development in the isle of Lewis has given rise to the term "Lewisian" (Hebridean), by which the gneisses of this region are now generally known. The Lewisian series comprises two great groups of rocks, (1) the so-called "fundamental complex," an assemblage of acid, basic and intermediate irruptive rocks, associated together in a complex of extraordinary intricacy, and (2) a series of dikes, which like the rocks they traverse, show every gradation from ultra-basic to ultra-acid types. But the above bald statement conveys no idea of the complexity of the series, for before the "fundamental complex" had been pierced by the later dike system it had been subjected to severe dynamo-metamorphism and many of the massive rocks had been folded, thrust and sheared, and a very general state of foliation had been produced. Nor was this all, for after the intrusion of the dikes, great movements brought about vertical dislocations, and thrust planes, which traversed the rocks at all angles, accompanied by still further internal shearing and superinduced foliation.

In the valley of Loch Maree and thence south-westward into Glenelg, a series of mica-schists, quartz-schists, saccharoid limestones and graphitic schists has been regarded as a group of sedimentary origin through which the Lewisian rocks have been irrupted.

In England several small masses of gneiss, notably at Primrose Hill on the Wrekin, Shropshire, in the Malvern hills, and on the island of Anglesey in North Wales, are supposed to correspond with the Lewisian of Scotland.

North America.—In this continent there is a great development of Archean rocks in Canada. On the eastern side it covers nearly the whole of the Labrador peninsula, and extends into Baffin Bay and possibly over much of Greenland; a broad tract unites the great lake region with Labrador, and from the same region, by way of the Mackenzie valley, a similar tract extends in a north-westerly direction to the Arctic Ocean. This northern (Canadian) area of Archean includes portions of the states of Minnesota, Michigan, Wisconsin and the Adirondack region of New York. On the western side of the continent a series of disconnected exposures of Archean rocks runs downwards in a narrow belt from Alaska to New Mexico; and on the eastern side a similar belt reaches from Newfoundland to Alabama.

Much attention is now being given to the more scattered exposures of Archean rocks, but the best-known area is the classical ground in the vicinity of Lake Superior and Lake Huron and in the Ottawa gneiss region of Canada. Some of the more important districts are the following:—

Rainy Lake district, Canada: The Archean rocks here consist of altered diorites and diabases (the lower Keewatin series) and black hornblende schists (probably altered igneous rocks), with mica gneisses which are perhaps of sedimentary origin.

The Mona and Kitichi schists; metamorphosed lava and tuffs, with serpentine and dolomite, probably derived from peridotites; there are also gneissic granites and syenites.

In the Menominee region of Michigan and Wisconsin, the Quinnesec schist series mainly consist of schistose quartz porphyry with associated gneisses.

In the Mesaba district of Minnesota the Archean consists of a complex of more or less foliated igneous rocks mostly basic in character.

The Archean of the Vermilion district of Minnesota comprises the Soudan formation, an altered sedimentary series with banded cherts, jasper and magnetite schists; the iron ores are extensively mined. At the base is a conglomerate containing pebbles from the formation below, the Ely greenstone, which is made up of altered basalts and andesites, generally in a schistose condition, but occasionally exhibiting spherulitic structures. Into these two formations a series of granites have been intruded.

Europe.—In Scandinavia, as in Scotland, the pre-Cambrian is represented by an earlier and a later series of rocks of which the former (Grundfjeldet, Urberget) may be taken to be the equivalent of the Lewisian gneisses. This assemblage of coarse red and grey banded gneisses, with associated granulites and many varieties of acid, basic and intermediate rocks in a gneissose condition, is intimately related to a highly metamorphosed sedimentary series comprising limestones, quartzites and schists, which, as in Scotland, is apparently older than the gneisses. Similar rocks occur in Sweden and Finland.

In Bavaria and Bohemia the Archean is divisible into a lower red gneiss, a comparatively simple series, called by C. W. von Gümbel the "gneiss of Bojan"; and an upper, grey gneiss with other schistose rocks, serpentine and graphitic limestone, termed by the same author the "Hercynian gneiss."

In Brittany a gneissose and schistose igneous series lies at the base of the pre-Cambrian. The pre-Cambrian cores of the eastern and central Pyrenees, consisting of gneiss, schists and altered limestones, are presumably of Archean age.

Asia, Australia, &c.—In northern China, mica-gneisses and granite-gneisses with associated schists may be regarded as Archean. In India the system is represented by the Bundelkhand gneiss and the central older gneisses of the Himalayas. In Japan, in the Abukuma plateau, there is much granite, gneiss and schist which may be of this age. In Australia, similar rocks are recognized as Archean in South Australia and Westralia, and they are estimated to cover an area of no less than 20,000 sq. m.; in Tasmania they are well developed on the western side. Although a great area is occupied by crystalline rocks in New Zealand, the Archean age of any portion of the series is not yet satisfactorily established; the lower granites and gneisses may belong to this period. Africa contains enormous tracts of crystalline gneisses, granites and schists, and some of these are almost certainly of Archean age; but in the present state of our knowledge it is impossible to speak more exactly.

REFERENCES.—A good general account of the Archean system will be found in Sir A. Geikie's *Text Book of Geology*, vol. ii., 4th ed. (1903), and in T. C. Chamberlin and R. D. Salisbury's *Geology*, vol. ii. (1906); these volumes contain references to all important literature. (J. A. H.)

ARCHELAUS OF CAPPADOCIA (1st century B.C.), general of Mithradates the Great in the war against Rome. In 87 B.C. he was sent to Greece with a large army and fleet, and occupied the Peiraeus after three days' fighting with Bruttius Sura, prefect of Macedonia, who in the previous year had defeated Mithradates' fleet under Metrophanes and captured the island of Sciathus. Here he was besieged by Sulla, compelled to withdraw into Boeotia, and completely defeated at Chaeroneia (86). A fresh army was sent by Mithradates, but Archelaus was again defeated at Orchomenus, after a two days' battle (85). On the

conclusion of peace, Archelaus, finding that he had incurred the suspicion of Mithradates, deserted to the Romans, by whom he was well received. Nothing further is known of him.

Appian, *Mithrid.* 30, 49, 56, 64; Plutarch, *Sulla*, 11, 16-19, 20, 23; *Lucullus*, 8.

ARCHELAUS, king of Egypt, was his son. In 56 B.C. he married Berenice, daughter of Ptolemy Auletes, queen of Egypt, but his reign only lasted six months. He was defeated by Aulus Gabinius and slain (55).

See Strabo xii. p. 558, xvii. p. 796; Dio Cassius xxxix. 57-58; Cicero, *Pro Rabirio*, 8; Hirtius (?), *Bell. Alex.* 66; also PTOLEMIES.

ARCHELAUS, king of Cappadocia, was grandson of the last named. In 41 B.C. (according to others, 34), he was made king of Cappadocia by Mark Antony, whom, however, he deserted after the battle of Actium. Octavian enlarged his kingdom by the addition of part of Cilicia and Lesser Armenia. He was not popular with his subjects, who even brought an accusation against him in Rome, on which occasion he was defended by Tiberius. Subsequently he was accused by Tiberius, when emperor, of endeavouring to stir up a revolution, and died in confinement at Rome (A.D. 17). Cappadocia was then made a Roman province. Archelaus was said to have been the author of a geographical work, and to have written treatises *On Stones* and *Rivers*.

Strabo xii. p. 540; Suetonius, *Tiberius*, 37, *Caligula*, 1; Dio Cassius xlix. 32-51; Tacitus, *Ann.* ii. 42.

ARCHELAUS, king of Judaea, was the son of Herod the Great. He received the kingdom of Judaea by the last will of his father, though a previous will had bequeathed it to his brother Antipas. He was proclaimed king by the army, but declined to assume the title until he had submitted his claims to Augustus at Rome. Before setting out, he quelled with the utmost cruelty a sedition of the Pharisees, slaying nearly 3000 of them. At Rome he was opposed by Antipas and by many of the Jews, who feared his cruelty; but Augustus allotted to him the greater part of the kingdom (Judaea, Samaria, Ituraea) with the title of ethnarch. He married Glaphyra, the widow of his brother Alexander, though his wife and her second husband, Juba, king of Mauretania, were alive. This violation of the Mosaic law and his continued cruelty roused the Jews, who complained to Augustus. Archelaus was deposed (A.D. 7) and banished to Vienne. The date of his death is unknown.

Archelaus is mentioned in Matt. ii. 22, and the parable of Luke xix. 11 f. probably refers to his journey to Rome.

See Schürer, *Gesch. des jüdischen Volkes*, i. 449-453.

(J. H. A. H.)

ARCHELAUS, king of Macedonia (413–399 B.C.), was the son of Perdiccas and a slave mother. He obtained the throne by murdering his uncle, his cousin and his half-brother, the legitimate heir, but proved a capable and beneficent ruler. He fortified cities, constructed roads and organized the army. He endeavoured to spread among his people the refinements of Greek civilization, and invited to his court, which he removed from Aegae to Pella, many celebrated men, amongst them Zeuxis, Timotheus, Euripides and Agathon. In 399 he was killed by one of his favourites while hunting; according to another account he was the victim of a conspiracy.

Diodorus Siculus xiii. 49, xiv. 37; Thucydides ii. 100. See MACEDONIA.

ARCHELAUS OF MILETUS, Greek philosopher of the 5th century B.C., was born probably at Athens, though Diogenes Laërtius (ii. 16) says at Miletus. He was a pupil of Anaxagoras, and is said by Ion of Chios (*ap.* Diog. Laërt. ii. 23) to have been the teacher of Socrates. Some argue that this is probably only an attempt to connect Socrates with the Ionian school; others (*e.g.* Gomperz, *Greek Thinkers*) uphold the story. There is similar difference of opinion as regards the statement that Archelaus formulated certain ethical doctrines. In general, he followed Anaxagoras, but in his cosmology he went back to the earlier Ionians. He postulated primitive Matter, identical with air and mingled with Mind, thus avoiding the dualism of Anaxagoras. Out of this conscious "air," by a process of thickening and thinning, arose cold and warmth, or water and fire, the one passive, the other active. The earth and the heavenly bodies are formed from mud, the product of fire and water, from which springs also man, at first in his lower forms. Man differs from animals by the possession of the moral and artistic faculty. No fragments of Archelaus remain; his doctrines have to be extracted from Diogenes Laërtius, Simplicius, Plutarch and Hippolytus.

See IONIAN SCHOOL; for his ethical theories see T. Gomperz, *Greek Thinkers* (Eng. trans., 1901), vol. i. p. 402.

ARCHENHOLZ, JOHANN WILHELM VON (1743–1812), German historian, was born at Langfuhr, a suburb of Danzig, on the 3rd of September 1743. From the Berlin Cadet school he passed into the Prussian army at the age of sixteen, and took part in the last campaigns of the Seven Years' War. Retiring from military service, on account of his wounds, with the rank of captain in 1763, he travelled for sixteen years and visited nearly all the countries of Europe, and resided in England for ten years (1769–1779). Returning to Germany in 1780, he obtained a lay canonry at the cathedral of Magdeburg, and immediately entered upon a literary career by publishing the periodical *Litteratur- und Völkerkunde* (Leipzig, 1782–1791). This was followed in 1785 by *England und Italien* (2nd ed., Leipzig, 1787), in which he gives a remarkably unprejudiced appreciation of English political and social institutions. Between 1789 and 1798 he published his *Annalen der britischen Geschichte* (20 vols). But the work by which he is best known to fame is his brilliantly written history of the Seven Years' War, *Geschichte des siebenjährigen Krieges* (first published in the *Berliner historisches Taschenbuch* of 1787, and later in 2 vols., Berlin, 1793; 13th ed., Leipzig, 1892). This work, though as regards the main facts and details it only follows other writers, is still a useful source of information upon the epoch with which it deals. In 1792 Archenholz removed to Hamburg, and there, from 1792 to 1812, edited the journal *Minerva*, which had a great reputation for its literary, historical and political information. Archenholz died at his country seat, Oyendorf, near Hamburg, on the 28th of February 1812.

ARCHER, WILLIAM (1856–), English critic, was born at Perth on the 23rd of September 1856, and was educated at Edinburgh University. He became a leader-writer on the *Edinburgh Evening News* in 1875, and after a year in Australia returned to Edinburgh. In 1879 he became dramatic critic of the *London Figaro*, and in 1884 of the *World*. In London he soon took a prominent literary place. Mr Archer had much to do with introducing Ibsen to the English public by his translation of *The Pillars of Society*, produced at the Gaiety Theatre, London, in 1880. He also translated, alone or in collaboration, other productions of the Scandinavian stage: Ibsen's *Doll's House* (1889), *Master Builder* (1893); Edvard Brandes's *A Visit* (1892); Ibsen's *Peer Gynt* (1892); *Little Eyolf* (1895); and *John Gabriel Borkman* (1897); and he edited *Henrik Ibsen's Prose Dramas* (5 vols., 1890–1891). Among his critical works are:—*English Dramatists of To-day* (1882); *Masks or Faces?* (1888); five vols. of critical notices reprinted, *The Theatrical World* (1893–1897); *America To-day, Observations and Reflections*; *Poets of the Younger Generation* (1901); *Real Conversations* (1904).

ARCHERMUS, a Chian sculptor of the middle of the 6th century B.C. His father Micciades, and his sons, Bupalus and Athenis, were all sculptors of marble, using doubtless the fine marble of their native land. The school excelled in draped female figures. Archermus is said by a scholiast (on Aristophanes' *Birds*, v. 573) to have been the first to represent Victory and Love with wings. This statement gives especial interest to a discovery made at Delos of a basis signed by Micciades and Archermus which was connected with a winged female figure in rapid motion (see GREEK ART), a figure naturally at first regarded as the Victory of Archermus. Unfortunately further investigation has discredited the notion that the statue belongs to the basis, which seems rather to have supported a sphinx.

ARCHERY, the art and practice of shooting with the bow (*arcus*) and arrow, or with crossbow and bolts. Though these weapons are by no means widely used amongst savage tribes of the present day, their origin is lost in the mists of antiquity.

Amongst the great peoples of ancient history the Egyptians were the first and the most famous of archers, relying on the bow as their principal weapon in war. Their bows were somewhat shorter than a man, and their arrows varied between 2 ft. and 2 ft. 8 in. in length. Here, as elsewhere, flint heads for arrows were by no means rare, but bronze was the usual material employed. The Biblical bow was of reed, wood or horn, and the Israelites used it freely both in war (Gen. xlviii. 22) and in the chase (xxi. 20). The Assyrians also were a nation of archers. Amongst the Greeks of the historic period archery was not much in evidence, in spite of the tradition of Teucer, Ulysses and many other archers of the *Iliad* and *Odyssey*. The Cretans, however, supplied Greek armies with the bowmen required. In the "Ten Thousand" figured two hundred Cretan bowmen of Sosias' corps. Rüstow and Köchly (*Geschichte des griechischen Kriegwesens*, p. 131) estimate the range of the Cretan bow at eighty to one hundred paces, as compared with the sling-bullet's forty or fifty, and the javelin's thirty to forty. The Romans as a nation were, equally with the Greeks, indifferent to archery; in their legions the archer element was furnished by Cretans and Asiatics. On the other hand nearly all Asiatic and derived nations were famous bowmen, from the nations who fought under Xerxes' banner onwards. The Persian, Scythian and Parthian bow was far more efficient than the Cretan, though the latter was not wanting in the heterogeneous armies of the East. The *sagittarii*, three thousand strong, who fought in the Pharsalian campaign, were drawn from Crete, Pontus, Syria, &c. But the Roman view of archery was radically altered when the old legionary system perished at Adrianople (A.D. 378). After this time the armies of the empire consisted in great part of horse-archers. Their missiles, we are told, pierced cuirass and shield with ease, and they shot equally well dismounted and at the gallop. These troops, combined with heavy cavalry and themselves not unprovided with armour, played a decisive part in the Roman victories of the age of Belisarius and Narses. The destruction of the Franks at Casilinum (A.D. 554) was practically the work of the horse-archers.

History in war.

In the main, the nations whose migrations altered the face of Europe were not archers. Only with the Welsh, the Scandinavians, and the peoples in touch with the Eastern empire was the bow a favourite weapon. The edicts of Charlemagne could not succeed in making archery popular in his dominions, and Abbot Ebles, the defender of Paris in 886, is almost the only instance of a skilled archer in the European records of the time. The sagas, on the other hand, have much to say as to the feats of northern heroes with the bow. With English, French and Germans the bow was the weapon of the poorest military classes. The Norman archers, who doubtless preserved the traditions of their Danish ancestors, were in the forefront of William's line at Hastings (1066), but contemporary evidence points conclusively to the short bow, drawn to the chest, as the weapon used on this occasion. The combat of Bourgtheroulde in 1124 shows that the Normans still combined heavy cavalry and archers as at Hastings. Horse-archers too (contrary to the usual belief) were here employed by the English.

Yet the "Assize of Arms" of 1181 does not mention the bow, and Richard I. was at great pains to procure crossbowmen for the Crusades. The crossbow had from about the 10th century gradually become the principal missile weapon in Europe, in spite of the fact that it was condemned by the Lateran Council of 1139. As early as 1270 in France, and rather later in Spain, the master of the crossbowmen had become a great dignitary, and in Spain the weapon was used by a *corps d'élite* of men of gentle birth, who, with their gay apparel, were a picturesque feature of continental armies of the period. But the Genoese, Pisans and Venetians were the peoples which employed the crossbow most of all. Many thousand Genoese crossbowmen were present at Creçy.

It was in the Crusades that the crossbow made its reputation, opposing heavier weight and greater accuracy to the missiles of the horse-archers, who invariably constituted the greatest and most important part of the Asiatic armies. So little change in warfare had centuries brought about that a crusading force in 1104 perished at Carrhae, on the same ground and before the same mounted-archer tactics, as the army of Crassus in 55 B.C. But individually the crusading crossbowman was infinitely superior to the Turkish or Egyptian horse-archer.

England, which was to become the country of archers *par excellence*, long retained the old short bow of Hastings, and the far more efficient crossbow was only used as a rule by mercenaries, such as the celebrated Falkes de Breauté and his men in the reign of John. South Wales, it seems certain, eventually produced the famous long-bow. In Ireland, in Henry II.'s time, Strongbow made great use of Welsh bowmen, whom he mounted for purposes of guerrilla warfare, and eventually the prowess of Welsh archers taught Edward I. the value of the hitherto discredited arm. At Falkirk (*q.v.*), once for all, the long-bow proved its worth, and thenceforward for centuries it was the principal weapon of English soldiers. By 1339, archers had come to be half of the whole mass of footmen, and later the proportion was greatly increased. In 1360 Edward III. mounted his archers, as Strongbow had done. The long-bow was about 5 ft., and its shaft a cloth-yard long. Shot by a Welsh archer, a shaft had penetrated an oak door (at Abergavenny in 1182) 4 in. thick and the head stood out a hand's breadth on the inner side. Drawn to the right ear, the bow was naturally capable of long shooting, and in Henry VIII.'s time practice at a less range than one furlong was forbidden. In rapidity it was the equal of the short bow and the superior of the crossbow, which weapon, indeed, it surpassed in all respects. Falkirk, and still more Creçy, Poitiers and Agincourt, made the English archers the most celebrated infantry in Europe, and the kings of England, in whatever else they differed from each other, were, from Edward II. to Henry VIII., at one in the matter of archery. In 1363 Edward III. commanded the general practice of archery on Sundays and holidays, all other sports being forbidden. The provisions of this act were from time to time re-issued, particularly in the well-known act of Henry VIII. The price of bows and arrows was also regulated in the reign of Edward III., and Richard III. ordained that for every ton of certain goods imported ten yew-bows should be imported also, while at the same time long-bows of unusual size were admitted free of duty. In order to prevent the too rapid consumption of yew for bow-staves, bowyers were ordered to make four bows of wych-hazel, ash or elm to one of yew, and only the best and most useful men were allowed to possess yew-bows. Distant and exposed counties were provided for by making bowyers, fletchers, &c., liable (unless freemen of the city of London) to be ordered to any point where their services might be required. In Scotland and Ireland also, considerable attention was paid to archery. In 1478 archery was encouraged in Ireland by statute, and James I. and James IV. of Scotland, in particular, did their best to stimulate the interest of their subjects in the bow, whose powers they had felt in so many battles from Falkirk to Homildon Hill.

English use.

The introduction of hand-firearms was naturally fatal to the bow as a warlike weapon, but the conservatism of the English, and the non-professional character of wars waged by them, added to the technical deficiencies of early firearms, made the process of change in England very gradual. The mercenary or professional element was naturally the first to adopt the new weapons. At Pont de l'Arche in 1418 the English had "*petits canons*" (which seem to have been hand guns), and during the latter part of the Hundred Years' War their use became more and more frequent. The crossbow soon disappeared from the more professional armies of the continent. Charles the Bold had, before the battle of Morat (1476), ten thousand *coulevrines à main*. But in the hands of local forces the crossbow lingered on, at least in rural France, until about 1630. Its last appearance in war was in the hands of the Chinese at Taku (1860). But the long-bow, an incomparably finer weapon, endured as one of the principal arms of the English soldier until about 1590. Edward IV. entered London after the battle of Barnet with 500 "smokie gunners"

Decline as weapon.

(foreign mercenaries), but at that engagement Warwick's centre consisted solely of bows and bills (1471). The new weapons gradually made their way, but even in 1588, the year of the Armada, the local forces of Devonshire comprised 800 bows to 1600 "shot," and 800 bills to 800 pikes. But the Armada year saw the last appearance of the English archer, and the same county in 1598 provides neither archers nor billmen, while in the professional army in Ireland these weapons had long given way to musket and caliver, pike and halberd. Archers appeared in civilized warfare as late as 1807, when fifteen hundred "baskiers," horse-archers, clad in chain armour, fought against Napoleon in Poland.

As a weapon of the chase the bow was in its various forms employed even more than in war. The rise of archery as a sport in England was, of course, a consequence of its military value, which caused it to be so heartily encouraged by all English sovereigns.

The Japanese were from their earliest times great archers, and the bow was the weapon *par excellence* of their soldiers. **Japan.** The standard length of the bow (usually bamboo) was 7 ft. 6 in., of the arrow 3 ft. to 3 ft. 9 in. Numerous feats of archery are recorded to have taken place in the "thirty-three span" halls of Kioto and Tokyo, where the archer had to shoot the whole length of a very low corridor, 128 yds. long. Wada Daihachi in the 17th century shot 8133 arrows down the corridor in twenty-four consecutive hours, averaging five shots a minute, and in 1852 a modern archer made 5583 successful shots in twenty hours, or over four a minute.

The Pastime of Archery.—The use of the bow and arrow as a pastime naturally accompanied their use as weapons of war, **History of sport.** but when the gun began to supersede the bow the pastime lost its popularity. Charles II., however, and his queen, Catherine of Braganza, interested themselves in English archery, the queen in 1676 presenting a silver badge or shield to the "Marshall of the Fraternity of Archers," which badge, once the property of the Finsbury Archers, was transferred to the keeping of the Royal Toxophilite Society, when in 1841 the two clubs combined. The Toxophilite Society was founded in 1781; for though in the north archery had long been practised, its resuscitation in the south really dates from the formation of this club by Sir Ashton Lever. This society received the title of "Royal" in 1847, though it had long been patronized by royalty. It is an error to suppose that the Finsbury Archers were connected with the Archers' division of the Hon. Artillery Company, but many members of the Toxophilite Society joined that division, and used its ground for shooting, securing, however, a London ground of their own in the district where Gower Street, W.C., now is. When this ground became unavailable, the shooting probably took place at Highbury, and later in 1820, on Lord's cricket ground, the present ground in the Inner Circle of Regent's Park, near the Botanical Gardens, not being acquired till 1833. The society may be regarded as the most important body connected with archery, most of the leading archers belonging to it, though the Grand National Archery Society controls the public meetings. Among its more important events is the shooting of 144 arrows at 100 yds. for the Crunder Cup and Bugle. In the early days of the club targets of different sizes were used at the different ranges, and the scores were recorded in money (*e.g.* "Mr Elwin, 86 hits, £5:5:6"). The Woodmen of Arden can claim an almost equal antiquity, having been founded—some say "revived"—in 1785. The number of members is limited to 80; at one time there were 81, Sir Robert Peel having been elected as a supernumerary by way of compliment. The headquarters of the Woodmen are at Meriden in Warwickshire; the club has a nominal authority over vert and venison, whence its officers bear appropriate names—warden, master-forester and verderers; and the annual meeting is called the Wardmote. The master-forester, or captain for the year, is the maker of the first "gold" at the annual target; he who makes the second is the senior verderer. The club devotes itself to the old-fashioned clout-shooting at long ranges, reckoned by "scores," nine score meaning 180 yds., and so on. (*Vide* "Clout-shooting" *infra.*) The chief matches in which the Woodmen engage are those against the Royal Company of Scottish Archers. The Royal British Bowmen date back to the end of the 18th century. Like many others, during the Napoleonic war they suspended operations, revived when peace was made. The club was finally dissolved in 1880. The Royal Kentish Bowmen were founded in 1785, but did not survive the war. John O'Gaunt's Bowmen, who still meet at Lancaster, were revived, not created, at the same time, and still flourish. The Herefordshire Bowmen only shoot at 60 yds., while the West Berks Society is limited to twelve members, who meet at each other's houses, except for their Autumn Handicap, shot on the Toxophilite Grounds—216 arrows at 100 yds. The Royal Company of Archers is the chief Scottish society. Originally a semi-military body constituted in 1676, it practised archery as a pastime from the time of its foundation, several meetings being held in the first few years of its existence. It devoted itself to "rovers," or long-range shooting at the "clout," among its most interesting trophies being the "Musselburgh Arrow," first shot for in 1603, possibly even earlier, in that town; the competition was then open to all comers, for archery was long popular in Scotland, especially at Kilwinning, the headquarters of popinjay (*q.v.*) shooting. Other prizes are the "Peebles Silver Arrow," dating back to 1626, the "Edinburgh Silver Arrow" (1709), the "Selkirk Arrow," a very ancient prize, the "Dalhousie Sword," the "Hopetoun Royal Commemoration Prize," and others, shot for at ranges of 180 or 200 yds. The most curious is the "Goose Medal." Originally a goose was buried in a butt with only its head visible, and this was the archers' mark; now a small glass globe is substituted. The "Popingo (Popinjay) Medal," for which a stuffed parrot was once used as the mark, is now contested at the ordinary butts. The Kilwinning Society of Archers, founded in 1688, did not disband till 1870; the Irvine Toxophilites flourished from 1814 till about 1867. But of all societies the Grand National Archery Society, regulating the great meetings, though comparatively young, is the most important. Various open meetings were already in existence, but in 1844 a few leading archers projected a Grand National Meeting, which was held in York in that year and in 1845 and 1846, and subsequently in other places. But the society did not exist as such till 1861, after the meeting held at Liverpool, since when, notwithstanding some financial troubles, it has been the legislative and managing body of English archery. The chief meetings are the "Championship," the "Leamington and Midland Counties," the "Crystal Palace," the "Grand Western" and the "Grand Northern." For some years a "Scottish Grand National" was held, but fell into abeyance. The "Scorton Arrow" is no longer shot for in the Yorkshire village of that name, but the meeting, held regularly in the county, dates back to 1673 by record, and is probably far older. The silver arrow and the captaincy are awarded to the man who makes the first gold; the silver bugle and lieutenancy to the first red; the gold medal to most hits, and a horn spoon to the last white.

In the United States archery has had a limited popularity. The only one of the early clubs that lasted long was the "United Bowmen of Philadelphia," founded in 1828, but defunct in 1859. There was a revival twenty years later, when a National Association was formed; and various meetings were held annually and championships instituted, but there was never any popular enthusiasm for the sport, though it showed signs of increasing favour towards the end of the 19th century. The longer ranges are not greatly favoured by American archers, though at some meetings the regulation "York Round" (*vide infra* under "Targets") and the "National" are shot. Other rounds are the "Potomac," 24 arrows at 80, 24 at 70, and 24 at 60 yds.; the "Double American," 60 arrows each at 60, 50 and 40 yds.; and the "Double Columbia," for ladies, 48 each at 50, 40 and 30 yds. In team matches ladies shoot 96 arrows at 50 yds., gentlemen 96 at 60.

The Bow.—As used in the pastime of archery the length of the bows does not vary much, though it bears some relation to the length

of the arrow and the length of the arrow to the strength of the archer, to which the weight of the bow has to be adapted. The proper weight of a bow is the number of lb which, attached to the string, will draw a full-length arrow to its head. For men's bows the drawing-power varies from 40 to 60 lb, anything above this being extreme; ladies' bows draw from 24 to 32 lb. Estimating 50 lb as a fair average, such a bow would be 6 ft. 1 in. long for a 30-in., 6 ft. for a 28-in., and 5 ft. 11 in. for a 27-in. arrow, but the height as well as the strength of the archer have to be considered. Similarly a lady's bow on the average measures about 5 ft. 6 in. and her arrows 25 in. Modern bows are either made entirely of yew (occasionally of other woods), when they are called "self-bows," or of a combination of woods, when they are called "backed-bows." Self-bows are rarely or never made in a single stave, owing to the difficulty of obtaining true and flawless wood of the necessary length; hence two staves joined by a double fish-joint, which forms the centre of the bow, are used, tested and adjusted so that they may be as equally elastic as possible. The best yew is imported from Italy and Spain, and is allowed to season for three years before it is made into a bow, which again is not used till it is two years older. In backed-bows the belly, the rounded part nearest to the string, is generally but not necessarily made of yew, the back, or flat part, of yew (the best), hickory, lance or other woods, glued together in strips. The centre of the bow, for about 18 in., should be stiff and resisting, then tapering off gradually to the horns in which the string is fitted, the greatest care being taken that the two limbs are uniform. The bow of self-yew is generally considered more agreeable to handle and has a better "cast," throwing the arrow more smoothly and with less jar, and since no glued parts are exposed, it is less liable to injury from wet. On the other hand, "crysals" (tiny cracks, which are apt to extend) are more frequent in this class of bow. Self-yew bows cost £8 or £10, where a good backed-bow can be bought for about half that. The self-bow is more sensitive than other bows, and its work is mostly done during the last few inches of the pull, where the backed-bow pulls evenly throughout. The backed-bow should be perfectly straight in the back, but after use often loses its shape either by "following the string," *i.e.* getting bent inwards on the string-side, or by becoming "reflex" (bending the opposite way). Self-bows are even more apt to lose their shape than backed-bows, as there is no hard wood to counteract the natural grain. A bow that is strongly reflexed at the ends is known as a "Cupid's bow." To form the handle the wood of the bow is left thick in the centre, and braid, leather or indiarubber is wound round it to give a better grip.

The String and Stringing.—The string is made of three strands of hemp, dressed with a preparation of glue, and should be perfectly round, smooth and not frayed, as a broken string may result in a broken bow. The string, at its centre, is 6 in. from the belly of the man's bow; 5 in. in the lady's bow. The clenched fist with the thumb upright was the old, rough and ready estimate, known as "fist-mele." For a few inches above and below the nocking point the string is lapped with carpet-thread to save it from fraying by contact with the arm; the nocking point being made by another lapping of filoselle silk, so that the string may exactly fit the nock of the arrow. When a bow is properly strung the string should be longitudinally along the middle of the belly.

Arrows and Nocking.—The parts of the arrow are the shaft, the "nock" or notch, the "pile" or point, and the feathers. The shaft is made of seasoned red deal, and may be "self" or "footed." Most arrows are "footed," *i.e.* a piece of hard wood to which the pile is attached is spliced to the deal shaft, which should be perfectly straight and stiff. The shaft is made in several shapes. Most archers prefer the "parallel" pattern—the shaft being the same size from nock to pile; the next is the "barrelled," the shape being thick in the centre and tapering towards the ends. The "bob-tail" diminishes from the pile to the nock; the "chested" tapers from the middle to the pile. The pile should not be taper but cylindrical, "broadshouldered" where the point begins. The nock is cut square. There are three feathers, the body feathers of a turkey or peacock being the best. They should all curve the same way, are about 1¼ in. long and ¼ in. deep, with the ends near the nock either square, or balloon-shaped. The weight of an arrow is its weight in new English silver; a five-shilling arrow is heavy for a man's bow, while four-shillings is light. A 28-in. arrow for a 50-lb bow may weigh four-and-ninepence; a 27-in. arrow four-and-sixpence. This may serve as a rough standard.

Other Implements.—The archer uses finger-tips, or a "tab" of leather, to protect the fingers against the string, and a leather "bracer" to protect the left arm from its blow. Quivers are not now used except by ladies. A special box for carrying bows and arrows about; a proper cupboard, known as an "ascham," in which they may be kept at home in a dry, even temperature, not too hot; and a baize or leather case for use on the ground, are important minor articles of equipment.

Targets, Scoring and Handicapping.—The targets, 4 ft. in diameter, are made of straw 3 to 4 in. thick, and are supported sloping slightly backwards by an iron stand. The faces are of floor-cloth painted with concentric rings, 4¾ in. each in breadth. The outer ring, white, counts one point; the next, black, three; the next, blue, five; the next, red, seven; and the next, gold—a complete circle of 4¾ in. radius—nine. The exact centre of the gold is called the "pin-hole." The targets are set up in pairs, facing each other, the distances for men being 100, 80 and 60 yds.; for ladies, 60 and 50; for convenience, 5 yds. are added to allow for a shooting-line that distance in front of each target. The centre of the gold should be 4 ft. from the ground. Each archer shoots three arrows—an "end"—at one target; they then cross over and mark the scores. If an arrow cuts two rings, the archer is credited with the value of the higher one. In matches a "York Round" or a "St George's Round" is usually shot by men, the former consisting of 144 arrows, 72 at 100 yds., 48 at 80 yds., and 24 at 60 yds., the latter of 36 arrows at each of these distances. One York Round only is shot on a day; a double York Round is shot, one on each day, at the more important meetings. Ladies usually shoot the "National Round" of 48 arrows at 60 yds. and 24 at 50 yds. At most meetings the prizes are awarded on the gross scores; at others, including the Championship meeting, on points, two points for the highest score on the round and two for most hits on the round, one point each for highest score and most hits at each of the three ranges, ten points in all. Ladies' scores are calculated similarly. To decide the Championship, the Grand National Archery Society passed a rule in 1894 that "The Champion prizes shall be awarded to the archer gaining the greatest number of points, provided that those for gross hits or gross score are included; any points won by other archers shall be redistributed among those gaining the points for gross hits or gross score." Handicapping may be done by "rings," the winner of a first prize not being allowed to count "whites" at subsequent meetings, and "blacks" and "blues" being lost for further successes. Better methods are (1) to deduct a percentage from the gross score of successful shooters, (2) to handicap by points, as in other pastimes, or (3) to rate a shooter according to the average of his last year's performances, re-rating him monthly, or at convenient intervals, the system being to add his average of the current year to his average of last year, and divide the sum by two to form his new rating.

Clout and Long Distance Shooting.—This form of archery is chiefly supported by the Woodmen of Arden and the Royal Company. At 100 yds., the target (smaller by 4 in. than the usual one, but with an inner white circle instead of the blue) is set up against a butt only 18 in. from the ground, but for nine-score, ten-score, and twelve-score shooting it is a white target, 2 ft. 6 in. in diameter, with a black centre. The target, the centre and the arrow that hits the centre are each known as a "clout." Hits and misses are signalled by a marker stationed, rather perilously, by the side of the butt. The target is sloped backwards to an angle of 60°, with rings marked round it on the ground at distances of 1½ ft., 3 ft., 6 ft. and 9 ft., a hit in the outer ring counting one, and in the next two, and so on, the clout or centre counting six. For the longer ranges lighter arrows are used. The Scottish clout was a piece of canvas, stretched on a frame; the range 180 or 200 yds.; all arrows counted one that were within 24 ft. of the target, the clout counting two. Modern archers have paid scant attention to mere distance-shooting, which is an art of its own, but their experiments prove that with a fairly heavy bow, say 60 lb or 63 lb, and a long light arrow, known as a "flight arrow," a good archer should be able to reach 300 or 310 yds. With a heavier bow, properly under control, 50 or 60 yds. might be added to this by a strong man. These experiments seem to be verified by a quotation from Shakespeare (*Henry IV.* Act iii. Sc. 2): "A' would have clapped i' the clout and twelve score, and carried you a forehand shaft a fourteen and fourteen and a half," *i.e.* 280 or 290 yds. Instances are recorded of Englishmen shooting 340 and 360 yds., but in 1795 Mahmoud Effendi of the Turkish embassy shot 482 yds. with a Turkish bow, and Sultan Selim 972. The Turk, however, used a Turkish bow and a 14-in. arrow, with a grooved rest on his left arm along which the arrow passed, to compensate for the difference between the draw of the bow and the shortness of the arrow. The diplomatist's shot is supported by good evidence, but the sultan's is regarded as improbable at least.

Championship and Scores.—The British championship meetings, instituted in 1844, are conducted under the laws of the Grand National Archery Society: the prizes, apart from the Challenge prizes, are given in money, there being also a rule that any one who makes three golds at one end receives a shilling from all others of the same sex who are shooting. The most notable champion was Horace A. Ford (d. 1880), who held the title for eleven consecutive years, 1849 to 1859 inclusive, and again in 1867. He made a four-figure score at four other championship meetings, his highest, 1251 (in 1857) for 245 hits being unapproached. To him the modern scientific practice of archery must largely be attributed, together with its improvement and its popularity. The names of G. Edwards, Major C. Hawkins Fisher, H. H. Palairet, C. E. Nesham, and G. E. S. Fryer, are also notable as champions. Among ladies Mrs Horniblow was champion for eleven years between 1852 and 1881, Miss Legh for nineteen years between 1880 and 1908; Mrs Piers Legh, Miss Betham and Mrs Bowly claim the title on four occasions. Mrs Bowly's score of 823 (1894) was the highest made for the championship till Miss Legh made 825 with 143 hits—only one arrow missed altogether—in 1898; beating her own record with a score of 841 (143 hits) in 1904. It should not be forgotten that as the championship is awarded by points, the highest score does not necessarily win.

See Roger Ascham, *Toxophilus* (1545), edited by Edward Arber (London, 1868); *The Arte of Warre*, by William Garrard (London 1591); *The Arte of Archerie*, by Gervase Markham (London, 1634); *Ancient and Modern Methods of Arrow Release*, by E. S. Morse (1885); *The English Bowman*, by T. Roberts (London, 1801); *A Treatise on Archery*, by Thomas Waring (London, 9th ed., 1832); *The Theory and Practice of Archery*, by Horace A. Ford (new ed., London, 1887); *Archery*, by C. J. Longman and H. Walrond (Badminton Library, London, 1894). (W. J. F.)

ARCHES, COURT OF, the English ecclesiastical court of appeal of the archbishop of Canterbury, as metropolitan of the province of Canterbury, from all the consistory and commissary courts in the province. It derives its name from its ancient place of judicature, which was in the church of *Beata Maria de Arcubus* —St Mary-le-Bow or St Mary of the Arches, "by reason of the steeple thereof raised at the top with stone pillars in fashion like a bow bent archwise." This parish was the chief of thirteen locally situated within the diocese of London but exempt from the bishop's jurisdiction, and it was no doubt owing to this circumstance that it was selected originally as the place of judicature for the archbishop's court. The proper designation of the judge is official principal of the Arches court, but by custom he came to be styled the dean of the Arches, a title belonging formerly to the chief official of the subordinate court. Originally, the official principal exercised metropolitan jurisdiction, while the dean of the Arches exercised the "peculiar" jurisdiction. The jurisdictions called "peculiars" at one time numbered nearly 300 in England. They were originally introduced by the pope for the purpose of curtailing the bishop's legitimate authority within his diocese; "an object which," says Phillimore, "they certainly attained, to the great confusion of ecclesiastical jurisdiction for many years." The dean of the Arches originally had jurisdiction over the thirteen London parishes above mentioned, but as the official principal was often absent as ambassador on the continent, he became his substitute, and gradually the two offices were blended together. The original office of the dean of the Arches may now be regarded as extinct, though the title is still popularly used, for no dean of the Arches has been appointed *eo nomine* for several centuries, and by an act of 1838 bishops have jurisdiction over all peculiars within their diocese. The judge of the Arches court was until 1874 appointed by the archbishop of Canterbury by patent which, when confirmed by the dean and chapter of Canterbury, conferred the office for the life of the holder. He took the oaths of office required by the 127th canon. But by the Public Worship Regulation Act 1874 the two archbishops were empowered, subject to the approval of the sovereign by sign-manual, from time to time to appoint a practising barrister of ten years' standing, or a person who had been a judge of one of the superior courts (being a member of the Church of England) to be, during good behaviour, a judge for the purpose of exercising jurisdiction under that act, and it was enacted (sec. 7) that on a vacancy occurring in the office of official principal of the Arches court the judge should become *ex officio* such official principal. In this way the late Lord Penzance became dean on the retirement of Sir Robert Phillimore in 1875. Lord Penzance received in 1878 a supplemental patent as dean from Archbishop Tait, but did not otherwise fulfil the conditions observed on the appointment of his predecessors. On Lord Penzance's retirement in 1899, his successor, Sir Arthur Charles, received a patent from the archbishop of Canterbury as official principal of the Arches court, and he took the oaths of office according to the practice before the Public Worship Regulation Act. He was subsequently and separately appointed judge under that act. Sir A. Charles resigned in 1903 and was succeeded by Sir L. T. Dibdin, who qualified in the same way as his immediate predecessor. The official principal of the Arches court is the only ecclesiastical judge who is empowered to pass a sentence of deprivation against a clerk in holy orders. The appeals from the decisions of the Arches court were formerly made to the king in chancery, but they are now by statute addressed to the king in council, and they are heard before the judicial committee of the privy council. By an act of Henry VIII. (Ecclesiastical Jurisdiction Act 1532) the Arches court is empowered to hear, in the first instance, such suits as are sent up to it by letters of request from the consistorial courts of the bishops of the province of Canterbury, and by the Church Discipline Act 1840, this jurisdiction is continued to it, and it is further empowered to accept letters of request from the bishops of the province of Canterbury after they have issued commissions of inquiry under that statute, and the commissioners have made their report.

The Arches court was also the court of appeal from the consistory courts of the bishops of the province in all testamentary and matrimonial causes. The matrimonial jurisdiction was transferred to the crown by the Matrimonial Causes Act 1857. Under the Clergy Discipline Act 1892 an appeal lies from the judgment of a consistory court under that act, in respect of fact by leave of the appellate court, and in respect of law without leave, to either the Arches court or the judicial committee of the privy council at the option of the appellant. Under the Benefices Act 1898 the official principal of the archbishop is required to institute a presentee to a benefice if the tribunal constituted under that act decides that there is no valid ground for refusing institution and the bishop of the diocese notwithstanding fails to institute him. After the College of Advocates was incorporated and had established itself in Doctors' Commons, the archbishop's court of appeal, as well as his prerogative court, were usually held in the hall of the College of Advocates, but after the destruction of the buildings of the college, the court of appeal held its sittings, for the most part, in Westminster Hall. For many years past there has been but little business in the Arches court, mainly owing to the unwillingness of a large number of the clergy to recognize the jurisdiction of what they deny to be any longer a spiritual court, and the consistent use by the bishops of their right of veto in the case of prosecutions under the Public Worship Regulation Act. On the rare occasions when a sitting of the court is necessary, it is held in the library of Lambeth Palace, or at the Church House, Westminster.

ARCHESTRATUS, of Syracuse or Gela, a Greek poet, who flourished about 330 B.C. After travelling extensively in search of foreign delicacies for the table, he embodied the result in a humorous poem called Ἡδυπάθεια, afterwards freely translated by Ennius under the title *Heduphagetica*. About 300 lines of this gastronomical poem are preserved in Athenaeus. The writer, who has been styled the Hesiod or Theognis of gluttons, parodies the style of the old gnomic poets; chief attention is paid to details concerning fish.

Ribbeck, *Archestrati Reliquiae* (1877); Brandt, *Corpusculum Poesis Epicae Graecae ludibundae*, i. 1888; Schmid, *De Archestrati Gelensis Fragmentis* (1896).

ARCHIAC, ÉTIENNE JULES ADOLPHE DESMIER DE SAINT SIMON, VICOMTE D' (1802–1868), French geologist and palaeontologist, was born at Reims on the 24th of September 1802. He was educated in the Military School of St Cyr, and served for nine years as a cavalry officer until 1830, when he retired from the service. Prior to this he had published an historical romance; but now geology came to occupy his chief attention. In his earlier scientific works, which date from 1835, he described the Tertiary and Cretaceous formations of France, Belgium and England, and dealt especially with the distribution of fossils geographically and in sequence. Later on he investigated the Carboniferous, Devonian and Silurian formations. His great work, *Histoire des progrès de la géologie, 1834–1859*, was published in 8 volumes at Paris (1847–1860). In 1853 the Wollaston Medal of the Geological Society was awarded to him. In the same year, with Jules Haime (1824–1856), he published a monograph on the Nummulitic formation of India. In 1857 he was elected a member of the Academy of Sciences, and in 1861 he was appointed professor of palaeontology in the Muséum d'Histoire Naturelle in Paris. Of later works his *Palêontologie stratigraphique*, in 3 vols. (1864–1865); his *Géologie et paléontologie* (1866); and his palaeontological contributions to de Tchihatcheff's *Asie mineure* (1866), may be specially mentioned.

He died on the 24th of December 1868.

See *Notice sur les travaux scientifiques du vicomte d'Archiac*, par A. Gaudry (Meulan, 1874); *Extrait du Bull. Soc. Géol. de France*, ser. 3, t. ii. p. 230 (1874).

ARCHIAS, AULUS LICINIUS, Greek poet, was born at Antioch in Syria 120 B.C. In 102, his reputation having been already established, especially as an improvisatore, he came to Rome, where he was well received amongst the highest and most influential families. His chief patron was Lucullus, whose gentile name he assumed. In 93 he visited Sicily with his patron, on which occasion he received the citizenship of Heracleia, one of the federate towns, and indirectly, by the provisions of the lex Plautia Papiria, that of Rome. In 61 he was accused by a certain Gratius of having assumed the citizenship illegally; and Cicero successfully defended him in his speech *Pro Archia*. This speech, which furnishes nearly all the information concerning Archias, states that he had celebrated the deeds of Marius and Lucullus in the Cimbrian and Mithradatic wars, and that he was engaged upon a poem of which the events of Cicero's consulship formed the subject. The Greek Anthology contains thirty-five epigrams under the name of Archias, but it is doubtful how many of these (if any) are the work of the poet of Antioch.

Cicero, *Pro Archia*; T. Reinach, *De Archia Poeta* (1890).

ARCHIDAMUS, the name of five kings of Sparta, of the Eurypontid house.

1. The son and successor of Anaxidamus. His reign, which began soon after the close of the second Messenian War, is said to have been quiet and uneventful (Pausanias iii. 7. 6).

2. The son of Zeuxidamus, reigned 476–427 B.C. (but see LEOTYCHIDES). He succeeded his grandfather Leotychides upon the banishment of the latter, his father having already died. His coolness and presence of mind are said to have saved the Spartan state from destruction on the occasion of the great earthquake of 464 (Diodorus xi. 63; Plutarch, *Cimon*, 16), but this story must be regarded as at least doubtful. He was a friend of Pericles and a man of prudence and moderation. During the negotiations which preceded the Peloponnesian War he did his best to prevent, or at least to postpone, the inevitable struggle, but was overruled by the war party. He invaded Attica at the head of the Peloponnesian forces in the summers of 431, 430 and 428, and in 429 conducted operations against Plataea. He died probably in 427, certainly before the summer of 426, when we find his son Agis on the throne.

Herod. vi. 71; Thuc. i. 79–iii. 1; Plut. *Pericles*, 29. 33; Diodorus xi. 48–xii. 52.

3. The son and successor of Agesilaus II., reigned 360–338 B.C. During his father's later years he proved himself a brave and capable officer. In 371 he led the relief force which was sent to aid the survivors of the battle of Leuctra. Four years later he captured Caryae, ravaged the territory of the Parrhasii and defeated the Arcadians, Argives and Messenians in the "tearless battle," so called because the victory did not cost the Spartans a single life. In 364, however, he sustained a severe reverse in attempting to relieve a besieged Spartan garrison at Cromnus in south-western Arcadia. He showed great heroism in the defence of Sparta against Epaminondas immediately before the battle of Mantineia (362). He supported the Phocians during the Sacred War (355–346), moved, no doubt, largely by the hatred of Thebes which he had inherited from his father: he also led the Spartan forces in the conflicts with the Thebans and their allies which arose out of the Spartan attempt to break up the city of Megalopolis. Finally he was sent with a mercenary army to Italy to protect the Tarentines against the attacks of Lucanians or Messapians: he fell together with the greater part of his force at Mandonion [1] on the same day as that on which the battle of Chaeronea was fought.

Xen. *Hell.* v. 4, vi. 4, vii. 1. 4,•5; Plut. *Agis*, 3, *Camillus*, 19, *Agesilaus*, 25, 33, 34, 40; Pausanias iii. 10, vi. 4; Diodorus xv. 54, 72, xvi. 24, 39, 59, 62, 88.

4. The son of Eudamidas I., grandson of Archidamus III. The dates of his accession and death are unknown. In 294 B.C. he was defeated at Mantineia by Demetrius Poliorcetes, who invaded Laconia, gained a second victory close to Sparta, and was on the point of taking the city itself when he was called away by the news of the successes of Lysimachus and Ptolemy in Asia Minor and Cyprus.

[1] So Plut. *Agis*, 3 (all MSS.). Following Cellarius, some authorities read Manduria or Mandyrium.

Plut. *Agis*, 3, *Demetrius*, 35; Pausanias, i. 13. 6, vii. 8. 5; Niese, *Gesch. der griech. u. makedon. Staaten*, i. 363.

5. The son of Eudamidas II., grandson of Archidamus IV., brother of Agis IV. On his brother's murder he fled to Messenia (241 B.C.). In 227 he was recalled by Cleomenes III., who was then reigning without a colleague, but shortly after his return he was assassinated. Polybius accuses Cleomenes of the murder, but Plutarch is probably right in saying that it was the work of those who had caused the death of Agis, and feared his brother's vengeance.

Plutarch, *Cleomenes*, i. 5; Polybius v. 37, viii. 1; Niese, *op. cit.* ii. 304, 311. (M. N. T.)

ARCHIL (a corruption of "orchil," Ital. *oricello*, the origin of which is unknown), a purple dye obtained from various species of lichens. Archil can be extracted from many species of the genera *Roccella*, *Lecanora*, *Umbilicaria*, *Parmelia* and others, but in practice two species of *Roccella*—*R. tinctoria* and *R. fuciformis*—are almost exclusively used. These, under the name of "orchella weed" or "dyer's moss," are obtained from Angola, on the west coast of Africa, where the most valuable kinds are gathered; from Cape Verde Islands; from Lima, on the west coast of South America; and from the Malabar coast of India. The colouring properties of the lichens do not exist in them ready formed, but are developed by the treatment to which they are subjected. A small proportion of a colourless, crystalline principle, termed orcinol (a dioxytoluene), is found in some, and in all a series of acid substances, erythric, lecanoric acids, &c. Orcinol in presence of oxygen and ammonia takes up nitrogen and becomes changed into a purple substance, orceine ($C_7H_7NO_3$), which is essentially the basis of all lichen dyes. Two other colouring-matters, azoerythin and erythroleinic acid, are sometimes present. Archil is prepared for the dyer's use in the form of a "liquor" (archil) and a "paste" (persis), and the latter, when dried and finely powdered, forms the "cudbear" of commerce, a dye formerly manufactured in Scotland from a native lichen, *Lecanora tartarea*. The manufacturing process consists in washing the weeds, which are then ground up with water to a thick paste. If archil paste is to be made this paste is mixed with a strong ammoniacal solution, and agitated in an iron cylinder heated by steam to about 140° F. till the desired shade is developed—a process which occupies several days. In the preparation of archil liquor the principles which yield the dye are separated from the ligneous tissue of the lichens, agitated with a hot ammoniacal solution, and exposed to the action of air. When potassium or sodium carbonate is added, a blue dye known as litmus, much used as an "indicator," is produced. French purple or lime lake is a lichen dye prepared by a modification of the archil process, and is a more brilliant and durable colour than the other. The dyeing of worsted and home-spun cloth with lichen dyes was formerly a very common domestic employment in Scotland; and to this day, in some of the outer islands, worsted continues to be dyed with "crottle," the name given to the lichens employed.

ARCHILOCHUS, Greek lyric poet and writer of lampoons, was born at Paros, one of the Cyclades islands. The date of his birth is uncertain, but he probably flourished about 650 B.C.; according to some, about forty years earlier but certainly not before the reign of Gyges (687–652), whom he mentions in a well-known fragment. His father, Telesicles, who was of noble family, had conducted a colony to Thasos, in obedience to the command of the Delphic oracle. To this island Archilochus himself, hard pressed by poverty, afterwards removed. Another reason for leaving his native place was personal disappointment and indignation at the treatment he had received from Lycambes, a citizen of Paros, who had promised him his daughter Neobule in marriage, but had afterwards withdrawn his consent. Archilochus, taking advantage of the licence allowed at the feasts of Demeter, poured out his wounded feelings in unmerciful satire. He accused Lycambes of perjury, and his daughters of leading

the most abandoned lives. Such was the effect produced by his verses, that Lycambes and his daughters are said to have hanged themselves. At Thasos the poet passed some unhappy years; his hopes of wealth were disappointed; according to him, Thasos was the meeting-place of the calamities of all Hellas. The inhabitants were frequently involved in quarrels with their neighbours, and in a war against the Saians—a Thracian tribe—he threw away his shield and fled from the field of battle. He does not seem to have felt the disgrace very keenly, for, like Alcaeus and Horace, he commemorates the event in a fragment in which he congratulates himself on having saved his life, and says he can easily procure another shield. After leaving Thasos, he is said to have visited Sparta, but to have been at once banished from that city on account of his cowardice and the licentious character of his works (Valerius Maximus vi. 3, *externa* 1). He next visited Siris, in lower Italy, a city of which he speaks very favourably. He then returned to his native place, and was slain in a battle against the Naxians by one Calondas or Corax, who was cursed by the oracle for having slain a servant of the Muses.

The writings of Archilochus consisted of elegies, hymns—one of which used to be sung by the victors in the Olympic games (Pindar, *Olympia*, ix. 1)—and of poems in the iambic and trochaic measures. To him certainly we owe the invention of iambic poetry and its application to the purposes of satire. The only previous measures in Greek poetry had been the epic hexameter, and its offshoot the elegiac metre; but the slow measured structure of hexameter verse was utterly unsuited to express the quick, light motions of satire. Archilochus made use of the iambus and the trochee, and organized them into the two forms of metre known as the iambic trimeter and the trochaic tetrameter. The trochaic metre he generally used for subjects of a serious nature; the iambic for satires. He was also the first to make use of the arrangement of verses called the epode. Horace in his metres to a great extent follows Archilochus (*Epistles*, i. 19. 23-35). All ancient authorities unite in praising the poems of Archilochus, in terms which appear exaggerated (Longinus xiii. 3; Dio Chrysostom, *Orationes*, xxxiii.; Quintilian x. i. 60; Cicero, *Orator*, i.). His verses seem certainly to have possessed strength, flexibility, nervous vigour, and, beyond everything else, impetuous vehemence and energy. Horace (*Ars Poetica*, 79) speaks of the "rage" of Archilochus, and Hadrian calls his verses "raging iambics." By his countrymen he was reverenced as the equal of Homer, and statues of these two poets were dedicated on the same day.

His poems were written in the old Ionic dialect. Fragments in Bergk, *Poetae Lyrici Graeci*; Liebel, *Archilochi Reliquiae* (1818); A. Hauvette-Besnault, *Archiloque, sa vie et ses poésies* (1905).

ARCHIMANDRITE (from Gr. ἄρχων, a ruler, and μάνδρα, a fold or monastery), a title in the Greek Church applied to a superior abbot, who has the supervision of several abbots and monasteries, or to the abbot of some specially great and important monastery, the title for an ordinary abbot being hegumenos. The title occurs for the first time in a letter to Epiphanius, prefixed to his *Panarium* (c. 375), but the *Lausiac History* of Palladius may be evidence that it was in common use in the 4th century as applied to Pachomius (*q.v.*). In Russia the bishops are commonly selected from the archimandrites. The word occurs in the *Regula Columbani* (c. 7), and du Cange gives a few other cases of its use in Latin documents, but it never came into vogue in the West. Owing to intercourse with Greek and Slavonic Christianity, the title is sometimes to be met with in southern Italy and Sicily, and in Hungary and Poland.

See the article in the *Dictionnaire d'archéologie chrétienne et de liturgie*.

ARCHIMEDES (*c.* 287–212 B.C.), Greek mathematician and inventor, was born at Syracuse, in Sicily. He was the son of Pheidias, an astronomer, and was on intimate terms with, if not related to, Hiero, king of Syracuse, and Gelo his son. He studied at Alexandria and doubtless met there Conon of Samos, whom he admired as a mathematician and cherished as a friend, and to whom he was in the habit of communicating his discoveries before publication. On his return to his native city he devoted himself to mathematical research. He himself set no value on the ingenious mechanical contrivances which made him famous, regarding them as beneath the dignity of pure science and even declining to leave any written record of them except in the case of the σφαιροποιΐα (*Sphere-making*), as to which see below. As, however, these machines impressed the popular imagination, they naturally figure largely in the traditions about him. Thus he devised for Hiero engines of war which almost terrified the Romans, and which protracted the siege of Syracuse for three years. There is a story that he constructed a burning mirror which set the Roman ships on fire when they were within a bow-shot of the wall. This has been discredited because it is not mentioned by Polybius, Livy or Plutarch; but it is probable that Archimedes had constructed some such burning instrument, though the connexion of it with the destruction of the Roman fleet is more than doubtful. More important, as being doubtless connected with the discovery of the principle in hydrostatics which bears his name and the foundation by him of that whole science, is the story of Hiero's reference to him of the question whether a crown made for him and purporting to be of gold, did not actually contain a proportion of silver. According to one story, Archimedes was puzzled till one day, as he was stepping into a bath and observed the water running over, it occurred to him that the excess of bulk occasioned by the introduction of alloy could be measured by putting the crown and an equal weight of gold separately into a vessel filled with water, and observing the difference of overflow. He was so overjoyed when this happy thought struck him that he ran home without his clothes, shouting εὕρηκα, εὕρηκα, "I have found it, I have found it." Similarly his pioneer work in mechanics is illustrated by the story of his having said δός μοι ποῦ στῶ καὶ κινῶ τὴν γῆν (or as another version has it, in his dialect, πᾶ βῶ καὶ κινῶ τὰν γᾶν), "Give me a place to stand and I (will) move the earth." Hiero asked him to give an illustration of his contention that a very great weight could be moved by a very small force. He is said to have fixed on a large and fully laden ship and to have used a mechanical device by which Hiero was enabled to move it by himself: but accounts differ as to the particular mechanical powers employed. The water-screw which he invented (see below) was probably devised in Egypt for the purpose of irrigating fields.

Archimedes died at the capture of Syracuse by Marcellus, 212 B.C. In the general massacre which followed the fall of the city, Archimedes, while engaged in drawing a mathematical figure on the sand, was run through the body by a Roman soldier. No blame attaches to the Roman general, Marcellus, since he had given orders to his men to spare the house and person of the sage; and in the midst of his triumph he lamented the death of so illustrious a person, directed an honourable burial to be given him, and befriended his surviving relatives. In accordance with the expressed desire of the philosopher, his tomb was marked by the figure of a sphere inscribed in a cylinder, the discovery of the relation between the volumes of a sphere and its circumscribing cylinder being regarded by him as his most valuable achievement. When Cicero was quaestor in Sicily (75 B.C.), he found the tomb of Archimedes, near the Agrigentine gate, overgrown with thorns and briers. "Thus," says Cicero (*Tusc. Disp.* v. *c.* 23, § 64), "would this most famous and once most learned city of Greece have remained a stranger to the tomb of one of its most ingenious citizens, had it not been discovered by a man of Arpinum."

Works.—The range and importance of the scientific labours of Archimedes will be best understood from a brief account of those writings which have come down to us; and it need only be added that his greatest work was in geometry, where he so extended the method of *exhaustion* as originated by Eudoxus, and followed by Euclid, that it became in his hands, though purely geometrical in form, actually equivalent in several cases to *integration*, as expounded in the first chapters of our text-books on the integral calculus. This remark applies to the finding of the area of a parabolic segment (mechanical solution) and of a spiral, the surface and volume of a sphere and of a segment thereof, and the volume of any segments of the solids of revolution of the second degree.

The extant treatises are as follows:—

(1) *On the Sphere and Cylinder* (Περὶ σφαίρας καὶ κυλίνδρου). This treatise is in two books, dedicated to Dositheus, and deals

with the dimensions of spheres, cones, "solid rhombi" and cylinders, all demonstrated in a strictly geometrical method. The first book contains forty-four propositions, and those in which the most important results are finally obtained are: 13 (surface of right cylinder), 14, 15 (surface of right cone), 33 (surface of sphere), 34 (volume of sphere and its relation to that of circumscribing cylinder), 42, 43 (surface of segment of sphere), 44 (volume of sector of sphere). The second book is in nine propositions, eight of which deal with segments of spheres and include the problems of cutting a given sphere by a plane so that (*a*) the surfaces, (*b*) the volumes, of the segments are in a given ratio (Props. 3, 4), and of constructing a segment of a sphere similar to one given segment and having (*a*) its volume, (*b*) its surface, equal to that of another (5, 6).

(2) *The Measurement of the Circle* (Κύκλου μέτρησις) is a short book of three propositions, the main result being obtained in Prop. 2, which shows that the circumference of a circle is less than $3\frac{1}{7}$ and greater than $3\frac{10}{71}$ times its diameter. Inscribing in and circumscribing about a circle two polygons, each of ninety-six sides, and assuming that the perimeter of the circle lay between those of the polygons, he obtained the limits he has assigned by sheer calculation, starting from two close approximations to the value of $\sqrt{3}$, which he assumes as known ($265/153 < \sqrt{3} < 1351/780$).

(3) *On Conoids and Spheroids* (Περὶ κωνοειδέων καὶ σφαιροειδέων) is a treatise in thirty-two propositions, on the solids generated by the revolution of the conic sections about their axes, the main results being the comparisons of the volume of any segment cut off by a plane with that of a cone having the same base and axis (Props. 21, 22 for the paraboloid, 25, 26 for the hyperboloid, and 27-32 for the spheroid).

(4) *On Spirals* (Περὶ ἑλίκων) is a book of twenty-eight propositions. Propositions 1-11 are preliminary, 13-20 contain tangential properties of the curve now known as the spiral of Archimedes, and 21-28 show how to express the area included between any portion of the curve and the radii vectores to its extremities.

(5) *On the Equilibrium of Planes or Centres of Gravity of Planes* (Περὶ ἐπιπέδων ἰσορροπιῶν ἢ κέντρα βαρῶν ἐπιπέδων). This consists of two books, and may be called the foundation of theoretical mechanics, for the previous contributions of Aristotle were comparatively vague and unscientific. In the first book there are fifteen propositions, with seven postulates; and demonstrations are given, much the same as those still employed, of the centres of gravity (1) of any two weights, (2) of any parallelogram, (3) of any triangle, (4) of any trapezium. The second book in ten propositions is devoted to the finding the centres of gravity (1) of a parabolic segment, (2) of the area included between any two parallel chords and the portions of the curve intercepted by them.

(6) *The Quadrature of the Parabola* (Τετραγωνισμὸς παραβολῆς) is a book in twenty-four propositions, containing two demonstrations that the area of any segment of a parabola is $\frac{4}{3}$ of the triangle which has the same base as the segment and equal height. The first (a mechanical proof) begins, after some preliminary propositions on the parabola, in Prop. 6, ending with an integration in Prop. 16. The second (a geometrical proof) is expounded in Props. 17-24.

(7) *On Floating Bodies* (Περὶ ὀχουμένων) is a treatise in two books, the first of which establishes the general principles of hydrostatics, and the second discusses with the greatest completeness the positions of rest and stability of a right segment of a paraboloid of revolution floating in a fluid.

(8) The *Psammiles* (Ψαμμίτης, Lat. *Arenarius*, or sand reckoner), a small treatise, addressed to Gelo, the eldest son of Hiero, expounding, as applied to reckoning the number of grains of sand that could be contained in a sphere of the size of our "universe," a system of naming large numbers according to "orders" and "periods" which would enable any number to be expressed up to that which we should write with 1 followed by 80,000 ciphers!

(9) *A Collection of Lemmas*, consisting of fifteen propositions in plane geometry. This has come down to us through a Latin version of an Arabic manuscript; it cannot, however, have been written by Archimedes in its present form, as his name is quoted in it more than once.

Lastly, Archimedes is credited with the famous *Cattle-Problem* enunciated in the epigram edited by G. E. Lessing in 1773, which purports to have been sent by Archimedes to the mathematicians at Alexandria in a letter to Eratosthenes. Of lost works by Archimedes we can identify the following: (1) investigations on *polyhedra* mentioned by Pappus; (2) Ἀρχαί, *Principles*, a book addressed to Zeuxippus and dealing with the *naming of numbers* on the system explained in the *Sand Reckoner*; (3) Περὶ ζυγῶν, *On balances or levers*; (4) Κεντροβαρικά, *On centres of gravity*; (5) Κατοπτρικά, an optical work from which Theon of Alexandria quotes a remark about refraction; (6) Ἔφοδιον, a *Method*, mentioned by Suidas; (7) Περὶ σφαιροποιΐας, *On Sphere-making*, in which Archimedes explained the construction of the sphere which he made to imitate the motions of the sun, the moon and the five planets in the heavens. Cicero actually saw this contrivance and describes it (*De Rep.* i. c. 14, §§ 21-22).

BIBLIOGRAPHY.—The *editio princeps* of the works of Archimedes, with the commentary of Eutocius, is that printed at Basel, in 1544, in Greek and Latin, by Hervagius. D. Rivault's edition (Paris, 1615) gave the enunciations in Greek and the proofs in Latin somewhat retouched. A Latin version of them was published by Isaac Barrow in 1675 (London, 4to); Nicolas Tartaglia published in Latin the treatises on *Centres of Gravity*, on the *Quadrature of the Parabola*, on the *Measurement of the Circle*, and on *Floating Bodies*, i. (Venice, 1543); Trojanus Curtius published the two books on *Floating Bodies* in 1565 after Tartaglia's death; Frederic Commandine edited the Aldine edition of 1558, 4to, which contains *Circuli Dimensio*, *De Lineis Spiralibus*, *Quadratura Paraboles*, *De Conoidibus et Spheroidibus*, and *De numero Arenae*; and in 1565 the same mathematician published the two books *De iis quae vehuntur in aqua*. J. Torelli's monumental edition of the works with the commentaries of Eutocius, published at Oxford in 1792, folio, remained the best Greek text until the definitive text edited, with Eutocius' commentaries, Latin translation, &c., by J. L. Heiberg (Leipzig, 1880–1881) superseded it. The *Arenarius* and *Dimensio Circuli*, with Eutocius' commentary on the latter, were edited by Wallis with Latin translation and notes in 1678 (Oxford), and the *Arenarius* was also published in English by George Anderson (London, 1784), with useful notes and illustrations. The first modern translation of the works is the French edition published by F. Peyrard (Paris, 1808, 2 vols. 8vo.). A valuable German translation with notes, by E. Nizze, was published at Stralsund in 1824. There is a complete edition in modern notation by T. L. Heath (*The Works of Archimedes*, Cambridge, 1897). On Archimedes himself, see Plutarch's *Life of Marcellus*. (T. L. H.)

ARCHIMEDES, SCREW OF, a machine for raising water, said to have been invented by Archimedes, for the purpose of removing water from the hold of a large ship that had been built by King Hiero II. of Syracuse. It consists of a water-tight cylinder, enclosing a chamber walled off by spiral divisions running from end to end, inclined to the horizon, with its lower open end placed in the water to be raised. The water, while occupying the lowest portion in each successive division of the spiral chamber, is lifted mechanically by the turning of the machine. Other forms have the spiral revolving free in a fixed cylinder, or consist simply of a tube wound spirally about a cylindrical axis. The same principle is sometimes used in machines for handling wheat, &c. (see CONVEYORS).

ARCHIPELAGO, a name now applied to any island-studded sea, but originally the distinctive designation of what is now generally known as the Aegean Sea (Αἰγαῖον πέλαγος), its ancient name having been revived. Several etymologies have been proposed: *e.g.* (1) it is a corruption of the ancient name, *Egeopelago;* (2) it is from the modern Greek, Ἅγιο πέλαγο, the Holy Sea; (3) it arose at the time of the Latin empire, and means the Sea of the Kingdom (*Archè*); (4) it is a translation of the Turkish name, Ak Denghiz, *Argon Pelagos*, the White Sea; (5) it is simply *Archipelagus*, Italian, *arcipelago*, the chief sea. For the Grecian Archipelago see AEGEAN SEA. Other archipelagoes are described in their respective places.

ARCHIPPUS, an Athenian poet of the Old Comedy, who flourished towards the end of the 5th century B.C. His most famous play was the *Fishes*, in which he satirized the fondness of the Athenian epicures for fish. The Alexandrian critics attributed to him the authorship of four plays previously assigned to Aristophanes. Archippus was ridiculed by his contemporaries for his fondness for playing upon words (Schol. on Aristophanes, *Wasps*, 481).

Titles and fragments of six plays are preserved, for which see T. Kock, *Comicorum Atticorum Fragmenta*, i. (1880); or A. Meineke, *Poetarum Comicorum Graecorum Fragmenta* (1855).

ARCHITECTURE (Lat. *architectura*, from the Gr. ἀρχιτέκτων, a master-builder), the art of building in such a way as to accord with principles determined, not merely by the ends the edifice is intended to serve, but by high considerations of beauty and harmony (see FINE ARTS). It cannot be defined as the art of building simply, or even of building well. So far as mere excellence of construction is concerned, see BUILDING and its allied articles. The end of building as such is convenience, use, irrespective of appearance; and the employment of materials to this end is regulated by the mechanical principles of the constructive art. The end of architecture as an art, on the other hand, is so to arrange the plan, masses and enrichments of a structure as to impart to it interest, beauty, grandeur, unity, power. Architecture thus necessitates the possession by the builder of gifts of imagination as well as of technical skill, and

in all works of architecture properly so called these elements must exist, and be harmoniously combined.

Like the other arts, architecture did not spring into existence at an early period of man's history. The ideas of symmetry and proportion which are afterwards embodied in material structures could not be evolved until at least a moderate degree of civilization had been attained, while the efforts of primitive man in the construction of dwellings must have been at first determined solely by his physical wants. Only after these had been provided for, and materials amassed on which his imagination might exercise itself, would he begin to plan and erect structures, possessing not only utility, but also grandeur and beauty. It may be well to enumerate briefly the elements which in combination form the architectural perfection of a building. These elements have been very variously determined by different authorities. Vitruvius, the only ancient writer on the art whose works have come down to us, lays down three qualities as indispensable in a fine building: *Firmitas*, *Utilitas*, *Venustas*, stabilty, utility, beauty. From an architectural point of view the last is the principal, though not the sole element; and, accordingly, the theory of architecture is occupied for the most part with aesthetic considerations, or the principles of beauty in designing. Of such principles or qualities the following appear to be the most important: size, harmony, proportion, symmetry, ornament and colour. All other elements may be reduced under one or other of these heads.

With regard to the first quality, it is clear that, as the feeling of power is a source of the keenest pleasure, size, or vastness of proportion, will not only excite in the mind of man the feelings of awe with which he regards the sublime in nature, but will impress him with a deep sense of the majesty of human power. It is, therefore, a double source of pleasure. The feelings with which we regard the Pyramids of Egypt, the great hall of columns at Karnak, the Pantheon, or the Basilica of Maxentius at Rome, the Trilithon at Baalbek, the choir of Beauvais cathedral, or the Arc de l'Étoile at Paris, sufficiently attest the truth of this quality, *size*, which is even better appreciated when the buildings are contemplated simply as masses, without being disturbed by the consideration of the details.

Proportion itself depends essentially upon the employment of mathematical ratios in the dimensions of a building. It is a curious but significant fact that such proportions as those of an exact cube, or of two cubes placed side by side—dimensions increasing by one-half (*e.g.*, 20 ft. high, 30 wide and 45 long)—or the ratios of the base, perpendicular and hypotenuse of a right-angled triangle (*e.g.* 3, 4, 5, or their multiples)—please the eye more than dimensions taken at random. No defect is more glaring or more unpleasant than want of proportion. The Gothic architects appear to have been guided in their designs by proportions based on the equilateral triangle.

By harmony is meant the general balancing of the several parts of the design. It is proportion applied to the mutual relations of the details. Thus, supported parts should have an adequate ratio to their supports, and the same should be the case with solids and voids. Due attention to proportion and harmony gives the appearance of stability and repose which is indispensable to a really fine building. Symmetry is uniformity in plan, and, when not carried to excess, is undoubtedly effective. But a building too rigorously symmetrical is apt to appear cold and tasteless. Such symmetry of general plan, with diversity of detail, as is presented to us in leaves, animals, and other natural objects, is probably the just medium between the excesses of two opposing schools.

Next to general beauty or grandeur of form in a building comes architectural ornament. Ornament, of course, may be used to excess, and as a general rule it should be confined to the decoration of constructive parts of the fabric; but, on the other hand, a total absence or a paucity of ornament betokens an unpleasing poverty. Ornaments may be divided into two classes—mouldings and the sculptured representation of natural or fanciful objects. Mouldings, no doubt, originated, first, in simply taking off the edge of anything that might be in the way, as the edge of a square post, and then sinking the chamfer in hollows of various forms; and thence were developed the systems of mouldings we now find in all styles and periods. Each of these has its own system; and so well are their characteristics understood, that from an examination of them a skilful architect will not only tell the period in which any building has been erected, but will even give an estimate of its probable size, as professors of physiology will construct an animal from the examination of a single bone. Mouldings require to be carefully studied, for nothing offends an educated eye like a confusion of mouldings, such as Roman forms in Greek work, or Early English in that of the Tudor period. The same remark applies to sculptured ornaments. They should be neither too numerous nor too few, and above all, they should be consistent. The carved ox skulls, for instance, which are appropriate in a temple of Vesta or of Fortune would be very incongruous on a Christian church.

Colour must be regarded as a subsidiary element in architecture, and although it seems almost indispensable and has always been extensively employed in interiors, it is doubtful how far external colouring is desirable. Some contend that only local colouring, *i.e.* the colour of the materials, should be admitted; but there seems no reason why any colour should not be used, provided it be employed with discretion and kept subordinate to the form or outline.

Origin of the Art.—The origin of the art of architecture is to be found in the endeavours of man to provide for his physical wants; in the earliest days the cave, the hut and the tent may have given shelter to those who devoted themselves to hunting and fishing, to agriculture and to a pastoral and nomadic life, and in many cases still afford the only shelter from the weather. There can be no doubt, however, that climate and the materials at hand affect the forms of the primitive buildings; thus, in the two earliest settlements of mankind, in Chaldaea and Egypt, where wood was scarce, the heat in the day-time intense, and the only material which could be obtained was the alluvial clay, brought down by the rivers in both those countries, they shaped this into bricks, which, dried in the sun, enabled them to build rude huts, giving them the required shelter. These may have been circular or rectangular on plan, with the bricks laid in horizontal courses, one projecting over the other, till the walls met at the top. The next advance in Egypt was made by the employment of the trunks of the palm tree as a lintel over the doorway, to support the wall above, and to cover over the hut and carry the flat roof of earth which is found down to the present day in all hot countries. Evidence of this system of construction is found in some of the earliest rock-cut tombs at Giza, where the actual dwelling of the deceased was reproduced in the tomb, and from these reproductions we gather that the corners, or quoins of the hut were protected by stems of the douva plant, bound together in rolls by the leaves, which, in the form of torus rolls, were also carried across the top of the wall. Down to the present day the huts of the fellahs are built in the same way, and, surmounted as they are by pigeon-cots, bear so strong a resemblance to the pylons and the walls of the temples as at all events to suggest, if not to prove, that in their origin these stone erections were copies of unburnt brick structures. From long exposure in the sun, these bricks acquire a hardness and compactness not much inferior to some of the softer qualities of stone, but they are unable to sustain much pressure; consequently it is necessary to make the walls thicker at the bottom than at the top, and it is this which results in the batter or raking sides of all the unburnt brick walls. The same raking sides are found in all their *mastabas*, or tombs, sometimes built in unburnt brick and sometimes in stone, in the latter case being simple reproductions of the former. In some of the early mastabas, built in brick, either to vary the monotony of the mass and decorate the walls, or to ensure greater care in their construction, vertical brick pilasters are provided, forming sunk panels. These form the principal decoration, as reproduced in stone, of an endless number of tombs, some of which are in the British Museum. At the top of each panel they carve a portion

of trunk necessary to support the walls of brick, and over the doorway a similar feature. In Chaldaea the same decorative features are found in the stage towers which constituted their temples, and broad projecting buttresses, indented panels and other features, originally constructive, form the decorations of the Assyrian palaces. There also, built in the same material, unburnt brick, the walls have a similar batter, though they were faced with burnt bricks. In later times in Greece and Asia Minor, where wood was plentiful, the stone architecture suggests its timber origin, and though unburnt brick was still employed for the mass of the walls, the remains in Crete and the representations in painting, &c., show that it was encased in timber framing, so that the raking walls were no longer a necessary element in their structure. The clearest proofs of original timber construction are shown in the rock-cut tombs of Lycia, where the ground sill, vertical posts, cross beams, purlins and roof joists are all direct imitations of structures originally erected in wood.

The numerous relics of structures left by primeval man have generally little or no architectural value; and the only interesting problem regarding them—the determination of their date and purpose and of the degree of civilization which they manifest—falls within the province of archaeology (see ARCHAEOLOGY; BARROW; LAKE-DWELLINGS; STONE MONUMENTS).

Technical terms in architecture will be found separately explained under their own headings in this work, and in this article a general acquaintance with them is assumed. A number of architectural subjects are also considered in detail in separate articles; see, for instance, CAPITAL; COLUMN; DESIGN; ORDER; and such headings as ABBEY; AQUEDUCT; ARCH; BASILICA; BATHS; BRIDGES; CATACOMB; CRYPT; DOME; MOSQUE; PALACE; PYRAMID; TEMPLE; THEATRE; &c., &c. Also such general articles on national art as CHINA: *Art*; EGYPT: *Art and Archaeology*; GREEK ART; ROMAN ART; &c., and the sections on architecture and buildings under the headings of countries and towns.

In the remainder of this article the general history of the evolution of the art of architecture will be considered in various sections, associated with the nations and periods from which the leading historic styles are chronologically derived, in so far as the dominant influences on the art, and not the purely local characteristics of countries outside the main current of its history, are concerned; but the opportunity is taken to treat with some attempt at comprehensiveness the leading features of the architectural history of those countries and peoples which are intimately connected with the development of modern architecture.

These consecutive sections are as follows:—

- Egyptian
- Assyrian
- Persian
- Greek
- Parthian
- Sassanian
- Etruscan
- Roman
- Byzantine
- Early Christian
- Early Christian Work in Central Syria
- Coptic Church in Egypt
- Romanesque and Gothic in—
  - Italy
  - France
  - Spain
  - England
  - Germany
  - Belgium and Holland
- Renaissance: Introduction
  - Italy
  - France
  - Spain
  - England
  - Germany
  - Belgium and Holland
- Mahommedan

Finally, a section on what can only be collectively termed *Modern* architecture deals with the main lines of the later developments down to the present day in the architectural history of different countries.

(R. P. S.)

EGYPTIAN ARCHITECTURE

Although structures discovered in Chaldaea, at Tello and Nippur, seeming to date back to the fifth millennium B.C., suggest that the earlier settlements of mankind were in the valley of the Tigris and Euphrates, north of the Persian Gulf, it is to Egypt that we must turn for the most ancient records of monumental architecture (see also EGYPT: *Art and Archaeology*). The proximity of the ranges of hills (the Arabian and Libyan chains) to the Nile, and the facilities which that river afforded for the transport of the material quarried in them, enabled the Egyptians at a very early period to reproduce in stone those structures in unburnt brick to which we have already referred.

Although the great founder of the first Egyptian monarchy is reputed to be Menes, the Thinite who traditionally founded the capital at Memphis, he was preceded, according to Flinders Petrie, by an earlier invading race coming from the south, who established a monarchy at This near Abydos, having entered the country by the Kosseir road from the Red Sea; and this may account for the early tradition that it was the Ethiopians who founded the earliest dynastic race, "Ethiopians" being a wide term which may embrace several races.

Egyptian architecture is usually described under the principal periods in which it was developed. They are as follows[1]:—(A) the Memphite kingdom, whose capital was at Memphis, south-west of Cairo, the Royal Domain extending south some 30 to 40 m.; (B) the first Theban kingdom with Thebes as the capital; this covers three dynasties. Then follows an interregnum of five dynasties, when the invasion of the Hyksos took place; this was architecturally unproductive. On the expulsion of the Hyksos there followed (C) the second Theban kingdom, consisting of three dynasties, under whose reign the finest temples were erected throughout the country. After 1102 followed six dynasties (1102–525 B.C.), with capitals at Sais, Tanis and Bubastis, when the decadence of art and power took place. Then followed the Persian invasion, 525–331 B.C., which was destructive instead of being reproductive. On the defeat of the Persians by Alexander the Great, and after his death in 323 B.C., was founded (D) the Ptolemaic kingdom, with Alexandria as the capital. A great revival of art then took place, which to a certain extent was carried on under the Roman occupation from 27 B.C., and lasted about 300 years.

With the exception of a small temple, found by Petrie in front of the temple of Medum, and the so-called "Temple of the Sphinx," the only monuments remaining of the Memphite kingdom are the Pyramids, which were built by the kings as their tombs, and the *mastabas*, in which the members of the royal family and of the priests and chiefs were buried. The mastaba (Arabic for "bench") was a tomb, oblong in plan, with battering side and a flat roof, containing various chambers, of which the principal were (1) the Chapel for offerings, (2) the Serdab, in which the Ka or double of the deceased was deposited, and (3) the well, always excavated in the rock, in which the mummy was placed.

The three best-known pyramids are those situated about 7 m. south-west of Cairo, which were built by the second, third and fourth kings of the fourth dynasty,—Khufu (*c.* 3969–3908 B.C.), Khafra (*c.* 3908–3845 B.C.), and Menkaura (*c.* 3845–3784 B.C.), who are better known as Cheops, Cephren and Mycerinus. The first of these is the largest and most remarkable in its construction and setting out. The pyramid of Cephren was slightly smaller, and that of Mycerinus still more so, compensated for by a casing in granite. The dimensions and other details are given in the article PYRAMIDS. From the purely architectural point of view they are the least impressive of masses, and their immense size is not realized until on a close approach.

The temple of the Sphinx, attributed to Cephren, is T-shaped in plan, with two rows of square piers down the vertical and one row down the cross portion. These carried a flat roof of stone. The temple is remarkable for the splendid finish given to the granite piers, and to the alabaster slabs which cased the rock in which it had been partially excavated (but see EGYPT: *History*, I.).

The Serapeum at Sakkara, in which the sacred bulls were embalmed and buried, the tomb of Ti (a fifth dynasty courtier), and the tombs of the kings and queens of Thebes, have no special architectural features which call for description here.

We pass on to the first Theban kingdom, the eighth king of which, Nebheprē Menthotp III., built the temple lately discovered on the south side of the temple at Deir-el-Bahri, of which it is the prototype. It was a sepulchral temple, and being built on rising ground was approached by flights of steps. In the centre was a solid mass of masonry which, it is thought by some authorities, was crowned by a pyramid. This was surrounded by a double portico with square piers in the outer range, and octagonal piers in the inner range, there being a wall between the two ranges.

The earliest tombs in which the *column* (*q.v.*) appears, as an architectural feature, are those at Beni Hasan, attributed to the period of Senwosri (formerly read Usertesen) I., the second king of the twelfth dynasty. These are carved in the solid rock. There are two

[1] For the various chronological systems proposed see EGYPT: *Chronology*.

types, the Polygonal column, sometimes in error called the Protodoric, which was cut in the rock in imitation of a wooden column, and a second variety known as the Lotus column, which is employed inside, supporting the rock-cut roof, but having such slender proportions as to suggest that it was copied from the posts of a porch, round which the Lotus plant had been tied.

The culminating period of the Egyptian style begins with the kings of the eighteenth dynasty, their principal capital being Thebes, described by Herodotus as the "City with the Hundred Gates"; and although the execution of the masonry is inferior to that of the older dynasties, the grandeur of the conception of their temples, and the wealth displayed in their realization entitle Thebes to the most important position in the history of the Egyptian style, especially as the temples there grouped on both sides of the river exceed in number and dimensions the whole of the other temples throughout Egypt. This to a certain extent may possibly be due to the distance of Thebes from the Mediterranean, which has contributed to their preservation from invaders. We have already referred to the probable origin of the peculiar batter or raking side given to the walls of the pylons and temples, with the Torus moulding surrounding the same and crowned with the cavetto cornice. What, however, is more remarkable is the fact that, once accepted as an important and characteristic feature, it should never have been departed from, and that down to and during the Roman occupation the same batter is found in all the temples, though constructively there was no necessity for it. The strict adherence to tradition may possibly account for this, but it has resulted in a magnificent repose possessed by these structures, which seem built to last till eternity.

An avenue with sphinxes on both sides forms the approach to the temple. These avenues were sometimes of considerable length, as in the case of that reaching from Karnak to Luxor, which is 1½ m. long. The leading features of the temple (see fig. 1) were:—(A) The pylon, consisting of two pyramidal masses of masonry crowned with a cavetto cornice, united in the centre by an immense doorway, in front of which on either side were seated figures of the king and obelisks. (B) A great open court surrounded by peristyles on two or three sides. (C) A great hall with a range of columns down the centre on either side, forming what in European architecture would be known as nave and aisles, with additional aisles on each side; these had columns of less height than those first mentioned, so as to allow of a clerestory, lighting the central avenue. (D) Smaller halls with their flat roofs carried by columns. And finally (E) the sanctuary, with passage round giving access to the halls occupied by the priest.

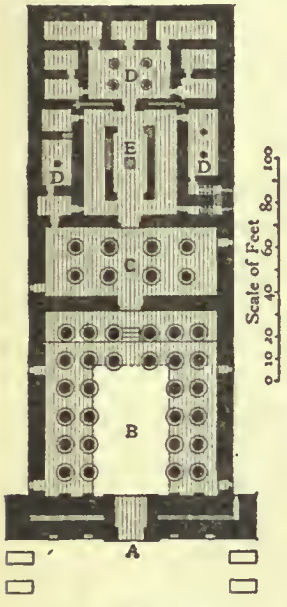


Fig. 1.—Plan of the Temple of Chons.

A, Pylon.
B, Great court.
C, Hall of columns.
D, Priest's hall.
E, Sanctuary.

Broadly speaking, the temples bear considerable resemblance to one another (see Temple), except in dimensions. There is one important distinction, however, to be drawn between the Theban temples and those built under the Ptolemaic rule. In these latter the halls are not enclosed between pylons, but left open on the side of the entrance court with screens in between the columns, the hall being lighted from above the screens. The temples of Edfu, Esna and Dendera are thus arranged.

The great temple of Karnak (fig. 2) differs from the type just described, in that it was the work of many successive monarchs. Thus the sanctuary, built in granite, and the surrounding chambers, were erected by Senwosri (Usertesen) I. of the twelfth dynasty. In front of this, on the west side, pylons were added by Tethmosis (Thothmes, Tahutmes) I. (1541–1516), enclosing a hall, in the walls of which were Osirid figures. In front of this a third pylon was added, which Seti (Sethos) I. utilized as one of the enclosures of the great hall of columns (fig. 3), measuring 170 ft. deep by 329 ft. wide, having added a fourth pylon on the other side to enclose it. Again in front of this was the great open court with porticoes on two sides, and a great pylon, forming the entrance. In the rear of all these buildings, and some distance beyond the sanctuary, Tethmosis III. (1503–1449) built a great colonnaded hall with other halls round, considered to have been a palace. All these structures form a part only of the great temple, on the right and left of which (*i.e.* to the north-east and south-west) were other temples preceded by pylons and connected one with the other by avenues of sphinxes. Though of small size comparatively, one of the best preserved is the temple of Chons, built by Rameses III. It was from this temple that an avenue of sphinxes led to the temple of Luxor, which was begun by Amenophis III. (1414–1379 B.C.), and completed by Rameses II. (1300–1234).

On the opposite or west bank of the Nile are the temple of Medinet Abū, the Ramesseum, the temples of Kurna and of Deir-el-Bahri; the last being a sepulchral temple, which, built on rising ground, had flights of steps leading to the higher level (fig. 4), and porticoes with square piers at the foot of each terrace. In the rear on the right-hand side was found an altar, the only example of its kind known in

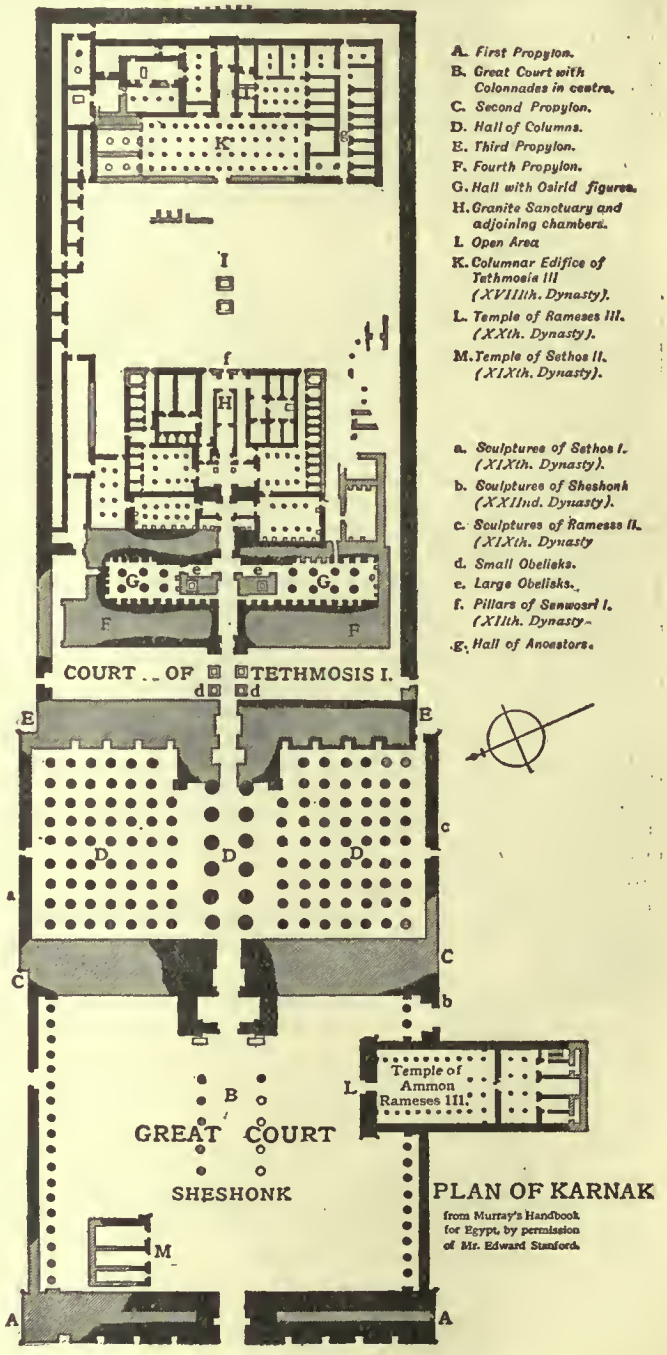

A. First Propylon.
B. Great Court with Colonnades in centre.
C. Second Propylon.
D. Hall of Columns.
E. Third Propylon.
F. Fourth Propylon.
G. Hall with Osirid figures.
H. Granite Sanctuary and adjoining chambers.
I. Open Area
K. Columnar Edifice of Tethmosis III (XVIIIth. Dynasty).
L. Temple of Rameses III. (XXth. Dynasty).
M. Temple of Sethos II. (XIXth. Dynasty).
a. Sculptures of Sethos I. (XIXth. Dynasty).
b. Sculptures of Sheshonk (XXIInd. Dynasty).
c. Sculptures of Rameses II. (XIXth. Dynasty
d. Small Obelisks.
e. Large Obelisks.
f. Pillars of Senwosri I. (XIIth. Dynasty.
g. Hall of Ancestors.
COURT OF TETHMOSIS I.
Temple of Ammon Rameses III.
GREAT COURT
SHESHONK
PLAN OF KARNAK
from Murray's Handbook for Egypt, by permission of Mr. Edward Stanford.

Fig. 2.

Egypt. The halls behind this and the portico of the right flank had polygonal columns.

In the palace of Tell el-Amarna, built shortly before 1350 B.C. by the heretic king Akhenaton (whose name was originally Amenophis IV.), and discovered by Petrie, there were no special architectural developments, but the painted decoration of the walls and pavements assumed a literal interpretation of natural forms of plants and foliage and of birds and animals, recalling to some extent that found at Cnossus in Crete.

Ascending the river from Cairo, the first temples of which important remains exist are the two at Abydos. One of these has an exceptional plan, with seven sanctuaries in the rear. It was built by Seti I., and consists of an outer portico with square piers, a hall

with two rows of columns down to the centre, and a second hall with three rows of columns. These halls are placed longitudinally to give access to the seven sanctuaries. The second temple is of the ordinary type, with pylon, court with portico on all four sides, two halls of columns, and three sanctuaries in the rear. The next temple is that of Dendera, commenced under the second Ptolemy but not completed until the reign of Nero. It has been completely excavated, and

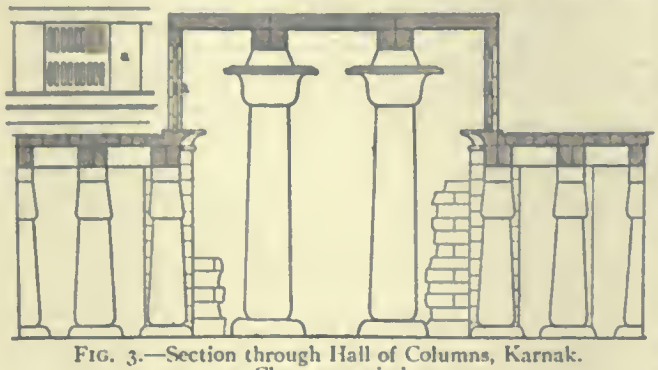
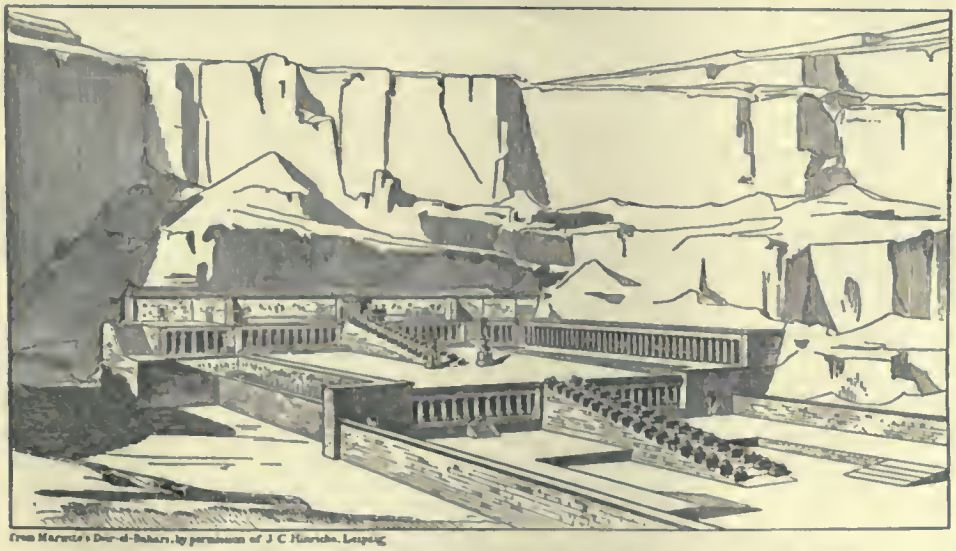


FIG. 3.—Section through Hall of Columns, Karnak.
a, Clerestory window.

retains the whole of its external walls. Above Thebes is the temple of Esna, of which the hall of columns only has been cleared out. The capitals of the front belong to the lotus-bud type, and those of the interior are carved with many varieties of river plant. The temple of Edfu is the best preserved in Egypt. Its plan (fig. 5) would seem to have been determined from the first, and it is singular to note that it presents the traditional type of plan, which in the Theban examples was evolved from additions made by successive monarchs. In dimensions it is but little inferior to these. Its pylon (fig. 6) is 250 ft. wide and 150 ft. high; the first court has porticoes on three sides. The great hall of columns, all of which here are of the same height, is lighted from above (fig. 7), the screen facing the court. Then follow the second hall of columns, two vestibules, and the sanctuary, surrounded by a passage giving access to the priest's rooms round. The temple of Kōm Ombo, which comes next, was dedicated to two deities, and had therefore two sanctuaries.

The temples of Philae owe much of their beauty and picturesqueness to the island on which they are situated; their plans, and that of the long porticoes in front of the pylons of the great temple, being fitted to the irregularity of the site. In the first court is a well-preserved example of the Mammeisi temple (see TEMPLE), the sanctuary and other rooms in which are entirely enclosed in a peristyle. It was built by Ptolemy Euergetes (247–222 B.C.). A second monarch of the same name (about 125 B.C.) built the pavilion on the north side of the island, known as "Pharaoh's bed," the roof



From Marcotte's Deir-el-Bahari, by permission of J. C. Hinrichs, Leipzig.

FIG. 4.—Temple of Deir-el-Bahri, conjectural restoration by Prof. E. Brune.

of which was covered with stone slabs, resting on timber beams. In consequence of the building of the Assuan dam all these temples are submerged for the greater part of the year. The principal temples between Philae and the second cataract are:—Dabōd, of which little remains; Kartassi; Kalābsha, still preserving its pylon and great hall of columns; the Bēt el-Wāli, in which are two ancient polygonal columns; Gerf Husen, partially cut in the rock; Dakka; Wadi es-Sebū'a; and lastly Abū Simbel. Owing to the proximity of the ranges of hills to the Nile, there was no room for the ordinary type of temple at Abū Simbel, so that those founded here by Rameses the Great (*c.* 1300–1234 B.C.) were excavated in the rock. In the place of the pylon the side of the cliff was worked off, leaving in relief four immense seated figures, 66 ft. high. The first hall had three aisles, divided by four piers on each side, in front of which Osirid figures (18 ft. high) were carved; beyond was a second hall, vestibule and sanctuary. The long rectangular chambers on each side are provided with benches cut in the rock. The depth of the temple is 90 ft. There is a second temple of smaller size which faces the Nile.

We have already referred to the lotus columns at Beni Hasan; these, when employed constructionally to carry stone roofs, assumed a far more solid appearance, and the stems of the lotus plant carved in the earlier examples were omitted in the later, in order to give more surface for intaglio carving. The capital and its neck still retain the lotus buds and the bands which tied them round the column. In the central avenues of the great halls the columns had bell capitals, the decoration of which was based on the flower of the papyrus. There are a few examples of the palm capital, often carved in granite, which date from an early period. Commencing with the Ptolemaic revival the capitals assume a much greater variety of form, their decoration being based on river plants; but here again the lotus plant, which seems still to be the favourite type, predominates, the buds in various degrees of their growth alternating one with the other. All these varieties of form are described in the article CAPITAL, but two or three may be mentioned here, as they depart from the usual type. The Hathor-headed capital, with faces on all four sides, and surmounted with a miniature shrine, is found at Dendera, Philae and other temples of the Ptolemaic or Roman periods; one of the earliest examples, but without the shrine, dates back to Tethmosis III. (1503–1449 B.C.). As a distinct type of pier decoration, the Osirid figures at Medinet Abū, at Karnak, Gerf Husen, Abū Simbel and other temples, constitute important features: the figure is carved in front of the pier and does not serve any constructive function.

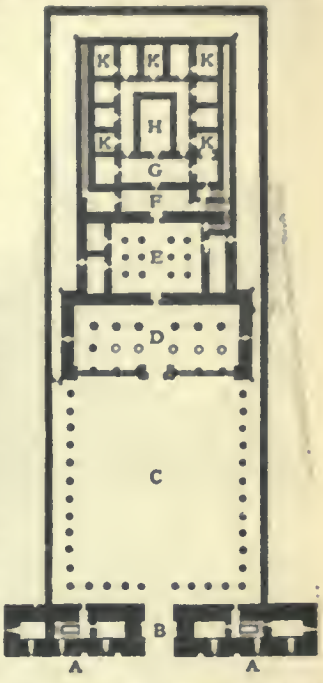


FIG. 5.—Plan of the Temple of Edfu.
AA, Pylon.
B, Entrance door.
C, Great Court.
D, Hall of Columns.
E, Second Hall.
F, Hall of the Altar.
G, Hall of the Centre.
H, Sanctuary.
KK, Storerooms.

With the exception of the great building in the rear of the temple at Karnak, built by Tethmosis III., and the pavilion of Medinet Abū on the west bank of the Nile at Thebes, no palatial residences of any importance have yet been found, from which it might be inferred that the king, being the head of the Egyptian religion, occupied with his family the sacred precincts of the temple; but large as these temple enclosures are, there would have been no room for the immense army of attendants and servants required in an Oriental court. Moreover, the darkness of the halls and the rigid enclosures would have made a residence in them anything but cheerful. There are two instances where, in consequence of the subsequent desertion of the site, remains have been found of ancient towns. At Tell el-Amarna, built by the heretic king, Akhenaton, portions of the houses remain, and at Kahun, in the Fayum, Petrie discovered the walls of a town which, erected for the overseers and workmen employed in the construction of the pyramid of Illahun,

built by Senwosri (Usertesen) II. (2684–2666 B.C.), was abandoned when the pyramid was completed. The houses were all built in unburnt brick, and in those cases where the rooms exceeded 8 or 9 ft. in width, columns in stone or wood were employed to assist in carrying the roof, which was constructed of beams carrying smaller timbers covered over with a flat roof of mud. The plans of the houses

FIG. 6.—Exterior of the Pylon of the Temple of Edfu.

were not unlike those found in Pompeii, with open courts and porticoes and no external windows. The streets ran at right angles to one another, and the houses varied in size from the workman's hut, of one room, to the overseer's house with several rooms and courts; the principal residence, in the centre, occupied by the governor of the town, being of still larger dimensions.

Further knowledge of the Egyptian dwellings is chiefly derived from the " soul-houses " recently discovered by Petrie, and from the paintings in the tombs, which suggest that they corresponded to that class of residence which in Rome was known as a villa, viz. a series of detached buildings built in immense enclosures, with porticoes round, groves of trees, artificial lakes, &c. The walls, gates and buildings were all built probably in unburnt brick, and the whole site, if on the borders of the river, raised on great mounds. In this respect they accord with the houses of the fellah at the present day, which are raised on the accumulation of centuries, for when, owing to the rise of the Nile, the houses succumb to the moisture creeping up, another house is built on the top. The representations in paintings show that the houses were chiefly built in unburnt brick, and they sometimes were of two or three storeys in height, with windows in the upper floors, and a flat roof with a kind of dormer known as the Mulhuf, turned towards the north-west to ventilate the house. The paintings frequently represent the store-rooms, or granaries; and the preservation of those built by Rameses the Great, in the rear of the Ramesseum at Thebes, as granaries to hold corn, enables us to follow their construction. These granaries consist of a series of long cellars, about 12 to 14 ft. wide, placed side by side, and roofed over with elliptical barrel vaults. The reason for the elliptical form and the method of their construction is given in the article VAULT (*q.v.*).

FIG. 7. — Façade of the Great Hall of Columns of the Ptolemaic temple at Edfu.

The pavilion of Medinet Abū was built in stone, and consequently has been preserved more or less complete to our day. It consisted of three storeys with a flat roof and battlement round, said to be in imitation of those on a Syrian fortress, as they are quite unlike anything else in Egypt. The floors were in wood, but there are traces of a stone staircase. The windows, of large size, were filled with thin stone slabs pierced with vertical slits, like those of the hall of columns at Karnak. (R. P. S.)

ASSYRIAN ARCHITECTURE

About 3800 B.C. the earlier inhabitants of Chaldaea or Babylonia were invaded and absorbed by a Semitic race, whose first monarch was Sargon of Agade (Akkad). 1800 years later, emigrations took place northward, and founded Nineveh on the banks of the Tigris, about 250 m. north of Babylon. 1200 years later, the Assyrians began building the magnificent series of palaces from which were brought the winged man-headed bulls and the sculptured slabs now in the British Museum. The leading characteristics of the style, and the nature of the structures, temples and palaces, evolved by the Chaldaeans (or first Babylonian empire), the Assyrians, and the new Babylonian empire, are similar; they are best known by those which represent a culmination of the style in north Mesopotamia, and are therefore described here.

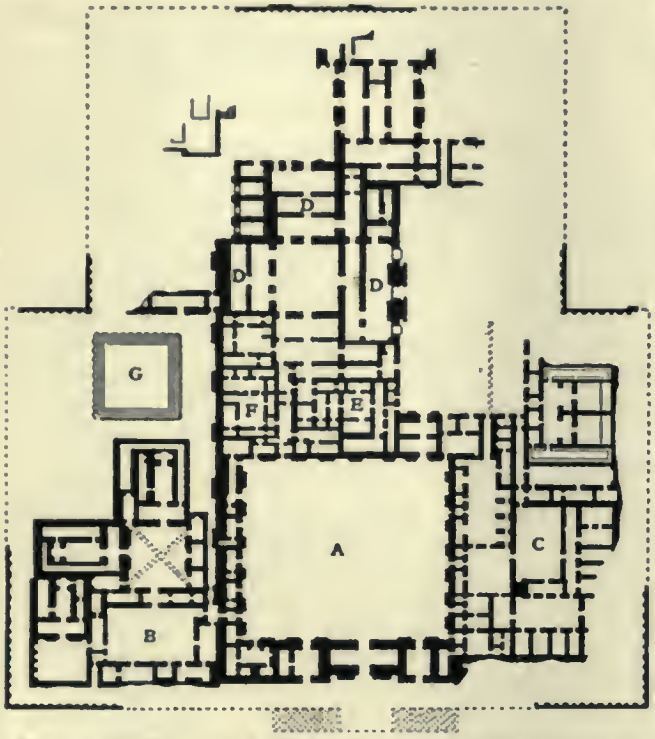
By a singular coincidence the remains of the oldest building found at Nippur (Niffar), in lower Mesopotamia, bear a close resemblance to the oldest pyramid in Egypt, Medum, before it received its final casing. The latter, however, is known to have been a tomb, whereas the structure at Nippur was a temple, which took the form of a *ziggurat* or stage tower. It consisted of several storeys built one over the other, the upper storey in each case being set back behind the lower, in order to leave a terrace all round. In some cases the terrace was wider in front, to give space for staircases ascending from storey to storey. In consequence of the extreme flatness of the country and its liability to sudden inundations, it became necessary, when erecting buildings of any kind, to raise them on mounds of earth. The more important the structure, the higher was it deemed necessary to raise it, so as to make it the most conspicuous feature in the landscape. The result is that from Abu Shahrain, the most southern town, to Akarkuf (Aqarquf), 220 m. north, there are a series of immense mounds, sometimes nearly a mile in diameter, and rising to a height of 200 ft., crowned with the remains of towns, which, notwithstanding the thirty centuries more or less during which they have been exposed to the torrential rains and the destructive agencies of man, form still the most prominent features in the country. The structures which were raised on the mound, *i.e.* the temples and palaces with their enclosure walls, were all built with bricks made of the alluvial clay of the country, shaped in wooden moulds and dried in the heat of the sun, a heat so intense that they acquired sometimes the hardness of the inferior qualities of stone. The walls of the temples, palaces and enclosures had the same batter as that already referred to in the preceding section on Egypt. In the latter country they were reproduced in stone, of which there were many quarries on either side of the Nile; in Chaldaea they were obliged to content themselves with the preservation of their ziggurats by outer casings of burnt brick and with pavements of tiles for their terraces. In order to vary the monotony of their temple walls, and perhaps to give them greater strength, they built vertical bands or buttresses at intervals, or they sank panels in the walls to two depths, a natural decoration to which brick work lends itself; and these two methods, which were employed in early times, were followed by the Assyrians in the palaces of Nimrud, Nineveh and Khorsabad.

The earlier settlements were those founded between the mouths of the Tigris and the Euphrates, on what was then the shore of the Persian Gulf, now some 140 m. farther south. The principal towns where the remains of ziggurats have been found, all on the borders of the Euphrates, beginning with the most southern, are:—Abu Shahrain (Eridu); Mugheir (Ur of the Chaldees); Senkera (? Ellasar or Larsa); Warka (Erech); Tello (Eninnu); Nippur; Birs Nimrūd (Borsippa); Babil (Babylon); El Ohemir (Kish); Abu Habba (Sippara); and Akarkuf (Durkurigalsu).

Although the ziggurats at Warka, Nippur and Tello are probably of older foundation, the great temple of Borsippa at Birs Nimrud is in better preservation, having been restored or rebuilt by Nebuchadrezzar, and may be taken as a typical example. The ground storey was 272 ft. square, and, according to Fergusson, 45 ft. high. The upper storeys or stages receded back, one behind the other, so as to leave a terrace all round. Although it is not possible to trace more than four storeys, it is known from the description on a cylinder found on the site that there were seven storeys, dedicated to the planets, each coloured with the special tint prescribed. The total height was about 160 ft., and on the top was a shrine dedicated to the god Nebo. An invaluable record of the researches which have been made during the last three centuries or more is given in H. V. Hilprecht's *Explorations in Bible Lands during the 19th Century*. Two or three of them might be mentioned here. At Warka Mr Kenneth Loftus uncovered a wall, strengthened by buttresses 15 ft. wide and projecting 18 in., between which were panels filled with a series of semicircular shafts side by side, both buttresses and shafts being decorated with geometrical patterns consisting of small earthenware cones embedded in the wall, the ends of which were enamelled in various colours. The design of these patterns is so unlike anything found in Assyrian work, but bears so close a resemblance to the geometrical designs carved on the columns at Diarbekr ascribed to the Parthians, that this wall may have been built at a much later period; and this becomes the more probable in view of the discoveries made subsequently at Tello and Nippur, where Parthian palaces have been found, crowning the summits of the ancient Chaldaean mounds. In both these towns the researches made in later years have been carried out far more methodically than previously, and, following the example of Schliemann, excavations have been made to great depths, careful notes being taken of the strata shown by the platforms at different levels. At Tello, de Sarzac discovered the magnificent collection of statues of diorite now in the Louvre, one of them (unfortunately headless) of Gudea, priest-king and architect of Lagash, seated and carrying on his lap a tablet, on which is engraved the plan of a fortified enclosure, whilst a divided scale and a stylos are carved in relief near the upper and right-hand side. A silver inlaid vase of Entemena, also priest-king of Lagash (about 3950 B.C.), and other treasures, were found on the same site.

At Nippur (the ancient Calneh) the research undertaken by the university of Pennsylvania resulted in the discovery, under a ziggurat dated from 4000–4500 B.C., of a barrel-vaulted tunnel, in the floor of which were found terra-cotta drain pipes with flanged mouths. At a later date (3750 B.C.) Naram-Sin, the son of Sargon, had built over the older ziggurat a loftier and larger temple, above which was a third built by Ur Gur (2500 B.C.), which still retained its burnt brick casing, 5 ft. thick. Crowning all these was the Parthian palace mentioned in the section on Parthian architecture below. The result of these researches has not only carried back the date of the earlier settlements to a prehistoric period quite unknown, but has suggested that if similar researches are carried out in other well-known mounds, among which the great city of Babylon should be counted as the most important, further revelations may still be made.

But we have now to pass to the principal cities of the Assyrian monarchy on the river Tigris. At Nineveh, the capital, which is about 250 m. north of Babylon, the remains of three palaces have been found, those of Sennacherib (705–681 B.C.), Esarhaddon (681–668 B.C.), and Assurbanipal (668–626 B.C.). At Nimrud (the ancient



From *The History of Art in Chaldæa and Assyria*, by permission of Chapman & Hall, Ltd.

FIG. 8.—Plan of the Palace at Khorsabad.

A, Principal courtyard.
B, The harem.
C, The offices.
DD, The halls of state.
E, Official residences.
F, The king's residence.
G, The ziggurat or temple.

Calah, founded by Assur), 20 m. south of Nineveh, are also three palaces, one (the earliest known) built by Assurnazirpal (885–860 B.C.), the others by Shalmaneser II. (860–825 B.C.) and Esarhaddon. At Balawat, 10 m. east of Nineveh, was a second palace of Shalmaneser II., and at Khorsabad, 10 m. north-east of Nineveh, the palace (fig. 8) built by Sargon 722–705 B.C.), which was situated on the banks of the Khanser, a tributary of the Tigris. As this palace is one of the most extensive of those hitherto explored, its description will best give the general idea of the plan and conception of an Assyrian palace.

The palace was built on an immense platform, made of sun-dried bricks, enclosed in masonry, and covering an area of nearly one million square feet, raised 48 ft. above the town level. The principal front of the palace measured 900 ft., there being a terrace in front. The approach was probably by a double inclined ramp which chariots and horses could mount. A central and two side portals (fig. 9), flanked with winged human-headed bulls (now in the British Museum), led to the principal courtyard (A), measuring 300 ft. by 240 ft. The block (B) on the left of the court, containing smaller courts and rooms, constituted the harem; that on the right the offices (C); those in the rear the halls of state (DDD), the residences of the officers of the court (E), the king's private apartments (F) being on the left, facing the ziggurat or temple (G). In the extreme rear were other state rooms with terraces probably laid out as gardens and commanding a view of the river and country beyond.

As there must have been nearly 700 rooms in the palace, the destination of the greater number of which it would be difficult to determine, it will be sufficient to refer only to those state rooms in which the principal sculptured slabs were found, and which decorated the lower 9 ft. of the walls. The two chief factors to be noted are (1) the great length of the halls compared with their width, the chief hall being 150 ft. long and 30 ft. wide, and (2) the immense thickness of the walls, which measured 28 ft. The only

FIG. 9.—Entrance gateway, Palace of Khorsabad.

reason for walls of this thickness would be to resist the thrust of a vault, and as La Place, the French explorer, found many blocks of earth of great size, the soffits of which were covered with stucco and had apparently fallen from a height, he was led to the conclusion, now generally accepted, that these halls were vaulted. These discoveries, and the fact that in none of the palaces excavated has a single foundation of the base of any column been found, quite dispose of Fergusson's restoration, which was based on the palaces of Persepolis. Moreover, the two climates are entirely different. In the mountainous country of Persia the breezes might be welcomed, but in Mesopotamia the heat is so intense that every precaution

FIG. 10.—Bas-relief of group of buildings at Kuyunjik. (After Layard.)

has to be taken to protect the inmates of the house or palace. Thick walls and vaults were a necessity in Nineveh, and even the windows or openings must have been of small dimensions. No windows have been found, nor are any shown on the bas-reliefs, except on the upper parts of towers. It is possible therefore that the light was admitted through terra-cotta pipes or cylinders, of which many were found on the site, and this is the modern system of lighting the dome in the East. Although no remains have ever been found of domes in any of the Assyrian palaces, the representation of many domical

forms is given in a bas-relief found at Kuyunjik (fig. 10), suggesting that the dome was often employed to roof over their halls.

Reference has already been made to the bas-reliefs which decorated the lower portion of the great halls; the less important rooms had their walls covered with stucco and painted. Externally the architectural decoration was of the simplest kind; the lower portion of the walls was faced with stone; and the monumental portals, in addition to the winged bulls which flanked them, had deep archivolts in coloured enamels on glazed brick, with figures and rosettes in bright colours. A similar decoration would seem to have been applied to the crenellated battlements, which crowned all the exterior walls, as also those of the courts. The buttresses inside the courts, and the towers which flanked the chief entrance, were decorated with vertical semicircular mouldings of brick. This system of decoration is also found in the ziggurats or observatories behind the harem, where the three lower storeys still exist. A winding ramp was carried round this tower, the storeys of which were set back one behind the other, the burnt brick paving of the ramp and the crenellated battlements forming a parapet, portions of which are still *in situ*.

Although not unknown in either Chaldaea or Assyria, the stone column, according to Perrot and Chipiez, found no place in those structures of crude brick of which the real architecture of Mesopotamia consisted. Only one example in stone, in which the shaft and capital together are 3 ft. 4 in. in height, has been found. Two bases of similar design to the capital are supposed to have supported wooden columns carrying an awning. There are representations in the bas-reliefs of kiosks in a garden, the columns in which, with volute capitals, are supposed to have been of wood sheathed in metal, and on the bronze bands of the Balawat gates in the British Museum are representations of the interior of a house with wood columns and bracket capitals, and several awnings carried by posts. Small windows are shown in some of the bas-reliefs, with balustrades of small columns, which were doubtless copied from the ivory plaques found at Nimrud and now in the British Museum. (R. P. S.)

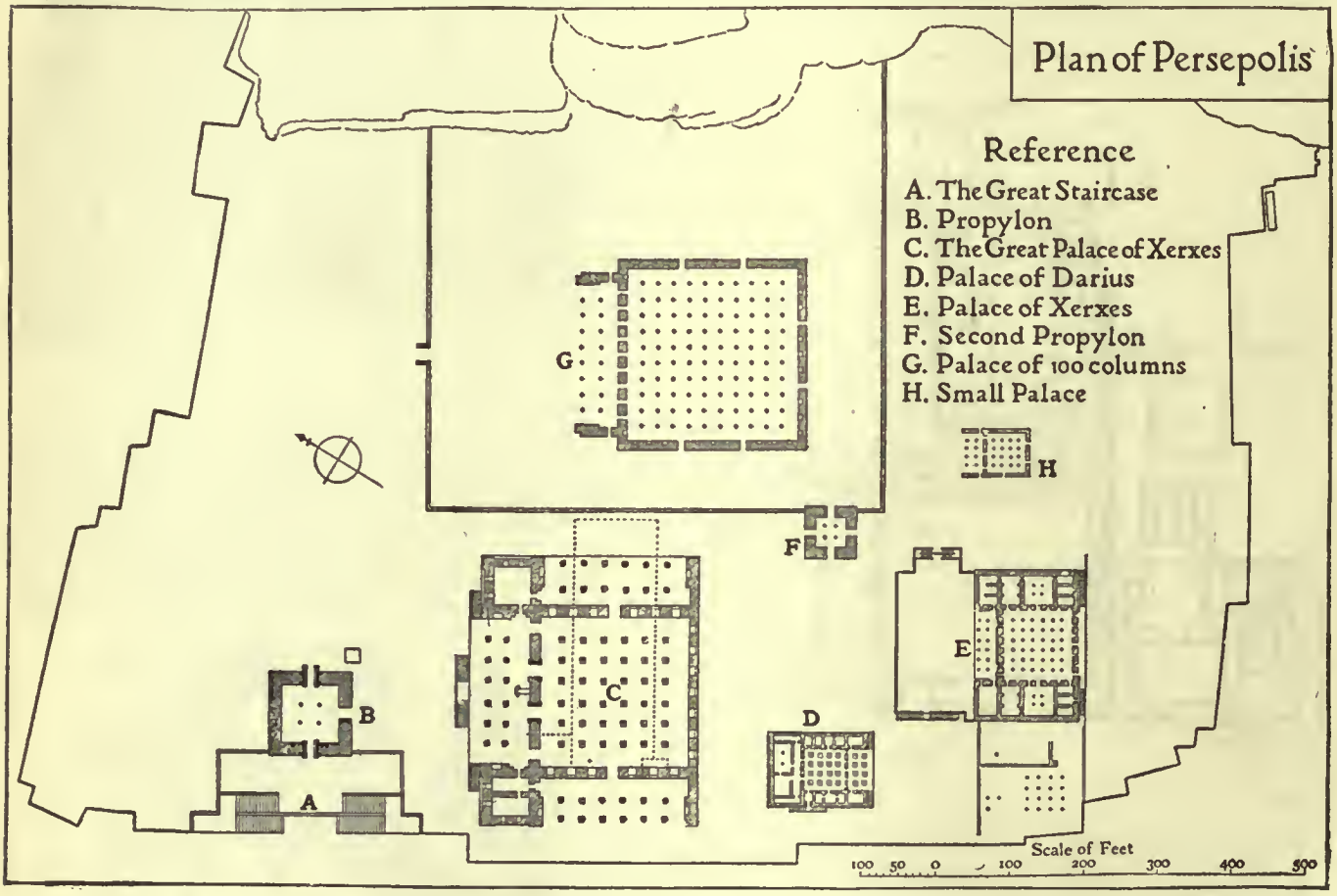


FIG. 11.

PERSIAN ARCHITECTURE

The origin of Persian architecture must be sought for in that of the two earlier dynasties,—the Assyrian and Median, to whose empire the Persian monarchy succeeded by conquest in 560 B.C. From the former, it borrowed the raised platform on which their palaces were built, the broad flights of steps leading up to them and the winged human-headed bulls which flank the portals of the propylaea. From Media it would seem to have derived the great halls of columns and the porticoes of the palaces, so clearly described by Polybius (x. 24) as existing at Ecbatana; the principal difference being that the columns of the stoas and peristyle, which there consisted of cedar and cypress covered with silver plates, were in the Persian palaces built of stone. The ephemeral nature of the one material, and the intrinsic value of the other, are sufficient to account for their entire disappearance; but as Ecbatana was occupied by Darius and Xerxes as one of their principal cities, the stone column, bases and capitals, which still exist there, may be regarded as part of the restoration and rebuilding of the palace; and as they are similar to those found at Persepolis and Susa, it is fair to assume that the source of the first inspiration of Persian architecture came from the Medians, especially as Cyrus, the first king, was brought up at the court of Astyages, the last Median monarch.

The earliest Persian palace, of which but scanty remains have been found, was built at Pasargadae by Cyrus. There is sufficient, however, to show that it was of the simplest kind, and consisted of a central hall, the roof of which was carried by two rows of stone columns, 30 ft. high, and porticoes *in antis* on two if not on three sides.

The great platform, also at Pasargadae, known as the Takht-i-Suleiman, or throne of Solomon, covered an area of about 40,000 sq. ft., and is remarkable for the beauty of its masonry and the large stones of which it is built. These are all sunk round the edge, being the earliest example of what is known as "drafted masonry," which at Jerusalem and Hebron gives so magnificent an effect to the great walls of the temple enclosures. No remains have ever been traced on this platform of the palace which it was probably built to support.

We pass on therefore to Persepolis, the most important of the Persian cities, if we may judge by the remains still existing there. Here, as at Pasargadae, builders availed themselves of a natural rocky platform, at the foot of a range of hills, which they raised in parts and enclosed with a stone wall. Here the masonry is not drafted, and the stones are not always laid in horizontal courses, but they are shaped and fitted to one another with the greatest accuracy, and are secured by metal clamps. The plan (fig. 11) shows the general configuration of the platform on which the palaces of Persepolis are built, which covered an area of about 1,600,000 sq. ft. The principal approach to it was at the north-west end, up a magnificent flight of steps (A) with a double ramp, the steps being 22 ft. wide, with a tread of 15 in. and a rise of 4, so that they could be

ascended by horses. The first building opposite this staircase was the entrance gateway or propylaea (B), a square hall, with four columns carrying the roof and with portals in the front and rear flanked by winged bulls. The earliest palace on the platform (D) is that which was built by Darius, 521 B.C. It was rectangular on plan, raised on a platform approached by two flights of steps, and consisted of an entrance portico of eight columns, in two rows of four placed *in antis*, between square chambers, in which were probably staircases leading to the roof. This portico led to the great hall, square on plan, whose roof was carried by sixteen columns in four rows. This hall was lighted by two windows on each side of the central doorway, all of which, being in stone, still exist, the lintels and jambs of both doors and windows being monolithic. The walls between these features, having been built in unburnt brick, or in rubble masonry with clay mortar, have long since disappeared. There were other rooms on each side of the hall and an open court in the rear. The bases of the columns of the portico still remain *in situ*, as also one of the antae in solid masonry; and as these in their relative position and height are in exact accordance with those

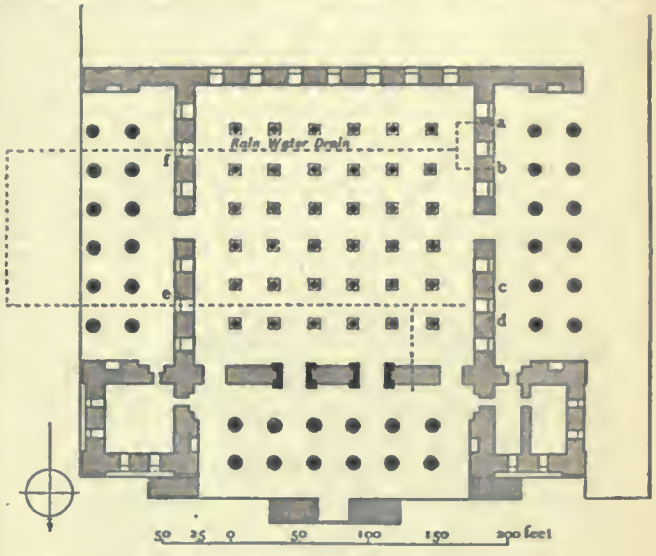
FIG. 12.—The Tomb of Darius, cut in the cliff at Nakshi Rustam, near Persepolis.

represented on the tomb of Darius (fig. 12) and other tombs carved in the rock near Persepolis (*q.v.*), there is no difficulty in forming a fairly accurate conjectural restoration of the same. In the representation of this palace, as shown on the tomb, and above the portico, has been sculptured the great throne of Darius, on which he sat, rendering adoration to the Sun god.

All the other palaces on the site, built or added to by various monarchs and at different periods, preserve very much the same plan, consisting always of a great square hall, the roof of which was carried by columns, with one or more porticoes round, and smaller rooms and courts in the rear. In one of the palaces (G) the roof was carried by 100 columns in ten rows of ten each. The most important building, however, and one which from its extent, height and magnificence, is one of the most stupendous works of antiquity, is the great palace of Xerxes (C), which, though it consists only of a great central hall and three porticoes, covered an area of over 100,000 sq. ft., greater than any European cathedral, those of Milan and St Peter's at Rome alone excepted.

It was built on a platform raised 10 ft. above the terrace and approached by four flights of steps on the north side, the principal entrance. The columns of the porticoes and of the great hall were 65 ft. high, including base and capital. In the east and west porticoes the capitals consist only of the double bull or griffin; the cross corbels on their backs, similar to those shown on the tomb of Darius, have disappeared, being probably in wood. In the north or entrance portico, and in the great hall, the capitals are of a much more elaborated nature, as under the double capital was a composition of Ionic capitals set on end, and below that the calix and pendant leaves of the lotus plant. It can only be supposed that Xerxes, thinking the columns of the east portico required more decoration, instructed his architects to add some to those of the entrance portico and hall, and that they copied some of the spoils brought from Branchidae and others from Egypt.

Fig. 13 shows the plan of the palace according to the researches of Mr Weld Blundell, who found the traces of the walls surrounding the great hall and of the square chambers at the angles, and also proved that the lines of the drains as shown in Coste's and Texier's plans were incorrect. M. Dieulafoy also traced the existence of walls enclosing the Apadana at Susa from the paving of the hall and the portico which stopped on the lines of the wall. The plan of



From R. P. Spiers's *Architecture, East and West.*

FIG. 13.—Plan of the Hall of Xerxes.

the palace at Susa was similar to that of the palace of Xerxes, except that on the side facing the garden facing south the apadana or throne room was left open. M. Dieulafoy's discoveries at Susa of the frieze of archers, the frieze of the lions, and other decorations of the walls flanking the staircase, all executed in bright coloured enamels on concrete blocks, revealed the exceptional beauty of the decoration both externally and internally applied to the Persian palaces.

The only other monumental works of Persian architecture are the tombs; to those cut in the solid rock, of which there are some examples, we have already referred. The most ancient tomb is that erected to Cyrus the Elder at Pasargadae, and consists of a small shrine or cella in masonry raised on a series of steps, inspired (according to Fergusson) by the ziggurat or terrace-temples of Assyria, but on a small scale. The tomb was surrounded on three sides by porticoes of columns. There are two other tombs, one at Persepolis and one at Pasargadae—small square towers with an entrance opening high up on one side, sunk panels in the stone, and a dentil cornice, copied from early Ionian buildings. (R. P. S.)

GREEK ARCHITECTURE

Prehistoric Period.—We have now to retrace our steps and go back to the prehistoric period of Greek architecture, to the origin and early development of that style which sowed the seed and determined the future form and growth of all subsequent European art.

The discoveries in Crete and Argolis have shown that Greek architecture owes much less than was at one time supposed to Egyptian and Chaldaean architecture; and although from very early times there may have been a commercial exchange between the several countries, the objects imported suggested only new and various schemes of decorative design, and exercised no influence on the development of architectural style. The remains of the palace at Cnossus in Crete, together with the representations in fresco painting and other decorative objects, show that whilst the lower part of the walls under the level of the ground and up to a height of 5 ft. above were all built in well-worked masonry, the upper portions were constructed in unburnt brick with timber framing, which not only gave strength and solidity to the walls, but carried the cross beams and timbers of intermediate floors and the roof, and further, that the walls were always vertical, which was not the case in Egypt or Chaldaea.

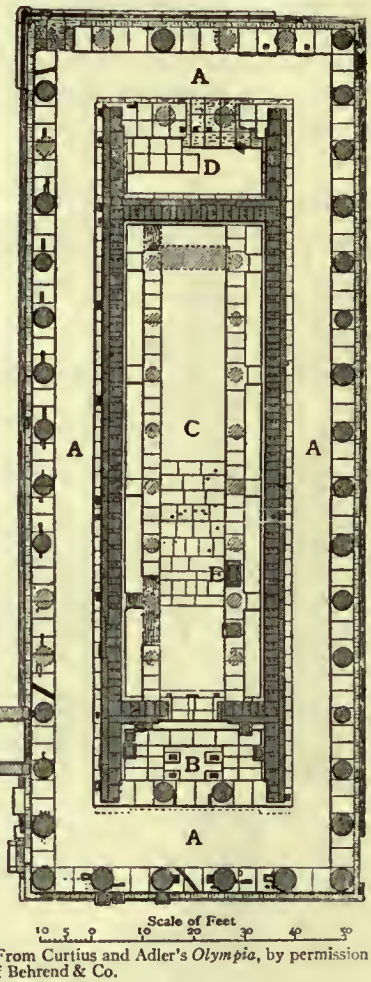
The principal remains discovered by Dr Arthur J. Evans (see CRETE) are described by him as belonging to the later Minoan age, from which it may be inferred they are the result of some

centuries of previous development. What, however, is most remarkable is the admirable planning of the whole palace, the bringing together, under one roof and in proper and regular intercommunication, of the numerous services, which in a palace are somewhat complicated. The palace measured about 400 ft. square, and was built round an open court, nearly 200 ft. long by 90 ft. wide; as the same arrangement was found at Phaestus, excavated by the Italian archaeologists, it may be assumed to have been the Cretan plan. It was built on the crest of a hill, and in the western or highest portion was the court entrance from the agora to the megaron or throne-room, and the halls of the officers of the state. In the lower portion facing the east (the rooms in which were two storeys below the level of the court on account of the slope of the hill) was the private suite of apartments of the king and queen. All the services of the palace were at the north end of the palace, where the entrance gateway to the central court was situated. This northern entrance, Dr Evans points out, "represents the main point of intercourse between the palace and the city on the one hand and the port on the other." This is the only part of the palace in which there is evidence of some kind of fortification, as the road of access is dominated by a tower or bastion. Other provisions also in the plan of the western entrance suggest that its passage was guarded to some extent. In this respect the palace of Tiryns, excavated by Dr Schliemann, presents an entirely different aspect; the whole stronghold bears a singular resemblance to a fortified castle of the middle ages; a high wall from 24 to 50 ft. thick surrounded the acropolis, and the inclined paths of approach and the double gateways gave that protection at Tiryns which at Cnossus was assured, as Dr Evans remarks, by the bulwarks of the Minoan navy. The area on the spur of the hill, on which the citadel of Tiryns was placed, was very much smaller, but if we accept the forecourt at Tiryns as equivalent to the great central court at Cnossus, there are great similarities in the plans of the two palaces. The propylaea, the altar court, the portico, and the megaron are found in both, and those details which are missing in the one are found in the other. The discoveries at Cnossus have enabled Dr Evans to reconstitute the timber columns, of which the bases only were found at Tiryns, and the spur walls of the portico of the megaron and the sills of the doorways at Tiryns give some clue to the restoration of similar features at Cnossus; and if in the latter palace we find the origin of the Doric column, at Tiryns is found that of the antae and of the door linings, further substantiated by the careful analysis made by Dr Dörpfeld of the Heraeum at Olympia.

The reconstruction by Dr Evans of the timber columns at Cnossus, which tapered from the top downwards, the lower diameter being about six-sevenths of the upper, has little historical importance (see ORDER), so that we may now pass on to the next early monument of importance, the tomb of Agamemnon, the principal and the best preserved of the beehive tombs found at Mycenae and in other parts of Greece. This tomb consists of three parts, the *dromos* or open entrance passage, the *tholos* or circular portion domed over, and a smaller chamber excavated in the rock and entered from the larger one. The tomb was subterranean, the masonry being concealed beneath a large mound of earth. The domed part, 48 ft. 6 in. in diameter and 45 ft. high, is built in horizontal courses of stone, which project one over the other till they meet at the top. Subsequently the projecting edges were dressed down, so that the section through the dome is nearly that of an equilateral triangle. Notwithstanding the great thickness of the lintel (3 ft.) over the entrance doorway, the Mycenaeans left a triangular void over, to take off the superincumbent weight, subsequently (it is supposed) filled with sculpture, as in the Lions' Gate at Mycenae. The doorway was flanked by semi-detached columns 20 ft. high, the shafts of which tapered downwards like those reconstituted at Cnossus; the shafts rested on a base of three steps, and carried a capital with echinus and abacus. These shafts carried a lintel which has now disappeared; the wall above was set back, and was at one time faced with stone slabs carved with spiral and other patterns, of which there are fragments in various museums, the most important remains being those of the shafts, of which the greater part, which was brought over to England in the beginning of the 19th century by the 2nd marquess of Sligo, was presented by the 5th marquess to the British Museum in 1905. These shafts, as also the echinus moulding of the capitals, are richly carved with the chevron and spirals, probably copied from the brass sheathing of wood columns and doorways referred to by Homer.

The Archaic Period.—The buildings just referred to belong to what is known as the prehistoric age in Greece; the dispersion of the tribes by invaders from the north about 1100 B.C. destroyed the Mycenaean civilization, and some centuries have to pass before we reach the results of the new development. Among the invaders the Dorians would seem to have been the chief leaders, who eventually became supreme. They brought with them from Olympus the worship of Apollo, so that henceforth the sanctuary of the god takes the place of the megaron of the king. From Greece the Dorians spread their colonies through the Greek islands and southern Italy. Later they passed on to Sicily and founded Syracuse, and subsequently Selinus and Agrigentum (Acragas). The prosperity of all these colonies is shown in the splendid temples which they built in stone, the remains of many of which have lasted to our day.

The earliest Greek temple of which remains have been discovered[1] is that of the Heraeum at Olympia, ascribed to about 1000 B.C. Its plan (fig. 14) shows that the enclosure of the sanctuary and its porticoes in a peristyle had already been found necessary, if only to protect the walls of the cella, built in unburnt brick on a stone plinth; further, that the antae of the portico and the dressings of the entrance were in wood; and, following Pausanias' statement relative to the wood column in the opisthodomos, all the columns of the peristyle were in that material, gradually replaced by stone columns as they decayed, evidenced by the character of their capitals, which in style date from the 6th century B.C. to Roman times. The ephemeral nature of the materials employed in this and other early temples, and the risk of fire, must have naturally led to the desire to render the Greek sanctuaries more permanent by the employment of stone. But the Greeks were always timid as regards the bearing value of that material, and would seem to have imagined that unless the blocks were of megalithic dimensions it was impossible to build in stone. This may be gathered from the remains of the earliest example found, the temple of Apollo in the island of Ortygia, Syracuse, where the monolith columns had widely projecting capitals, the abaci of which were set so close together that the intercolumniation was less than one diameter of the column.



From Curtius and Adler's *Olympia*, by permission of Behrend & Co.

FIG. 14.—Plan of the Heraeum. A, Peristyle; B, Pronaos; C, Naos; D, Opisthodomus; E, Base of statue of Hermes.

Following the temple of Apollo at Syracuse is the temple of Corinth, ascribed to 650 B.C., of which seven columns remain *in situ*, all monoliths, and the Olympieum at Syracuse. Nearly contemporary with the latter is one of the temples at Selinus in Sicily, 630 B.C., remarkable for the archaic nature of its sculptured metopes. Of later date there are five or six other temples in Selinus, all overthrown by earthquakes; the temple of Athena at Syracuse, which having been converted into a church is in fair preservation; an unfinished temple at Segesta; and six at Agrigentum, built on the brow of a hill facing the sea, one of which was so large that it was necessary to build in walls between the columns.

In Magna Graecia, in the acropolis at Tarentum, are the remains of a 7th century temple and three at Paestum about a century later in date. In one of these, the temple of Poseidon (figs. 15 and 16) the columns which carried the ceiling and roof over the cella are still standing; these are in two stages superimposed with an architrave between them, and although there are no traces in this instance of a gallery, they serve to render more intelligible Pausanias' description of that which existed in the temple of Zeus at Olympia.

The temple of Assus in Asia Minor is an early example remarkable for its sculptured architrave, the only one known, and in the temple of Aphaea in Aegina (*q.v.*) we find the immediate predecessor of the Parthenon, if we may judge by its sculpture and the proportions of its columns.

So far we have only referred to the early temples of the Doric order; of the origin and development of those of the Ionic order far less is known. The earliest examples are those of the temple of Apollo at Naucratis in Egypt, and of the archaic temple of Diana at Ephesus, both about 560 B.C. The remains of the latter, discovered by Wood, are now in the British Museum; they consist of two capitals, one with a portion of a shaft in good preservation; the sculptured drum and the base of one of the columns, inscribed with the name of Croesus, who is known to have contributed to it;

[1] Except, possibly, the earliest of those at Sparta (*q.v.*).—ED.

two other bases, and the cornice or cymatium. The treasury of the Cnidians at Delphi was Ionic, judging by the carved ornament enriching the cornice and architraves, and in the Naxian votive column we have another early example of an early voluted capital.

The tombs of Tantalais, near Smyrna, and of Alyattes, near Sardis, belong to the same date as those we shall find in Etruria. The Harpy tomb, now in the British Museum, built after 547 B.C., is the predecessor of many other Lycian tombs of the 5th and 4th centuries, to which we return.

As already pointed out, in the temple of Hera at Olympia (10th century B.C.), we find the complete plan of an hexastyle peripteral Greek temple, where columns originally in wood supported a wood architrave and superstructure protected by terra-cotta plaques and roofed over with tiles. The temple of Apollo at Syracuse, and the temple at Corinth (7th century B.C.) represent the earliest examples in stone, and in the temple of Poseidon at Paestum (6th century) are preserved the columns of the cella which carried the ceiling and roof. The structural development therefore of the temple was completed, and no great constructional improvements reveal themselves after 550 B.C. The next century would seem to have been chiefly directed to the beautifying and refining of the features already prescribed, and it was the traditional respect for, and the conservative adherence to, the older type, which led the architects to the production of such masterpieces as the Parthenon and the Erechtheum, which would have been impossible but for the careful and logical progression of preceding centuries.

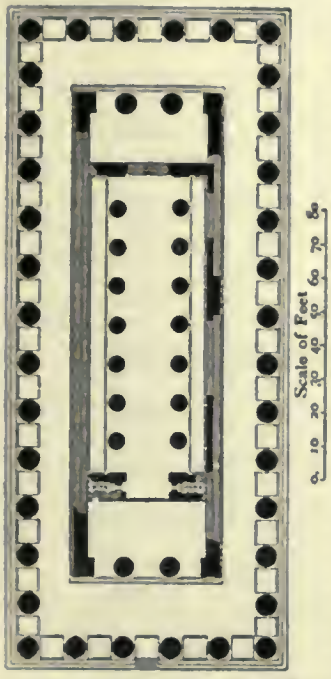


FIG. 15.—Plan of the Temple of Poseidon at Paestum.

The Parthenon (*q.v.*) at Athens represents the highest type of perfection, not only in its conception but in its realization. It is only necessary here to give a general description. It was designed by Ictinus in collaboration with Callicrates, and built on the south side of the Acropolis on a foundation carried down to the solid rock. The temple, commenced in 454 B.C. and completed in 438 B.C., was of the Doric order and raised on a stylobate of three steps; it had eight columns in front and rear and was surrounded by a peristyle, there being twenty columns on the flanks. It contained two divisions; the eastern chamber was originally known as the Hekatompedos (temple of 100 ft.), that being the dimension of the cella of the ancient temple which it was built to replace. The chamber on the western side was called the Parthenon (*i.e.* chamber of the virgin). All the principal lines of the building had delicate curves. The entablature rose about 3 in. in the middle to correct an optical illusion caused by the sloping lines of the pediment, which gave to the horizontal cornice the appearance of having sunk in the centre. The stylobate had therefore to be similarly curved so that the columns should be all of the same height. The columns are not all equidistant, those nearer the angle being closer together than the others, which gave a greater appearance of strength to the temple; this was increased by a slight inclination inwards of all the columns. In order to correct another optical illusion, which causes the shaft of a column, when it diminishes as it rises, and is formed with absolute straight lines, to appear hollow or concave, an increment known as the entasis was given to the column, about one-third up the shaft. The columns were not monoliths, like those of the earliest stone temples mentioned above; they were built in several drums, so closely fitted together that the joint would be imperceptible but for the slight discoloration of the marble. The setting of the lowest drum of these columns on the curved stylobate, with the slight inclination of the column, must have been a work of an extraordinary nature, only possible with such a material as Pentelic marble. The cella or naos was built to enshrine the chryselephantine statue of Athena by Pheidias. In order to carry the ceiling and roof there was a range of columns on each side of the cella returning round the end. These columns probably carried an upper range as in the temple of Poseidon at Paestum. The tympana of the two pediments and all the metopes were enriched with the finest sculpture, and were realized, designed, and executed by Pheidias and his pupils. On the upper part of the cella wall and under the peristyle was the Panathenaic frieze, of which, as also of the other sculptures, the British Museum possesses the finest examples.

The Propylaea (*q.v.*), designed by Mnesicles and built 437–432 B.C., was the only entrance to the Acropolis. It was of the Doric order, and consisted of a portico of six columns, the two centre ones being wider apart, to allow of the road through, up which the chariots and beasts for sacrifices ascended. The columns carrying the marble ceiling of the vestibule were of the Ionic order; beyond them the wall was pierced by three doorways, and on the other side and facing east was another portico of six columns. The front entrance was flanked on the left hand by a chamber known as the Pinacotheca, and on the right by a chamber intended probably to be a replica but subsequently curtailed in size in consequence of the proximity of another temple.

The Erechtheum on the north side of the Acropolis occupied the site of three older shrines, which may account for its irregular plan. The eastern portion was the temple of Athena Polias, with a portico of six columns of the Ionic order. At a lower level on the north side was a portico of six columns (four in front and two at the sides) leading to the shrine of Erechtheus; the west front of this shrine had originally a frontispiece of four columns *in antis* raised on a podium; subsequently during the Roman occupation these columns were taken down and reproduced as semi-detached columns with windows between. On the west side was a court in which was the olive tree and the shrine of Pandrosus (Pandroseion). At the south-west angle was the well-known portico or tribune of the Caryatides. There was a small entrance through the podium at the side, and stairs leading down to the shrine of Erechtheus.

The only other building remaining on the Acropolis is the temple of Niké Apteros, raised on a lofty substructure south-west of the propylaea. It also was of the Ionic order, and belonged to the type known as "amphiprostyle," with a portico of four columns in the front and rear but no peristyle. The term "apteros" applied to the temple and not to the goddess of victory.

From a photo by Brogi.

FIG. 16.—Temple of Poseidon at Paestum.

In 430 B.C., shortly after the completion of the Parthenon, Ictinus was employed to design the temple of Apollo Epicurius, at Bassae, in Arcadia. This temple externally was of the Doric order, but, being built in local stone, no attempt was made to introduce those refinements which are found in the Parthenon. In the rear of the cella is a second sanctuary with a doorway facing east; it was probably the site of an ancient temple which had to be preserved, and this may account for the fact that the temple runs north and south. The cella is flanked by five columns of the Ionic order which are connected by spur walls to the cella wall. These columns carry an architrave, frieze richly sculptured with figure subjects, cornice and wall above rising to the roof. There was no ceiling therefore, and the interior was probably lighted through pierced Parian marble tiles, of which three examples were found. The Corinthian capital found on the site is supposed by Cockerell to have belonged to the shaft between the two cellas.

The same architect, Ictinus, was employed in 420 B.C. to rebuild the hall of the mysteries at Eleusis on a larger scale. The hall was 185 ft. square, and its ceiling and roof were carried by seven rows of columns with six in each row. The propylaea, which gave access to the sacred enclosure at Eleusis, was copied from the propylaea at Athens. The so-called lesser propylaea had some connexion with the mysteries.

The temple of Zeus at Olympia had much in common with the Parthenon, being nearly contemporaneous, built to enshrine a second chryselephantine statue by Pheidias, and in plan having a similar arrangement of columns inside the cella; the lower range of columns (according to Pausanias) supported a gallery round, so that privileged visitors could approach nearer to the statue. The temple, however, was built in the local conglomerate stone covered with a thin coat of stucco and painted.

Of circular temples there are two examples known, the Philippeion at Olympia and the Tholos at Epidaurus. The latter had, inside the cella, a peristyle of Corinthian columns, the capitals of which are of great beauty and represent in their design the transition

between those of the monument of Lysicrates and the temple of Zeus Olympius at Athens.

In the sacred enclosures of the Greek sanctuaries were other smaller temples or shrines, altars, statues and treasuries, the latter being built by the various cities, from which pilgrimages were made, to contain their treasures. At Olympia there were ten or eleven, the remains of some of which are of great interest. Of the treasury of the Cnidians at Delphi, discovered by the French, so much has been found that it has been possible to evolve a complete conjectural restoration in plaster, now in the Louvre. Its sculpture and the rich carving of its architectural features show that it was Ionian in character. In front was a portico-in-antis, in which the caryatide figures standing on pedestals took the place of columns. These are the earliest examples known of caryatide figures, and they precede those of the Erechtheum by about a century.

The most important temple in Asia Minor was the temple of Diana (Artemis) at Ephesus (356–334 B.C.). The archaic temple was burnt in 356, and was immediately rebuilt with greater splendour from the designs of Paeonius. The site of the temple was discovered by Wood in 1869, and the remains brought over to the British Museum in 1875. There were 100 columns, 36 of which (according to Pliny) were sculptured, and it was probably on account of the magnificence of the sculpture that this temple was included among the seven wonders of the world. The sculptured bases are of two kinds, square and circular, in the latter case being the lower drums of the columns. Examples of both are in the British Museum, and several

FIG. 17.—Lycian Tomb of Telmessus.

conjectural restorations have been made, among which that of Dr A. S. Murray has been generally accepted, but recent researches (1905) suggest that it remains still an unsolved problem.

The temple of Apollo Didymaeus, near Miletus, was the largest temple in Asia Minor, and its erection followed that of the temple at Ephesus, Paeonius and Daphnis of Miletus being the architects. The temple was decastyle, dipteral, with pronaos and vestibule, but no opisthodomos. The cella was so wide (75 ft.) that it remained open to the sky. The bases of the columns were elaborately carved with ornament, as if in rivalry with the temple of Diana. Both these temples were of the Ionic order, as also were those of Athena Polias at Priene (340 B.C.), many of the capitals of which are in the British Museum, and the temples of Aphrodite at Aphrodisias and Cybele at Sardis.

The mausoleum at Halicarnassus, also of the Ionic order, built by Queen Artemisia in memory of her husband Mausolus, who died in 353 B.C., was, according to Pliny, recorded as one of the seven wonders of the world, probably on account of the eminence of the sculptors employed, Bryaxis, Leochares, Timotheus, Scopas and Pythius. Pliny's description is somewhat vague, so that its actual design is a problem not yet solved. Professor Cockerell's restoration is in accord with the description, but does not quite agree with the actual remains brought over by Newton and deposited in the British Museum. If the Nereid monument and the tombs at Cnidus and Mylasa be taken as suggesting the design, the peristyle (pteron) of thirty-six columns of the Ionic order with entablature stood on a lofty podium, richly decorated with bands of sculpture, and was crowned by a pyramid which, according to Pliny, "contracted itself by twenty-four steps into the summit of a meta." The steps found are not high enough to constitute a meta, and it is possible therefore that, according to Mr J. J. Stevenson, these steps were over the peristyle only, and that the lofty steps which constituted the meta were in the centre, carried by the inner row of columns. The magnificent sculpture of the Macedonian period has in recent times been demonstrated by the discovery of the marble sarcophagi found at Sidon by Hamdi Bey and now in the museum at Constantinople.

The Lycian tombs, of which there are many hundreds carved in the rock in the south of Asia Minor, are copies of timber structures, based on the stone architecture of the neighbouring Greek cities (fig. 17). The Paiafa or Payava tomb (375–362 B.C.), found at Xanthus and now in the British Museum, is apparently a copy, cut in the solid rock, of a portable shrine, in which the wood construction is clearly defined.

Capitals of the Greek Corinthian order have been found at Bassae, Epidaurus, Olympia and Miletus, but the earliest example of the complete order is represented in the Choragic monument of Lysicrates at Athens.

The most important example of the Greek Corinthian order is that of the temple of Jupiter Olympius at Athens, begun in 174 B.C., but not completed till the time of Hadrian, A.D. 117. The temple was 135 ft. wide and 354 ft. long, built entirely in Pentelic marble, the columns being 56 ft. high. There were eight columns in front and a double peristyle round.

The two porches of the Tower of the Winds at Athens (*c.* 75 B.C.) had Corinthian capitals. The upper part of the tower, which was octagonal in plan, was sculptured with figures representing the winds.

The Greek houses discovered at Delos and Priene were very simple and unpretentious, but the palace near Palatitza in Macedonia, discovered by Messrs Heuzey and Daumet, would seem to have been of a very sumptuous character. The front of the palace measured 250 ft. In the centre was a vestibule flanked with Ionic columns on either side, leading to a throne room at one time richly decorated with marble, and with numerous other halls on either side. The date is ascribed to the middle of the 4th century B.C.

In selecting the sites for their theatres, the Greeks always utilized the slope of a hill, in which they could cut out the cavea, and thus save the expense of raising a structure to carry the seats, at the same time obtaining a beautiful prospect for the background. The theatre of Dionysus at Athens was discovered and excavated in 1864, and has fortunately preserved all the seats round the orchestra, sixty-seven in number, all in Pentelic marble, with the names inscribed thereon of the priests and dignitaries who occupied them. The largest theatre was at Megalopolis, with an auditorium 474 ft. in diameter. The most perfect, so far as the seats are concerned, is the theatre at Epidaurus, with a diameter of 415 ft. Other theatres are known at Dodona in Greece, Pergamum and Tralles in Asia Minor, and Syracuse and Segesta in Sicily. (R. P. S.)

PARTHIAN ARCHITECTURE

The architecture of the Parthian dynasty, who from 250 B.C. to A.D. 226 occupied the greater part of Mesopotamia, their empire in 160 B.C. extending over 480,000 sq. m., was quite unknown until Sir A. H. Layard, following in the steps of Ross and Ainsworth, visited and measured the plan of the palace at Hatra (el Hadr) about 30 m. south of Mosul; the architecture of this palace shows that, on the one hand, the Parthians carried on the traditions of the barrel vault of the Assyrian palace, and on the other, from their contact with Hellenistic methods of building, had acquired considerable knowledge in the working of ashlar masonry.

El Hadr is first mentioned in history as having been unsuccessfully besieged by Trajan in A.D. 116, and it is recorded to have been a walled town containing a temple of the sun, celebrated for the value of its offerings. The temple referred to is probably the large square building at the back of the palace, as above the doorway is a rich frieze carved with griffins, similar to those found at Warka by Loftus, together with large quantities of Parthian coins. The remains (fig. 18) consist of a block of 380 ft. frontage, facing east, and 128 ft. deep, subdivided by walls of great thickness, running at right angles to the main front, and built in an immense court, divided down the centre by a wall, separating that portion on the south side, where the temple was situated, from that on the north side, which constituted the king's palace. The seven subdivisions of the different widths were all covered with semi-circular barrel vaults which, being built side by side, mutually resisted the thrust, the outer walls being of greater thickness, with the same object. In the centre of the south block was an immense hall 49 ft. wide and 98 ft. deep, which formed the vestibule to the temple in the rear; this vestibule was flanked by a series of three smaller halls on either side, over which there was probably a second floor. On the palace or north side were

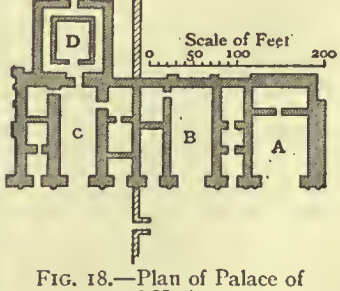


FIG. 18.—Plan of Palace of el Hadr.

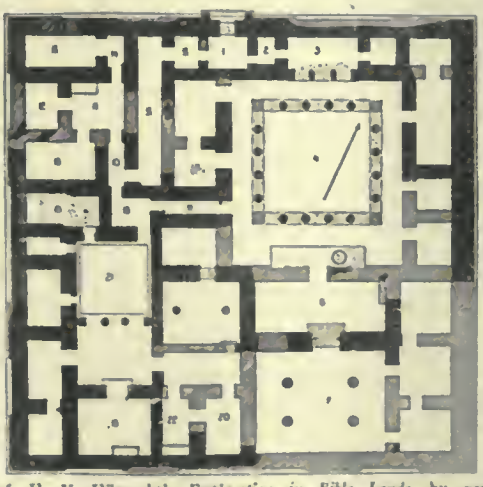
A, Throne or reception room.
B, Large hall, or
C, Entrance hall of temple.
D, Temple.

two great aiwans or reception halls. The main front (fig. 19) was built in finely jointed ashlar masonry with semicircular attached shafts between the entrance doorways, which had semicircular heads, every third voussoir of the three larger doors being decorated by busts in strong relief with a headgear similar to that shown on Parthian coins; other carvings, with the acanthus leaf, belonged to that type of Syrio-Greek work, of which Loftus found so many

FIG. 19.—Portion of front of Palace of el Hadr.

examples at Warka (Loftus, *Chaldaea, Susiana*, p. 225). In the great mosque of Diarbekr are two wings at the north and south ends respectively, which are said to have been Parthian palaces built by Tigranes, 74 B.C.; they have evidently been rearranged or rebuilt at various times, the columns with their capitals and the entablature having been utilized again. The shafts of the columns of the upper storey are richly carved with geometrical patterns similar to those found by Loftus at Warka.

The American researches at Nippur have resulted in the discovery on the top of the mounds of the remains of a Parthian palace; and the disposition of its plan (fig. 20), and the style of the columns of



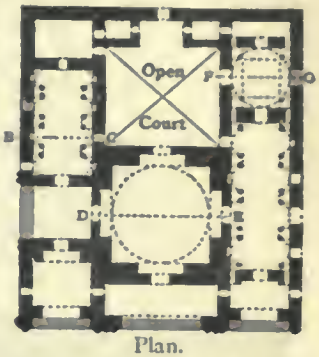
From Prof. H. V. Hilprecht's *Exploration in Bible Lands*, by permission of A. J. Holman & Co. and T. & T. Clark.

FIG. 20.—Plan of the Parthian Palace at Nippur.

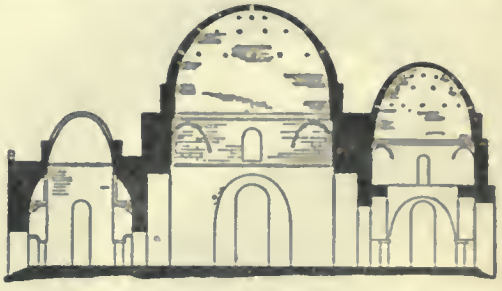
the peristylar court, show so strong a resemblance to Greek work as to suggest the same Hellenistic influence as in the palace of el Hadr. Having no stone, however, they were obliged to build up these columns at Nippur with sections in brick, covered afterwards with stucco. The columns diminished at the top to about one-fifth of the lower diameter, and would seem to have had an entasis, as the lower portion up to one-third of the height is nearly vertical. A similar palace was discovered at Tello by the French archaeologists, and the bases of some of the brick columns are in the Louvre. (R. P. S.)

SASSANIAN ARCHITECTURE

Although, on the overthrow of the Parthian dynasty in A.D. 226, the monarchs of the Sassanian dynasty succeeded to the immense Parthian empire, the earliest building found, according to Fergusson, is that at Serbistan, to which he ascribes the date A.D. 380. The palace (fig. 21), which measures 130 ft. frontage and 143 ft. deep, with an internal court, shows so great an advance in the arrangements of its plan as to suggest considerable acquaintance with Roman work. The fine ashlar work of el-Hadr is no longer adhered to, and in its place we find rubble masonry with thick mortar joints, the walls being covered afterwards, both externally and internally, with stucco. While the barrel vault is still retained for the chief entrance porches, it is of elliptical section, and the central hall is covered with a dome, a feature probably handed down from the Assyrians, such as is shown in the bas-relief (fig. 10) from Kuyunjik, now in the British Museum. In order to carry a dome, circular on plan, over a square hall, it was necessary to arch across the angles, and here to a certain extent the Sassanians were at fault, as they did not know how to build pendentives, and the construction of these are of the most irregular kind. As, however, their mortar had excellent tenacious properties, these pendentives still remain *in situ* (fig. 22), and their defects were probably hidden under the stucco. In the halls which flank the building on either side, however, they displayed considerable knowledge of construction. Instead of having enormously thick walls to resist the thrust of their vaults, to which we have already drawn attention in the Assyrian work and at el Hadr, they built piers at intervals, covering over the spaces between them, with semi-domes on which the walls carrying the vaults are supported, so that they lessened the span of the vault and brought the thrust well within the wall. This, however, lessened the width of the hall, so they replaced the lower portions of the piers by the columns, leaving a passage round. It is possible that this idea was partly derived from the great Roman halls of the thermae (baths), where the vault is brought forward on columns; but it was an improvement to leave a passage behind. The elliptical sections given to all the barrel vaults may have been the traditional method derived from Assyria, of which, however, no remains exist. In the article VAULT there will be found a reason



Plan.



Section in lines BC, DE, FG of plan.

FIG. 21 and FIG. 22.—The Palace of Serbistan.

why these elliptical sections were adopted (see also below in the description of the great hall at Ctesiphon). In the palace of Firuzabad, attributed by Fergusson to Perōz (Firuz) (A.D. 459–485), the plan (fig. 23) follows more closely the disposition of the Assyrian palaces, and we return again to the thick walls, which might incline us to give a later date to Serbistan, except that in the pendentives carrying the three great domes in the centre of the palace at Firuzabad they show greater knowledge in their construction. The angles of the square hall are vaulted, with a series of concentric arches, each ring as it rises being brought forward, the object being to save centreing, because each ring rested on the ring beneath it. The plan is a rectangular parallelogram with a frontage of 180 ft. and a depth of 333 ft., more than double, therefore, of the size of Serbistan. An immense entrance hall in the centre of the main front is flanked on each side by two halls placed at right angles to it, so as to resist the thrust of the elliptical barrel vaults of the entrance hall. This hall leads to a series of three square halls, side by side, each surmounted by a dome carried on pendentives. Beyond is an open court, the smaller rooms round all covered with barrel vaults. Here, as in Serbistan, the material employed is rubble masonry with thick joints of mortar, and fortunately portions of the stucco with which this Sassanian masonry was covered remain both externally and internally. As there are no windows of any sort, the wall surface of the exterior has been decorated with semi-circular attached shafts and panelling between, which recall the primitive decorations found in the early Chaldaean temples, except that arches are carried at the top across the sunk panels. Internally an attempt has been made to copy the decoration of the Persian doorway, which represents a kind of renaissance of the ancient style. But instead of the lintel the arch has been introduced, and the ornament in stucco representing the Persian cavetto cornice shows imperfect knowledge of the original and is clumsily worked. The niches also, in the main front, have been copied from

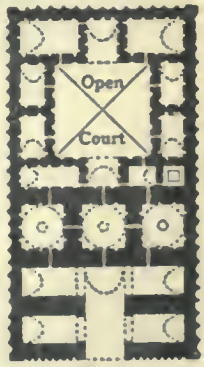


FIG. 23.—Plan of the Palace at Firuzabad.

the windows which flank the doorway in the Persian palace. But they are decorative only, and are too shallow to serve any purpose.

If there has been some difficulty in determining the exact date of Firuzabad, that of the third great palace, at Ctesiphon, on the borders of the Tigris, is known to have been built by Chosroes I. in A.D. 550. Owing probably to its proximity to Bagdad, from which it lies about 25 m. distant, it is much better known than the other examples we have quoted; but while they are constructed in rubble masonry, Ctesiphon is built of brick, because we have now returned to the alluvial plain where no stone could be procured. The only portion of the palace which still exists is that which was built in burnt brick, and this far exceeds in dimensions Serbistan and Firuzabad. Its main front measured 312 ft.; its height was about 115 ft.; and its depth 175 ft. The plan is very simple, and consisted of an *aiwan* or immense hall, 86 ft. in width and 163 ft. long, covered with an elliptical barrel vault, the thrust of which is counteracted by five long halls on each side, also covered with barrel vaults and probably used as guard chambers or stores. The great hall was open in the front, and constituted an immense portal, 83 ft. wide and 95 ft. to the crown of the arch. The springing of the vault is 40 ft. from the ground, but up to about 26 ft. above the springing the walls are built in horizontal courses projecting inwards as they rise, so that the actual width of the vaulted portion (fig. 24) has been diminished

From Dieulafoy's *L'Art Antique*, by permission of Morel et Cie.

FIG. 24.—The Great Hall at Ctesiphon.

one-sixth and measures only about 71 ft. The crown of the vault is 9 ft. thick, the walls at the base being 23 ft. The bricks or tiles of which the vault is built are, like those at Thebes, laid flat-wise, and there is also a similar inclination of the rings of brick-work, which are about 10° out of the vertical. This leads to the conclusion that this immense vault was built without centreing, as the tenacious quality of the mortar would probably be sufficient to hold each tile in its position until the ring was complete. In the building of the arch of the great portal other precautions were taken; bond timbers 23 ft. long and in five rows, one above the other, were carried through the wall from front to back. The lower portion of the arch (5 ft. in height) was built with bricks placed flat-wise; the upper portion (4 ft. in height) in the usual way, viz. right angles to the face. The reason for this change was probably that the upper portions might be carved, as they have been, with a series of semi-circular cusps.

The decoration of the flanks of this great central portal is of the most bewildering description. There has evidently been a desire to give a monumental character to the main front. With this idea in view they would seem to have attempted to reproduce Roman features, such as are found decorating the fronts of the various amphitheatres of the Empire. But the semi-circular shafts which form the decoration do not come one over the other on the several storeys, and there is a reckless employment of blank arcades distributed over the surface.

There are remains of two other palaces at Imamzade and Tag Iran, and in Moab a small example, the Hall of Rabboth Ammon, supposed to have been erected for Chosroes II. during the subjugation of Palestine, which is richly decorated with carving, probably by Syrio-Greek artists, with a mixture of Greek, Jewish and Sassanian details. At Takibostan and Behistun (Bisutun), some 200 m. north-east of Ctesiphon, are some remarkable Sassanian capitals and panels (published in Flandin and Coste's *Voyage en Perse*, 1851, Paris). (R. P. S.)

ETRUSCAN ARCHITECTURE

Although our acquaintance with Etruscan architecture is confined chiefly to the entrance gateways and the walls of towns, and to tombs, it forms a very important link between the East and the West. Though little is known of the history of Etruria (*q.v.*), the influence which her people exerted on Roman architecture, lasting down to the period when Greece was overrun and plundered of her treasures, was so great that it would be difficult to follow the origin of Roman architecture without some inquiry into the work of its immediate predecessor. The theory put forward by Fergusson, as to the migration of the Etruscans from Asia Minor in the 12th or 11th century B.C., is substantiated by the resemblance of the tumuli in the latter country, such as those at Tantalais, on the northern shore of the gulf of Smyrna, and that of Alyattes near Sardis, as compared with the Regulini Galeassi tomb at Cervetri and the Cucumella tomb at Vulci, in all cases consisting of a sepulchral chamber buried under an immense mound surrounded by a podium in stone. The chamber was covered over with masonry, laid in horizontal courses, each stone projecting slightly over the one below. The same system of construction prevailed in the bee-hive tombs of Greece, except that the latter were always circular on plan, whilst these cited above were rectangular. Similar methods of construction are found at Tusculum and in a gateway at Arpino. In all these cases the projecting courses were worked off on the completion of the tomb, in Greece and at Tusculum and Arpino following a curve, and in the Regulini Galeassi tomb a raking line.

The earliest example known of the arched vault, with regular voussoirs in stone, is found in the canal of the Marta near Graviscae, ascribed to the 7th century. The vault is 14 ft. in span, with voussoirs from 5 to 6 ft. in depth. In the tomb of Pythagoras near Cortona, with a span of about 10 ft., only four voussoirs were employed. In the Cloaca Maxima at Rome the vault (now ascribed by Commendatore Boni to the 1st century B.C.) is built with three concentric rings of voussoirs. In all these cases the thrust of the arch was amply resisted as they were constructed under ground, and in the entrance gateways at Volterra, Perugia and Falerii a similar resistance was given by the immense walls in which they were built.

We have already referred to one class of tomb in which the sepulchral chamber, built above the ground, was covered over with a mound of earth; there is a second class, carved out of the solid rock, in which we find the same treatment as that described in connexion with Egypt. The tomb represents, in its internal arrangements and in its decorations, the earthly dwelling of the defunct (compare the Egyptian "soul-houses"). The ceilings are carved in imitation of the horizontal beams and slanting rafters of the roof, the former carried by square piers with capitals; one well-known tomb at Corneto (fig. 25) represents the atrium of an Etruscan house, which corresponds with the description given by Vitruvius of the *cavaedia displuviata*, in which there was a small opening at the top, known as the compluvium, the roof sloping down on all four sides.

The paintings which decorate these tombs have very much the same character as those which are found on what were thought to have been Etruscan, but are now generally considered as Greek vases, the principal difference being that instead of allegorical subjects, domestic scenes recalling the life of the deceased are represented. In a tomb at Cervetri the walls and piers were carved with representations of the helmets, swords and other accoutrements of a soldier, and also the mirrors and jewelry of his wife, even the kitchen utensils being included, so as to give the complete fittings of the house they occupied. In two examples at Castel D'Asso the rock has been cut away on all sides, leaving a rectangular block, crowned with reverse mouldings.

Scarcely any remains *in situ* of Etruscan temples have been found, and the description given by Vitruvius is very scanty. Of late years, however, in the British Museum and in the museums at Florence and Rome, a large amount of material has been brought together, from which it is possible to make some kind of conjectural restoration. This has been facilitated by the discoveries made at Olympia, Delphi and elsewhere in Greece, showing the important function which terra-cotta served in the protection and decoration of the timber roofs of the Greek temples and treasuries. The cornices, antefixae, pendant slabs and other decorative features in terra-cotta, found on the sites of the Etruscan temples, show that the timber construction of their roofs was protected in the same way; and although Vitruvius (bk. iii. ch. 2) considered the temple of Ceres at Rome to be clumsy and heavy, and its roofs low and wide, in comparison with the purer examples of Greek architecture, the remains of terra-cotta found at Civita Castellana (the ancient

Falerii), at Luna, Telamon and Lanuvium (the latter in the British Museum), show that in their modelling and colour they must have possessed considerable decorative effect, and when raised on an eminence, as in the case of the temple of Jupiter on the Capitol, formed striking features of importance, enriched as they were with gilding. There is one feature in the Etruscan examples which seems to have been peculiar to their temples, viz. the pendant slabs hung round the eaves to protect the walls; these latter were probably covered with stucco and decorated with paintings. The lower

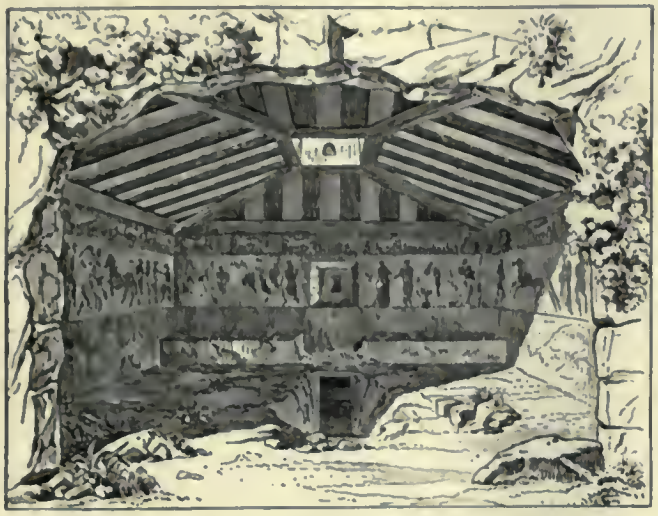


FIG. 25.—The Corneto Tomb.

portions of many of these slabs were decorated in relief and in colour at the back, showing that they were exposed to view below the soffit of the projecting eaves.

Owing to the ephemeral nature of the materials employed in the building of the walls of Etruscan temples, viz. unburned brick or rubble masonry with clay mortar, the roofs being in timber, little is known of their general design; the terra-cotta decorations are, however, fortunately in good preservation, and suggest that although the Etruscan temple, architecturally speaking, was not of a very monumental character, its external decoration and colour added considerably to its effect. (R. P. S.)

ROMAN ARCHITECTURE

The rebuilding of Rome, which began in the reign of Augustus, and was carried on by his successors to a much greater extent, has caused the destruction of nearly all those examples of early work to which the student, working out the history of a style, would turn. There are, however, a few early buildings still existing, and these are of value as showing the extremely simple nature of their design. The temple of Fortuna Virilis (so-called) in the Forum Boarium, attributed to the beginning of the 1st century B.C., shows the great difference between Greek and Roman temples. Like the Etruscan temple, it is raised on a podium, and approached by a flight of steps. The Etruscan cella is dispensed with; and what may be looked upon as the semblance of a Greek peristyle is retained in the semi-detached columns which are carried round the walls of the cella. To the entrance portico, however, the Roman architect attached great importance, and we find here that one-third of the whole length of the temple is given up to the portico. The Tabularium built by Lutatius Catulus (78 B.C.) is a second example of early work. On a lofty substructure, built of peperino stone, was raised an arcade, which formed a passage from one side of the capitol to the other, and here we find the earliest example of the use of the Classic order, as a decorative feature only, applied to the face of a wall. The arcade consists of a series of arches with intermediate semi-detached Doric columns carrying an entablature. The architectural design of the substructure is of the simplest kind, depending for its effect only on the size of the stones employed and the finish given to the masonry. The same remark applies to the few remains left of the Forum Julium (47 B.C.), where an additional decorative effect was produced by the bevelled edge worked round all the stones, producing the effect of rusticated masonry.

If, however, the remains are few, the records of classical writers show that already before the beginning of the 1st century B.C. the influence of Greece had been shown in the transformation of the Forum, the embanking of the river Tiber, the erection of numerous porticoes throughout the Campus Martius, and of basilicas, one of which, rebuilt by Paulus Aemilius in 50 B.C., was remarkable for its monolithic columns of pavonazetto marble; and further that on the Palatine hill were various mansions, the courts and peristyles of which were richly decorated with marble.

The boast of Augustus that he found Rome built of brick and left it in marble is true in a sense, but not in the way it is usually interpreted. He greatly encouraged the use of marble—the temple of Venus in the forum of Julius Caesar is said to have been built entirely of that material—but as a rule marble was only used as a facing. This, however, led to the substitution of solid concrete for the core of walls, in place of the unburnt brick which up to that time had been employed. On this subject the writings of Vitruvius, the Roman architect, are of the greatest value, as they describe clearly not only the materials used at this time (about 30 B.C.), but the different methods of building walls (see ROME). The material which contributed more than any other to the magnificent conceptions of the Roman Imperial style was that known as pozzolana, a volcanic earth which, mixed with lime, formed an hydraulic cement of great cohesion and strength. Not only the walls but the vaults were built in this pozzolana concrete, and formed one solid mass. Bricks were employed in arches, on the quoins of walls, occasionally in bond courses, and in the constructional vaults as ribs, in order to relieve the centreing of the weight until the pozzolana concrete had been poured in and had consolidated. The bricks employed in these ribs, and for the voussoirs of arches, were of the kind we should describe as tiles, being about 2 ft. square and 2 in. thick. Bricks also of smaller size and triangular in shape were used for the facing of walls, the triangular portions being embedded into the concrete walls.

The Romans themselves do not seem to have realized the tenacious properties of this pozzolana cement which, when employed for the foundation of temples, formed a solid mass capable of bearing as much weight as the rock itself. They feared also the thrust of the immense vaults over their halls, and always provided crosswalls to counteract the same, as shown in the plan of all the thermae; when, however, they had discovered the secret of covering over large spaces with a permanent casing indestructible by fire, it not only gave an impetus to the great works in Rome, but led to a new type of plan, which spread all through the Empire, varied only by the difference in materials and in labour. In this respect the Romans always availed themselves of the resources of the country, which they turned to the best account. As pozzolana was not to be found in North Africa or Syria, they had to trust to the excellent qualities of the Roman mortar, but even in Syria, where stone was plentiful and could be obtained in great dimensions, when they attempted to erect vaults of great span similar to those in Rome, these probably collapsed before the building was finished, and were replaced by roofs in wood.

In the styles hitherto described the gradual development has been traced to their primitive, culminating and decadent periods. This is not called for in a description of the Roman style of architecture, which to a certain extent appeared phoenix-like in its highest development under Augustus. Roman orders in the Augustan age had reached their culminating development. The capitals of the portico of the Pantheon (27 B.C.), or of the temple of Mars Ultor (2 B.C.), constitute the finest examples of the Corinthian order, whilst those of later temples show a falling off in style. It was only in the application of the orders that new combinations presented themselves, and this can be better understood when we refer to the monuments themselves. The description of the Roman orders, with the subsequent modifications, is given in the article ORDER. It is necessary, however, here to draw attention to two very important developments which the Roman architect introduced as regards the orders: firstly, their employment as decorative features in combination with the arcade, known as composite arcades, and secondly, their superposition one above the other in storeys. The earliest example of the first class is that found in the Tabularium as it now exists; of the second class the Colosseum and the theatre of Marcellus are the best known examples. In principle the practice must be condemned, for the employment of the column and entablature, which was designed by the Greek architect as an independent constructive feature, in a purely decorative sense stuck on the face of a wall, is contrary to good taste, but it is impossible not to recognize in its application to the Colosseum the value of the scale which it has given to the whole structure, a scale which would have been entirely lost if the building had been treated as one storey. The superposition of the orders as exemplified in the Roman theatres and amphitheatres throughout the Empire constitutes the greatest development made in the style, and it is one which, from the Italian revivalists down to our time, has had more influence in the design of monumental work than any other Roman innovation.

In the preceding sections it has been necessary to confine our descriptions, in the case of Egypt and Greece, more or less to temples and tombs, and in that of Assyria to palaces, but in Roman architecture the monuments are not only of the most extensive and varied kinds, but in some parts of the Empire they become modified by the requirements of the country, so that a tabulated list alone would occupy a considerable space. The following are the principal subdivisions: The Roman forum (see ROME); the colonnaded streets in Syria and elsewhere, and temple enclosures; temples (*q.v.*), rectangular and circular; basilicas (*q.v.*); theatres (*q.v.*) and amphitheatres (*q.v.*); thermae or baths (*q.v.*); entrance gateways and triumph arches (see TRIUMPHAL ARCH); memorial buildings and tombs, aqueducts (*q.v.*) and bridges (*q.v.*), palatial architecture (see PALACE); domestic architecture (see HOUSE).

The *Forum Romanum* under the Republic would seem to have served several purposes. The principal temples and important public buildings occupied sites round it, and up to the time of Julius Caesar there were shops on both sides: it was also used as a hippodrome and served for combats and other displays. Under the Empire, however, these were relegated to the amphitheatre and the theatre, markets were provided for elsewhere, and the forum became the chief centre for the temples, basilicas, courts of law and exchanges. But already in the time of Julius Caesar the Forum Romanum had become too small, and others were built by succeeding emperors. In order to find room for these, not only were numerous crowded sites cleared, but vast portions of the Quirinal hill were cut away to make place for them. The Fora added were those of Julius Caesar, Augustus, Trajan, Nerva and Vespasian. Outside Rome, in provincial towns and in Africa and Syria, the Forum was generally built on the intersection of the two main streets, and was surrounded by porticoes, temples and civic monuments.

Colonnaded Streets.—We gather from some Roman authors that in early days the Campus Martius was laid out with porticoes. All these features have disappeared, but there are still some existing in Syria, North Africa and Asia Minor, which are known as colonnaded streets. The most important of these are found in Palmyra, where the street was 70 ft. wide with a central avenue open to the sky and side avenues roofed over with stone. The columns employed were of the Corinthian order, 31 ft. high, and formed a peristyle on each side of the street, which was nearly a mile in length. The triple archway in this street is still one of the finest examples of Roman architecture. At Gerasa, the colonnaded streets had columns of the Ionic order, the street being 1800 ft. long, with other streets at right angles to it; similar streets are found at Amman, Bosra, Kanawat, &c. At Pompeiopolis, in Asia Minor, are still many streets of columns, and in North Africa the French archaeologists have traced numerous others.

Temple Enclosures.—In Rome the great cost, and the difficulty of obtaining large sites, restricted the size of the enclosures of the temples; this was to a certain extent compensated for by the magnificence of the porticoes surrounding them. The most important was that built by Hadrian, measuring 480 ft. by 330 ft., to enclose the double temples of Venus and Rome. The portico of Octavia measures 400 ft. by 370 ft., enclosing two temples, and the portico of the Argonauts, which enclosed the temple of Neptune, was about 300 ft. square. These dimensions, however, are far exceeded by those of the enclosures in Syria and Asia Minor. The court of the temple of the Sun at Palmyra was raised on an artificial platform 16 ft. high, and measured 735 ft. by 725 ft., with an enclosure wall of 74 ft. on the west and 67 ft. high on the other three sides.

At Baalbek the platform was raised 25 ft. above the ground, the dimensions being 400 ft. wide and 900 ft. deep. At Damascus the enclosure of the temple of the Sun has been traced, and it extended to about 1000 ft. square. Similar enclosures are found at Gerasa, Amman and other Syrian towns. In Asia Minor, at Aizani the platform was 520 by 480 ft., raised about 20 ft., and in Africa the French have found the remains of similar enclosures.

Roman Temples.—The Romans, following the Etruscan custom, invariably raised their temples on a podium with a flight of steps on the main front. Their temples were not orientated, and being regarded more as monuments than religious structures occupied prominent sites facing the Forum or some great avenue. Much importance was attached to the entrance portico, which was deeper than those in Greek temples, and the peristyle when it existed was rarely carried round the back. On the other hand the cella exceeded in span those of the Greek temples, as the Roman, being acquainted with the principle of trussing timbers, could roof over wider spaces. The principal temples in Rome, of which remains still exist, are those of Fortuna Virilis, Mars Ultor, Castor, Neptune, Antoninus and Faustina, Concord, Vespasian, Saturn and portions of the double temples of Venus and Rome. At Pompeii are the temples of Jupiter and Apollo, at Cora the temple of Mercury, and in France, the Maison Carrée at Nîmes and the temple at Vienne. In Syria are the temples of Jupiter at Baalbek, of the Sun at Palmyra and Gerasa, and in Spalato the temple of Aesculapius.

Of circular temples the chief are the Pantheon at Rome, the temple of Vesta on the Forum, of Mater Matuta, so-called, on the Forum Boarium, the temple of Vesta at Tivoli, of Jupiter at Spalato and of Venus at Baalbek.

Of the rectangular temples the Maison Carrée at Nîmes is the most perfect example existing (fig. 26). It was built by Antoninus Pius, and dedicated to his adopted sons Lucius and Martius. This temple, 59 ft. by 117 ft., is of the Corinthian order, hexastyle, pseudoperipteral, with a portico three columns deep, and is raised on a podium 12 ft. high. The next best preserved example is the temple of Jupiter at Baalbek, also of the Corinthian order, octastyle, peripteral, with a deep portico, and a cella richly decorated with three-quarter detached shafts of the Corinthian order.

Of the circular temples the Pantheon is the most remarkable. It was built by Hadrian, and consists of an immense rotunda 142 ft. in diameter, covered with a hemispherical dome 140 ft. high. Its walls are 20 ft. thick, and have alternately semicircular and rectangular recesses in them. In the centre of the dome is a circular opening 30 ft. in diameter open to the sky, the only source from which the light is obtained. The rotunda is preceded by a portico, originally built by Agrippa as the front of the rectangular temple erected by him, taken down and re-erected after the completion of the rotunda, with the omission of the two outer columns. In other words Agrippa's portico was decastyle; the actual portico is octastyle.

Basilicas.—The earliest example of which remains exist is that of the Basilica Julia on the Forum, the complete plan of which is now exposed to view. It consisted of a central hall measuring 255 ft. by 60 ft., surrounded by a double aisle of arches carried on piers, which were covered with groined vaults. The Basilica Ulpia built by Trajan was similar in plan, but in the place of the piers were monolith columns, with Corinthian capitals carrying an entablature, with an upper storey forming a gallery round.

The third great basilica, commenced by Maxentius and completed by Constantine, differs entirely from the two above mentioned. It

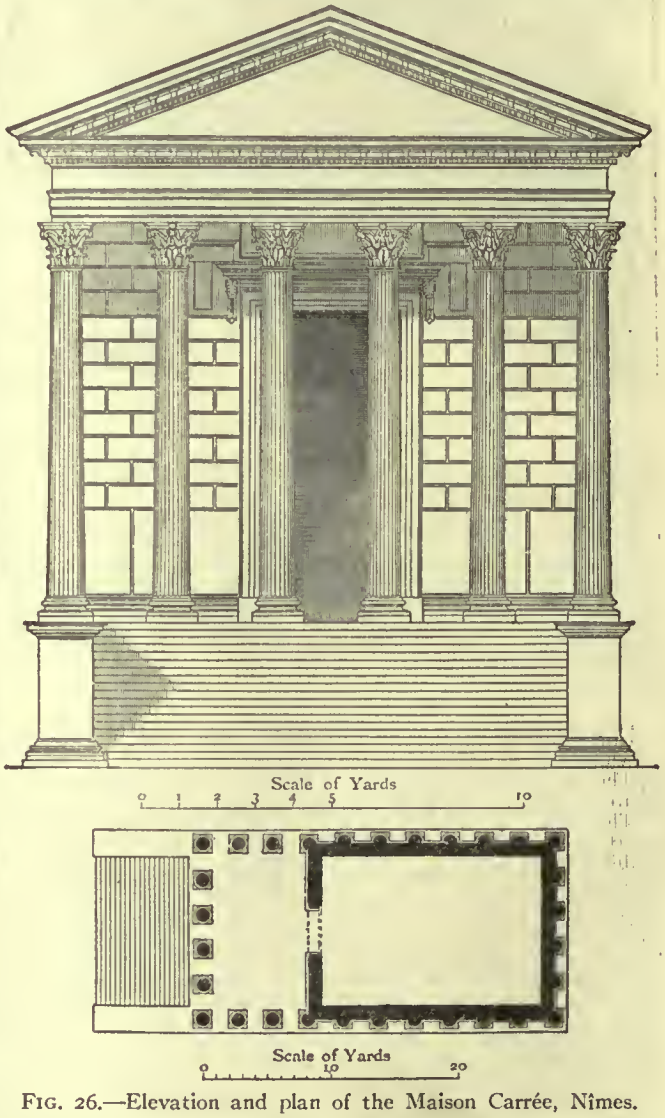


FIG. 26.—Elevation and plan of the Maison Carrée, Nîmes.

followed the design and construction of the Tepidarium of the Roman thermae, and consisted of a hall 275 ft. long by 82 ft. wide and 114 ft. high, covered with an intersecting barrel vault with deep recesses on each side which communicated one with the other by arched openings and constituted the aisles.

Theatres.—The only example in Rome is the theatre of Marcellus, built by Augustus 13 B.C., and one of the purest examples of Roman architecture. Amongst the best preserved examples is the theatre of Orange in the south of France, the stage of which was 203 ft. long. In the theatre at Taormina in Sicily are still preserved some of the columns which decorated the rear wall of the stage. The theatre of Herodes Atticus at Athens (A.D. 160) retains portions of its enclosure walls and some of the marble seats. There are two theatres in Pompeii where the seats and the stage are in fair preservation. Other examples in Asia Minor are at Aizani, Side, Telmessus, Alinda, and in Syria at Amman, Gerasa, Shuhba and Beisan.

Amphitheatres.—The largest amphitheatre is that known as the Colosseum, commenced by Vespasian in A.D. 72, continued by Titus and dedicated by the latter in A.D. 80. This refers to the three lower

storeys, for the topmost storey was not erected until the first part of the 3rd century, when it was completed by Severus Alexander and Gordianus. The building is elliptical in plan and measures 620 ft. for the major axis and 513 ft. for the minor axis. There were eighty entrances, two of which were reserved for the emperor and his suite. The Cavea (*q.v.*) was divided into four ranges of seats; the whole of the exterior and the principal corridors were built in travertine stone, and all other corridors, staircases and substructures in concrete. Externally the wall was divided into four storeys, the three lower ones with arcades divided by semi-detached columns of the Tuscan, the Ionic and the Corinthian orders respectively. The walls of the topmost storey were decorated with pilasters of the Corinthian order, the only openings there being small windows, to light the corridors and the upper range of seats. Among other amphitheatres the best preserved are those found at Capua, Verona, and Pompeii in Italy; at El Jem in North Africa; at Pola in Istria, and at Arles and Nîmes in France.

The Thermae or *Imperial Baths.*—The term thermae is given to the immense bathing establishments which were built by the emperors to ingratiate themselves with the people. Of the ordinary baths (*Balneae*) there were numerous examples not only in Rome but at Pompeii and throughout the Empire. The thermae were devoted not only to baths but to gymnastic pursuits of every kind, and being the resorts of the poets, philosophers and statesmen of the day, contained numerous halls where discussions and orations could take place. The plans of these thermae were measured by Palladio about 1560, at a time when they were in far better preservation and more extensive than they are to-day. They have, however, been measured since by some of the French Grand Prix students; and Blouet's work on the *Thermae of Caracalla* (1828) and Paulin's on the *Thermae of Diocletian* (1890) give accurate drawings as well as conjectural restorations which are of the greatest value. The earliest thermae were those built by Agrippa (20 B.C.) in the Campus Martius, and of others those of Titus and Trajan are the best preserved; plans can be found in Cameron's *Baths* (1775).

Entrance Gateways and *Arches of Triumph.*—As the entrance gateways were sometimes erected to commemorate some important event, we have grouped these together, the real difference being that the arch of triumph was an isolated feature and served no utilitarian purpose, whereas the entrance gateway constituted part of the external walls of the city and could be opened and closed at will. Of the latter those at Verona, Susa, Perugia and Aosta in Italy, Autun in France, and the Porta Nigra at Trèves (Trier) are the best known, but there are also numerous examples throughout Syria and North Africa. The arches of triumph offered a fine scope for decoration with bas-reliefs setting forth the principal events of the campaign; the representation on coins also suggests that they were looked upon as pedestals to carry large groups of sculpture. The best known examples are those of Titus, Septimius Severus and Constantine at Rome, of Trajan at Ancona, and, in France, at Orange, St Remi and Reims. There were numerous examples throughout North Africa and Syria, of which the arch of Caracalla at Tebessa in the former and the great gateway of Palmyra in Syria are the best preserved.

Memorial Buildings and Tombs.—Columns of victory constituted another type of memorial, and the shafts of the columns of Trajan and Marcus Aurelius in Rome lent themselves to a better representation of the records of victory than those which could be obtained in the panels of a triumphal arch. Other columns erected are those of Antoninus Pius in Rome, a column at Alexandria, and others in France and Italy.

If the Romans derived from the Etruscans a custom of erecting tombs in memory of the dead, they did not follow on the same lines, for whilst the Etruscans always excavated the tomb in the solid rock, constituting a more lasting memorial, the Romans regarded them as monumental features and lined the routes of the *via sacra* of their towns with them. The earliest example remaining is that of Caecilia Metella (58 B.C.), of which the upper portion, consisting of a circular drum 93 ft. in diameter, remains. Of the tomb of Hadrian the core only exists in the castle of Sant' Angelo. From the descriptions given it must have been a work of great magnificence. The tombs known as Columbaria (*q.v.*) were always below ground, but in some cases an upper storey was built above them consisting of a small temple, and these flanked the Via Appia in large numbers. At Pompeii outside the Herculaneum Gate the Via Appia was lined on both sides with tombs of varied design, and with exedrae or circular seats in marble, provided for the use of those visiting the tombs. The tombs in Syria form a very large and important series, the earliest perhaps being those in Palmyra, where they took the form of lofty towers, from 70 to 90 ft. high, externally simple as regards their design, but in the several storeys inside profusely decorated with Corinthian pilasters and coffered ceilings in stone. The tombs in Jerusalem built in the 1st century of our era are partly excavated in the rock and partly erected. The most important were those known as the tomb of Absalom, the tomb of St James, and the tombs of the judges and the kings, all cut in the solid rock. In central Syria some of the tombs are excavated in the rock, and over them are built a group of two or more columns held together by their entablatures. The most important series are the tombs at Petra, all cut in the side of cliffs and of elaborate design. The sculptor, being free from the restriction of construction, realized his conception much in the same way as a scene-painter produces a theatrical background.

Aqueducts and *Bridges.*—Although at the present day aqueducts and bridges would be classed under the head of engineering works, those built by the Romans are so fine in their conception and design that they take their place as monuments. The Pont-du-Gard near Nîmes, and the aqueducts of Segovia, Tarragona and Merida in Spain, and some of those in or near Rome, are of the simplest design, depending for their effect on their magnificent construction, their dimensions both in length and height, and the scale given in the ranges of arches one above the other. Few of the Roman bridges have lasted to our day; the bridges of Augustus at Rimini and of Alcantara in Spain may be taken as types of the design, in which we note that there are no architectural superfluities; the quality of the design depends on the graceful proportion of the arches and the fine masonry in which they are built.

Palatial Architecture.—By far the most magnificent group of palaces are those which were erected by the Caesars on the Palatine hill at Rome. Commenced by Augustus and added to by his successors down to the reign of Severus, they cover an area considerably over 1,000,000 sq. ft., and comprise an immense series of great halls, throne room, banqueting hall, basilicas, peristylar courts, temple, libraries, schools, barracks, a stadium and separate suites for princes and courtiers. The service of the palace would seem to have been carried on in vaulted corridors in several storeys, some of which on the north side, overlooking the Circus Maximus, must have been over 100 ft. in height. Except under the Villa Mills, the greater part of the plan has been traced; and large remains of mosaic pavements have been found *in situ*, and in the approaches, vaulted halls, some still retaining their stucco decoration.

A similar variety of groups of every description of structure is found at Tivoli, but spread over a very much larger area. The villa of Hadrian extended over 7 m.; the works there were probably begun about A.D. 123, the first portion being his own residential palace. In addition to the numerous halls, courts, libraries, &c., Hadrian attempted to reproduce some of the most remarkable monuments which he had seen during his long travels; the Stadium, Palaestra, Odeum, the two theatres, the artificial lake, Canopus and other features were, however, constructed in the Roman style. Built on a ridge between two valleys, the several buildings occupied various levels, so that immense terraces and flights of stairs existed throughout the site and, combined with the natural scenery, must have been of extraordinary beauty.

The palace of Diocletian at Spalato, to which he retired after his abdication, constituted a fortress, three of its walls being protected by towers, the fourth on the south by the sea. For an account of its well-preserved remains see SPALATO. The emperor's own residence was on the south side, and had a gallery 520 ft. long overlooking the sea. The two main streets, with arcades on each side and crossing one another, divided the whole palace into four sections. One of these streets crossed from gate to gate, the other from the north gate led to the entrance into the palace of the emperor.

Private Houses.—The entire absence of the remains of the private houses of Rome, with the single exception of the house of Livia on the Palatine, would have left us with a very poor insight into their design were it not for the discovery of Pompeii (*q.v.*) and Herculaneum (*q.v.*). The descriptions given by Pliny of the lavish extravagance in the Roman houses, and the employment of various Greek marbles in the shape of monolith columns and panelling of walls, are substantiated by those which are found in the Pantheon, in the palaces on the Palatine, and in Hadrian's villa at Tivoli; and these compared with what is found at Pompeii show that the latter was only a provincial town of second or third-rate importance, where painted imitations took the place of real marbles, and where the wall paintings were very inferior to those which have been discovered in Rome. (R. P. S.)

BYZANTINE ARCHITECTURE

The term "Byzantine" is applied to the style of architecture which was developed in Byzantium after Constantine had transferred the capital of the Roman empire to that city in A.D. 324.

It is not possible, in the early ages of any style which is based on preceding or contemporaneous styles, to draw any hard and fast line of demarcation; and already before the Peace of the Church, a gradual transformation in the Roman style had been taking place, even in Rome itself. Thus the arch had gradually been taking the place of the lintel, either frankly as a relieving arch above it (portico of Pantheon), or introduced in the frieze just above the architrave (San Lorenzo), or by the conversion of the architrave into a flat arch by dividing it into voussoirs, as in the Forum Julium at Rome or in the temple of Jupiter at Baalbek. In the palace built by Diocletian at Spalato, the architrave or ljntel of the Golden Gate is built with several voussoirs, and the pressure is further relieved by an arch thrown across above it. Long before this, however, and already in the 2nd century A.D. in Syria, this relieving arch had been moulded and decorated, with the result of emphasizing it as a new architectural feature. In this same palace at Spalato, in order to obtain a wider opening in the centre of the portico, leading to the throne room, it was spanned by an arch, round which were carried the

mouldings of the whole entablature, viz. architrave, frieze and cornice. At a still earlier date in Syria the same had been done in the Propylaea of the temple at Damascus (A.D. 151) and other examples are found in North Africa.

Now when Constantine transferred the capital to Byzantium, he is said to have imported immense quantities of monolith columns from Rome, and also workmen to carry out the embellishments of the new capital; for his work there was not confined to churches, but included amphitheatres, palaces, thermae and other public buildings. Owing to the haste with which these were built, and in some cases probably to the ephemeral materials employed, for the roofs of the churches were only in timber, all these early works have been swept away; but there remain two structures at least, which are said to date from Constantine's time, viz. the Binbirderek or cistern of a thousand columns, and the Yeri-Batan-Serai, both in Constantinople. As one of the first tasks a Roman emperor set himself to perform was the provision of an ample supply of water, of which Byzantium was much in need, there is every reason to suppose that they are correctly attributed to Constantine's time. If so, as the construction of their vaults is quite different from that employed by the Romans, it suggests that there already existed in the East a traditional method of building vaults of which the emperor availed himself; and, although it is not possible to trace all the earlier developments, the traditional art of the East, found throughout Syria and Asia Minor, must from the first have wrought great changes in the architectural style, and in some measure this would account for the comparatively short period of two centuries which elapsed between the foundation of the new empire and the culminating period of the style under Justinian in AD. 532–558.

Constantine is said to have built three churches in Palestine, but these have either disappeared or have been reconstructed since; an early basilican church is that of St John Studius (the Baptist) in Constantinople, dating from A.D. 463, and though it shows but little deviation from classic examples, in the design and vigorous execution of the carving in the capitals and the entablature we find the germ of the new style. The next typical example is that found in the church of St Demetrius at Salonica, a basilican church with atrium in front, a narthex, nave and double aisles, with capacious galleries on the first floor for women, and an apsidal termination to the nave. Instead of the classic entablature, the monolithic columns of the nave carry arches both on the ground and upper storeys; above the capitals, however, we find a new feature known as the *dosseret*, already employed in the two cisterns referred to, a cubical block projecting beyond the capital on each side and enabling it to carry a thicker wall above. In later examples, when the aisles were vaulted, the dosseret served a still more important purpose, in carrying the springing of the vaults. The nave and aisles of this church of St Demetrius were covered with timber roofs, as the architects had neither the knowledge, the skill, nor perhaps the materials to build vaults, so as to render the whole church indestructible by fire.

One of the first attempts at this (though the early date given is disputed) would seem to have been made at Hierapolis, on the borders of Phrygia in Asia Minor, where there are two churches covered with barrel vaults carried on transverse ribs across the nave, the thrust of which was met by carrying up solid walls on each side, these walls being pierced with openings so as to form aisles on the ground floor and galleries above. The same system was carried out a century earlier in central Syria, where, in consequence of the absence of timber, the buildings had to be roofed with slabs of stone carried on arches across the nave. It is probable that in course of time other examples will be found in Asia Minor, giving a more definite clue to the next development, which we find in the work of Justinian, who would seem to have recognized that the employment of timber or combustible materials was fatal to the long duration of such buildings. Accordingly in the first church which he built (fig. 27), that of SS. Sergius and Bacchus (A.D. 527), the whole building is vaulted; the church is about 100 ft. square, with a narthex on one side. The central portion of the church is octagonal (52 ft. wide), and is covered by a dome, carried on arches across the eight sides, which are filled in with columns on two storeys. These are recessed on the diagonal lines, forming apses. The vault is divided into thirty-two zones, the zones being alternately flat and concave.

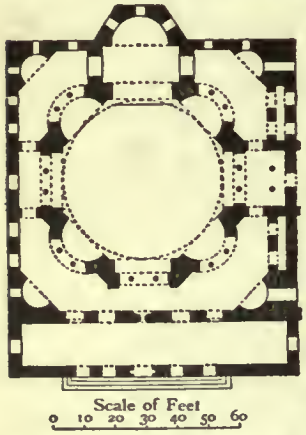


FIG. 27.—Plan of SS. Sergius and Bacchus.

We now pass to Justinian's greatest work, the church of St Sophia (fig. 28), begun in 532 and dedicated in 537, which marks the highest development of the Byzantine style and became the model on which all Greek churches, and even the mosques built by the Mahommedans in Constantinople, from the 15th century onwards, were based. The architects employed were Anthemius of Tralles and Isidorus of Miletus, and the problem they had to solve was that of carrying a dome 107 ft. in diameter on four arches. The four arches formed a square on plan, and between them were built spherical pendentives, which, overhanging the angles, reduced the centre to a circle on which the dome was built. This dome fell down in 555, and when rebuilt was raised higher and pierced round its lower part with forty circular-headed windows, which give an extraordinary lightness to the structure. At the east and west ends are immense apses, the full width of the dome, which are again subdivided into three smaller apses. The north and south arches are filled with lofty columns carrying arches opening into the aisle on the ground storey and a gallery on the upper storey, the walls above being pierced with windows of immense size. The church was built in brick, and internally the walls were encased with thin slabs of precious marble up to a great height (fig. 29). The walls and vault above were covered with mosaics on a gold ground, which, as they represented Christian subjects, were all covered over with stucco by the Turks

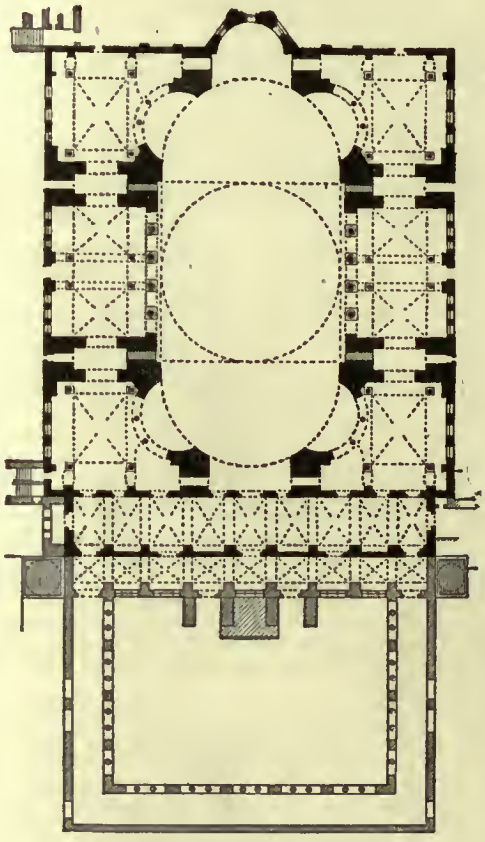


FIG. 28.—Plan of St Sophia.

after the taking of Constantinople. During the restoration in the middle of the 19th century, when it became necessary to strip off the stucco, these mosaics were all drawn and published by Salzenburg, and they were covered again with plaster to prevent their destruction by the Turks. The columns of the whole church on the ground floor are of porphyry, and on the upper storey of verd antique. The length of the church from entrance door to eastern apse is 260 ft.; in width, including the aisles, it measures 238 ft., and it measures 175 ft. to the apex of the dome. The columns and arches give scale to the small apses, the small apses to the larger ones, and the latter to the dome, so that its immense size is grasped from the first. The lighting is admirably distributed, and the rich decoration of the marble slabs, the monolith columns, the elaborate carving of the capitals, the beautiful marble inlays of the spandrils above the arches, and the glimpse here and there of some of the mosaic, which shows through the stucco, give to this church an effect which is unparalleled by any other interior in the world. The narthex or entrance vestibule forms a magnificent hall 240 ft. in length, equally richly decorated. Externally the building has little pretensions to architectural beauty, but its dimensions and varied outline, with the groups of smaller and larger apses and domes, make it an impressive structure, to which the Turkish minarets, though ungainly, add picturesqueness.

In A.D. 536 a second important church was begun by Theodora, the church of the Holy Apostles, which was destroyed in 1454 by order of Mahommed II. to build his mosque. The design of this church is known only from the clear description given by Procopius,

the historian who has transmitted to us the record of Justinian's work, and its chief interest to us now is that it forms the model on which the church of St Mark at Venice was based, when it was restored, added to, and almost rebuilt about 1063.

The church of St Sophia was not only the finest of its kind at the time of its erection, but no building approaching it has ever been built since in the Byzantine style, nor does much seem to have been done for two or three centuries afterwards. At the same time the erection of new churches must have been going on, because there are certain changes in design, the results probably of many trials. The difficulty of obtaining sufficient light in domes of small diameter led to the windows being placed in vertical drums, of which the earliest example is that of the western dome of St Irene at Constantinople, rebuilt A.D. 718–740. This simplified the construction and externally added to the effect of the church. The greatest change, however, which took place, arose in consequence of the comparatively small dimensions given to the central dome, which rendered it necessary to provide more space in another way, by increasing the area on each side, so that the plan developed into what is known as the Greek cross, in which the four arms are almost equal in dimensions to the central dome, and were covered with barrel vaults which amply resisted its thrust. In front of the church a narthex and sometimes an exonarthex was added, which was of greater width than the church itself, as in the churches (both in Constantinople) of the Theotokos and of Chora (A.D. 1080). The latter, better known as the

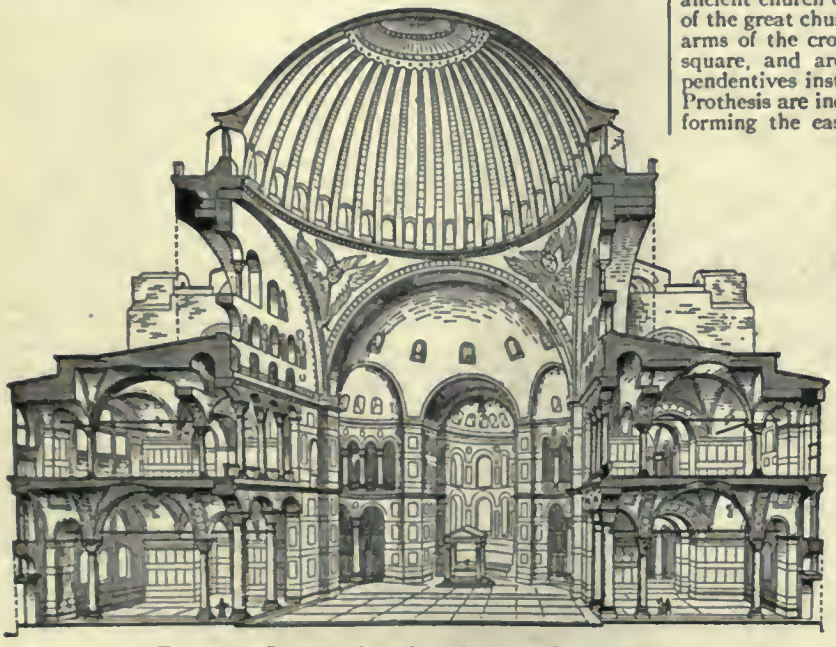


FIG. 29.—Cross section of the interior of St Sophia.

"mosaic mosque," on account of its splendid decoration in that material, is of special interest, because in the five arches of its façade we find the same design as that which originally constituted the front of the lower part of St Mark's at Venice, before it was encrusted with the marble casing and the plethora of marble columns and capitals brought over from Constantinople.

Sometimes an additional church was built adjoining the first church and dedicated to the immaculate Virgin, as in the church of St Mary Panachrantos, Constantinople, the church of St Luke of Stiris, Phocis, and the church in the island of Paros. In the last-named church the apse still retains its marble seats, rising one above the other, with the bishop's throne in the centre. In addition to the churches already mentioned in Constantinople, there are still some which have been appropriated by the Turks and utilized as mosques. At Mount Athos there are a large number of Greek churches, ranging from the 10th to the 16th centuries, which are attached to the monasteries. At Athens one of the most beautiful examples is preserved in the Catholicon or cathedral, the materials of which were taken from older classical buildings. This cathedral measures only 40 ft. by 25 ft., and is now overpowered by the new cathedral erected close by.

The external design of the Byzantine churches, as a rule, is extremely simple, but it owes its quality to the fact that its features are those which arise out of the natural construction of the church. The domes, the semi-domes over the apses, and the barrel vaults over other parts of the church, appear externally as well as internally, and as they are all covered with lead or with tiles, laid direct on the vaults, they give character to the design and an extremely picturesque effect. The same principle is observed in the doorways and windows, to which importance is given by accentuating their constructive features. The arches, always in brick, are of two orders or rings of arches set one behind the other, and the voussoirs, alternately in brick and stone, have the most pleasing effect. The same simple treatment is given to the walls by the horizontal courses of bricks or tiles, alternating with the stone courses. In the apse of the church of the Apostles at Salonica, variety is given by the interlacing of brick patterns. This elaboration of the surface decoration is carried still further in the palace of Hebdomon at Blachernae, in Constantinople, built by Constantine Porphyrogenitus (913–949), where the spandrils of the arches are inlaid with a mosaic of bricks in various colours arranged in various patterns.

There would seem to have been a revival in the 11th century, possibly a reflex of that which was taking place in Europe, and it is to this period we owe the churches of St Luke in Phocis, the church at Daphne, and the churches of St Nicodemus and St Theodore in Athens. The finest example of brick patterns is that which is found in the church of St Luke of Stiris, attached to the monastery in the province of Phocis, north of the Gulf of Corinth, of which an admirable monograph was published in 1901 by the committee of the British School at Athens, illustrated by measured drawings of the plans, elevations, sections and mosaics by Messrs Schultz and Barnsley, with a detailed description. The church of St Luke of Stiris is one of those already referred to, where a second church dedicated to the Holy Virgin has been added, but in this case, according to Messrs Schultz and Barnsley, on the site of a more ancient church of which the narthex alone was retained. The plan of the great church differs from the ordinary Greek cross in that the arms of the cross are of much less width than the central domed square, and arches being thrown across the angles carry eight pendentives instead of four. On the east side the Diaconicon and Prothesis are included in the width of the domed portion instead of forming the eastern termination of the aisles. The churches at Daphne in Attica and of St Nicodemus at Athens have a similar plan.

The decoration of the smaller church of St Luke of Stiris is of the most elaborate character, bright patterns of infinite variety alternating with the brick courses, and as blocks of marble, removed from the site of the old city near, were available, they have been utilized in various parts of the structure and richly carved. The church at Mistra in the Peloponnesus, 13th century, built in the side of a hill, is one of the most picturesque examples, and is almost the only example in which a tower is to be found.

Armenia.—One other phase of the Byzantine style has still to be mentioned, the development of church architecture in Armenia, which follows very much on the same lines as that of the Greek church, with a central dome on the crossing, a narthex at the west end and a triapsal east end. In two churches at Echmiadzin and Kutais there are transeptal apses in addition to those at the east end. One of the differences to be noted is that the domes and roofs are generally in stone externally, and this has led to another change; the domes, though hemispherical inside, have conical roofs over them. There is also a greater admixture of styles, the Persian, Byzantine and Romanesque phases entering into the design; the last was probably derived from the churches of central Syria, as the Armenians were the only race who seem to have penetrated there, and the finest example, at Kalat Seman, was at one time in their possession. The church at Dighur near Ani, of the 7th century, also probably owes its classical details to the work in central Syria. The most important example of the Armenian style is found in the cathedral at Ani, the capital of Armenia, dating from A.D. 1010. In this church pointed arches and coupled piers are found, with all the characteristics of a complete pointed-arch style, which, as Fergusson remarks, "might be found in Italy or Sicily in the 12th or 14th century." Externally the walls are decorated with lofty blind arcades similar to those in the cathedral at Pisa and other churches in the same town, which are probably fifty years later. The elaborate fret carving of the window dressings and hood moulds are probably borrowed from the tile decoration found in Persia.

Russia.—The architecture of Russia is only a somewhat degraded version of the style of the Byzantine empire. The earliest buildings of importance are the cathedrals of Kiev and Novgorod, 1019–1054. The original church of Kiev consisted of nave, with triple aisles each side, the piers in which are of enormous size, a transept and square bays of the choir beyond, each with deep apsidal chapels. Externally the chief features are the bulbous domes adopted from the Tatars, which sometimes assume great dimensions. Internally, the chief feature is the Iconostasis, which corresponds to the English rood screen, except that in Russia it forms a complete separation between the church and the sanctuary with its altar.

One of the most remarkable churches is that of St Basil at Moscow (1534–1584), which in plan looks like a central hall, surrounded by eight other halls of smaller dimensions, all separated one from the

other by vaulted corridors; this arrangement is not intelligible until one sees the exterior view, which accounts for the plan; each one of these halls is crowned by lofty towers with bulbous domes, the centre one rising above all the others and terminated with an octagonal roof, probably derived from the Armenian conical roof. The oldest and most interesting church in Moscow is the church of the Assumption (1479), where the tsars are always crowned; but as it measures only 74 ft. by 50 ft., it is virtually little more than a chapel; the plan is that of a Greek cross with central dome and four others over the angles. One other church deserves mention—at Curtea de Argesh, in Rumania. It was built in 1517–1526, and though small (90 by 50 ft.), is built entirely of stone, instead of brick covered with stucco, as is the case with the churches in Moscow. The interior has been entirely sacrificed to the exterior, the domes being raised to an extravagant height. The relative proportion of width of nave to height of dome in St Sophia at Constantinople is about one to two; in the church at Curtea de Argesh it is about one to five; and yet there can be little doubt the design was made by one of those Armenian architects who seem to have been always employed at Constantinople, and who presumably based their designs there on St Sophia as regards its principal features. Here, however, he was working for Tatar employers who attached more importance to display than to good proportion. In general design the church is based on Armenian work. The elaborately carved panels and disks are copied from the inlays in the mosques in Damascus and of Sultan Hassan at Cairo, and the stalactite cornices and capitals of the columns are transcripts of the Mahommedan style of Constantinople, which was derived from the style developed by the Seljuks.

We were only able to point to a single example of a tower in the Byzantine style, but in Russia the towers not only constitute the principal accessory to the church but were necessary adjuncts, in order to provide accommodation for bells, the casting of which has at all times formed one of the most important crafts in Russia. The chief examples, all in Moscow, are the tower attached to the church of the Assumption; the tower of Boris, inside the Kremlin; and that erected over the sacred gate of the same. But they abound throughout Russia, and in some cases form important features in the principal elevations on either side of the narthex. (R. P. S.)

Early Christian Architecture

Of the earliest examples of the housing of the Christian church few remains exist, owing partly to their destruction from time to time by imperial edicts, and partly to the fact that in most cases they were only oratories of a small and unpretending nature, which, immediately after the Peace of the Church, were rebuilt of greater size and with increased magnificence. In Rome itself, the principal religious centre was that which was found in the catacombs (*q.v.*), almost the only resort in times of persecution. In the houses of the wealthy Romans who had been converted, rooms were set apart for the reception of the faithful, and these may have been increased in size by the addition of side aisles. At all events, either in Rome or in the East, where greater freedom of worship was observed, the requirements of the religious had already resulted in a traditional type of plan, which may account for the similarity of all the great churches built by Constantine. It has often been assumed that the great Roman basilicas, if not actually utilized by the Christians, were copied so far as their design is concerned. This, however, is not borne out by the facts, there being very little similarity between the first churches built and the two great Roman basilicas, the Ulpian basilica and that built by Constantine; the latter was roofed with an immense vault, an imperishable covering, not attempted till two centuries later in Byzantium, and the former had its entrance in the centre of the longer side, and the tribunes at either end were divided off from the basilica by a double aisle of columns. The basilica plan was adopted because it was the simplest and most economical building of large size which could be erected, having an immense central area or nave well lighted by clerestory windows, and single or double aisles to divide the two sexes, and further because the immense supply of columns which could be taken from existing temples or porticoes enabled the architect to provide at small cost the colonnades or arcades between the nave and the aisles. On the other hand, there is no doubt that the temples, for which there was no further use, were largely appropriated, not only in Italy but in Greece, Sicily and elsewhere, and it is to this appropriation that we owe the preservation of the Parthenon, the Erechtheum and the temple of Theseus at Athens. There are some cases in which it is interesting to note the changes which were made to convert the temple into a church. In the temple of Athena at Syracuse, walls were built in between the columns of the peristyle, the cella was appropriated for the nave, and arcades were cut through the cella walls to communicate with the peristyle, so as to constitute the aisles. In the temple of Aphrodisias, in Asia Minor, a further development occurred. The walls of the cella were taken down, a wall was built outside the columns of the peristyle to form aisles, and the columns of the east and west end were taken down and placed in line with the others, in order to increase the length of the church.

The earliest Christian basilica built in Rome was the Lateran, which has, however, been so completely transformed in subsequent rebuildings as to have lost its original character. The next in date was that of the old St Peter's, which was taken down in 1506, in consequence of its ruinous condition, in order to make way for the present cathedral, begun by Pope Julius II. It was of considerable size, covering an area of 73,000 ft. Its plan consisted of an atrium, or open court, having a fountain in the centre, and arcades round; a nave, 275 ft. long and 77 ft. wide, with double aisles on each side; a transept, 270 ft. long by 54 ft. wide; and a semi-circular apse or tribune with a radius of 27 ft.: the high altar being in the centre of its choir, and ranges of marble seats and the papal throne in the middle, corresponding to the benches and the judge's seat of the Roman tribune. The nave, therefore, with its double aisles, was similar to that of the Ulpian basilica, but the aisles were not returned across the east end, and at the west end, in their place, was the great triumphal arch opening into the transept. The monolith columns of the nave and their capitals (together 40 ft. high) were all taken from ancient buildings, as also were those of the aisle arcades and in the atrium.

The basilica of St Paul, outside the walls, was originally of comparatively small dimensions, with its apse at the west end; in A.D. 386 the church was rebuilt on a plan similar to St Peter's, with nave and double aisles, divided by columns carrying arches, transept and apse. In the Lateran basilica, StPeter's, Santa Maria Maggiore, and St Lawrence (outside the walls), the columns of the nave were close-set (*i.e.* with narrow intercolumniations) and supported architraves, but in St Paul (outside the walls) the columns of the second church (A.D. 386) were wider apart and carried arches. The same feature is found in the church of St Agnes, founded A.D. 324, but rebuilt 620–640; here the arcade is carried across the west end and there are galleries above, the arches being carried on dosseret blocks above the capitals; these are also found in the galleries over the western end of St Lawrence, added by Honorius (A.D. 620–640); the dosseret, a Byzantine feature, being derived either from Ravenna or from the East. In the church of Santa Maria-in-Cosmedin (A.D. 772–795) another Byzantine feature appears in the triple apse at the east end, the earliest example in Europe. In this church, as also in those of San Clemente and San Prassede, piers are built at intervals to carry the arcades separating the nave and aisles. Those in the latter, however, were probably added when the great arches were thrown across the nave. The church of San Clemente was built in 1108, above a much older church dating from 385 and restored later; it is almost the only church in Rome which has preserved its atrium intact; the internal arrangement of the church also is different from that found elsewhere, the choir, enclosed with marble piers and screens removed from the lower church and erected in front of the tribune, dating from A.D. 514–523. The mosaics executed in 1112 are in fine preservation.

Other early churches in Rome are those of Santa Pudenziana (335); San Pietro-in-Vincoli (442), with Doric columns in the nave; SS. Quattro Coronati (450); Santa Sabina (450), an interesting church on account of the marble inlaid decoration in the arch spandrils of the nave, which date from 824; San Prassede (817), with arches thrown across the nave later; San Vincenzo ed Anastasio alle Tre Fontane (626); and Santa Maria in Domnica, where there are galleries over the aisles and across the east end as in St Agnes.

Hitherto we have said little about the architectural design, the fact being that externally these churches had the appearance of barns; it is only in a few cases, notably in St Peter's, that the principal fronts were decorated with mosaics. The magnificent materials employed internally, the monolith marble columns, the enrichment of the apse and the triumphal arch with mosaics, and probably the painting and gilding of the ceiling or roof, gave to the early basilican churches in Rome that splendour which characterizes those in Byzantium and in Ravenna.

With the exception of the baptistery attached to St John Lateran, and the so-called tomb of Santa Constantia, both erected by Constantine, the circular form of church was not adopted in Rome; there is one remarkable circular building of great size, San Stefano Rotondo, at one time thought to have been a Roman market, but now known to have been erected by Pope Simplicius (468–482). It consisted of a central circular nave, 44 ft. in diameter, and double aisles round. In the arcade dividing the aisles the arches are carried on dosserets, the earliest known example of this feature in Rome.

Although inferior in size, the two churches of S. Apollinare Nuovo, built by Theodoric (493–525) and Sant' Apollinare-in-Classe (538–549), both in Ravenna, have the special advantage that they were constructed in new materials, there being no ancient Roman temples there to pull down. The ordinary basilican plan was adhered to, but as the architects and workmen came from Constantinople, they incorporated in the building various details of the Byzantine style, with which they were best acquainted. Thus the contour of the mouldings, the carrying of the capitals and imposts, the dosseret above the capital, and the scheme of decoration of the interior with marble casing on the lower portion of the walls and mosaic above, are all Byzantine. Externally the churches are extremely plain, the wall surfaces of the nave and aisle walls being varied by blind arcades.

The earliest building in Ravenna is the tomb of Galla Placidia, built 450, a small cruciform structure with a dome on pendentives over the centre, perhaps the earliest example known. The baptistery of St John, which was attached to the cathedral built by Archbishop

Ursus (380), now destroyed, is a plain octagonal building, 40 ft. in diameter, originally with a timber roof; when in 451 it was determined to replace this by a vault, in order to resist the thrust, the upper part of the walls was brought forward on arches and corbels, and the interior richly decorated with paintings, stucco reliefs and mosaics in the dome. The most interesting building in Ravenna, however, from many points of view, is the church of San Vitale (fig. 30), built 539–547, its plan and design being based on the church of SS. Sergius and Bacchus at Constantinople. The proportions of the interior of St Sergius are much finer than those in San Vitale, where the dome is raised too high; the timber roofs also of San Vitale have deprived the church externally of that fine architectural effect found in Byzantine churches. In order to lighten the dome, its shell was built with hollow pots, the end of one fitted into the mouth of the other. The interior of the church is of great beauty, owing to the alternating of the piers carrying the eight arches with the columns set back in apsidal recesses. Unfortunately the church has been much restored, but the magnificent mosaics in the choir and the variety of design shown in the capitals and dosserets render

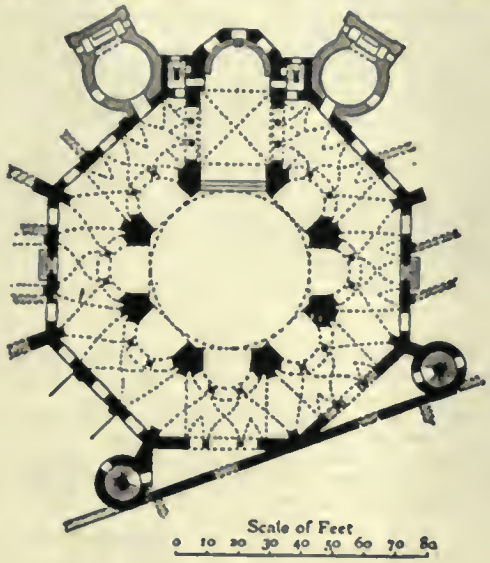


FIG. 30.—Plan of S. Vitale, Ravenna.

this church, though small, one of the most attractive in Italy. One other Ravenna building must be mentioned, though it would be difficult to know under what style to class it. The tomb of Theodoric, having a decagonal plan in two storeys, the lower one vaulted at the upper storey, set back to allow of a "terrace" round, once sheltered by a small arcade, and covered by a single stone 35 ft. in diameter, belongs to no definite style; the mouldings of the upper portion have some resemblance to the mouldings of some of the Etruscan tombs at Castel d'Asso, which was probably known to Theodoric.

As Dalmatia and Istria both formed part of Theodoric's kingdom, we find there the same Byzantine influence as that which was asserted in Ravenna, in both cases the work being done by artists and masons from Constantinople. There is not much left in Dalmatia, but in Istria are two important examples,—the churches at Parenzo (535–543) and Grado (571–586). Like the two churches in Ravenna, they are basilican in plan, with apses, semi-circular internally and polygonal externally, the latter being a characteristic found in all the churches in Europe which were influenced directly by Byzantine custom. Although the monolith columns were derived from ancient Roman buildings, all the capitals were specially carved for the two churches, and they have the same variety of design and in many cases are identical with those in San Vitale, Sant' Apollinare Nuovo, Sant' Apollinare-in-Classe, and those brought over from Constantinople, which now decorate St Mark's at Venice internally as well as externally. The decoration of the lower part of the walls internally with marble slabs, and the upper portion and apsidal vaults with mosaic, follows on the same lines as those at Ravenna and Constantinople. The church at Parenzo still retains its baptistery and atrium, from which fragments of the mosaics which originally decorated the west front can be seen. The church at Aquileia was rebuilt in the 11th century, and the Duomo of Trieste has been so altered as to lose its original Byzantine character. (R. P. S.)

Early Christian Work in Central Syria

Contemporaneously with the early developments of the Christian churches just described, another line of treatment was being evolved in central Syria, which would seem to have been quite independent of the others, though at first sight it bears considerable resemblance to the Byzantine style, and for that reason was probably classed and described under that head by Fergusson. But the leading characteristic of the Byzantine style is the dome over the centre of the church round which all other features are grouped, whereas in central Syria, with the exception of two examples—one a circular, the other a polygonal church—there are no domes. There is considerable Greek feeling in the mouldings and carvings of the capitals, but that is probably due to the fact that the masons were originally of Greek extraction. A comparison, for instance, of the design and carving of the largest church in central Syria, the famous building erected round the column of St Simeon Stylites at Kalat-Seman, dating from the 6th century, with any Byzantine church of the same date, shows very little resemblance, because the former was inspired more or less directly by the Roman remains in the country. A similar inspiration is found in the churches of St Trophime at Arles and St Gilles in the south of France, and at Autun and Langres in Burgundy. Both were founded on Roman work, and the mouldings of the pediments and archivolts and the fluting of the pilasters at Kalat-Seman, of the 6th century, are identical with what is found, quite independently, in Provence and Burgundy in the 11th and 12th centuries. There is, however, another special characteristic found in the masonry of the churches in central Syria, which is peculiar to the whole of Palestine, and is found in the earliest remains there, as also in Roman work, and to a certain extent in much of the Mahommedan construction and in that of the Crusaders, viz. its megalithic qualities. Instead of building an arch in several voussoirs, they preferred to do it in three or five only, and sometimes would cut the whole arch out of a single vertical slab. If they employed voussoirs, they were not content with ordinary depth, shown by the archivolt mouldings, but made them three or four times as deep.

The masons, in fact, would seem to have retained the traditional Phoenician custom of the country to employ the largest stones they were able to quarry, transport and raise on the building. Subsequently, in working down the masonry, they reproduced the architectural features they found in Roman buildings; this was done, however, without any knowledge as to their constructional origin or meaning; thus, in copying a Roman pilaster, the capital and part of the shaft would be worked out of one stone, and the lower part of the shaft and the base out of another. It is only from this point of view that we can account for the peculiar development given to the decoration of their later work, where archivolts, wood mouldings and window dressings are looked upon as simply surface decoration to be applied round doorways and windows, without any reference to the jointing of the masonry.

The immense series of monuments, civil as well as religious, existing throughout central Syria, were almost entirely unknown before the publication of the marquis of Vogüé's work, *La Syrie centrale*, in 1865–1867. This work, illustrated with measured plans, sections and elevations, with perspective views, and accompanied by detailed descriptions of the various buildings, forms an invaluable record of an architectural style, more or less completely developed, which flourished from the 3rd to the beginning of the 7th century. An American archaeological expedition made further investigations in 1899–1900, and its report, written by Mr H. C. Butler, contains additional plans and a large number of photogravures, which bear testimony to the truth and accuracy of the engraved plates of the marquis de Vogüé. The preservation of these central Syrian remains, more or less intact, is considered to have been due either to the desertion of all the towns in which they were situated by the inhabitants at the time of the Mahommedan invasion, or, according to Mr H. C. Butler, to the deforesting of the whole country about the commencement of the 7th century.

The monuments and buildings illustrated may be divided into three classes,—ecclesiastical, including monasteries; civil and domestic; and tombs. It is in the two first that the principal interest is centred.

Churches.—The earliest of these date from the end of the 4th century, and the latest inscription on a church is 609, so that a little over 200 years includes the whole series. With one or two small exceptions all the churches follow the basilican plan, with nave and aisles separated by arcades, the arches of which are carried by columns, four arches on each side in the smaller churches, ten in the largest. The churches are all orientated, and have generally a semi-circular apse, and occasionally a square or rectangular sanctuary at the east end, on either side of which are square chambers,—the *diaconicon*, reserved for the priests, on the south side, and the *prothesis*, on the north side, in which the offerings of the faithful were deposited. Except in the earliest churches, the entrance was generally at the west end, and was sometimes preceded by a porch. In addition to the west entrance, there were sometimes doorways leading direct into the north and south aisles, with projecting porticoes. About the middle of the 6th century a change was made in the design of the arcades in the nave, and rectangular piers with arches of wide span were substituted for the ordinary arcade with columns. The effect as shown in the engravings and photogravures is so fine that it is strange that the scheme was never adopted in the earlier Romanesque churches of Europe. The two more important examples are at Kalb-Lauzeh (fig. 31) and Ruweiha, but three or four others are known, and this plan was adopted in the basilica erected in the great court of the temple at Baalbek. All

the churches are built in fine ashlar masonry, with moulded archivolts and architraves to doorways and windows, and moulded string courses and cornices of simple design. The principal decoration externally is found in the hood-mould or label round the windows, continued as a string-course and carried round other windows, and sometimes terminating in a disk with cross in centre. These hood-moulds are occasionally richly carved. All the churches in central Syria had open timber roofs which have now disappeared; this is proved by the sinkings in the end walls to receive the purlins, and the corbels provided to carry the tie beams. The apses were always covered with semi-domes. The three most important churches were those of Turmanin, Kalb-Lauzeh and Kalat-Seman. The plans of the two first are similar, except that in Turmanin the nave arcade is of the ordinary type, with seven arches carried on columns, while in Kalb-Lauzeh (fig. 32) there are three wide arches on each side carried on two rectangular piers and responds. Both have entrance porches (fig. 33), which are flanked by angle buildings carried up as towers in three storeys; these probably contained wooden staircases to ascend to an open gallery, which consisted of four columns in-antis between the angle towers above the porch. The north and south walls were quite plain, except for window and door dressings and string courses; the apse was richly decorated, with wall shafts superimposed between the windows, and carrying a projecting cornice with alternate corbels. The church at Ruweiha has a similar plan to that at Kalb-Lauzeh, but two transverse arches in stone are thrown across the nave, resting on abutments attached to the nave piers.

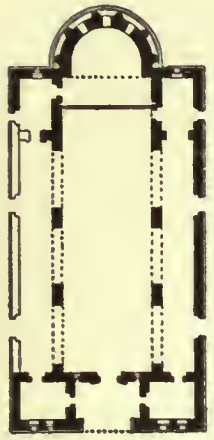


FIG. 31.—Plan of Church of Kalb-Lauzeh.

The most remarkable example and by far the largest is the great basilica at Kalat-Seman (fig. 34), which was erected round the pillar on which St Simeon Stylites spent thirty years of his life. The base of the pillar stands in the centre of an immense octagonal court open to the sky. The plan consists of nave, transept and choir, all with side aisles, separated in the centre by the octagonal court which constitutes the crossing. The nave built on the side of a hill is raised on a crypt, and the principal entrance would seem to have been through the porch of the north transept, which occupies the full width of transept and aisles. There were, however, in addition two doorways with porches to each aisle, as well as portico and doors to the north transept. At the eastern end were three apses, the two outer ones, facing the aisles, being additions in the second half of the 6th century. St Simeon died in 459, and the church was probably begun shortly afterwards, but not completed till the 6th century. The archivolts of the great arches on each side of the octagonal court consist of architrave, frieze and cornice, copied from the arch of the propylaea at Baalbek or other Roman work. Here, as in the great southern porch, the classic nature of the details is remarkable, the pilasters are all fluted, and the modillion and dentil, derived from Roman models, exist throughout. On the other hand, the carving of the foliage was certainly executed by Greek artists, and the well-known Byzantine capital, with the leaves bending under the influence of the wind, is here reproduced. The great apse externally retains its decoration with superimposed shafts and cornice, as in Turmanin and Kalb-Lauzeh.

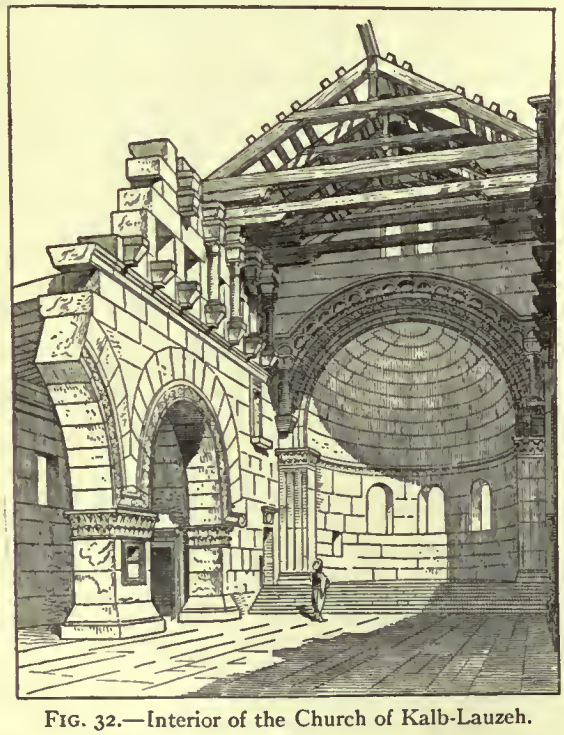


FIG. 32.—Interior of the Church of Kalb-Lauzeh.

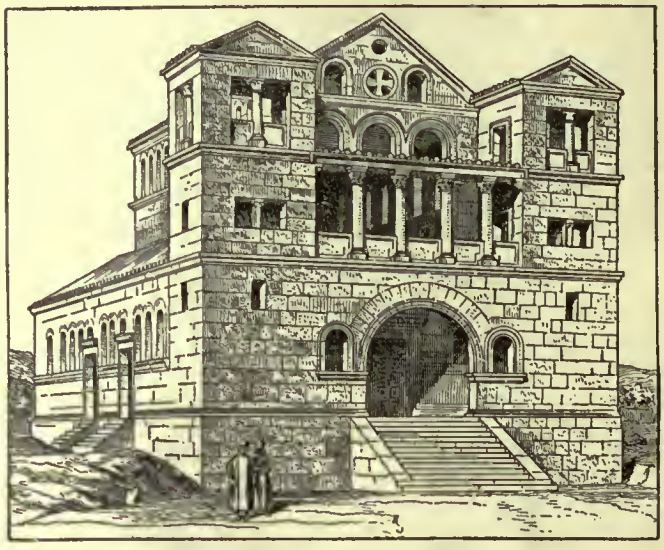


FIG. 33.—Church of Turmanin.

The monastery of Kalat-Seman was built on the south side of the great church, and many of the rooms had roofs of slabs of stone carried on arches across the room, a method of construction universally found in the Hauran, where the absence of timber necessitated this more permanent method of construction. The monasteries differ from the domestic work in being much plainer, and, instead of columns in the porticoes, having invariably square piers of stone.

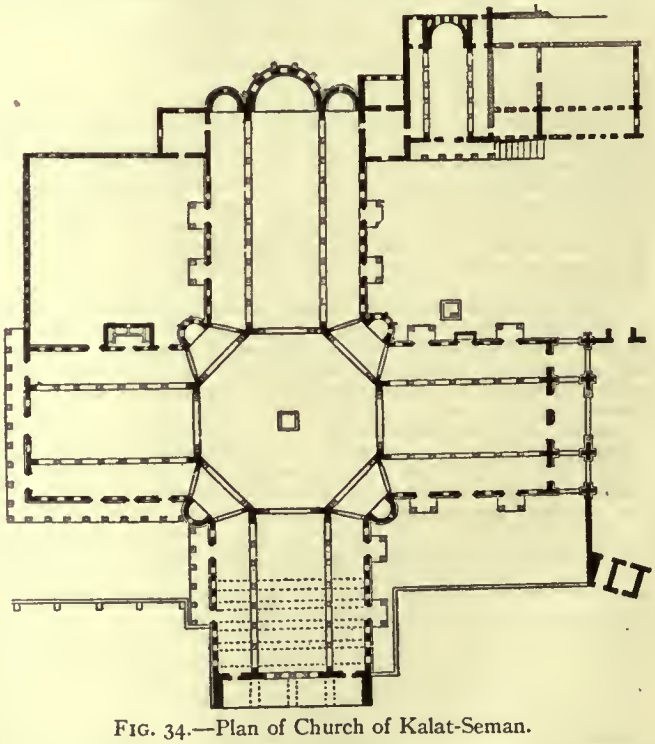


FIG. 34.—Plan of Church of Kalat-Seman.

Among circular churches, the walls of the cathedral at Bozra are gone, so that the conjectural restoration shown in de Vogüé's work is purely speculative, but in the church at Ezra (510) the central octagon is covered by a high dome of elliptical section. An aisle is carried round the octagon with similar recesses on the diagonal lines,

the whole being enclosed in a square; in the apse at the east end the seats of the tribune are still preserved.

Domestic Work.—The domestic work in central Syria is, in a way, even more remarkable than the ecclesiastical. Broadly speaking, there are two types of plan—those found in the towns and grouped together, and those which, with increased area, constituted a villa. At El Barah the average house occupied a site of about 80 ft. by 60 ft., of which about 30 ft. in width was occupied by an open court; facing this court, which was enclosed with high walls, is an open colonnade on two floors, which always faces south, occupies the whole front (80 ft.) of the house, and is the only means of approach to the rooms in the rear, three on each floor, side by side. In the centre of these rooms, 14 ft. wide each, an arch is thrown across on each floor, which carries slabs of stone covering the first floor and the roof; the upper storey was reached probably by a timber staircase, now gone, but in poorer dwellings an external flight of steps in stone led to an upper floor. All the houses face the same way. The colonnade of the house consisted of about fifteen columns on each storey. Each column, including its capital and base, was cut out of a single stone; on the upper storey, between the columns, are stone vertical slabs forming a balustrade; the houses are all built in fine ashlar masonry with architraves and cornices to doors and windows, a luxury which in England could rarely be indulged in for ordinary houses. At El Barah, in an area of about 250 ft. by 150 ft. as shown by de Vogüé, there are about 100 monolith columns, 12 ft. high, on the ground storey alone. In a villa at El Barah the open court is surrounded on three sides by buildings, those at the east end of considerable extent and in three storeys. A smaller example at Mujeleia has two courts, one of them being for stables and other services; otherwise the residence of the proprietor is similar to the one above described. Here and there the fantasy of the artist has been allowed to revel in the carving of the balustrades, door lintels, &c. The capitals are of endless design, and show interpretations of Ionic and Corinthian capitals, in some cases not dissimilar to the Byzantine versions in St Mark's at Venice.

Hostelries and public baths are amongst other civil buildings which are recognizable, the hostelries in some cases being attached to the monasteries.

Tombs.—The principal tombs are either excavated in the rock, with an open court in front and an entrance portico, like the tombs of the kings at Jerusalem, and sometimes a superstructure of columns or a podium raised above them; or again they are built in masonry, and take the form of sepulchral chapels; in the latter case, if many sarcophagi have to be deposited, and the chapel is of great length, arches are thrown across, about 6 ft. centre to centre, to support the slabs of stone with which they are covered. This carries on the traditional custom of the Roman temples in Syria, the roofs of which, in stone, were similarly supported. Sometimes there will be two storeys, the upper one covered with a dome. Those which are peculiar to the country are square tombs, with a pyramidal stone roof all built in horizontal courses, and either enclosed with a peristyle all round, on one or two storeys, or having a portico in front with flat stone roof. The cornices, string courses and lintels of the doors of these tombs of the 4th and 5th centuries, are enriched with carving, showing strong Byzantine influence, though probably due to the employment of Greek artists. (R. P. S.)

The Coptic Church in Egypt

The earliest places of Christian worship in Egypt were probably only chapels or oratories of small dimensions attached to the monasteries, which were spread throughout the country; a wholesale destruction of these took place at various times, more especially by the order of Severus, about 200 B.C., so that no remains have come down to us. The most ancient examples known are those which are attributed to the empress Helena, of which there are important portions preserved in the churches of the White and Red monasteries at the foot of the Libyan hills near Suhag.

Although the plan of the Coptic church is generally basilican, *i.e.* consists of nave and aisles, it is probable that they were not copied from Roman examples, but were based on expansions of the first oratories built, to which aisles had afterwards been added. There are no long transepts, as in the early Christian basilicas of St Peter's at Rome, and of St Paul outside the walls, and there is only one example of a cruciform church with a dome in the centre following the Byzantine plan. Even at an early period the nave and aisles were covered sometimes with barrel vaults, either semicircular or elliptical. The Coptic church was always orientated with the sanctuaries at the east end. The aisles were returned round the west end and had galleries above for women. Sometimes the western aisle has been walled up to form a narthex; in many cases a narthex was built, but, in consequence of the persecution to which the Copts were subject at the hands of the Moslems, its three doors have been blocked up and a separate small entrance provided. The narthex was the place for penitents, but was sometimes used for baptism by total immersion, there being epiphany tanks sunk in the floor of the churches at Old Cairo, known as Abu Serga, Abu-s-Sifain (Abu Sefen) and El Adra; these are now boarded over, as total immersion is no longer practised.

There are a few exceptions to the basilican plan; and in four examples (two in Cairo and two at Deir-Mar-Antonios in the eastern desert by the Gulf of Suez) there are three aisles of equal widths, divided one from the other by two rows of columns with three in each row, thus dividing the roof into twelve square compartments, each of which is covered with a dome.

The sanctuaries at the east end, as developed in the Coptic church, differ in some particulars from those of any other religious structures. There are always three chapels or sanctuaries, with an altar in each, the central chapel being known as the Haikal. The chapels are more often square than apsidal, and are always surmounted by a complete dome, a peculiarity not found out of Egypt. The seats of the tribune are still preserved in a large number of the sanctuaries, and there are probably more examples in Egypt than in all Europe, if Russia and Mount Athos be excepted. Those of Abu-Serga, El Adra and Abu-s-Sifain, with three concentric rows of seats and a throne in the centre, are the most important; but even in the square sanctuaries the tradition is retained, and seats are ranged against the east wall, and in one case (at Anba-Bishôi) three steps are carried across, and behind them is a segmental tribune of three steps, with throne in the centre.

The most remarkable Coptic churches in Egypt are those of the Deir-el-Abiad (the White monastery) and the Deir-el-Akhmar (the Red monastery) at Suhag. These were of great size, measuring about 240 ft. by 130 ft. with vaulted narthex, nave and aisles separated by two rows of monolith columns taken from ancient buildings, twelve in each row and probably roofed over in timber, and three apses, directed respectively towards the east, north and south. These apses are unusually deep and have five niches in each, in two storeys separated by superimposed columns. In the church of St John at Antinoe there are seven niches. A similar arrangement is found in the three apses, placed side by side, in the more ancient portion of St Mark's, Venice, built A.D. 820, and said to have been copied from St Mark's at Alexandria. There is no external architecture in the Coptic churches; they are all masked with immense enclosure walls, so as to escape attention. The walls of the interior still preserve a great portion of the paintings of scriptural subjects; the screens dividing off the Haikal and other chapels from the choir are of great beauty, and evidently formed the models from which the panelled woodwork, doors and pulpits of the Mahommedan mosques have been copied and reproduced by Copts.

Illustrations are given in A. J. Butler's *Ancient Coptic Churches of Egypt* (1884); Wladimir de Bock's *Matériaux archéologiques de l'Égypte chrétienne* (1901); and A. Gayet's *L'art coptique*.

(R. P. S.)

Romanesque and Gothic Architecture in Italy

"Romanesque" is the broad generic term adopted about the beginning of the 19th century by French archaeologists in order to bring under one head all the various phases of the round-arched Christian style, hitherto known as Lombard and Byzantine Romanesque in Italy, Rhenish in Germany, "Romane" and Norman in France, Saxon and Norman in England, &c. In character, as well as in time, the Romanesque lies between the Roman and the Gothic or Pointed style, but its first manifestation in Italy has already been described in the section on "Early Christian Architecture," and it only remains to deal with the subsequent development from the age of Charlemagne, which marks an epoch in the history of architecture, and from which period examples are to be found in every country.

In consequence of the lack of homogeneousness in the Romanesque style as developed in Italy, owing to the mixture of styles, and the difficulty of tracing the precise influence of any one race in buildings frequently added to, restored or rebuilt, their description will be more easily followed if a geographical subdivision be made, the simplest being Northern or Lombard Romanesque, Central Romanesque and Southern Romanesque; after the latter would follow the Sicilian Romanesque, which, owing to the Saracenic craftsman, constitutes a type by itself. This leaves still one other phase to be noted, the influence recognized in northern Italy of the architectural style of the Eastern Empire at Byzantium, either direct or through Istria and Dalmatia. In the churches at Ravenna, this influence has already been referred to in the section on "Early Christian Architecture," but it appears again in the church of St Mark at Venice, and in much of its domestic architecture, so that it is necessary to recognize another term, that of "Byzantine Romanesque."

Northern or Lombard Romanesque.—Although the materials for forming an adequate notion of the earlier work of the Lombards are very scanty, after their conversion to the Catholic faith the Church probably exercised a powerful influence in their architectural work. Under Liutprand, towards the close of the 8th century, an order

known as the Magistri Commacini was established, to whom were given the privileges of freemen in the Lombard State. These Commacini, so named from the island in the lake of Como whence they sprang, were trained masons and builders, who in the 9th and 10th century would seem to have carried the Lombard style through north and south Italy, Germany and portions of France. It was at one time assumed that they had influenced the church architecture throughout Europe, but this is not borne out by the evidence of the buildings themselves, except in the Rhenish provinces and in the districts on the slope of the Harz Mountains, where in sculpture a strange mixture is found of monstrous animals with Scandinavian interlaced patterns and Byzantine foliage, bearing a close resemblance to the early sculpture in Sant' Ambrogio at Milan and San Michele at Pavia (Plate V., fig. 72). Although the earliest Lombard buildings in Italy (such as those of San Salvatore in Brescia, San Vincenzo-in-Prato at Milan, the church of Agliate and Santa Maria delle Caccie at Pavia) were basilican in plan with nave and aisles, there are some instances in which the adoption of a transept has produced the Latin cross plan (*e.g.* San Michele at Pavia, Sant' Antonino at Piacenza, San Nazaro-Grande at Milan, and the cathedrals of Parma and Modena), though to what extent this is due to subsequent rebuilding is not known. In the early basilicas above mentioned. the columns, carrying the arcades between nave and aisles, were taken from earlier buildings, while the capitals, where not Roman, were either rude imitations of Roman, or Byzantine in style. The roofs were always in wood, and the exteriors of the simplest description. In the external decoration, however, of the apses of the churches of San Vincenzo-in-Prato, Santa Maria delle Caccie, the church at Agliate and the ancient portion of S. Ambrogio at Milan, we find the germ of that decorative feature which (afterwards developed into the eaves-gallery) became throughout Italy and on the Rhine the most beautiful and characteristic element of the Lombard style. In order to lighten the wall above the hemispherical vault of the apse, a series of niches was sunk within the arches of the corbel table, which gave to the cornice that deep shadow where it was most wanted for effect. In addition to the churches above named, similar niches are found in the baptisteries of Novara and Arsago, the Duomo Vecchio at Brescia and the church of San Nazaro Grande at Milan. Towards the close of the 11th century, the imposts of these niches take the form of isolated piers, with a narrow gallery behind, and eventually small shafts with capitals are substituted for the piers, producing the eaves-galleries of the apses, which in Santa Maria Maggiore at Bergamo (1137) and the cathedral of Piacenza are the forerunners of numerous others in Italy, and in the churches of Cologne, Bonn, Bacharach and other examples on the Rhine, constitute their most important external decoration.

In the apses of San Vincenzo-in-Prato and of the church at Agliate (both of the 9th century) there is another decorative feature, destined afterwards to become one of the most important methods of breaking up or subdividing the wall surface, *i.e.* the thin pilaster strips, which, at regular intervals, rise from the lower part of the wall to the corbel table of the cornice.

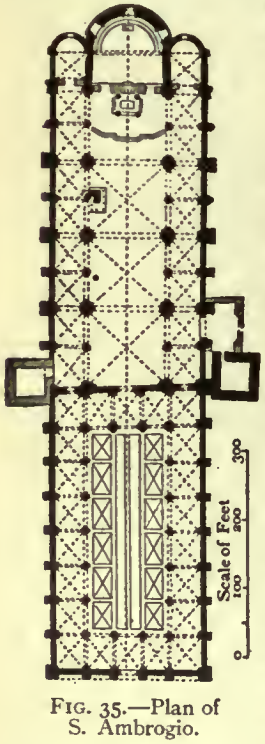


FIG. 35.—Plan of S. Ambrogio.

The two most important churches of the Lombard Romanesque style are those of Sant' Ambrogio at Milan and S. Michele at Pavia, their importance being increased by the fact that they probably represent the earliest examples of the solution of the great problem which was exercising the minds of the church builders towards the end of the 11th century, the vaulting of the nave. In the original church, of the 9th century, the nave and aisles of Sant' Ambrogio were divided in the usual way with arcades, and were covered with open timber roofs. In the rebuilding of the church (fig. 35) the nave (38 ft. wide) was divided into four square bays, and compound piers of large dimensions were built, to carry the transverse and diagonal ribs of the new vault. To resist the thrust, the walls across the aisles were built up to the roof, and had external buttresses; the diagonal ribs, instead of following the elliptical curve which the intersection of the Roman semicircular barrel-vault gave to the groin, were made semicircular, so that the web or vaulting surface which rested on these ribs rose upwards towards the centre of the bay, giving a distinct domical form to the vault. The aisles, being half the width of the nave, were divided into eight compartments, two to each bay of the nave, and were covered both in the ground storey and the triforium with intersecting groin vaults. When this rebuilding took place, the front of the church was brought forward, bearing a narthex, and the arcades of the atrium were rebuilt in the first years of the 12th century. The triple apse, to the external decoration of which we have called attention, the crypt underneath, and the south campanile, are the only remains of the 9th century church. The campanile on the north side was built 1125–1149, and the decoration with pilaster strips, semi-detached shafts, and arched corbel table, is repeated on the façade of the church and on the arcade round the atrium. In the rebuilding, portions of the sculptural decoration of the 9th century church were utilized; this would appear to have been a Lombard custom, as in the church of San Michele the lower part of the main front is encrusted with sculptured decoration taken from the earlier churches built on the site. These ancient sculptures are of special interest, as they constitute the best records of the rude Lombard work of the 8th and 9th centuries, and are intermingled with Byzantine scroll work and interlaced patterns. If the plan of Sant' Ambrogio, with its comparatively thin enclosure walls, suggests its original construction as an ordinary basilica, this is not the case with San Michele (fig. 36), where all the external walls are of great thickness, showing that from the first it was intended to vault the whole structure. The church is much smaller than Sant' Ambrogio, there being originally only two square bays to the nave (in the 15th century the vaults were rebuilt with four bays); the transept, however, projects widely beyond the aisles, and as there is another bay given to the choir in front of the apse, the area of the two churches is about the same. The existing church was

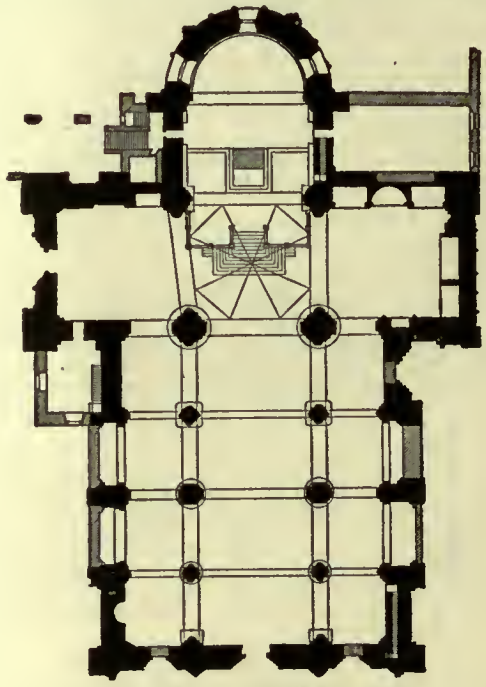


FIG. 36.—Plan of San Michele, Pavia.

probably begun shortly after the destructive earthquake of 1117, and was consecrated in 1132. In Sant' Ambrogio the transverse and diagonal arches spring from just above the triforium floor, so that there was no room for clerestory windows, and consequently the interior is dark. In San Michele the ribs rise from the level of the top of the triforium arcades, and two clerestory windows are provided to each bay. The crossing of the nave and transept is covered with a dome, carried on squinches, which dates from the first building. The dome over the fourth bay of Sant' Ambrogio replaced the original vault about the beginning of the 13th century.

The cathedral of Novara, originally of the ordinary basilica type of the 10th century with timber roofs, was reconstructed in the 11th century, compound piers being built to carry the transverse and diagonal ribs, and walls built across the outer aisles to resist the thrust; on the other hand SS. Pietro and Paolo at Bologna is a 12th century church, which was designed from the first to be vaulted. To these, and still belonging to the basilican plan, must be added San Pietro in Cielo d'oro (1136) and San Teodoro, both in Pavia; S. Evasio at Casale-Monferrato, having a comparatively narrow nave with double aisles on either side and a very remarkable narthex or porch: S. Lorenzo at Verona (lately restored), which in the 12th century was rebuilt with compound piers to carry a vault (the apse and the two remarkable circular towers in the west front belong to the ancient church); and Sant' Abbondio at Como, often restored and partly rebuilt, retaining, however, some of the original sculpture of the early Lombard period.

Of churches built on the plan of the Latin cross, examples are Sant' Antonino at Piacenza, with an octagonal lantern tower over the crossing; Parma cathedral (*c.* 1175), with an octagonal pointed dome over the crossing; Modena cathedral, rebuilt and consecrated

Photo, Brogi.

FIG. 62.—PISA.

Photo, Anderson.

FIG. 63.—ST MARK'S, VENICE.

ARCHITECTURE

Photo, Neurdein.
FIG. 64.—AMIENS CATHEDRAL.

Photo, F. Frith & Co.
FIG. 65.—BURGOS CATHEDRAL.

Photo, F. Frith & Co.
FIG. 66.—ST PAUL'S, LONDON.

Photo, F. Frith & Co.
FIG. 67.—ELY CATHEDRAL.

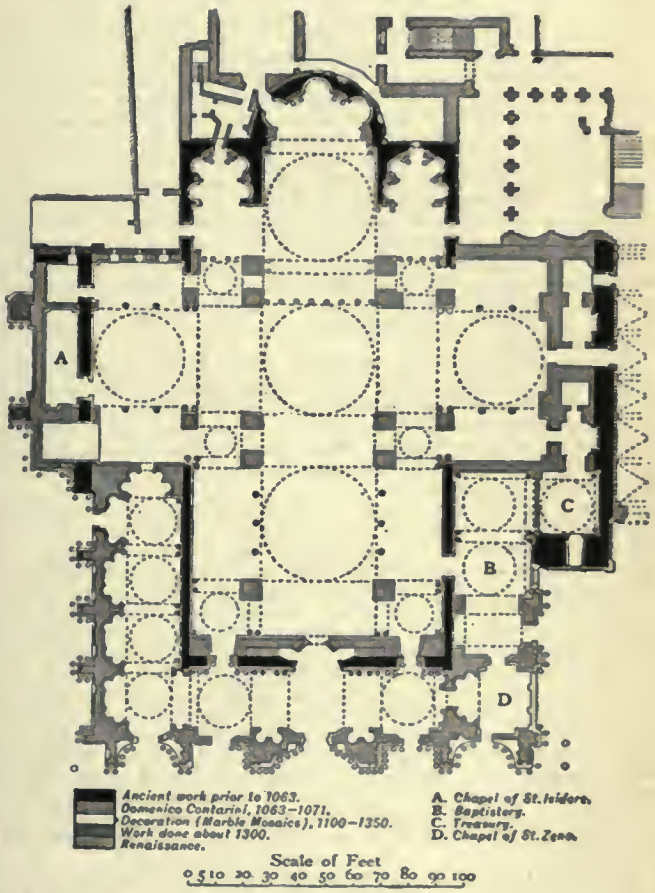
in 1184; San Nazaro-Grande at Milan; and San Lanfranco at Pavia, the two latter without aisles.

Reference has already been made to the eaves-galleries of the apses of the Lombard churches. A similar gallery was carried across the main front, rising with the slope of the roof, as in San Michele, Pavia; also on the west fronts of San Pietro in Cielo d'oro and San Lanfranco, at Pavia; and in the cathedrals of Parma and Piacenza. In all these cases the galleries are not quite continuous, vertical buttresses or groups of shafts or single shafts being carried up through them to the corbel tables. In S. Ambrogio at Milan the central original lantern is surrounded with two tiers of galleries. The finest example of their employment, however, is in the magnificent central tower of the Cistercian church at Chiaravalle, near Milan, where the two lower storeys form the drum of the internal dome, the two storeys above are set back, and the upper storey consists of a lofty octagonal tower with conical spire.

One of the serious defects in the front of the church of San Michele at Pavia is that it forms a mask, and takes no cognizance of the aisle roofs, which are at a lower level, and the same is found in San Pietro-in-Cielo d'oro at Pavia. This mask is carried to an absurd extent in the church of Santa Maria della Pieve at Arezzo, in which, above the ground storey of the arcades, are three galleries forming strong horizontal lines, which suggest the numerous floors of a civic building instead of the vertical subdivisions of a church. This defect is not found in the church of San Zeno at Verona, which is one of the finest of the Lombard churches; the church is basilican in plan, the nave being divided into five bays with compound piers, as in Sant' Ambrogio, as if it were intended to vault it; this, however, was never done, but stone arches are thrown across the two western-most bays of the nave as if to carry the roof (now concealed by a wooden ceiling). The façade is of marble and sandstone, with pilaster-strips rising from the base to the arched corbel table, and the outline of the nave and aisles is preserved in the front, in which all the mouldings and carving are of the utmost delicacy. Both here and in the cathedral are fine examples of those projecting porches, the columns of which are carried on the backs of lions or other beasts. At Piacenza, Parma, Mantua, Bergamo and Modena are porches of a similar kind, and in the cathedral of Modena the columns which support the balcony on the entrance to the crypt are all carried on the backs of lions. The cathedral of Verona has suffered so much from rebuilding and restoration that little remains of the earlier structure, but the apse of the choir, decorated with a close set range of pilaster-strips, with bases and Corinthian capitals and crowned with a highly enriched entablature, is quite unique in its design.

Among circular buildings, the Rotonda at Brescia was at one time considered to date from the 8th century, owing to its massive construction and the simplicity and plainness of its external design. Later discoveries, however, have shown that the early date can only be given to the crypt of San Filasterio situated to the eastward of the Rotonda. The church of Santo Sepolcro at Bologna, as its name implies, is one of those reproductions of the church of the Holy Sepulchre at Jerusalem which were built by the Templars during the crusades. Of much earlier date is the circular church of San Tommaso-in-Limine, an early Lombard work of the 9th century, to which period belong also the baptisteries of Albenga, Arsago, Biella, Galliano and Asti. One of the most beautiful examples is the baptistery of Santa Maria at Gravedona, at the northern end of the lake of Como, built in black and white marble. The plan is unusual, and consists of a square with circular apses on three sides.

Byzantine Romanesque.—Although in the first basilican church of St Mark at Venice, erected in 929 to receive the relics of the saint recovered from St Mark's in Alexandria, the capitals of the columns and other decorative accessories showed Greek influence, its transformation into a five-domed Byzantine structure was not begun till about the middle of the 11th century. The date given by Cattaneo is 1063, the same year in which the cathedral of Pisa was begun; it is probable, however, that the scheme had already been in contemplation for some years, as the problem was not an easy one to solve, owing to the restrictions of the site, and to the desire to reproduce in some way the leading features of the church of the Holy Apostles at Constantinople. This church was destroyed in 1464, but its description by Procopius is so clear, and corresponds so closely with St Mark's, completed towards the end of the 11th century, as to leave little doubt about the source of its inspiration. From what has already been said with reference to the great changes made when it was proposed to vault the early Lombard basilican churches, those of equal importance which were carried out in St Mark's will be better understood. The nave was divided into three square bays (fig. 37), with additional bays on the north and south to form transepts; the five square bays thus obtained were covered with domes carried on pendentives, as in St Sophia at Constantinople, and on wide transverse barrel vaults; the domes over the north and south transepts and the choir were of slightly less dimensions than those over the nave and crossing, in consequence of the limitations in area caused by the chapel of St Theodore on the north, the ducal palace on the south, and the ancient apse of the original basilica which it was desired to retain. In the reconstruction, many of the old columns, capitals and parapets were utilized again in the arcades carrying the galleries and in the balustrades over them. Externally the brick walls were decorated with blind arcades and niches of Lombard style, and all the roof vaults were covered with lead as in Constantinople. The subsequent decoration of the exterior took two centuries to carry out, not including the florid work of later date. There is no precedent in the East for the superimposed columns and capitals exported from Constantinople and Syria which now decorate the north, south and west fronts (Plate I., fig. 63), though the materials were all of the finest Byzantine type. Internally, the mosaic decoration of the domes, vaults and the upper part of the walls, was carried out by Greek artists from Constantinople, who probably also were employed for the marble panelling of the lower part of the walls. The marble casing of the front was certainly executed by Constantinopolitan artists, since the moulded string known as the "Venetian dentil" is a direct reproduction of that in St Sophia. At a later date the domes were all surmounted by lanterns in wood, covered with lead, and the roofs were all raised. So far, therefore, the building departs from its prototype, the church of the Apostles. A similar transformation took place in the church of Santa Fosca at



From R. P. Spiers's *Architecture, East and West.*

FIG. 37.—Plan of St Mark's, Venice.

Torcello, where a single large dome was contemplated over the centre of the original basilican church, but was never built. The cathedral of Torcello and the church at Murano are richly decorated with carved panels, capitals, choir screens and other features, either imported from the East or reproduced by Greek artists or Italians trained in the style. The influence of St Mark's in this respect extended far and wide on the east coast of Italy; and at Pomposa, Ancona, and as far south as Brindisi, Byzantine details can be traced everywhere. The designs of the churches of San Ciriaco at Ancona and of Sant' Antonio at Padua were both based on St Mark's. Sant' Antonio's had six domes, there being two over the nave; and in all cases the domes were surmounted by domes in timber like those of St Mark's.

In domestic work, Venice is richer in Byzantine architecture than Constantinople, for with the exception of the Hebdomon palace the continual fires there have destroyed all the earlier palaces and houses. The Fondaco-dei-Turchi, built probably in the 11th century, is one of the most remarkable; the front on the great canal is 160 ft. long, having a lofty arcade with ten stilted arches on the ground storey and an arcade of eighteen arches above; the pavilion wings at the east end are in three storeys, with blind arcades and windows pierced in the central arcade. The whole was built in brick encased with marble, with panels or disks enriched with bas-reliefs or coloured marbles. A second example is found in the Palazzo Loredan, having

similar arcades, stilted arches and marble panelling; and there are two others, one on the Grand Canal and the other on the Rio-Cà-Foscari. Throughout Venice the decoration of these Byzantine palaces would seem to have influenced those of later date; for the Venetian dentil, interlaced scroll-work and string courses, with the Byzantine pendant leaf, are found intermingled with Gothic work, even down to the 15th century, and the same to a certain extent is found at Padua, Verona and Vicenza.

Central Romanesque.—The builders in the centre of Italy would seem to have followed more closely the Roman basilican plan, for in two of the earliest churches, Santa Maria Fuorcivitas at Lucca and San Paolo a Ripa d'Arno at Pisa, the T-shaped plan of St Peter's and St Paul's, with widely projecting transepts, was adopted; the difference also between the north and central developments is very marked, as in the place of the massive stone walls, compound piers, and internal and external buttresses deemed necessary to resist the thrusts of the great vaults, and the low clerestory of the northern churches, those in the south retain the light arcades with classic columns, the wooden roofs, and the high clerestory of the Roman basilicas. Instead of the vigorous sculpture of the Lombards in the Tuscan churches, marbles of various colours take its place, the carving being more refined in character and much quieter in effect.

The earliest church now existing is that of San Frediano at Lucca, dating from the end of the 7th century. Originally it was a five-aisled basilica, with an eastern apse, but when it was included within the walls in the 11th century the apse and the entrance doorway changed places, and a fine eaves-gallery was carried round the new apse; the outer aisles were also transformed into chapels. So many of the churches in Pisa and Lucca had new fronts given to them in the 11th or 12th century, that it is interesting to find, in the church of San Pietro-in-Grado at Pisa, an example in which the external decoration with pilaster strips and arched corbel tables is retained, showing that in the 9th century, when that church was built, the Lombard style prevailed there. Other early churches are those of San Casciano (9th century), San Nicola and San Frediano (1007), all in Pisa.

Of early foundation, but probably rebuilt in the 11th century, are two interesting churches in Toscanella, Santa Maria and San Pietro; they are both basilican on plan, but the easternmost bay is twice the width of the other arches of the arcade, and is divided from the nave by a triumphal arch. In both churches the floor of the transept is raised some feet above the nave, and a crypt occupies the whole space below it.

One of the earliest and most perfect examples of this subdivision is the church of San Miniato, on a hill overlooking Florence. The church was rebuilt in 1013, and some of the Roman capitals of the earlier building are incorporated in the new one. It is divided into nave and aisles by an arcade of nine arches, and every third support consists of a compound pier with four semi-detached shafts, one of which, on each side of the nave, rises to the level of the summit of the arcade and carries a massive transverse arch to support the roof. The east end of the church, occupying the last three bays of the arcade, is raised 11 ft. above the floor of the nave, over a vaulted crypt extending the whole width of the church and carried under the eastern apse. The interior of the church, which is covered over with an open timber roof, painted in colour and gilded, is decorated with inlaid patterns of black and white marble of conventional design, and the same scheme is adopted in the main façade, enriching the panels of the blind arcade on the lower storey, and above an extremely classic design of Corinthian pilasters, entablature and pediment.

As none of the façades of the Pisan churches was built before the middle of the 11th century, it is possible that Buschetto, the architect of the cathedral of Pisa, may have profited by the scheme suggested in the lower storey of San Miniato; if so he departed from its classic proportions. There are seven blind arcades in the lower storey of the Pisan cathedral, the arcades are loftier, and the position of the side doors which open into the inner aisle on each side is of much better effect. The cathedral was begun in 1063, the year following the brilliant capture of Palermo by the Pisans, when they returned in triumph with immense spoils. In plan it consists of a Latin cross, with double aisles on either side of the nave extending to the east end, a central apse, transepts with single aisles on each side, and north and south transepted apses (fig. 38). The nave arcade, with its Corinthian capitals and monolith stone columns, is of exceptional boldness, and as it is carried across the transept up to the east end (a length of 320 ft.) it forms a continuous line greater than that in any other cathedral. The crossing is covered by a dome, elliptical on plan, being from east to west the length of the transept and aisles. The result is unfortunate, and detracts both externally and internally from its beauty; otherwise the exterior decoration, which must have been schemed out in its entirety from the beginning (with the exception of the dome, which is of later design), has the most satisfactory and pleasing effect. The lofty blind arcade of the lower storey, and the open gallery above on the façade (the latter represented by a blind arcade), are carried round the whole building, and the horizontal lines of the galleries of the upper storeys accord with the roofs of the aisles and nave respectively and the blind arcade of the clerestory. The walls are faced within and without with white and grey marble, and the combination of sculpture and inlay which enriches the arcades of the façades gives an additional attraction to the building. The cathedral is sometimes quoted as Byzantine in style, but its plan and design are of widely different character from those of any building found in the East, and the mosaics, which constitute the finest decorative element in that style, were not added till the 14th century, and formed no part of the architect Buschetto's scheme.

The Baptistery, begun in 1153, was not completed till towards the close of the 13th century, when important alterations were made in the design to bring it into accordance with the new Gothic style. The crocketed gables, and the upper gallery, substituted for the arcades, which followed on the lines of those in the cathedral, have taken away the quiet repose found in the latter; the lower storey,

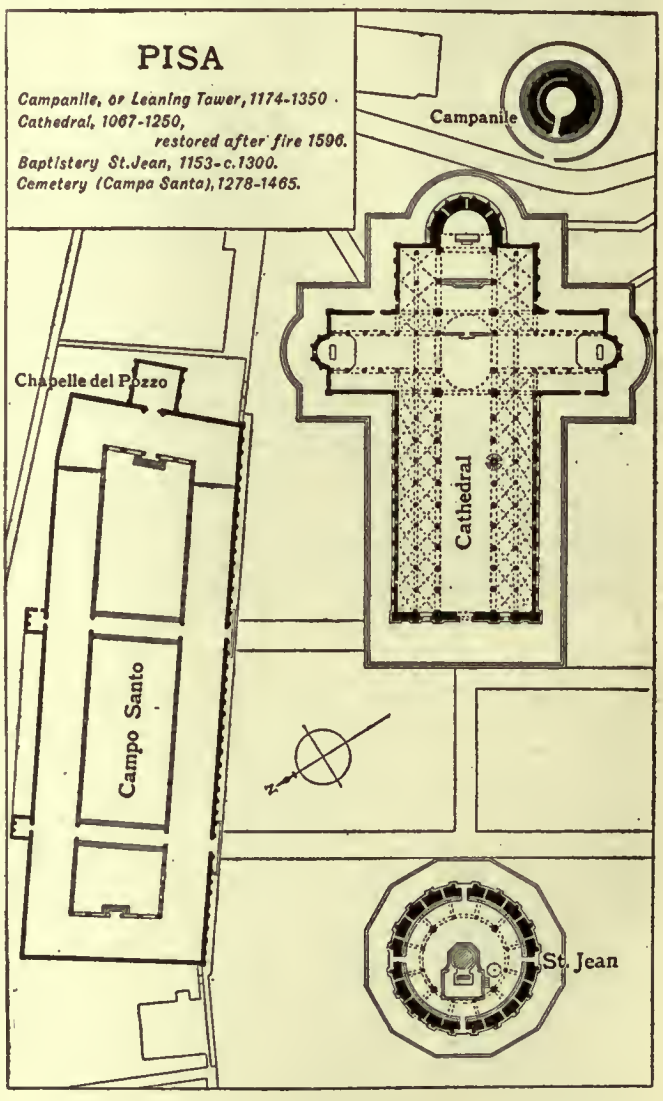


FIG. 38.

however, with its lofty blind arcades, similar to those of the cathedral, and the principal doorway, are of great beauty. The central area of the baptistery, which is surrounded by aisles and triforium gallery, is covered by a conical dome; internally as well as externally this can never have been a beautiful feature, and the additions of the 13th century have made it one of the ugliest roofs in existence.

The Campanile or leaning tower was begun in 1174. Owing, however, to the treacherous nature of the ground, the piles driven in to support the tower gave way on the south side, so that, when only 35 ft. above the ground, a settlement was noticed, and slight additions in height were made from time to time in order to obtain a horizontal level for the stone courses; but this was without avail, and on the completion of the third gallery above the ground storey the work was suspended for many years. In 1350 it was recommenced, three more gallery storeys were added, and the upper or belfry stage was set back in the inner wall. The tower is now 178 ft. high, and overhangs nearly 14 ft. on the south side; its design is made to harmonize with the cathedral, but shows much less refinement and grace.

The Campo Santo, an immense rectangular court 350 ft. long by 70 ft. wide, surrounded by a cloister 35 ft. wide, was begun in 1280; the details are refined, but the poverty in the design of the tracery with which the arcades were fitted in at a much later date detracts from its interest, which is now mainly concerned with the beautiful frescoes which decorate its walls.

As might have been expected, the cathedral of Pisa set the model not only for the restoration of existing churches but also for new ones, in Pisa itself and also at Lucca, Pistoia and Prato. In Pisa, the church of San Paolo a Ripa d'Arno was rebuilt about 1060, possibly by the architect of the cathedral; San Pietro-in-Vincoli and San Nicola date from the early years of the 12th century. At Lucca the churches of Santa Giulia, San Giusto, San Martino, San Michele, and the restored front of Santa Maria Fuorcivitas, are the principal examples in which the Pisan cathedral has suggested the design; and at Pistoia we can point to the cathedral, Sant' Andrea, San Pietro and San Giovanni Fuorcivitas, the latter with a south wall decorated with three stages of blind arcades of great richness. The cathedral of Lucca was either restored or rebuilt at the beginning of the 14th century, and has a distinctly Gothic effect. The lower storey of the façade presents the unusual feature of an open porch across the whole front with three great archways. This porch with the three galleries above was added to the cathedral at the beginning of the 13th century.

Southern Romanesque.—The influences exerted in the early development of the Romanesque style in the south of Italy are much more complicated than in the north, since two new elements come into the field, the Norman and Saracenic. Of early work very little remains, owing to the general rebuilding in the 11th century; what is more remarkable, there is scarcely any trace of the result of the Byzantine occupation for so many centuries; the only exception being the church of San Gregorio at Bari, a small basilican structure in which the arches of the arcades separating the nave from the aisles are stilted like those of the Fondaco-dei-Turchi at Venice.

One of the chief characteristics noticeable in the plan is the almost universal adoption of a transept projecting north and south slightly beyond the aisle walls, and in some cases raised over a crypt, as in the churches at Toscanella. Since, however, there is no choir bay, and the central apse opens direct into the transept, the plan is not that of the Latin cross. The most complete development of this arrangement is found in the cathedral and in the church of San Nicola at Bari (fig. 39); both being basilican churches with a triumphal arch opening into the transept,—in this respect similar to the churches of St Peter and St Paul at Rome, except that the transepts project only slightly, beyond the aisles. There is one peculiarity in both these churches, as also in that of the cathedral at Molfetta. East of the transept, and at the north and south sides, are towers, between which is carried a wall which hides the apse, the only indication of its existence being the round arched window which lights it. A similar arrangement exists in the cathedrals of Giovenazzo, Bitetto and Bitonto. The central bay of the transept of the cathedral at Bari is surmounted by an octagonal drum, the dome within which is carried on squinches; a similar dome was projected in San Nicola, but never built. In the cathedral at Bari, as also in San Nicola, the lofty nave is covered with a timber roof, and has an arcade on the ground storey and a fine triforium and clerestory windows above.

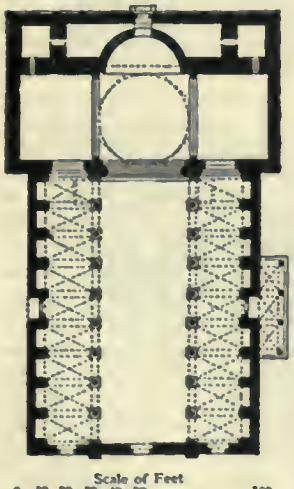


FIG. 39.—Plan of S. Nicola at Bari.

Externally these churches depend for their effect more on their fine masonry than on any decorative treatment; the blind arcades of the lower storey have very little projection, and the pilaster strips which in the Lombard churches break up the wall surface are not found here; the arched corbel table is freely employed but rarely the open gallery. There is one remarkable example in Bitonto cathedral; above the aisle chapels, and approached from the triforium, is an open gallery, the arches of which rest on widely projecting capitals sculptured with animals and foliage, half Lombardic and half Byzantine in style. The small shafts supporting these capitals are of infinite variety of design, with spirals, chevrons, fluting and vertical mouldings of many kinds.

The cathedral at Molfetta is in plan quite different from those already described, and consists of square bays with aisles, transept and apse, having domes over the nave and crossing. The Byzantine influence here comes in, but it is much more pronounced in La Cattolica at Stilo, a small church square on plan with four columns carrying the superstructure, which consists of a central and four domes on the angles. Other domed churches are those of the Immaculata at Trani; San Sabino, Canosa; and San Marco, Rossano. The lower part of the cathedral at Troja shows the direct influence of the cathedral at Pisa. The cathedral at Trani has the same plan as the churches at Bari, except that the earlier apses are not enclosed. The cathedral of Salerno retains still the fine atrium by Robert Guiscard in 1077. In the cathedrals of Acerenza, Aversa and Venosa, the French chevet was introduced towards the end of the 12th century.

In the magnificent octagonal tower which encloses the dome on the crossing in the cathedral of Caserta-Vecchia, we find the interlacing blind arcades of the Norman architecture in Sicily, as also in the cathedral at Amalfi. The porches, entrance doorways and windows being the chief decorative feature of the south Italian churches, were enriched with splendid sculptures. So were the pulpits of the cathedrals of Sessa, Ravello, Salerno and Troja, the rich mosaic inlays at Sessa, Ravello and Salerno according in design with the Cosmati work in Rome, though they possibly had an earlier origin in Sicily.

Sicilian Romanesque.—Although the earliest remains in Sicily date from the Norman occupation of the island, they are so permeated with Saracenic detail as to leave no doubt that the conqueror employed the native workmen, who for two centuries at all events had been building for the Mahommedans, and therefore, whether Arab or Greek, had been reproducing the same style as that found in Egypt or North Africa.

It is possible that, so far as the Norman palaces of the 12th century are concerned, they were based on those built under the Saracenic rule, but the requirements of a mosque and of a church are entirely different, and therefore in the earliest church existing (San Giovanni-dei-Leprosi, at Palermo, built by Robert Guiscard in A.D. 1071) we find a completely developed Christian structure, having nave, aisles and transepts, with a dome over the crossing and three apses. The next church, at Troina (1078), was similar on plan, but had three square wings at the east end instead of apses. The next two churches, La Martorana and San Cataldo (1129), at Palermo, followed the plan of the Greek church, with four columns carrying the superstructure and three domes over the nave bays carried on Saracenic squinches, similar to those in San Giovanni-dei-Leprosi. San Giovanni-degli-Eremiti (T-shaped on plan) has no aisles, but carries domes over the nave and three smaller domes on the transept. The most important feature found in all these churches is the pointed arch, of Saracenic origin imported from the East, which was employed for the nave, arcades, the crossing, and in the squinches carrying the domes. The blind arcades which decorate the walls of San Cataldo and of the Norman palaces—La Favara, the Torre della Ninfa, La Ziza and La Cuba (all in or near Palermo),—in two or three orders, and sometimes (as in the Favara palace) of great height, have all pointed arches and no impost mouldings or capitals. The distinguishing characteristic of these blind arcades (and the same is found in the open arcades) is the very slight projection of the outer order of arch.

The finest early example of Norman architecture in Sicily is the Cappella Palatina, at Palermo, consecrated in 1140, and attached to the palace. The plan consists of nave, aisles, transept and triple apse, the arches, all pointed and stilted, being carried on monolith columns of granite and marble alternately. The nave is covered over with a timber roof with stalactitic coves and coffered ceiling, richly decorated in colour and gilded, the borders of the panels bearing Arabic inscriptions in Cufic characters. Similar inscriptions exist on the upper part of the walls of the Cuba and Ziza palaces, proving that they were built by Saracenic workmen. The plans of the cathedrals of Palermo, Messina (destroyed 1908), Cefalu and Monreale are all similar, with nave and aisles separated by arcades, in which the arches are all pointed and stilted, transepts projecting north and south beyond the aisle walls, and square bays beyond, with apsidal terminations. That of Palermo has much suffered from restorations, but the cathedral of Monreale is in perfect condition. It was begun in 1176 and consecrated in 1182. The proportions of the arcade are much finer than in the Cappella Palatina, where the stilted arch was of the same height as the shaft of the columns, whereas here it is only half the height. The columns are all of granite with extremely fine capitals, some of which were taken from ancient buildings. All the roofs are in wood, with coffered ceilings richly decorated in gold and colour. The walls to a height of 22 ft. are all lined with slabs of marble with mosaic friezes, and all the surfaces of walls and arches are covered above with mosaics representing scenes from the Old and New Testaments, while in the apse at the east end a gigantic figure of Christ dominates the whole church. The same is found at Cefalu, where the mosaic decorations, however, are confined to the apses. Externally the walls are comparatively plain, the decoration being confined to the east end, where the three apses are covered with a series of blind intersecting arcades of pointed arches. This class of enrichment prevails throughout the great Sicilian churches, and extends sometimes to the smaller churches, as that of the Chiesa-dei-Vespri. Of the conventual buildings attached to the cathedral of Monreale, which occupied an immense site, there remain only the cloisters, about 140 ft. square, enclosed by an arcade with pointed arches carried on coupled columns, the shafts of which are elaborately carved and inlaid with

mosaic; the capitals are of the most varied design and of exquisite execution.

Italian Gothic.—Italy is poorer than any other country in examples of the transition from round arched to pointed arched buildings. The use of the pointed arch was accepted at last as a necessity, and cannot be said ever to have been welcomed. The first buildings in which it is seen worked out fully in detail are those of Niccola Pisano, and but few examples exist of good Gothic work earlier than his time. The elaborately arcaded and sculptured west front of Ferrara cathedral is a screen to an early building. The cathedral and other churches at Genoa are certainly exquisite works, but they appear to owe their internal design rather to the influence of (perhaps) Sicilian taste than north Italian, and the exquisite beauty of the west front owes a good deal, at any rate, to French influence, softened, refined and decorated by the extreme taste of an Italian architect. The feature which most marks all Italian Gothic is the indifference to the true use of the pointed arch. Everywhere arches were constructed which could not have stood for a day had they not been held together by iron rods. There was none of that sense of the unities of art which made a northerner so jealous to maintain the proper relations of all parts of his structure. In Niccola Pisano's works the arch mould rarely fits the capital on which it rests. The proportions of buttresses to the apparent work to be done by them are bad and clumsy. The window traceries look like bad copies of some northern tracery, only once seen in a hurry by an indifferent workman. There is no life, or development, or progress in the work. If we look at the ground-plans of Italian Gothic churches, we shall find nothing whatever to delight us. The columns are widely spaced, so as to diminish the number of vaulting bays, and to make the proportions of the oblong aisle vaulting bay very ungainly. Clustered shafts are almost unknown, the columns being plain cylinders with poorly sculptured capitals. There are no triforium galleries, and the clerestory is generally very insignificant. In short, a comparison of the best Gothic works in Italy with the most moderate French or English work would show at once how vast its inferiority must be allowed to be. Still there were beauties which ought not to be forgotten or passed over. Such were the beautiful cloisters, whose arcades are carried on delicate coupled shafts,—*e.g.* in St John Lateran and St Paul's at Rome. Such also were the porches and monuments at Verona and elsewhere; and the campaniles,—both those in Rome, divided by a number of string-courses into a number of storeys, and those of the north, where there are hardly any horizontal divisions, and the whole effort is to give an unbroken vertical effect; or that unequalled campanile, the tower of the cathedral at Florence by Giotto, where one sees in ordered proportion, accurately adjusted, line upon line, and storey upon storey, perhaps the most carefully wrought-out work in all Europe.

The Italian architects were before all others devoted to the display of colour in their works. St Mark's had led the way in this, but, throughout the peninsula, the bountiful plenty of nature in the provision of materials was seconded by the zeal of the artist. They were also distinguished for their use of brick. Just as in parts of Germany, France, Spain and England, there were large districts in which no stone could be had without the greatest labour and trouble; and here the reality and readiness which always marked the medieval workman led to his at once availing himself of the natural material, and making a feature of his brickwork.

The Gothic of Italy has, it must be admitted, no such grand works to show as more northern countries have. Allowance has to be made at every turn for some incompleteness or awkwardness of plan, design or construction. There is no attempt to emulate the beauties of the best French plans. Milan cathedral, magnificent as its scale and material make it, is clumsy and awkward both in plan and section, though its vast size makes it impressive internally. San Francesco, Assisi, is only a moderately good early German Gothic church, converted into splendour by its painted decorations. At Orvieto a splendid west front is put, without any proper adjustment, against a church whose merit is mainly that it is large and in parts beautifully coloured.

The finest Gothic interiors are of the class of which the Frari at Venice and Sant' Anastasia at Verona are examples. They are simple vaulted cruciform churches, with aisles and chapels on the east side of the transepts. But even in these the designs of the various parts in detail are poor and meagre, and only redeemed from failure by the picturesque monuments built against their walls, by the work of the painter, and by their furniture. In fine, Gothic art was never really understood in Italy, and, consequently, never reached to perfection.

Whilst the Pointed style was almost exclusively known and practised in northern Europe, the Italians were but slowly improving in their Gothic style; and the improvement was more evinced in their secular than in their ecclesiastical structures. Florence, Bologna, Vicenza, Udine, Genoa, and, above all, Venice, contain palaces and mansions of the 12th, 13th, 14th and 15th centuries, which for simplicity, utility and beauty far excel most of those in the same and other places of the three following centuries. The contemporary churches do not exhibit the same degree of improvement in style that is conspicuous in these domestic works, for there are no works in Europe more worthy of study and admiration than the Ducal Palace at Venice, and some of the older works of the same class, and even of earlier date. The town halls of Perugia, Piacenza and Siena, and many houses in these cities, and at Corneto, Amalfi, Asti, Orvieto and Lucca, the fountains of Perugia and Viterbo, and the monuments at Bologna, Verona and Arezzo, may be named as evidence of the interest which the national art affords to the architectural student even in Italy, as late as the end of the 14th century; but after this it gradually gave way to the new style, though in some instances its influence may be traced even when it had been overborne by it. (R. P. S.)

Romanesque and Gothic Architecture in France

Most generally, Romanesque art is thought of as that period of art which followed and partook of the nature of Roman art and yet was too far removed from it to be classed as Roman. The difference, however, was not merely one of decay; it is rather in positive factors that we shall find the true characteristics of the style. Its formation was parallel to the development of the Romance languages, and like them it acquired barbaric elements.

In Rome itself hardly any, if any, contributions were made to its growth, and there as late as the 12th century the early Christian form of basilican church continued to be built. It may, perhaps, best be conceived as a Germano-Roman product, for even in Spain and north Italy, which became such strong centres of the art, the Visigoths and Lombards provided the Teutonic element. Besides this change of "blood" in the style, there is another element of change in the influences obtained from the more rapidly developed art of the East. This influence indeed was so strong and constant that, having it in view, we might almost describe the Romanesque style as Germano-Byzantine.

In the 6th and 7th centuries we have, on the one hand, the almost pure traditional early Christian art of Rome and indeed of western Europe, and on the other the direct establishment of matured Byzantine art at Ravenna, Parenzo, Naples and even in Rome. Then followed the mixture of these and of barbaric elements in the formation of several pre-Romanesque varieties, one of which has been named Italo-Byzantine. It was not until the age of Charlemagne that a centre was established strong enough for the formation of a new western school which should persist. From this time a progressive style was developed which led straight forward to the Gothic, and it is this movement which is best called Romanesque. This art was a perfect ferment of striving and experiment, of gathering and even of research; Roman, Byzantine and Saxon elements entered into its composition. It is probable also, as a result of Saracenic pressure on Syria, Asia Minor, North Africa and Spain, that artists, "bringing their crafts with them," drew together from still remoter parts to gain the protection of the great ruler of the West and to help in the formation of Carolingian art. With the disintegration of the empire of Charlemagne many local schools arose in Germany, France and Lombardy, which—especially after the year 1000, when there appears to have been a renewed burst of building energy—resulted in considerable differentiation of styles. The centre of energy seems to have been now here, now there, yet with all the differences there was a general resemblance over the whole field. Until the exact date of a very large number of monuments is more perfectly established, it will be impossible to trace out exactly the intricate windings of the line of advance. In fact there are two conflicting sides to the question presented by Romanesque art. In the first place we have to consider the several schools in regard to a standard of absolute attainment, and in the second as relative to the line of persistence and to the formation of Gothic, which was so largely the culmination, and then the decay, of the forces present in Romanesque art. Some of the most beautiful and complete of the Romanesque schools contributed least, some of the most inchoate gave the most, to that which was to be.

The most important existing monument of the age of Charlemagne is the cathedral of Aix-la-Chapelle (see fig. 44), which was being built in the year 800. It has an octagonal central area, covered by a dome and surrounded with two storeys of aisles both completely vaulted. The interior surface of the dome was encrusted with mosaic. Another important work of about the same time is the church of Germigny-des-Prés near Orleans, which also is of the "central type," having a square tower above four piers surrounded

Photo, Brogi.

FIG. 68.—ST PETER'S, ROME.

Photo, Alinari

FIG. 69.—INTERIOR OF ST PETER'S, ROME.

ARCHITECTURE

Photo, Koch.

FIG. 70.—TOWN HALL, BREMEN.

Photo, Brogi.

FIG. 71.—VENDRAMINI PALACE, VENICE.

by an aisle with semicircular apses in the centre of each external wall, the apse to the east having a mosaic.

From the 9th to the 11th century the great problem worked out was that of perfecting the standard plans of large churches. In the MS. plan of the monastic church of St Gall, drawn about 820, we find a great nave with aisles, apsidal terminations both to the east and the west, transepts and probably a central tower (cf. the abbey church of Saint-Riquier near Abbeville, built *c.* 800, of which a slight representation has been preserved). In St Martin at Tours was probably evolved the most perfect type of plan, that with an ambulatory and radiating chapels surrounding the eastern apse. A magnificent church of this form was built here at the beginning of the 11th century, but not for the first time. Excavations have shown that the plan was probably suggested by a still earlier church in which five tomb-niches surrounded the central apse and tomb of St Martin. At Jumièges (begun 1040) it has recently been found that the plan terminated to the east with parallel apses, as at St Albans in England; this is a second important type. A third type is that in which the transepts as well as the east end are finished with apses, like St Mary-in-the-Capitol at Cologne.

When we come to the developed Romanesque of the end of the 11th century, we find not only several French varieties, but strong schools in Lombardy and on the Rhine. Without distinguishing too minutely, four broad types representing schools of the east and west, north and south (or rather north-east, north-west, south-east and south-west) of France, may be spoken of, and all of these were engaged in the task of completely covering with vaults large churches of basilican plan—the typical problem of this period. In the east of France we have a school represented by the monastic church of Tournus, where the nave was vaulted by a series of compartments placed transversely to the axis of the church. This church, which has a plan of the type of St Martin's at Tours, was begun in 1019, but the nave vaults were not reached until after 1066. This style of vaulting persisted in Burgundy, and from thence it spread to Fountains Abbey in England, where it is found over the aisles. The most beautiful class of buildings in eastern France is that of which the church at Issoire is the most perfect example. The external walls are here ornamented with patterns countercharged in light and dark stone. The wonderful church at Le Puy also belongs to this group, but here strong Moorish influence is to be traced. The inlays were probably derived from a late Gallo-Roman source. Countercharging of stones of two colours was a favourite method of building in Romanesque churches erected between 1100 and 1150. We find it at Vézelay, a magnificent abbey church of Burgundy, at Le Mans cathedral, and as far north-west as Exeter and Worcester. In the west (south-west) the most prominent school was that of Perigord, of which the church of St Front, Périgueux, may be taken as the example. St Front was rebuilt after a fire in 1120, but there are many earlier specimens, two of the most important being at Angoulême (1105–1128) and Fontevrault. This school applied a series of domes of eastern fashion not only at the centre but over the whole extent of the church. St Front so closely resembles St Mark's, Venice, that it must be derived from it or from some similar eastern church. The method largely influenced the Angevin school of vaulting, but it does not seem to have been effective as a protection from the weather. Some examples were covered by external roofs, as was St Front itself at a late time. St Ours at Loches, originally a small church covered by domes, had spire-like pyramids substituted for them when the church was enlarged about 1168.

The third class of vaulting we may for symmetry's sake associate with the south, though it is found widely distributed. The chapel in the Tower of London is an example, and its true centre seems to be the Auvergne. The vaults of this type run along with the axis of the space to be covered. In the case of large churches the central span is frequently supported by quadrant vaults leaning against it on either side. One of the most noble churches in which the central span is covered by such a barrel vault is that of St Savin near Poitiers, where very much has been preserved of the complete series of paintings which once adorned it and the walls beneath.

The most characteristic buildings of the south are the churches of Moissac, St Trophime at Arles, St Gilles near Nîmes and St James of Compostella, where there is much sculpture of a Lombardic type. There was a great revival of sculpture, going together with a study of the antique, in Lombardy at the end of the 11th century. Wiligelmus, who later worked at San Zeno, Verona, signed some sculptures at Modena in 1099.

Of the schools of the north, Normandy took the lead. It was adventurous, if somewhat barbaric. It derived much from Germany and gave much to the Gothic style. About the middle of the 11th century the Normans began to experiment with cross-groined vaults and their application to the church problem. This from the first contained an important possibility of future development, in that it allowed of windows of considerable height being placed in the lunettes of these vaults. Soon a very great step in advance was made by the invention or application of diagonal ribs under the intersection of the plain groined vault. This association of strengthening ribs in a cross form to each bay of the structure forms the *ogive*, the characteristic form from which the alternative name to Gothic, "ogival," has been derived. The first instance we know of the use of this system is at Durham cathedral, where the aisles of the east end were so covered about 1093, and where the high vault erected about 1104 was almost certainly of the same kind. Another outcome of the genius of Norman builders seems to have been the donjon or keep type of castle.

The word "Gothic" was applied by Italian writers of the Renaissance to buildings later than Roman, which in some cases (*e.g.* Theodoric's works at Ravenna) might be properly so named. What we now call Gothic the same writers called Modern. Later the word came to mean the art which filled the whole interval between the Roman period and the Renaissance, and then last of all, when the Byzantine and Romanesque forms of art were defined, Gothic became the art which intervened between the Romanesque era and the Renaissance.

As remarked above, Gothic architecture is to a large extent the crown of Romanesque. It is agreed that its chief element of construction was the ogival vaulting which was being widely used by Romanesque builders in the first half of the 12th century; and pointed arches appeared as early.

The eminent architect, G. E. Street, writing[1] of what we have called the standard plan of great 12th-century churches, says, "In whatever way the early *chevets* (as the French term them) grew up there is no doubt that they contain the germ of the magnificent *chevets* in the complete Gothic churches of the north of France." Architecture of the middle ages having been continuously developed, it is necessarily somewhat arbitrary to mark off any given period; all are agreed, however, that about the year 1150 there was a time of rapid change towards a slenderer and more energetic type of building, and the forms which followed for about four centuries we now call Gothic. The special character which the architecture of this period took was partially conditioned by the fact that the expanding power of the French kingdom, with its centre at Paris, was situated in a particular artistic environment. The body of ideas on which it for the most part worked was furnished by the Romanesque art of north France, the German borderland and Burgundy. A great contributory cause was the immense monastic activity of the time, and the need of accomplishing large results with limited means resulted in a casting aside of old ornamental commonplaces and in innovations of planning and structure. This was especially the case with the Cistercian order, which carried certain transitional Gothic forms of building into England, Germany, Italy and Spain. If, however, we make the transition to Gothic date from the first use of "ogival" vaults in north-west Europe, then Durham cathedral is, so far as we now know, the earliest example of the transitional style. The next step, the appearance of Gothic itself, may best be held to date from the systematic but not exclusive use of pointed arches in association with ogival vaults about the middle of the 12th century.

At this time was waged a war of domination amongst the styles, a war which resulted not necessarily in the victory of the most beautiful nor even of the strongest, but one in which political and geographical considerations had much to do with the decision. When the French kingdom took the lead in western civilization, it was settled that a northern form of art, one which had perforce to make a chief element of the window, should be followed out. The consequent development of the window is, after all, as the first observers thought, the great mark of the mature style. As to the position of France in the movement, Mr Street may again be quoted:—"When once the Gothic style was well established, the zeal with which the work of building was pursued in France was almost incredibly great. A series of churches exists there within short distances of each other, so superb in all their features that it is impossible to contest their superiority to any corresponding group of buildings. The old Domaine Royale is that in which French art is seen in its perfection. Notre Dame, Paris, is a monument second to nothing in the world; but for completeness in all its parts it would be better to cite the cathedral of Chartres, a short description of which must suffice as an explanation of what French art at its zenith was. The plan has a nave with aisles, transepts with aisles on each side, a choir with two aisles all round it, and chapels beyond them. There are two immense steeples

[1] Article "Architecture," *Ency. Brit.*, 9th ed.

at the west end, two towers to each transept and two towers at the junction of the choir with its apse. The doorways are triple at the west end, whilst to each transept is a vast triple porch in front of the three doorways. The whole of these doorways are covered with sculpture, much of it refined, spirited and interesting in the highest degree. You enter and find the interior surpassing even the exterior. The order of the columns and arches, and of all the details, is so noble and simple that no fault can be found with it. The whole is admirably executed; and, finally, every window throughout its vast interior is full of the richest glass coeval with the fabric. As compared with English churches of the same class, there are striking differences. The French architects aimed at greater height, greater size, but much less effect of length. Their roofs were so lofty that it was almost impossible for them to build steeples which should have the sort of effect that ours have. The turret on Amiens cathedral is nearly as lofty as Salisbury spire, but is only a turret; and so throughout. Few French churches afford the exquisite complete views of the exterior which English churches do; but, on the other hand, their interiors are more majestic, and man feels himself smaller and more insignificant in them than in ours. The palm must certainly be given to them above all others. There is no country richer in examples of architecture than France. The student who wishes to understand what it was possible for a country to do in the way of creating monuments of its grandeur, would find in almost every part of the country, at every turn and in great profusion, works of the rarest interest and beauty. The 19th century may be the consummation of all, but the evidences of its existence to posterity will not be one-tenth in number of those which such a reign as that of Philip Augustus has left us, whilst none of them will come up to the high standard which in his time was invariably reached."

The remarks which have been made as to the variation in style visible in various parts of the same country, apply with more force, perhaps, in what we now call France than to any other part of Europe. For the purposes of complete study it would be necessary to keep distinct from each other in the mind the following important divisions:—(1) Provence and Auvergne; (2) Aquitaine; (3) Burgundy; (4) Anjou and Poitou; (5) Brittany; (6) Normandy; (7) the Île-de-France and Picardy; (8) Champagne; and, finally, (9) the eastern border-land (neither quite German nor quite French in its character), the meeting-point of the two very different developments of French and German art. Speaking generally, it is safe to say that Gothic architecture was never brought to its highest perfection in any portion of the south of France. Aquitaine, Auvergne and Provence were too wedded to classic traditions to excel in an art which seems to have required for its perfection no sort of looking back to such a past. Hence there is no Gothic work in the south for which it is possible to feel the same admiration and enthusiasm as must be felt by every artist in presence of the great works of the north. In Anjou this is less the case; but even there the art is extremely inferior to that which is seen in Normandy and the Île-de-France. Brittany may be dismissed from consideration, as being, like Cornwall, so provincial and so cut off from neighbours, that its art could not fail to be very local, and without much influence outside its own borders.

There are examples of true Gothic outside its proper habitat, almost pure French works being found as far south as Laon and Burgos, as far east as Strassburg and Lausanne and as far north as Canterbury and Cologne. Westminister Abbey was profoundly influenced by direct study of French work. Normandy, Burgundy, and the land as far north as Tournay seem to have shared in the work of transition; but the Gothic area proper is the Île-de-France with Picardy and Champagne, then Burgundy, Normandy and England.

Four remarkable buildings best represent the early phase of the Gothic style, the abbey church of St Denis, and the cathedrals of Noyon, Senlis and Sens. The first was begun in 1137, and the choir was consecrated in 1143. The few parts of this work which remain are sufficient to show how stately and yet fresh the whole work must have been. Noyon cathedral, begun after a fire which occurred in 1131, had its choir consecrated in 1157. The cathedral of Senlis was begun in 1155. Sens cathedral, begun about the same time, or even earlier, is the first of the great cathedrals. Many other buildings belong to the first years of the style; such are the abbey churches of St Remi at Reims, Notre Dame at Châlons and St Germain-des-Prés, Paris. The choir of this last was consecrated in 1163, and in the same year Notre Dame, Paris, was begun. This mighty building, although very complete, was altered as to its effect by the substitution, early in the 13th century, of large two-light windows for the earlier lancets of the clerestory. The sculptures of the west front are exquisite. Laon cathedral, another of the great churches, is of about the same age as Notre Dame. It also has beautiful sculpture in its western porches, but its most marked characteristic is the group of six great and romantic towers which flank the fronts to the west, the north and the south. In the 13th century, the church was extended to the east and the original *chevet* was destroyed. From the evidence furnished by fine double-staged chapels to the transepts, it is most probable that three similar chapels were set about the ambulatory of the apse, the upper chapels opening from the fine vaulted triforium. Such an arrangement existed at the noble church of Valenciennes, now destroyed, but well recorded. At the end of the 12th century Chartres cathedral was begun, perhaps its most notable constructive feature being the high development that the flying buttresses have here attained. It was followed in the early years of the 13th century by Rouen cathedral, which derived much from its prototype. St Omer, a fine early church, in turn followed Rouen.

The second stage of Gothic, introducing the traceried window, was opened by the building of the cathedral of Reims, begun in 1211. This is in every way one of the most perfect of cathedrals, as well for its sculpture and glass as for its structure. Reims was followed by the still greater cathedral at Amiens (fig. 40), which was begun in 1220 at the west front, so that the superb sculpture (Plate II., fig. 64) of the porches is earlier than that of Reims. Beauvais cathedral was begun in 1247 on a still vaster scale, and with an ambition that o'erleaped itself. Auxerre cathedral, and the very beautiful collegiate churches of St Quentin and Semur, also followed Reims. Two other cathedrals of the first rank which must be mentioned are those of Bourges and Le Mans, each of these having double aisles about the apse, with a large clerestory to the inner one of the two, above which rises the great clerestory. This scheme is one of the great feats of Gothic construction. Le Mans again furnished the most highly developed form of *chevet* planning (fig. 41). On this point Mr Street may again be cited. "It was in the planning of the apse, with its surrounding aisles and chapels, that all their ingenuity and science were displayed. A simple apse is easy enough of construction, but directly it is surrounded by an aisle or aisles, with chapels again beyond them, the difficulties are great. The bays of the circular aisle, instead of being square, are very much wider on one side than the other, and it is most difficult to fit the vaulting to the unequal space. In order to get over this, various plans were tried. At Notre Dame, Paris, the vaulting bays were all triangular on plan, so that the points of support might be twice as many on the outside line of the circle as on the inside. But this was rather an unsightly contrivance, and was not often repeated, though at Bourges there is something of the same sort. At Le Mans the aisle vaulting bays are alternately triangular and square; and this is, perhaps, the best arrangement of all, as the latter are true and square, and none of the lines of the vault are twisted or distorted in the slightest degree. The arrangement of the chapels round the apse was equally varied. Usually they are too crowded in effect; and, perhaps, the most beautiful plan is that of Rouen cathedral, where there are only three chapels with unoccupied bays between, affording much greater relief and variety of lighting than the commoner plan which provided a chapel to every bay. The planning and design of the *chevet* is the great glory of the French medieval school. When the same thing was attempted, as at Westminster, or by the Germans at Cologne, it was evidently a copy, and usually an inferior copy, of French work. No English works led up to Westminster Abbey, and no German works to the cathedral at Cologne."

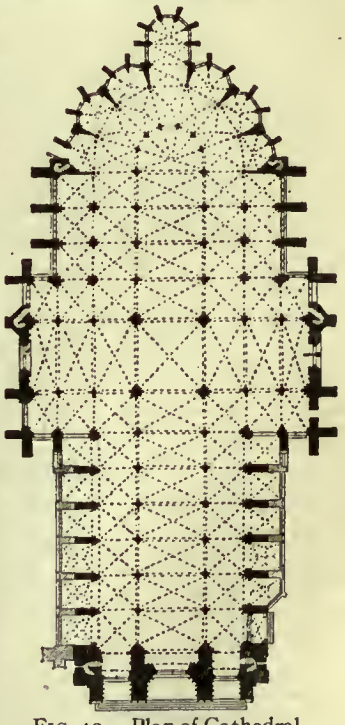


FIG. 40.—Plan of Cathedral at Amiens.

The variety in the planning of the *chevets* must be remarked. There might be only one chapel opening from the semicircular ambulatory, as at Langres, Sens, Auxerre, Bayeux and Lausanne. Canterbury cathedral, designed by William of Sens, is perhaps the most perfect example. There were three separated chapels, as at Rouen, St Omer, Semur, &c., or there might be five filling the whole space, which became the general later scheme. Chartres furnishes an intermediate plan, in having the alternate chapels much shallower than the others. The chapels might be circular or polygonal or alternately square and round. Of the last the cathedral of Toledo is a wonderful example. The plan with parallel apses also continued in use, as at the beautiful abbey church at Dijon and St Urbain at Troyes. Apsidal transepts were built at Noyon, Soissons and Valenciennes.

Another stage of development was reached with the building of the Sainte Chapelle in Paris, begun in 1244. With this work the Gothic system reached complete maturity. Here for the first time large traceried windows seem to have been perfected, and, moreover, the structure was so organized into a series of wide window spaces, only divided by strong far-projecting buttress piers, that the stained glass ideal found full expression and the building became a lantern for its display.

During the next half-century the influence of the Sainte Chapelle is to be traced everywhere, and its system of construction was developed to the furthest possible point in St Urbain at Troyes, begun in 1260. Exploration of the Gothic theory of structure could be carried no further. From this point the style turned in on

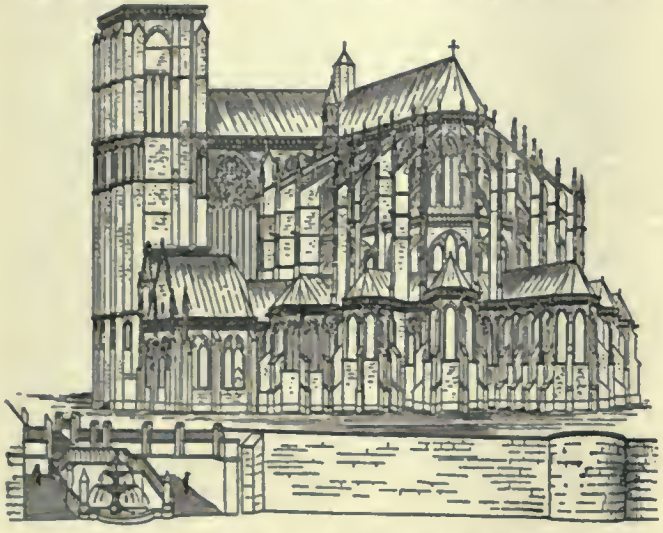


FIG. 41.—Cathedral of Le Mans. East end and Chevet.

itself, becoming more unreasonably intricate, artificial and mannerized. One of the finest examples of the style of the early 14th century is the eastern limb of St Ouen, Rouen; Troyes cathedral is also an important example of later work. As Mr Street says: "Later French architecture ran a very similar course to that in England. The 13th century was that in which it was seen at its best. In the 14th the same sort of change took place as elsewhere; and art was beautiful, but it was too much an evidence of skilfulness and adroitness. It was harder and colder also than English work of the same age; and when it fell, it did so before the inroads of a taste for what has been called Flamboyant architecture,—a gay and meretricious style which trusted to ornament for all its effect, and, in spite of many beauties, had none of the sturdy magnificence of much of our English Perpendicular style."

M. Enlart has recently accepted the view that the germs of flamboyancy in the later French Gothic are to be found in the flowing curvilinear forms of early 14th-century work in England.

Up to the middle of the 16th century, magnificent works in the national style were still being executed. St Vulfran at Abbeville, St Maclou in Rouen, and the façade of the cathedral of Rouen, may be mentioned; some of the last works were the immense transepts of Beauvais cathedral and the façade of Tours.

We have necessarily spoken most of churches, but the palaces, castles and civic buildings form another great class hardly less interesting. The castles of Coucy and Château Gaillard may rival any cathedral. Among civic buildings may be mentioned the palais de justice at Rouen and the hôtel de ville at Compiègne, both late but beautiful and impressive types. The royal palace of Paris is now represented by the Sainte Chapelle, but accounts of its splendid hall and general arrangements have been preserved. At Poitiers is still extant the hall of the palace of the counts of Poitou; at Laon the episcopal palace is almost entire; there are considerable remains of the bishops' palaces of Beauvais, Evreux, Rouen, Reims: and the pope's palace at Avignon must also be mentioned in this connexion. The most perfect existing great houses of the middle ages are those of Jacques Cœur at Bourges and of the abbot of Cluny in Paris. A large number of fine houses on a small scale, dating from the 12th and 13th centuries, are still preserved at Beauvais, Auxerre, Chartres, Cordes, &c. The house of the musicians at Reims, *c.* 1280, is adorned by a series of seated life-sized figures playing instruments, in sculpture of a very high order. A good and concise account of the smaller houses in France is given in Hudson Turner's *Some Account of Domestic Architecture*, and in C. Enlart's *Manuel d'archéologie*, the best and most recent survey of the whole field of medieval antiquities in France. (W. R. L.)

ROMANESQUE AND GOTHIC ARCHITECTURE IN SPAIN

What strikes the architectural student most forcibly in Spain is the concurrent existence of two schools of art during the best part of the middle ages. The Moors invaded Spain in 711, and were not finally expelled from Granada until 1492. During the whole of this period they were engaged, with more or less success, in contests for superiority with the Christian natives. In those portions of the country which they held longest, and with the firmest hand, they enforced their own customs and taste in art almost to the exclusion of all other work. Where their rule was not permanent their artistic influence was still felt, and even beyond what were ever the boundaries of their dominion, there are still to be seen in Gothic buildings some traces of acquaintance with Arabic art not seen elsewhere in Europe, with the exception, perhaps, of the southern part of the Italian peninsula, and there differing much in its development. The mosque of Cordova in the 9th century, the Alcazar and Giralda at Seville in the 13th, the Court of Lions in the Alhambra in the 14th, several houses in Toledo in the 15th century, are examples of what the Moors were building during the period of the middle ages in which the best Gothic buildings were being erected. Some portions of Spain were never conquered by the Moors. These were the greater part of Aragon, Navarre, Asturias, Biscay and the northern portion of Galicia. Toledo was retaken by the Christians in 1085, Tarragona in 1089, Saragossa in 1118, Lerida in 1149, Valencia in 1238 and Seville in 1248. In the districts occupied by the Moors Gothic architecture had no natural growth, whilst even in those which were not held by them the arts of war were of necessity so much more thought of than those of peace, that the services of foreign architects were made use of to an extent unequalled in any other part of Europe.

Of early Christian buildings erected from the 9th to the 11th century remains of some twenty to thirty are known, and there are probably others which will be found when the communications in the country become more extended. The most interesting of these is Santa Maria de Naranco near Oviedo, originally built in 848 as part of a palace. It consisted of a rectangular hall, 42 ft. long and 16 ft. wide, with entrance doorways in the centre of each side, and at each end an arcade of three arches, carried on piers and coupled columns, which led to an open loggia from which the hall was lighted. Fifty to sixty years later it was converted into a church by blocking up the end of the east loggia. The church is remarkable for its barrel vault, built in fine masonry, and for the knowledge that is displayed in meeting its thrust. Internally, in order to lessen the span, the upper part of the walls is brought forward and carried on a series of arches on each side, which are supported on piers consisting of four coupled columns, virtually constituting an interior abutment. Externally, the thrust is met by buttresses, features not found in France until about a century and a half later. All the columns are spiral-fluted, and a twisted-cord torus-moulding decorates the capitals and other features in the church. The transverse ribs of the hall, which are of slight projection, are carried on broad bands with disks in the spandrils of the arches, the disks having badges in the centre, and being bordered, as well as the bands, with twisted cords. Underneath the church is a spacious vaulted crypt, which was built as a cellar or basement storey, to raise and give more importance to the palace. The twisted cord seems to have been a favourite device in all the early churches, and is extensively employed in the decoration of San Miguel de Lino, a small church about a quarter of a mile from Santa Maria de Naranco and coeval with that church. Externally the church of San Miguel has all the character of a Byzantine church; the windows in the front are pierced with Moorish tracery, probably brought there by those Christians who were flying to the sanctuaries of Asturias from the incursions of the Moors. In another church, about 15 m. south of Oviedo, Santa Christina de Leon, all the attached staffs are decorated with spiral fluting. The choir is raised, and approached by steps on either side through a screen of three arches, of the type known as Transennae in the earlier Christian of Rome. Here, as

in Santa Maria de Naranco, the church is covered with a barrel vault with similar constructive and decorative features. Externally the buttresses are in great profusion, there being two to each bay. The screen, the pierced marble slabs between the columns carrying it, and the decoration of the capitals, all show Byzantine influence. Other early churches are those of San Pablo del Campo (930) and San Pedro de las Puellas, both in Barcelona, the fine church at the village of Priesca near Villaviciosa (915), the monastery of Valdedios (893) and that of San Salvador (1218), in which, notwithstanding its late date, there is a distinct Moorish influence. This influence is also to be noticed in the north of Spain, although it was never occupied by the Moors. Thus in the earliest church known, at Baños de Cerrato near Palencia (founded in 662, but restored in 711), there is a horse-shoe barrel vault over the square apse. Again in San Miguel de Escalada (913) near Leon, there are horse-shoe arches in the nave, and the three apses are horse-shoe on plan. San Pedro at Zamora is a vaulted church with horse-shoe arches in the nave, but otherwise Byzantine in style. In the church of Corpus Christi at Segovia the nave is Moorish in style, and the octagonal columns of the nave have capitals with fir cones, as in the well-known Santa Maria la Blanca at Toledo, originally a synagogue. The most remarkable church of all, so far as Moorish style is concerned, is the church of the monastery of Santiago de Peñalva, near Villafranca del Vierzo, built between 931 and 951, and therefore coeval with Cordova. The church is 40 ft. long by 20 ft. wide, covered by a barrel vault with transverse horse-shoe arch in the centre carrying the same. At each end is an apse with horse-shoe arches carried on marble shafts with Byzantine capitals. Though of later date, there is another interesting Romanesque example in the Templars' church of La Vera Cruz at Segovia (1204), which is twelve-sided with three apses, and in the centre has a chapel built in imitation of the Holy Sepulchre at Jerusalem.

The buildings which come next in point of date are all evidently derived from or erected by the architects of those which were at the time being built in the south of France. These churches are uniform in plan, with central lanterns and three eastern apses. The nave has usually a waggon or barrel vault, supported by quadrant vaults in the aisles, and the steeples are frequently polygonal in plan. If these churches are compared with examples like that of the cathedral at Carcassonne on the other side of the Pyrenees, their identity in style will at once be seen. A still more remarkable evidence of similarity has been pointed out between the church of St Sernin, Toulouse, and the cathedral of Santiago. The plan, proportions and general design of the two churches are identical. Here we see a noble ground-plan, consisting of nave with aisles, transepts, central lantern and *chevet*, consisting of an apsidal choir, with a surrounding aisle and chapels opening into it at intervals. This example is the more remarkable, inasmuch as the early Spanish architects very rarely built a regular *chevet*, and almost always preferred the simpler plan of apsidal chapels on either side of the choir. And its magnificent scale and perfect preservation to the present day combine to make it one of the most interesting architectural relics in the country.

Among the more remarkable buildings of the 12th and the beginning of the 13th century are San Isidoro, Leon; San Vicente, Avila; several churches in Segovia; and the old cathedral at Lerida. They are much more uniform in character than are the churches of the same period in the various provinces of France, and the developments in style, where they are seen at all, seldom have much appearance of being natural local developments. This, indeed, is the most marked feature of Spanish architecture in all periods of its history. In such a country it might have been expected that many interesting local developments would have been seen; but of these there are but one or two that deserve notice. One of them is illustrated admirably in the church of San Millan, Segovia, where beyond the aisles of the nave are open cloisters or aisles arcaded on the outside, and opening by doors into the aisles of the nave. A similar external south portico exists in San Miguel de Escalada, already referred to, Santo Domingo, Burgos, and San Estéban at Segovia. It would be difficult to devise a more charming arrangement for buildings in a hot country, whilst at the same time the architectural effect is in the highest degree beautiful. The universality of the central tower and lantern has been already mentioned. This was often polygonal, and its use led to the erection of some lanterns or domes of almost unique beauty and interest. The old cathedral at Salamanca, the church at Toro and the cathedral of Zamora, all deserve most careful study on this score. Their lanterns are almost too lofty in proportion to be properly called domes, and yet their treatment inside and outside suggests a very beautiful form of raised dome. They are carried on pointed arches, and are circular in plan internally and octagonal on the exterior, the angles of the octagon being filled with large turrets, which add much to the beauty of the design, and greatly also to its strength. Between the supporting arches and the vault there are, at Salamanca, two tiers of arcades continued all round the lantern, the lower one pierced with four, and the upper with twelve lights, and the vault or dome is decorated with ribs radiating from the centre. On the exterior the effect is rather that of a low steeple covered with a stone roof with spherical sides than of a dome, but the design is so novel and so suggestive, that it is well worth detailed description. Nothing can be more happy than the way in which the light is admitted, whilst it is also to be noted that the whole work is of stone, and that there is nothing in the design but what is essentially permanent and monumental in construction. The only other Spanish development is the introduction, to a very moderate extent, of features derived from the practice of the Moorish architects. This is, however, much less seen than might have been expected, and is usually confined to some small feature of detail, such, *e.g.* as the carving of a boss, or the filling in of small tracery in circular windows, where it would in no way clash with the generally Christian character of the art.

The debateable period of transition which is usually so interesting is very sterile in Spain. A good model once adopted from the French was adhered to with but little modification, and it was not till the 13th-century style was well established in France and England that any introduction of its features is seen here; and then, again, it is the work of foreign architects imported for the work and occasion, bringing with them a fully developed style to which nothing whatever in Spain itself led up by a natural or evident development. The three great Spanish churches of this period are the cathedrals of Toledo, Leon and Burgos (Plate II., fig. 65). Those of Siguënza, Lerida and Tarragona, fine as they are, illustrate the art of the 12th rather than of the 13th century, but these three great churches are perfect Early Pointed works, and most complete in all their parts. The cathedral of Toledo is one of the most nobly designed churches in Europe. In dimensions it is surpassed only by the cathedrals of Milan and Seville, whilst in beauty of plan it leaves both those great churches far behind. The *chevet*, in which two broad aisles are carried round the apse with chapels alternately square and apsidal opening out of them, is perhaps the most perfect of all the schemes we know. It is as if the French *chevets*, all of which were more or less tentative in their plan, had culminated in this grand work to which they had led the way. The architectural detail of this great church is generally on a par with the beauty and grandeur of its plan, but is perhaps surpassed by the somewhat later church at Leon. Here we have a church built by architects whose sole idea was the erection of a building with as few and small points of support as possible, and with the largest possible amount of window opening. It was the work of men whose art had been formed in a country where as much sun and light as possible were necessary, and is quite unsuited for such a country as Spain. Nevertheless it is a building of rare beauty and delicacy of design. Burgos, better known than either of the others, is inferior in scale and interest, and its character has been much altered by added works more or less Rococo in character, so that it is only by analysis and investigation that the 13th-century church is still seen under and behind the more modern excrescences.

The next period is again marked by work which seems to be that of foreigners. The fully developed Middle Pointed or Geometrical Gothic is indeed very uniform all over Europe. Here, however, its efforts were neither grand in scale nor interesting. Some of the church furniture, as, *e.g.* the choir screens at Toledo, and some of the cloisters, are among the best features. The work is all correct, tame and academical, and has none of the dignity, power and interest which marked the earlier Spanish buildings. Towards the end of the 14th century the work of Spanish architects becomes infinitely more interesting. The country was free from trouble with the Moors; it was rich and prosperous, and certainly its buildings at this period were so numerous, so grand and so original, that they cannot be too much praised. Moreover, they were carefully designed to suit the requirements of the climate, and also with a sole view to the accommodation conveniently of enormous congregations, all within sight of the preacher or the altar. This last development seems to have been very much the work of a great architect of Majorca, Jayme Fabre by name. The grandest works of his school are still to be seen in Catalonia. Their churches are so vast in their dimensions that the largest French and English buildings seem to be small by comparison, and being invariably covered with stone vaults, they cannot be compared to the great wooden-roofed churches of the preaching orders in Italy and elsewhere, in which the only approach is made to their magnificent dimensions. The cathedral of Gerona is the most remarkable example. Here the choir is planned like the French *chevet* with an aisle and chapels round it, and opens with three lofty arches into the east wall of a nave which measures no less than 73 ft. in the clear, and is covered with a stone vaulted ceiling. In Barcelona there are several churches of very similar description; at Manresa another, but with aisles to its nave; and at Palma in Majorca one of the same plan as the last, but of even much larger dimensions. Perhaps there is no effort of any local school of architects more worthy of study and respect than this Catalonian work of the 14th and 15th centuries. Such a happy combination of noble design and proportions with entirely practical objects places its author among the very greatest architects of any time. It is one thing to develop patiently step by step from the work of one's fathers in art, quite another to strike out an entirely new form by a new combination of the old elements. In comparison with the works just mentioned the other great Spanish churches of the 15th century are uninteresting. But still their scale is grand and though their detail is over-elaborated and not beautiful, it is impossible to deny the superb effect of the interior of such churches as those of Seville, Segovia and Salamanca (new cathedral). They

Photo, Alinari.

FIG. 72.—DOOR OF SAN MICHELE, PAVIA.

Photo, Lacoste.

FIG. 73.—UNIVERSITY, SALAMANCA.

Photo, Lacoste.

FIG. 74.—TOWN HALL, SEVILLE.

ARCHITECTURE

Photo, F. Frith & Co.

FIG. 75.—BANQUETING HOUSE, WHITEHALL.

Photo, F. Frith & Co.

FIG. 76.—WOLLATON HALL.

Photo, Stuart.

FIG. 77.—HAMPTON COURT

are very similar in their character, their columns are formed by the prolongation of the reedy mouldings of the arches, their window traceries are poorly designed, and their roofs are covered with a complex multitude of lierne ribs. Yet the scale is fine, the admission of light, generally high up and in sparing quantity, is artistic, and much of the furniture is either picturesque or interesting. The *tout ensemble* is generally very striking, even where the architectural purist is apt to grumble at the shortcomings of most of the detail.

The remarks which have been made so far have been confined to the fabrics of the churches of Spain. It would be easy to add largely to them by reference to the furniture which still so often adorns them, unaltered even if uncared for; to the monuments of the mighty dead; to the sculpture which frequently adorns the doorways and screens; and to the cloisters, chapter-houses and other dependent buildings, which add so much charm in every way to them. Besides this, there are very numerous castles, often planned on the grandest scale, and some, if not very many, interesting remains of domestic houses and palaces; and most of these, being to some extent flavoured by the neighbourhood of Moorish architects, have more character of their own than has been accorded to the churches. Finally, there are considerable tracts of country in which brick was the only material used; and it is curious that this is almost always more or less Moorish in the character of its detail. The Moors were great brickmakers. Their elaborate reticulated enrichments were easily executed in it, and the example set by them was, of course, more likely to be followed by Spaniards than that of the nearest French brick building district in the region of Toulouse. The brick towers are often very picturesque; several are to be seen at Toledo, others at Saragossa, and, perhaps the most graceful of all, in the old city of Tarazona in Aragon, where the proportions are extremely lofty, the face of the walls everywhere adorned with sunk panels, arcading, or ornamental brickwork, and at the base there is a bold battered slope which gives a great air of strength and stability to the whole. On the whole, it must be concluded that the medieval architecture of Spain from the 12th century is of less interest than that of most other countries, because its development was hardly ever a national one. The architects were imported at one time from France, at another from the Low Countries, and they brought with them all their own local fashions, and carried them into execution in the strictest manner; and it was not till the end of the 14th century, and even then only in Catalonia, that any buildings which could be called really Spanish in their character were erected. (R. P. S.)

Romanesque and Gothic Architecture in England

Pre-Conquest.—The history of English architecture before the Norman Conquest is still only imperfectly known. Its parentage is triple: Roman, Celtic and Teutonic. To the first belongs the general building tradition of the Romanized West, and the influence of the mission of Augustine at the end of the 6th century, and of such men as Wilfrid in the 7th. The Celtic element is due to the Scottish (Irish) church, which never gained much hold on the south of England, while the Teutonic influence shows itself in the later developments, which are allied to the early buildings of kindred peoples in Germany. Fragments of existing early churches have been attributed to the time of the Roman occupation, but all are doubtful, with the exception of the remains of what is believed to have been a Christian church excavated at Silchester in 1892. This was a basilica of ordinary form, comprising an apse with western orientation, nave and aisles, transepts of slight projection, and narthex. Augustine's cathedral church of Canterbury, which he had learned was originally constructed by the labours of Roman believers (Bede), was also a basilica with western apse; its eastern apse and *confessio* beneath were probably a later addition. Remains of early churches are found on several sites where churches are recorded to have been built during the missionary period. Of these, Reculver (*c.* 670) and Brixworth (*c.* 680) have aisled naves and eastern apses. At Brixworth a square bay intervenes between the apse and the nave. St Pancras, Canterbury, of the time of Augustine, Rochester (604), and Lyminge (founded 633), show unaisled naves of relatively wide proportion, with eastern apses of stilted curve. In some of these churches there was a triple arcade in front of the sanctuary, in place of the usual "triumphal arch." The technique shows Roman influence, and Roman materials are largely used. The existing crypts of Hexham and Ripon were built by Wilfrid, *c.* 675. The description of Wilfrid's church at Hexham gives the impression of an elaborate structure (*columnis variis et porticibus multis suffultam*). Wilfrid also built at Hexham a church of central plan, with projections (*porticus*) on the four sides, a type of which no example has survived in England. Escomb (Durham) and parts of Monkwearmouth and Jarrow, which are attributed to the same period, have plans of an entirely different type—a relatively long and narrow nave, with small square-ended chancel—a plan, usually attributed to Celtic influence, which is most extensively represented in churches recognized as Saxon.

The evolution of the characteristic features of pre-Conquest architecture was slow, and was doubtless greatly hindered by the invasions of the Northmen from the end of the 8th century onward, but germs of the fully developed style are to be found in the earliest buildings. The western tower, usually of tall and slender proportion, was developed from the western porch found at St Pancras, Canterbury, and Monkwearmouth; sometimes, as in the latter church, actually raised over the older porch. The lateral chapels of St Pancras, which existed also in the Saxon cathedral of Canterbury, were developed into a transept, culminating in the cruciform plan with central tower. The characteristic "long-and-short" work, which consists of tall upright stones alternating with stones bedded flat bonding into the rubble work of the wall, has its prototype in the western arch of the porch of Monkwearmouth, and in the jambs of the chancel arch at Escomb. Sometimes the flat stones are cut back on the face, so that the plaster which covered the rubble extended up to the line of the upright stones, thus giving the quoin the appearance of a narrow pilaster. The repetition of these pilasters on the face of the walling constitutes rib-work, and these ribs are frequently connected by semicircular or so-called "triangular" arches, forming a kind of rude arcading (Earls Barton, Barton-on-Humber.) Windows in the earliest Saxon work are generally wide in proportion, and splayed on the inside only; in the later work they commonly have splays both on the inside and outside. Doorways have square jambs, without splay or rebate; sometimes the jambs of doorways and windows are inclined, as in early buildings in Ireland. Imposts to doorways, tower arches or chancel arches are often square projecting blocks, sometimes chamfered on the lower edge. The mid-wall shaft is a characteristic feature in the belfry openings of Saxon towers; it supports an impost or through-stone, of the full thickness of the wall, which receives the semicircular arches over the openings. The method is analogous to that commonly found in northern Italy and the Rhineland. Sometimes the mid-wall shaft is a baluster, turned in a lathe. In some of the later belfry openings, a capital intervenes between the mid-wall shaft and the impost. The dating of buildings of this style is at present a matter of considerable difficulty, but certain points, such as the development of the cruciform plan, are useful for comparison. A fully developed cross church was built at Romsey in 969, having also a single axial western tower, and this seems to have been the normal type of a large church in the later years of the style. Cruciform plans, not yet fully developed, are found at Deerhurst, Breamore and St Mary in the castle at Dover, and fully developed at Norton (Durham) and Stow (Lincolnshire). The most advanced detail which occurs in pre-Conquest buildings is the recessing of arches in orders. But for the Conquest, English architecture might have developed somewhat on the lines of contemporary work in Germany. It must be remembered, however, that, although the Norman Conquest marks the beginning of a new epoch in English architecture, the Norman manner had already been introduced into England under Edward the Confessor, as is proved by the considerable remains of that king's work at Westminster Abbey.

The succeeding periods of English architecture have been divided into so-called "styles" or "periods," though it should be recognized that all such hard and fast divisions are purely artificial, and that, apart from the objection that they exaggerate the importance of mere details, they tend to obscure the fact that the history of Gothic architecture is a history of continuous development. The following classifications, those of Thomas Rickman and Edmund Sharpe, are in most general use for the present by such students as are not content with a nomenclature based on simple chronology:—

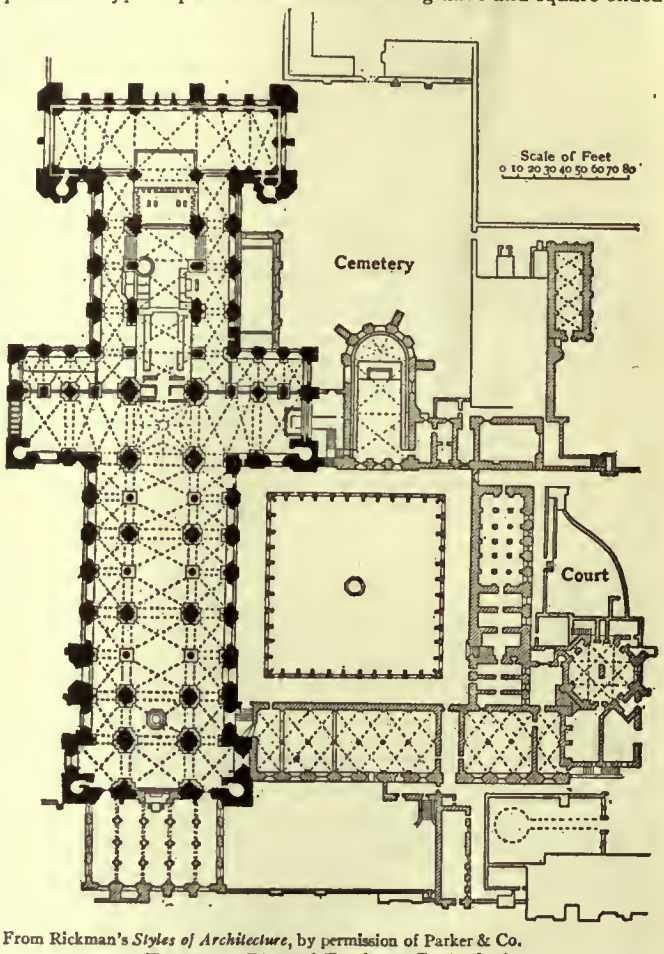
Rickman.		Sharpe.	
1066–1189	Norman.	1066–1145	Norman.
		1145–1190	Transitional.
1189–1307	Early English.	1190–1245	Lancet.
		1245–1315	Geometrical.
1307–1377	Decorated.	1315–1360	Curvilinear.
1377–1546	Perpendicular.	1360–1550	Rectilinear.

Norman Conquest to c. 1150.—At the time of the Conquest of England, the Norman school was already one of the most advanced Romanesque schools of western Europe. Its marked individuality and logical character are clearly expressed in the abbey churches of Jumièges and St Étienne and Sainte-Trinité at Caen, and it quickly supplanted the less advanced Romanesque

manner of the conquered English. As soon as the conqueror had made himself master in his new kingdom, cathedral and abbey churches were rebuilt on a scale hitherto unknown either in Normandy or England. As the effect of the Norman Conquest was to incorporate the church in England more closely with western Christendom, so its effect on architecture was to bring it into line with the best continental achievement of its time. The immense energy of the Norman bishops and abbots gave such a stimulus to architecture that by the close of the 11th century, England, rather than Normandy, had become the real *foyer* of the Norman school.

The plans of the larger churches show greater development in the length of choir, transept and nave than was usual in Normandy. Many follow the type of choir plan generally represented in the contemporary churches of Normandy which have survived—a central apse, flanked by an apse terminating each aisle, but the two bays usual in the Norman churches frequently became four in England. The Confessor's church of Westminster seems to have had an ambulatory with radiating chapels, a plan which, although rare in the surviving churches of Normandy, was adopted in several of the more important English churches (St Augustine's, Canterbury; Winchester; Worcester; Gloucester; Bury St Edmunds; Norwich; Tewkesbury). Some of these have great vaulted crypts extending under the choir and its aisles. The transept, generally of considerable length, has one or more apsidal chapels on the east side of each arm, or an eastern aisle, or even (as at Winchester and Ely) both eastern and western aisles. The lantern-tower over the crossing was a characteristic feature in England, as in Normandy. Frequently the nave was of great length, extending to twelve bays at Winchester, thirteen at Ely, and fourteen at Norwich. Some churches, as Ely, Bury St Edmunds, and later Peterborough (Plate VIII., fig. 81), show a western transept, with corresponding development of the west front. Two western towers are most usual, but Ely (Plate II., fig. 67), and originally Winchester, had the single western tower, a survival from pre-Conquest times, which is found also in numberless parish churches. In their general design, the Norman churches show great skill in composition, and in the logical expression of structure, and sure grasp of the problems to be solved. The subordination of arches (arches built in rings, or orders, recessed one within the other) was carried further than in other Romanesque schools, and with this went the subordination of the pier, planned with a shaft to receive each order of the semicircular arch. Sometimes the shafted piers of the great arcades alternate with cylindrical (or later with octagonal) pillars; sometimes, as at Gloucester and Tewkesbury, all the pillars are cylindrical. The triforium usually has a single wide semicircular arched opening, enclosing two or more minor semicircular arches springing from detached shafts. Usually the aisle wall is carried up to form a complete triforium storey, unvaulted, and lighted by windows in the outer wall. The clerestory has a single window in each bay, with a wall passage between the window and an internal arcade, usually of three semicircular arches on shafts, the central arch being wider than the side arches. Most frequently naves and transepts were unvaulted, and finished with wood ceilings, while the aisles were covered with groined vaults of rubble, on transverse arches. The general design of the greater churches indicates, however, that the Norman builders were aiming at a completely vaulted structure. The half-barrel vault over the triforium of Gloucester, and the transverse arches over the triforium of Chichester, seem to be constructed to afford the necessary abutment to vaults over the choir, such indeed as still exist over some choirs in Normandy built before the end of the 11th century. The problem was only successfully solved by the introduction of the diagonal rib, which completed the structural membering of the vault. Durham, begun in 1093 (fig. 42), is the earliest example in England of this important innovation, and it precedes by some quarter of a century the earliest ribbed vaults of the Île-de-France. The abutting arches under the roof of its triforium are actually rudimentary flying-buttresses, and we have here all the essential elements of Gothic architecture, except the pointed arch, which is only systematically used in English vaulted construction from about the middle of the 12th century. The decorative forms of the earlier buildings of the Norman school are severely simple. Arches, which at first were usually unmoulded, soon received effective mouldings of rolls and hollows, continuing a tradition of the latest pre-Conquest architecture. Two types of capitals are found in the earlier buildings after the Conquest; the volute capital, descended from the Corinthian, which was the normal type in Normandy; and the cubic or cushion capital, formed by the penetration of a segment of a sphere, or segments of cones, with a cube, a type which, appearing earlier in England than in Normandy, was doubtless derived from pre-Conquest models, and in the 12th century developed into the scalloped capital. The decoration of wall-surfaces by arcades, frequently of intersecting semicircular arches, is characteristic of the Norman school. Windows are splayed in the interior, and in the more important buildings are enriched with shafts and moulded arches. Ornamentation is frequently concentrated on the doorways, which are often of many orders, with a shaft under each order. Based chiefly on geometric forms, such as the chevron or zigzag, star, fret and cable, the decoration becomes richer and more refined as the 12th century advances, though in sculpture the Norman was less advanced than some other Romanesque schools.

The foregoing generalization applies more particularly to the greater churches, but numberless parish churches present similar characteristics. Chancels are sometimes apsidal, but by far the most prevalent type of plan is the aisleless oblong nave and square-ended



From Rickman's *Styles of Architecture*, by permission of Parker & Co.

FIG. 42.—Plan of Durham Cathedral.

chancel, with or without a western tower. Other types of aisleless plans are the cruciform church with central tower, or simply nave and chancel with central tower. Even where subsequent alterations and rebuildings have destroyed almost everything, the influence of these plans on the later work is the key to a right understanding of the history of the greater number of English medieval churches.

12th Century (second half).—The second half of the 12th century is the period of transition *par excellence*—of transition from Romanesque to Gothic. The school of the Île-de-France, which up to *c.* 1120 was one of the most backward of the Romanesque schools, had made enormous progress when the ambulatory of Suger's church of Saint-Denis was built (1140–1144), and thenceforth it continued to lead the way. There is no doubt that, from the middle of the 12th century, English architecture was continuously influenced by the Île-de-France, for the most part through Normandy, but it must be considered to be a development on parallel lines, with strongly marked characteristics of its own, and not merely as an importation of forms already developed elsewhere. At the same time, the influence of the Cistercian revival was considerable, not so much in the introduction of foreign forms as in the direction of simplicity and severity, which acted as a valuable check to the prevalent tendency to exaggerate the importance of surface decoration.

The substitution of the square east-end for the apse in the plans of the greater churches, already effected at Romsey, was furthered by the simple plans of the Cistercian churches. The altar spaces provided by the radiating chapels of the French chevet were in England obtained by returning the aisles across the square east-end of the choir, or by an eastern transept. The latter occurs first here in

"the glorious choir of Conrad" of the beginning of the 12th century at Canterbury, which affords also the first example of the eastward extension of the choir, which became so characteristic a feature of English planning. The reconstruction of Conrad's choir after the fire of 1174 led to a further extension eastward, with the eastern chapel, which was adopted in many of the greater churches, either in the form of a lower building, sometimes of three spans, eastward of the east gable, or of an extension of the choir itself to its full height. The work of William of Sens at Canterbury (1175–1178) was naturally more French in character than other contemporary works in England, but the work of his successor, William the Englishman (1179–1184), shows the beginnings of what became the characteristically English manner of the 13th century.

The second half of the 12th century was a period of rapid development of architectural forms in the direction of increased elegance and refinement. The pointed arch, employed at first for the arches of construction, entirely superseded the semicircular arch in doorways, windows and arcades by the end of the century, and its adoption finally solved the problem of vaulted construction. The abutting arches under the triforium roofs of the earlier churches were developed into flying buttresses above the roofs, springing from buttresses of increased projection, and weighted by pinnacles. Mouldings became more graceful and subtle in their profiles. Capitals reverted to the volute type, transformed and refined. The massive Romanesque pier was gradually developed into the lighter Gothic pier, in which detached shafts were extensively adopted. The use of Purbeck marble for these shafts must be considered in relation to the painted decoration of the wall-surfaces, which, although now almost entirely lost, was an important factor in the internal effect.

13th Century (first half).—The last decade of the 12th century marks the achievement of a fully developed Gothic style, with strongly marked national individuality. During the 13th century, English Gothic follows the same general course of evolution as that of northern France, but the parallelism is less close than in the preceding century.

St Hugh's choir at Lincoln (begun 1192) had indeed an apse, with ambulatory and radiating chapels, though its plan does not appear to have been controlled by the vaulting as in the French chevets, and what there is of French influence seems to have come rather through Canterbury than by a more direct route. This choir has the eastern transept which characterizes several of the greater churches of the first half of the 13th century—Salisbury (fig. 43), Beverley, Worcester, Rochester, Southwell. The square eastern termination, the less ambitious height, and the comparatively simple buttress-system, combine to give the English Gothic cathedral an air of greater repose than is found in the magnificent triumphs of French Gothic art. In its structural system, too, English Gothic retained something of the Romanesque treatment of wall-surface; the suppression of the wall, and the concentration of the masonry in the pier, was never carried so far as in the complete Gothic of France. The general tendency during the 13th century, as in the 12th, was in the direction of increased lightness and elegance. The employment of detached shafts, and the extensive use of marble (generally Purbeck) for these shafts, is a distinguishing feature of the first half of the century. The vaulting system is fully developed; the most usual form is the simple quadripartite, but the tendency to introduce additional ribs (tiercerons) and ridge-ribs already makes its appearance in the nave of Lincoln and the presbytery of Ely (Plate VIII., fig. 82), to be yet further developed in the second half of the century. Capitals are either simply moulded, an elaboration of the plain bell capitals of the latter part of the 12th century, or finely sculptured, with conventional, or "stiff-leaved," foliage of the crocket type. The use of the circular abacus, begun in the preceding century, entirely supersedes the square abacus, which was retained in France. Mouldings are profiled with great refinement, the alternation of rounds and hollows producing effective contrasts of light and shade, and the far more complicated profiles of arch mouldings provide another feature which distinguishes English work of this period from French. Windows of single pointed lights, the so-called "lancet," though frequently by no means sharply pointed, are the prevalent type, grouped in pairs, triplets, &c., and arranged in tiers in the large gables, or sometimes with only a single group of tall lights, like the "five sisters" of the north transept of York. Few works are more admirably designed than some of the towers of this period. Probably the greatest excellence ever attained in English art of the 13th century was reached in the great Yorkshire abbeys; for purity of general design, excellence of construction, and beauty of detail, they are unsurpassed by the work of any other period.

13th Century (second half).—The grouping together of "lancet" windows, the piercing of the wall above them with foiled circles, and the combination of the whole under an enclosing arch, soon led to the introduction of tracery, for which the design of earlier triforium arcades had also afforded a suggestion.

Bar-tracery appears just before the middle of the 13th century, and the great tracery window filling the whole width of a bay, or the entire gable-end, soon becomes a most characteristic feature. The earlier tracery windows show only simple geometrical forms, foiled arches to the heads of the lights, and foiled circles above, of which the abbey-church and the chapter-houses of Westminster and Salisbury afford most beautiful examples. In some particulars, such as its chevet plan and its comparatively great height, Westminster approaches more nearly to the French type than other English churches of the 13th century, but its details are characteristically English and of great beauty. In the last quarter of the century, pointed trefoils or quatrefoils are largely used in tracery, and the foliations frequently form the lines of the tracery, without enclosing circles. Contemporary with this change is the gradual

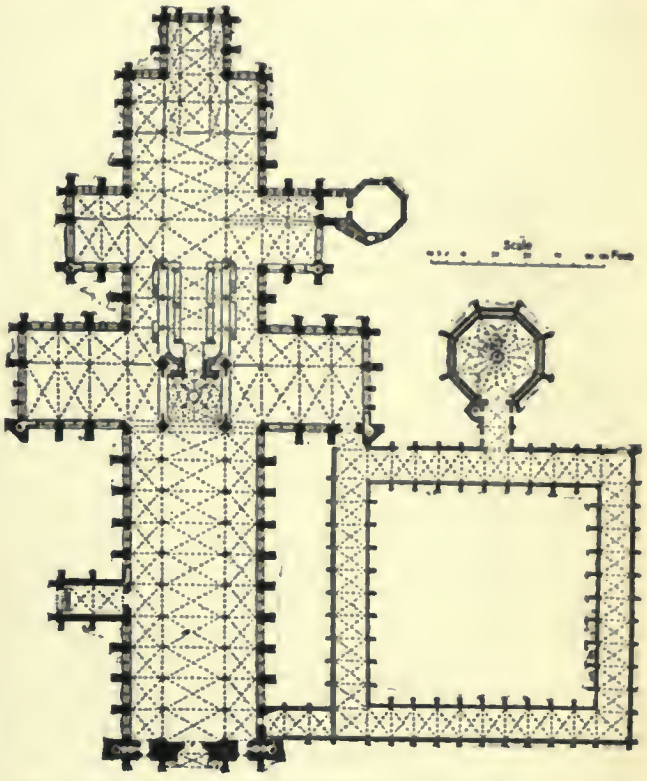


FIG. 43.—Plan of Salisbury Cathedral.

absorption of the triforium into the clerestory, of which Southwell and Pershore are precocious examples. Contemporary also was the adoption of an excessively naturalistic type of foliage. The art of masonry and stone-cutting was rapidly developed. The detached shaft, always structurally weak, was abandoned for the pier with engaged shafts separated by mouldings. The mouldings of arches become less deeply undercut, and the greater use of the fillet tends to give a more liney effect. The whole practice of art was growing more scholarly, perhaps, but at the same time it was more conscious, and the cleverness of the mason was almost as often suggested as the noble character of his work.

14th Century (first half).—The juxtaposition of the foliations without enclosing circles in tracery windows produced curves of contraflexure, which led insensibly to the complete substitution of flowing lines for geometrical forms in tracery.

Flowing tracery makes its appearance in England about 1310, and lasts some fifty years. Up to the end of the 13th century, window tracery had developed in France and England on parallel lines, though the English work was always slightly behind France in point of date. All this is changed with the adoption of flowing tracery in England; its development was purely national, and owed nothing to France. Indeed, the French flamboyant only makes its appearance at the time when flowing tracery was being abandoned in England. Not only window traceries, but mouldings, carvings and other details are changed in character. The ogee form is used in arches, in wall-arcades of great beauty and elaboration, as in the Lady-chapel at Ely, and in the canopies of tombs, such as the magnificent Percy tomb at Beverley. Niches and arcades are richly ornamented, and small decorative buttresses are used in the jambs of doorways, windows and niches. The moulded capital is still used, along with the capital with a continuous convex band of wavy foliage. Many of the most beautiful English towers and spires date from this period, the work of which is perhaps seen at its best in the parish churches of south Lincolnshire.

From Middle of 14th Century.—The over-elaboration of flowing tracery inevitably led to a reaction. The beauty of the lines of the tracery had controlled everything, and the resulting forms of the openings, which presented serious difficulties for the glass painter, had been a secondary consideration. Hence an endeavour to return to a simpler and more dignified, if more mechanical, style of building. The splendid exuberance of the earlier 14th century style gave way to the introduction of vigorous, straight, vertical and horizontal lines.

The beginnings of the new manner are to be seen in the south transept of Gloucester before 1337. After the great interruption of building works caused by the Black Death of 1349 and its recurrence in following years, the so-called "Perpendicular" style became general all over the country. The preference for straight in place of flowing lines became more and more developed. Doorways and arches were enclosed within well-defined square outlines; walls were decorated by panelling in rectangular divisions; vertical lines were emphasized by the addition of pinnacles, and buttresses were used as mere decorations, while horizontal lines were multiplied in string-courses, parapets and window transoms. Capitals were frequently omitted, and the mouldings of arches were continued down the piers. The use of the depressed "four-centred" arch became common. Vaulting, which had already been enriched by the multiplication of ribs, was further complicated by cross-ribs (liernes), subdividing the simple spaces naturally produced by the intersection of necessary ribs into panels; these, again, were filled with tracery. The fan-vault was developed by giving to all the ribs the same curvature; the outline of the fan is bounded by a horizontal circular rib, and its effect is that of a solid of revolution upon whose surface panels are sunk. The cloister of Gloucester presents the earliest and perhaps the most beautiful example. Finally, the builders displayed their mechanical skill by introducing pendants, as in Henry VII.'s chapel at Westminster. This latest period of English Gothic was a purely national development of which it has been too much the fashion to speak disparagingly; for it is futile to call such works as the nave of Winchester or the choir and Lady-chapel of Gloucester "debased." Perhaps the worst that can be said of this period is that there was too great a love of display, and too much mechanical repetition, but it is none the less true that it is to the 15th century that a very large number of English parish churches owe their fine effect. East Anglia and Somersetshire possess some of the choicest examples, and few things can be more beautiful than the central towers of Gloucester and Canterbury, and the towers of the Somersetshire churches. The open timber roofs, as, for instance, those of the East Anglian churches, are superb, while many of the churches of this period are still full of interesting furniture and decoration. Finally, a word must be said of the wealth of interesting examples of domestic architecture, which yet count among the ornaments of the country.

After the middle of the 16th century the practice of Gothic architecture virtually died out, though traces of its influence, especially in rural districts, were hardly lost until the end of the 17th century. Good, sound, solid and simple forms, well constructed by men who respected themselves and their work, and did not build only for the passing hour, were still popular and general, so that the vernacular architecture to a late period was often good and never absolutely uninteresting.

Scotland.—A few words will suffice for Scottish and Irish architecture, since the development in these countries followed much the same course of change as in England.

The earliest ecclesiastical structures which still survive in Scotland follow the same general type as those of Ireland. The monastic foundations of Queen Margaret and her sons introduced into Scotland the Norman manner then universal in England. The best examples, such as the nave of Dunfermline, which is an obvious inspiration from Durham, Kelso of the later 12th century, and the parish churches of Dalmeny and Leuchars, present the same characteristics as are found in English churches of somewhat earlier dates than the buildings in question, and some Romanesque forms survive to a later period than in England. In the 13th century, too, the style of the Scottish churches corresponds very closely with that of England, though the details are generally simpler, and the structures are smaller. It is naturally allied most closely with the north of England, where Cistercian influence in the direction of simplicity and severity had been exercised with the best results. The transept of Dryburgh, the choir and crypt of Glasgow cathedral, the nave of Dunblane, the choir of Brechin, and later Elgin cathedral, exhibit the style at its purest and best. The disturbed condition of the country during the 14th century was unfavourable to architecture, and when building revived at the beginning of the 15th century its style became more national. During the first half of the 15th century, it shows a certain borrowing from English architecture of the flowing-tracery period. Later, many features are borrowed both from England and France, and architecture develops in picturesque and interesting fashion. Melrose is one of the most characteristic, as it certainly is one of the most charming of Scottish buildings; its earlier parts bear a close resemblance to the earlier 14th-century work at York, while its later parts show more similarity to English "Perpendicular" than is common in Scotland. One of the most characteristic features of Scottish architecture in the 15th century is the pointed barrel vault, which directly supports the stone flagged roof. French influence is seen in the employment of the polygonal apse for the termination of choirs, and in some approaches to Flamboyant tracery. The details of the later Gothic churches have but slight connexion either with France or England, and show a curious revival of earlier motives. The semicircular arch is in frequent use, and the "nail-head" and "dog-tooth" ornament, as well as the use of detached shafts, are revived. One of the most remarkable buildings of the 15th century in Scotland is the collegiate church of Roslin, which has a pointed barrel vault over its choir, with transverse barrel vaults over the aisles, and is distinguished by the extreme richness of its decoration.

The domestic remains in Scotland are full of picturesque beauty and magnificence. They are a distinctly national class of buildings of great solidity, and much was sacrificed by their builders to the genius of the picturesque. They can only be classed with the latest Gothic buildings of other countries, but the mode of design shown in them lasted much later than the late Gothic style did in England. The vast height to which their walls were carried, the picturesque use made of circular towers, the freedom with which buildings were planned at various angles of contact to each other, and the general simplicity of the ordinary wall, are their most distinct characteristics.

Ireland.—The chief interest of the medieval architecture of Ireland belongs to the buildings which were erected before the English conquest of the 12th century. The early monastic settlements seem to have resembled the primitive Celtic fortresses, and consisted of a series of huts or cells, surrounded by an enclosing wall. The so-called "bee-hive" cell, which goes back to pre-Christian times, was built of rough stone rubble without mortar, and roofed in the same manner by corbelling over the courses of masonry. Some of these were certainly dwellings, but others were oratories. The largest of those in Skellig Michael is four-sided, and from this type the stone-roofed church of oblong plan was developed. The later type, with oblong nave and small square-ended chancel, retained much of the character of these primitive structures, and their barrel vaults were sometimes independent of the stone roof-covering, a system which lasted into the 12th and 13th centuries. A certain megalithic character, and the inclined jambs of doorway openings, are marked features of these early churches. The round towers so frequently associated with them are believed to be not earlier than the 9th century. Before the introduction of Norman forms, Ireland possessed a Romanesque style of her own, characterized by the survival of horizontal forms and their incorporation into the round-arched style, the retention of the inclined jambs of doorways, rich surface decoration, and the use of certain ornamental motives of earlier Celtic origin. King Cormac's chapel at Cashel is one of the best examples of the imported Norman manner of the 12th century, and here we find much of the influence of the earlier native style. The English conquest may be said to have been the introduction to Ireland of Gothic art, and it was the local variety of western England and south Wales which the conquerors introduced. Among the buildings erected by the English in Ireland, Kilkenny cathedral and the two 13th-century cathedrals of Dublin—Christ Church and St Patrick's—are the most remarkable, but there are many others. Their style is most plainly that of the English conqueror, with no concession to, or consideration of, earlier Irish forms of art. The result of the conquest was that the native style of construction was never applied to large buildings, though it did not at once disappear, as is witnessed by the church St Doulough near Malahide, which appears to be a 14th-century building. The characteristic features of later medieval Irish buildings, such as the stepped battlements, the retention of flowing lines in the tracery, and the peculiar treatment of crockets, are matters of no great importance in the history of architecture, and indeed it is hardly to be expected that a country with so stormy a history could have given rise to any systematic developments. Of the monastic remains those of the friaries are the most numerous, Ireland having many more friars' churches to show than England, but such peculiarities as they possess belong rather to the order than to any local influences. (J. Bn.)

Romanesque and Gothic Architecture in Germany

With the exception of the church built at Trèves (Trier) by the empress Helena, of which small portions can still be traced in the cathedral, there are no remains of earlier date than the tomb-house built by Charlemagne at Aachen (Aix-la-Chapelle), which, though much restored in the 19th century, is still in good preservation. It consists (fig. 44) of an octagonal domed hall surrounded by aisles in two storeys, both vaulted; externally the structure is a polygon of sixteen sides, about 105 ft. in diameter, and it was preceded by a porch flanked by turrets. It is thought to have been copied from S. Vitale at Ravenna, but there are many essential differences. The same design was repeated at Ottmarsheim and Essen, and a simpler version exists at Nijmwegen in the Netherlands, also built by Charlemagne. Although no remains exist of the monastery of St Gall in Switzerland (see Abbey), built in the beginning of the 9th century, a valuable manuscript plan was found in the 17th century, in its library, which would seem to have been a design for a complete

monastery. It contains features which are peculiar to the early German churches and are rarely found elsewhere, and is therefore of considerable interest, suggesting that some of the accessories of a monastery, supposed to have been the result of subsequent development, were all clearly set forth at this early period. The plan shows an eastern apse with a crypt, and a choir in front; a western apse, nave and aisles, with a series of altars down the latter; and on the west side, but detached from the apse, two circular towers with staircases in them. Unfortunately there are no churches remaining of the same date from which we might judge how far these arrangements were followed; but there are three early churches in the island of Reichenau on the Lake of Constance, in one of which, Mittelzell, is a western apse with staircases (here built up into a central tower), nave, and aisles with altars at the side between every window. The eastern portion has been rebuilt. At Oberzell, at the south end of the island, is a vaulted crypt, which dates from the end of the 10th century. In the third and much smaller church, Unterzell, there was no crypt, but three eastern apses and a western apse, which was destroyed when the present nave was built. At Gernrode in the Harz is a church with western and eastern apses with vaulted crypts underneath (one of which dates from 960 when the church was founded), and circular towers with staircases in them on either side of the western apse. The church was completed about a century later. In the arcade between the nave and aisles piers alternate with the columns. Alternating piers are found also in Quedlinburg (the crypt of which dates from 936 and the church above about 1030) and many other early churches. Western apses exist at Drübeck, Ilbenstadt, Trèves, Huyseberg, St Michael and St Godehard at Hildesheim, Mainz, the Obermünster at Regensburg, Laach, Worms, and at a later date at Naumberg and Bamberg, showing that it was a feature generally accepted in early and late periods. It has, however, one great defect, that of depriving the west end of the church of those magnificent porches which are the glory of the churches of France; the cathedral of Spires (Speyer), the church at Limburg near Dürkheim, the cathedrals of Erfurt and Regensburg, being the few examples where a dignified entrance is given; and further, that on entering the church from the side, one is distracted by the rivalry of the two apses, and it is only when turning the back on one or the other that one is able to judge of the monumental effect of the interior.

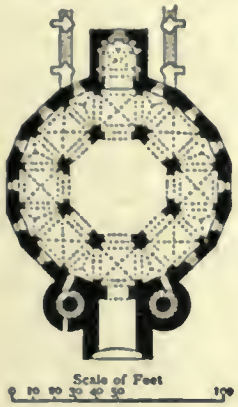


FIG. 44.—Plan of Cathedral at Aix-la-Chapelle.

The greater number of the churches above mentioned were covered over with open timber roofs or flat ceilings; but the problem to be solved in Germany, as well as in Italy, was that of vaulting over the nave, and the cathedrals of Spires, Worms and Mainz (fig. 45) are the three most important churches in which this was accomplished. The dates of their vaults have never been quite settled; that of Spires would seem to have been the earliest built, probably after 1162, when the church was seriously damaged by a conflagration, and the vault is groined only. In Worms (fig. 46) and Mainz there are diagonal moulded ribs, which suggest a later date. Although of great height and width, the absence of a triforium gallery in these cathedrals is a serious defect, as it deprives the interior of that scale which the smaller arcades in such a gallery give to the nave arcade below and the clerestory above, and of those horizontal lines given by string courses which are entirely wanting in these churches. Seeing that in some of the earlier churches, as at Gernrode, St Ursula (Cologne), and Nieder-Lahnstein, the triforium had already been introduced, and that it was repeated in the later examples at Limburg on the Lahn, Bacharach, Andernach, Bonn, Sinzig, and St Gereon (Cologne), it is difficult to understand why, in the three great typical German Romanesque churches, they should have been omitted. Externally the design is extremely fine, owing to the grouping of the many towers at the west and on either side of the transept or choir. In this respect the cathedral of Mainz is the most superb structure in Germany, and to the cathedral of Spires with its fine entrance porch (fig. 47) must be given the second place.

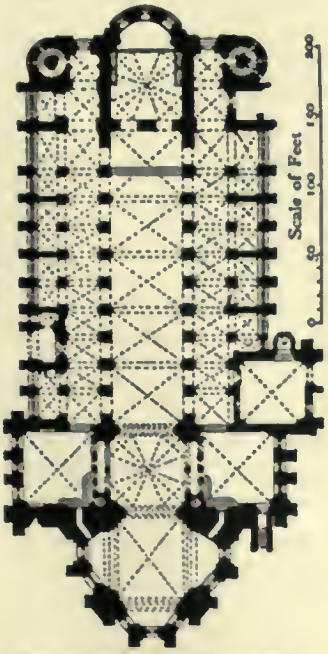


FIG. 45.—Plan of Cathedral at Mainz.

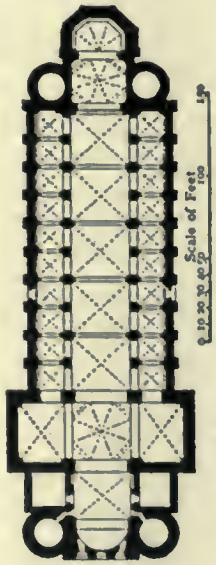


FIG. 46.—Plan of Cathedral at Worms.

One of the most perfect examples of the Rhenish-Romanesque styles is the church of the abbey of Laach, completed shortly after the middle of the 12th century. The eastern part of the church resembles the ordinary type, but at the west end there is a narrow transept flanked by circular towers, and a western apse enclosed in an atrium with cloisters round, which forms the entrance to the church. The sculptures in the capitals of the atrium are of the finest description and represent the perfected type of the German Romanesque style. In addition to the two circular towers flanking the west transept, a square tower rises in the centre of the west front, two square towers flank the choir and a crystal lantern crowns the crossing of the main transept, and the grouping of all these features is very fine and picturesque in effect. A small church at Kosheim in Alsace is quite Lombardic in its exterior design, the pilaster strips and arched corbel tables being almost identical. The same applies to the church at Marmoutier, but the towers flanking the main front and the square tower on the crossing of the western transept produce a composition which one looks for in vain in the greater number of the churches in Italy.

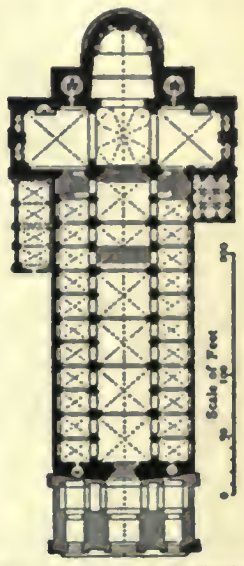


FIG. 47.—Plan of Cathedral at Spires.

In describing the Lombardic churches of North Italy, reference has been made to the probable origin of the eaves-gallery, best represented in the eastern apse of Santa Maria Maggiore, Bergamo. This feature was largely adopted throughout the Rhine churches, and in the Apostles' church and St Martin's at Cologne receives its fullest development, being in addition to the eastern apse carried round the apses of the north and south transepts, which in these two churches and in St-Mary-in-the-Capitol, also in Cologne, constitute a special treatment. In the Apostles' church, where round towers are built at the junction of the three apses, the effect is extremely pleasing. In the church at Bonn, the single apse is flanked by two lofty towers which give great importance to the east front.

The steeples of the same period have a character of their own. They are either square or octangular in plan, arcaded or pierced with windows, and roofed with gables or with spires rising out of the gables.

One peculiarity found in some of the German churches, and specially those in the north-east, is that the nave and aisles are of the same height. To these the term *Hallenkirchen* is given. This type of design is very grand internally, owing to the vast height of the piers and arches. It also dispenses with the necessity for flying buttresses, as the aisles, which are only half the width of the nave, carry the thrust of the vault direct to the external buttresses. The nave, however, is not so well lighted, though the aisle windows are sometimes of stupendous height. The principal examples are those of the church of St Stephen, Vienna, where both nave and aisles are carried over with one vast roof; at Münster, the *Wiesenkirche* at Soest; St Lawrence, Nuremberg; St Martin's, Landshut; Munich cathedral, and others.

St Gereon (1200–1227) and St Cunibert (1205–1248), in Cologne, besides churches at Naumburg, Limburg and Gelnhausen, in which the pointed arch is employed, are almost the only transitional examples in Germany, and respond to work of a century earlier in France. Toward the end of the 13th century the Romanesque style was supplanted by a style which in no way grew out of it, but was

rather an imitation of a foreign style, the earliest examples being in the *Liebfrauenkirche* at Trèves (1227–1243), and the churches at Marburg (1235–1283) and Altenberg (1255–1301). In the latter church is a French *chevet* with seven apsidal chapels. This brings us to the great typical cathedral of Germany at Cologne (fig. 48), which had the advantages of having been designed at the best age and completed on the original design, so that with small exceptions a uniformity of style reigns throughout it. It was begun in 1270 and apparently based on the plan of Amiens, the transepts however having an additional bay each, and the two first bays of the nave having thicker piers so as to carry the enormous towers and spires which flank the chief façade. The principal defect of the building is its relative shortness, owing to its disproportionate height. This has always been felt in the interior, and now that the lofty buildings

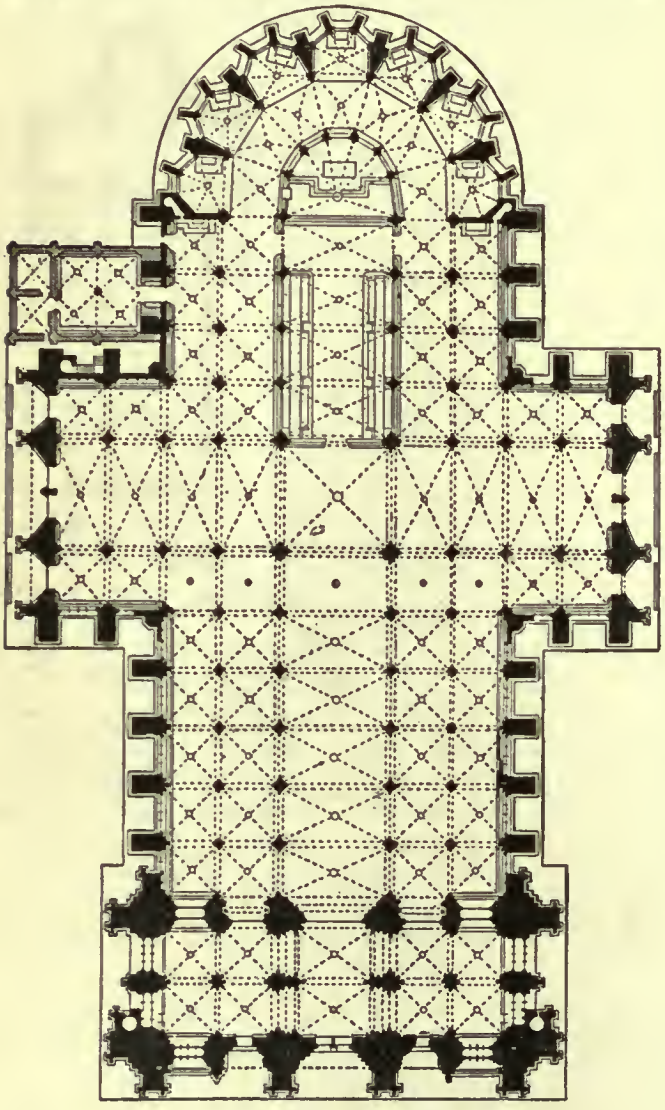


FIG. 48.—Plan of Cathedral at Cologne.

all round have been taken down, isolating the cathedral on all sides, it has the appearance of an overgrown monster. The length of the cathedral is 468 ft., 17 ft. less than the cathedral at Ulm, the longest in Germany. The height of the nave vault is 155 ft., and as the width is only 41·6 (about one in four) the proportion is very unpleasing. There is also a certain mechanical finish throughout the design, which renders it far less poetical than the great French cathedrals. Where, however, it excels is in the extraordinary vigour of its execution, the depth of the mouldings, and the projection given to the leading architectural features; and in this respect, when compared with St Ouen at Rouen, about fifty years later, the latter (which is even more mechanical in its setting out) looks wire-drawn and poor. The twin spires of the façade rise to the height of 510 ft.; they were completed only in the latter part of the 19th century, and would have gained in breadth of effect if there had been some plain surfaces left. In this respect the spire of Freiburg cathedral, which is simple in outline and detail, is finer, and gains in contrast on account of the simpler masonry of the lower part of the tower. The spire at Ulm cathedral, only recently terminated, rises to the height of 530 ft. In both these cases the single tower is preferable to the double towers of Cologne, when elaborated to the same extent, as they are in all these examples; and perhaps that is one of the reasons why the spires of Strassburg and Antwerp cathedrals are more satisfactory, as the twin towers were never built. The front of Strassburg cathedral (1277–1318), by Erwin von Steinbach, is too much cut up by vertical lines of masonry, owing to the *tours-de-force* in tracery of which the German mason was so fond. On the whole the most beautiful of German spires is that of St Stephen's at Vienna, and one of its advantages would seem to be that its transition from the square base to the octagon is so well marked in the design that it is difficult to say where the tower ends and the spire begins. The strong horizontal courses under the spires of Strassburg or Freiburg are defects from this point of view.

In domestic architecture nothing remains of the palace at Aix-la-Chapelle, but at Lorsch near Mannheim is the entrance gateway of the convent which was dedicated by Charlemagne in 774. It is in two storeys, in the lower one three semicircular arches flanked by columns with extremely classic capitals. The upper storey is decorated with what might have been described as a blind arcade, except that instead of arches are triangular spaces similar to some windows found in Saxon architecture; the whole gateway being crowned with a classic cornice. The palaces at Goslar (1050) and Dankwarderode in Brunswick (1150–1170) still preserve their great halls, and in the palace built (1130–1150) by the emperor Frederick I. at Gelnhausen there remain portions extremely fine and vigorous in style, and showing a strong Byzantine influence. The largest and most important castle is that of the Wartburg at Eisenach, which is in complete preservation.

To sum up, the German Complete Gothic is essentially national in its complete character. It has many and obvious defects. From the first there is conspicuous in it that love of lines, and that desire to play with geometrical figures, which in time degenerated into work more full of conceit and triviality than that of any school of medieval artists. These conceits are worked out most elaborately in the traceries of windows and panelling. The finest early examples are in the cathedral at Minden; a little later, perhaps, the best series is in the cloister of Constance cathedral; and of the latest description the examples are innumerable. But it is worth observing that they rarely at any time have any ogee lines. They are severely geometrical and regular in their form, and quite unlike our own late Middle Pointed, or the French Flamboyant. In sculpture the Germans did not shine. They, like the English, did not introduce it with profusion, though they were very prone to the representations of effigies of the deceased as monuments.

In one or two respects, however, Germany is still possessed of a wealth of medieval examples, such as is hardly to be paralleled in Europe. The vast collection of brick buildings, for instance, is unequalled. If a line be drawn due east and west, and passing through Berlin, the whole of the plain lying to the north, and extending from Russia to Holland, is destitute of stone, and the medieval architects, who always availed themselves of the material which was most natural in the district, built all over this vast extent of country almost entirely in brick. The examples of their works in this humble material are not at all confined to ecclesiastical works; houses, castles, town-halls, town walls and gateways, are so plentiful and so invariably picturesque and striking in their character, that it is impossible to pass a harsh verdict on the architects who left behind them such extraordinary examples of their skill and fertility of resource.

This development is largely due to the fact that all these countries in north-east Germany were connected and very much influenced by the confederation of the Hanse towns, and hence the similarity in the design of all their buildings. Although some of the earliest buildings date from the 12th century, the chief development took place in the 14th and 15th centuries, and in the 16th century formed the basis of the transitional works of the Renaissance. The principal Hanse towns are Hamburg, Lübeck and Danzig. The chief buildings in Hamburg were destroyed by the fire in 1842, and it is in Lübeck that the most important churches are to be found. The church of St Mary (Marienkirche), 1304, is the most striking on account of its dimensions, 346 ft. in length, the nave being 123 ft. high, with two western towers 407 ft. high. Great scale is given to the building in consequence of the small material (brick) used, and some of the windows in this or other churches are nearly 100 ft. in height, with lofty mullions, all in moulded brick. The *Dom* or cathedral of Lübeck, though slightly larger, is not so good in design, but has a remarkable north porch in richly moulded brick, with marble shafts and carved capitals. In the church of St Catherine the choir is raised above a lofty vaulted crypt, similar to examples in some of the Italian churches. The *Marienkirche* at Danzig (1345–1503), built by a grand master of the Teutonic knights, to whom the chief development of the architecture of north-east Germany is largely due, is one of those examples already mentioned as *Hallenkirchen*. The nave, aisles, side chapels, transept and aisles, and choir with square east end, are all of the same height; as the church is 280 ft. long and 125 ft. wide, with a transept 200 ft. long, the effect is that of one stupendous hall, but as the light is only obtained through the windows of the side chapels, the interior, though impressive, is somewhat gloomy. The same is found in the choir of the Franciscan church at Salzburg, where five slender piers, 70 ft. in height and

4 ft. in diameter, carry the vault over an area 160 ft. long by 66 ft. wide. Right up in the north of Germany, in Pomerania, are many fine examples in brick and sometimes of great size, such as those at Stralsund, Stettin, Stargard, Pasewalk, and in the island of Rügen. The *Marienkirche* at Stralsund, owing to its massive construction and picturesque grouping, is an interesting example. Its western transept or narthex with tower in centre is a common type of the churches in Pomerania, and though very inferior in design is a version of those which in England are seen in Ely and Peterborough cathedrals.

In the entrance gateways to the towns and in domestic architecture north Germany is very rich; the palace of the grand master of the Teutonic Order at Marienburg is a vast and imposing structure in brick (1276–1335), in which the chapter house of the grand master, with its fan-vaulted roof, resting on a single pillar of granite in the centre, and the entrance porch of the church richly carved in brick, are among the finest examples executed in that material. (R. P. S.)

Romanesque and Gothic in Belgium and Holland

Of early Romanesque work neither Belgium nor Holland retains any examples; for with the exception of the small building at Nijmwegen built by Charlemagne, there are no churches prior to the 11th century, and at first the influence in Belgium would seem to have come from Lombardy, through the Rhine Provinces. As all her large churches are built in the centres of her most important towns, it is probable that the older examples were pulled down to make way for others more in accordance with the increasing wealth and population. In the 13th century they came under the influence of the great Gothic movement in France, and two or three of their cathedrals compare favourably with the French cathedrals. The finest example of earlier date is that of the cathedral of Tournai (fig. 49), the nave of which was built in the second half of the 11th century, to which a transept with north and south apses and aisles round them was added about the middle of the 12th century. These latter features are contemporaneous with similar examples at Cologne, and the idea of the plan may have been taken from them; externally, however, they differ so widely that the design may be looked upon as an original conception, though the nave arcades, triforium storey, and clerestory resemble the contemporaneous work in Normandy. The original choir was pulled down in the 14th century, and a magnificent *chevet* of the French type erected in its place. The grouping of the towers which flank the transept, with the central lantern, the apses, and lofty choir, is extremely fine (fig. 50). The sculptures on the west front, dating from the 12th to the 16th century, protected by a portico of the late 15th century, are of remarkable interest and in good preservation. They are in three tiers, the two lowest consisting of bas-reliefs, the upper tier with life-size figures in niches, resting on corbels. The Romanesque tower of the church of St Jacques in the same town, with angle turrets, is a picturesque and well-designed structure.

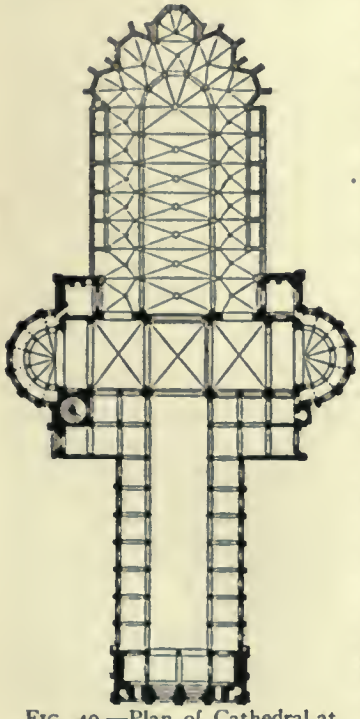


Fig. 49.—Plan of Cathedral at Tournai.

Other early examples are those of St Bartholomew at Liége (A.D. 1015) and the churches at Roermonde and St Servais at Maastricht, both belonging to Holland. The latter is an extremely fine example, which recalls the work at Cologne, and in its great western narthex follows on the lines of the German churches at Gernrode, Corvey and Brunswick.

Among other churches of later date are St Gudule at Brussels, with Gothic 13th century choir and a 14th century nave with great circular pillars, the west front of later date, approached by a lofty flight of steps, having a very fine effect; Ste Croix at Liége, with a western apse; St Martin at Ypres and St Bavon at Ghent, both with 13th-century choir and 14th-century nave; Tongres, 13th century with great circular pillars and an early Romanesque cloister; Notre Dame de Pamele at Oudenarde; and Notre Dame at Bruges, 14th century. Of 15th and 16th century work (for the Gothic style lasted without any trace of the Renaissance till the middle of the 16th century) are St Gommaire at Lierre (1425–1557); St Martin, Alost (1498); St Jacques, Antwerp; and St Martin and St Jacques, both at Liége. The largest in area, and in that sense the most important church in Belgium, is Notre Dame at Antwerp (misnamed the cathedral). It was begun in 1352, but not completed till the 16th century, so that it possesses many transitional features. It is one of the few churches with three aisles on each side of the nave, the outer aisle being nearly as wide as the nave, which is too narrow to have a fine effect. Only one of the two spires of the west front is built, perhaps to its advantage; the upper portion presents in its pierced stone spires one of those remarkable *tours-de-force* of which masons are so proud, and having a simple substructure it gains by contrast with and is much superior to the spires of Cologne, Vienna and Ulm.

Among the most remarkable features in these Belgian churches are the rood screens, the earliest of which is in the church of St

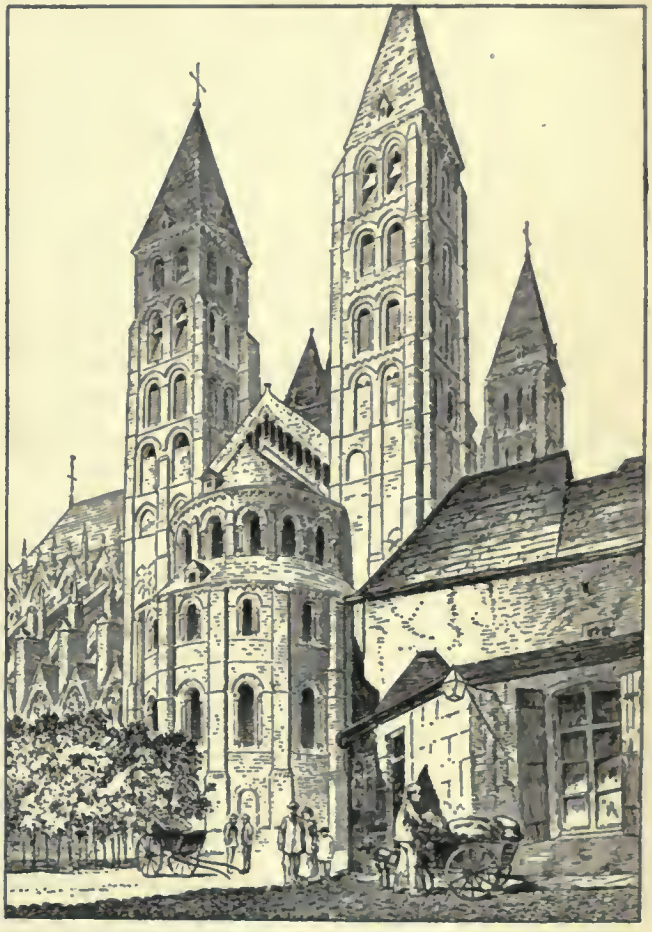


Fig. 50.—Tournai Cathedral.

Peter at Louvain, dating from 1400, in rich Flamboyant Gothic, retaining all its statues. In the church at Dixmuiden, St Gommaire at Lierre (1534), and in Notre Dame, Walcourt (1531), are other examples all in perfect preservation; the last is said to have been given by the emperor Charles V., and in the same church is a lofty tabernacle in Flamboyant Gothic.

Owing to the comparatively late date of many of the Belgian churches, they are all more or less unfinished, as the religious fervour of the citizens who built them would seem to have changed in favour of their town halls and civic buildings immediately connected with trade. The Cloth Hall at Ypres (1200–1334) with a frontage of 460 ft., three storeys high with a lofty central tower and a hall on the upper storey 435 ft. long, one of the finest buildings of the period in Europe; Les Halles at Bruges, originally built as a cloth hall, also with a lofty central tower; and a simple example at Malines, are the earliest buildings of this type.

There follow a series of magnificent town halls, of which that at Brussels is the largest, but the tower not being quite in the centre of its façade gives it a lopsided appearance. There is no tower to the town hall at Louvain (1448–1469), but this is compensated for by the angle turrets, and the design is far bolder. In both these examples the vertical lines are too strongly accentuated, and seeing that they are in two or three storeys, the latter should have been maintained in the design of the façades. In this respect the town hall of Oudenarde (1527–1535) is more truthful, and as a result is far superior to them; the tower also is in the centre of the principal front, which at all events is better than at Brussels, though as a matter of composition it would have been more effective and picturesque if it

had been placed at one end of the façade. In the town hall at Mons there is no tower, but a fine upper storey with ten windows filled with good tracery. Of the town hall at Ghent only one half is Gothic (1480–1482), as it was not completed till a century later, and though overladen with Flamboyant ornament it has fine qualities in its design. Although but few examples still exist of the Gothic structures belonging to the various gilds, owing to their having been rebuilt in the Renaissance style, those of the Bateliers at Ghent (1531), and of the Fishmongers at Malines (1519), bear witness in the rich decoration to the wealth of these corporations.

Holland is extremely poor in church architecture, but there are two examples which should be noted, at Utrecht and Bois-le-Duc ('s Hertogenbosch). Of the former only the choir exists. It is of great height (115 ft.), and belongs to the finest period of Gothic architecture (1251–1267). The nave was destroyed by a hurricane in 1674, and so seriously damaged that it was all taken down (a wall being built to enclose the choir) and an open square left between it and the lofty west tower. The cathedral of St John at Bois-le-Duc, though founded in 1300, was rebuilt in the Flamboyant period (1419–1497). It is of great length (400 ft.) with a fine *chevet*, and possessed originally a magnificent rood screen in the early Renaissance style (1625); this seemed to the burghers to be out of keeping with the Gothic church, so it was taken down and sold to the South Kensington Museum, being replaced by a very poor example in Modern Gothic.

There is only one Gothic town hall of importance in Holland, that at Middleburg (1468), a fine example, and quite equal to those in Belgium. The ground and upper floors are kept distinct, and as the wall surface of these lower storeys is in plain masonry, the traceried windows and the canopied niches (all of which retain their statues) gain by the contrast. There is a small picturesque specimen at Gouda, and at Leeuwarden in the house of correction (Kanselary) a rich example in brick and stone, with a remarkable stepped gable in the centre having statues on its steps.

Both in Belgium and Holland there are numerous examples of domestic architecture in brick with quoins and tracery in stone, in both cases alternating with brick courses and arch voussoirs and with infinite variety of design. (R. P. S.)

The Renaissance Style: Introduction

The causes which led to the evolution of the Renaissance style in Italy in the 15th century were many and diverse. The principal impulse was that derived from the revival of classical literature. Already in the 14th century the coming movement was showing itself in the works of the painters and sculptors, especially the latter, owing to the influence of the classic sculpture which abounded throughout Italy. Thus in the tomb of St Dominic (1221) at Bologna, the pulpits of Pisa (1260) and Siena (1268), and in the fountain of Perugia (1277–1280) by Niccola Pisano and his son Giovanni, all the figures would seem to have been inspired in their character by those found in Roman sarcophagi. A classic treatment is noticeable in the doorway of the Baptistery of Florence by Andrea Pisano (1330), probably influenced by Giotto, in whose paintings are found the representation of imaginary buildings in which Gothic and Classic details are mixed up together. The time for its full development, however, did not come till the following century, when, with the papal throne again firmly established under Martin V., the amelioration of the city of Rome was commenced, and discoveries were made which awakened an archaeological interest fostered by the Medici at Florence, who not only became enthusiastic collectors of ancient works of art, but promoted the study of the antique figure. In addition to the acquisition of marbles and bronzes, ancient manuscripts of classic writers were sought for and supplied by Greek exiles who seemed to have foreseen the breaking up of the eastern empire; everything, therefore, at the beginning of the 15th century fostered the spread of the new movement. Accordingly, when a great architect like Brunelleschi, who for fifteen years had been making a special study of the ancient monuments in Rome and who possessed in addition great scientific knowledge, brought forward his proposals for the completion of the cathedral built by Arnolfo di Lapo, and showed how the existing substructure could be covered over with a dome like the Pantheon at Rome, his designs were accepted by the town council of Florence, and in 1420 he was entrusted with the work. Subsequently he carried out other works, in which pure classic architectural forms are the chief characteristics. There were, however, other causes which not only promoted the encouragement of the revival, but extended it to other countries, though at a later period; the most important of these was the invention of printing (1453), which in a sense revolutionized art, not so much in its enabling classical literature to be more extensively studied and known, as in its taking away to a certain extent from the painter and sculptor and indirectly the architect one of their principal missions, so far as ecclesiastical architecture is concerned. Henceforth these who had hitherto taught their lessons in sculpture, painting, stained glass and fresco, could, through the printed book, bring them more immediately before and directly to mankind. Victor Hugo's pithy saying, "*ceci tuera cela*; *le livre tuera l'église*," expressed not only the fall of architecture from the position it occupied as the principal teacher, but to a certain extent the change in the channel by which religious teachers and the writers of the day, the poets and philosophers, could best make their works known.

With the invention of printing came the partial cessation of fresco painting, stained glass and sculpture, which subsequently came to be regarded more as decorative adjuncts than as having educational functions. But this transfer from the Church to the Book, the extinction of the one by the other, led to another important change. Henceforth the architect or master-mason, as he was then known, could no longer count on the co-operation of the various craftsmen, men often of greater culture than himself; and the individuality of the man, which has sometimes been put forward as a gain to humanity, was a loss so far as architecture is concerned, since it was scarcely possible that the imagination and conceptions of a single individual, however brilliant they might be, could ever reach to the high level of the joint product of many minds, or that there could be the same natural expression in what had hitherto been the traditional work of centuries.

In France the introduction of the Revival resulted at first in a transitional period during which classic details gradually crept in, displacing the Gothic. In Italy this does not seem to have been the case to the same extent. It is true that in Florence and Venice, where an independent style existed, the new buildings in their general principles of design were copied from the old, but with no mixture of details as in France; in Brunelleschi's church, Santo Spirito at Florence, the capitals and details are all pure Italian, as pure as if they had been carried out in the 3rd or 4th century, the fact being that already before the 15th century the craftsman's work was approaching the new movement, and this was facilitated by the numerous remains still existing of Roman architecture. In the four or five years Brunelleschi spent in Rome, he had the opportunity of studying a far larger number of Roman buildings than are preserved at the present day, so that the purity of style in the work which he carried out in Florence was due to his previous training; the same is found in Alberti's work, and with these two great men leading the way it is not surprising that throughout the earlier Renaissance period in Italy we find a classic perfection of detail which it took half a century to develop in other countries.

It is difficult to say what might have been its ultimate development if another discovery had not been made about 1452, that of the manuscript of Vitruvius, a Roman architect who lived in the time of the emperor Augustus; his work on architecture gives an admirable description of the building materials employed in his day (*c.* 25 B.C.), and among other subjects, a series of rules regulating the employment of the various orders and their correct proportions. These rules were based on the descriptions which Vitruvius had studied of Greek temples, but as he was not acquainted with the examples quoted, never having been in Greece or even in south Italy at Paestum, his knowledge was confined to the architectural monuments then existing in Rome. Vitruvius's manuscript, entitled *De re aedificatoria*, was illustrated by drawings, none of which have however been preserved; when therefore in subsequent years translations of the architectural portion of the manuscript were printed and published by various Italian architects, among whom Vignola and Palladio were the more important, they were accompanied by woodcuts representing their interpretation of the lost illustrations, and thus copybooks of the orders were

published, with more or less fidelity to those of existing Roman monuments, in which attempts were made to adhere to the rules laid down by Vitruvius. In Rome and other parts of Italy, where ancient monuments or portions of them still remained *in situ*, architects could study their details and base their designs on them, but in other countries they were bound to follow the copybook, and thus they lost that originality and freedom of design which characterizes the earlier work of the Renaissance.

On the other hand, there is no doubt that the publications of Vignola and Palladio, based as they were on the remains of ancient Rome, then much better preserved than at the present day, tended to maintain a high standard in the employment of the Classic orders, with correct proportions and details; so much so, that in referring to the influence which those works exerted from the middle of the 16th century in France and Spain, and during the 17th and 18th centuries in England and to a certain extent in Spain, Germany and the Netherlands, it is generally spoken of as the introduction of the pure Italian style. The tendency, however, of such hard and fast rules leads eventually to an excess in the opposite direction, and the works of Borromini in Italy and Churriguera in Spain in the middle of the 17th century resulted in the production of what is generally referred to as the Rococo style. This style was fostered in France by the attempts to reproduce, externally and in stone, ornamental decoration of a type which is only fitted for internal work in stucco, and in Germany and the Netherlands by reproductions of fantastic designs published in copybooks, which led to the bastard style of the Zwinger palace in Dresden and the Dutch architecture of the 18th century. Vignola's work on the five orders was published in 1563, and Palladio's in 1570; they were preceded by a publication of Serlio's in 1540, giving examples of various architectural compositions, and to him is probably due the introduction of the pure Italian style in the Louvre in 1546. They were followed by other authors, as Scamozzi in Italy, Philibert de l'Orme in France, and, at a later date, Sir William Chambers in England.

The term given to the earlier Renaissance or transition work in Italy is the Cinque-cento style, though sometimes that title is given to buildings erected in the 16th century; in France it is known as the François I. style, in Spain as the Plateresque or Silversmiths' style, and in England as the Elizabethan and Jacobean styles.

There is still another and very important difference to be noted between the styles of the middle ages and those of the Renaissance. Although the names of the designers in the former are occasionally known and have been handed down to us, they were only partially responsible, as the works were carried out by other craftsmen working on traditional lines, whereas in the latter they are of much more importance because of the independent thought and study of the individual; and though to a certain extent the development of each man's work may have been influenced by others working in the same direction, his special object was to acquire personal fame and by his own fancy or predilection to produce what he conceived to be an original work peculiar to himself. Consequently in our description the name of the architect who designed a particular building, as well as the date of its erection, are necessarily given to show the progress made in his studies or otherwise. (R. P. S.)

Renaissance Architecture in Italy

In the styles hitherto described a chronological order has been followed, as far as possible, in order to show the gradual development of the style; that course is adopted here to a certain extent, when dealing with the Renaissance, though the introduction of the personal element, to which reference has been made, brings in a change of some importance. Henceforth the career of the individual has to be taken into consideration, and at times it may be an advantage when describing a building by an architect of eminence to mention other works by him, and so depart from the chronological sequence.

Ecclesiastical.—The classic revival in Italy, though foreshadowed in other branches of art, as in painting and sculpture, and also to a marked degree in literature, was virtually introduced by one great man, Filippo Brunelleschi of Florence, who, trained as a sculptor, and disappointed with his want of success in the competition held in 1403 for the bronze gates of the baptistery at Florence, determined to devote himself to architecture, possibly in the hope that he might some day be able to solve the great problem of erecting over the crossing of Arnolfo di Lapo's great cathedral the dome projected by the latter but never executed. Having spent some years in Rome, Brunelleschi returned to his native town about 1410, with a profound knowledge of classic architecture and of Roman construction, as shown in the Pantheon, the thermae, Colosseum and other remains, then in much better preservation than at the present day. Some years passed in the production of various schemes and in deliberations with the council of Florence, but eventually in 1420 the completion of the cathedral was entrusted to him, and he undertook to construct the dome without centreing, and to raise it on a drum so as to give it greater importance than Arnolfo had contemplated, as shown in the fresco of the Spanish chapel of Santa Maria Novella, Florence. The dome as projected by Brunelleschi was of considerable size, being 130 ft. in diameter and 135 ft. from the cornice to the eye of the dome, including the drum on which it was raised; it was octagonal in plan, and built with an inner and outer casing partly in brick, with angle and two intermediate ribs on each face, which were in stone. The construction of the dome was completed in 1434; but the lantern, built on the basis of the model he had made, was not carried out till 1462, some years after his death. Brunelleschi's other works in Florence consisted of the church of San Lorenzo, which he rebuilt in 1425 after a fire, and the church of Santo Spirito (1433), a very remarkable building, the design of which was based on the medieval basilicas of Rome, with such modifications in plan and section as his knowledge of ancient Roman work suggested. This church consists of nave, transept and choir, with aisles all round, the centre or crossing being covered with a dome on pendentives, which henceforth became the chief characteristic in all the Renaissance churches. Brunelleschi's earliest work was the Pazzi chapel, an original conception which is more remarkable for the pure classic feeling and refinement in all its details than for the design. The weakness of the archivolt round the central archway, and the mass of panelled wall carried on columns (far too slight in their dimensions), detract seriously from the effect of the façade; internally the structural function of the pilasters is not sufficiently maintained, and instead of a simple hemispherical dome, as in the cathedral, a quasi-Gothic type was built, with twelve ribs and scalloped cells, which destroys its dignity.

Brunelleschi was followed by another great Florentine architect, Leon Battista Alberti, who was also a great mathematician and a scholar, and further promoted the study of classic architecture by writing a treatise in Latin, *Opus praestantissimum de re aedificatoria*, which was based partly on that of Vitruvius and was published in 1485, after his death, accompanied by illustrations. The first building with which he was connected was the church of San Francesco at Rimini, to which in 1440 he added the front. In this he was evidently inspired by the Roman triumphal arch in that city, and his interpretation of it, to meet the requirements in its façade which were imposed upon him by the existing nave, was admirable. Unfortunately the principal front was never completed, but on the south side he designed a series of recesses to hold the sarcophagi containing the remains of the friends of his client, Sigismondo Malatesta, the effect of which is simple and grand. Alberti's largest work, the church of Sant' Andrea at Mantua (1472), in which the nave, transept and choir are all covered with barrel vaults, recalls the vaulted corridors of the Colosseum. There are no aisles, but a series of rectangular chapels on each side, the division walls of which act as buttresses to resist the thrust of the great vault. The lofty arched openings to the chapels, separated by Corinthian pilasters with entablature supporting the coffered vault and a central dome (since rebuilt), complete the structure, which has served since as the model for all the Renaissance churches of the same type. The principal front is not satisfactory, as it takes no cognizance of the width of the nave, and the side doors have no use or meaning; here Alberti seems to have been led astray in his triumphal arch treatment, which is inferior to his scheme for the church at Rimini.

In 1462 Michelozzo, another Florentine architect, built the chapel of St Peter at the east end of the church of Sant' Eustorgio, Milan. Externally it has little attraction, but internally the dome, with its magnificent frieze of winged angels in relief with a painted background of arcades and other accessories, is the most beautiful composition of the Renaissance. Michelozzo's first work was the Dominican monastery and church of San Marco at Florence (1439–1452), but he is better known for his secular work, to which we shall return.

The next great architect chronologically is Bramante d' Urbino, to whom was entrusted the commencement of the church of St Peter at Rome. His first important work was the church of Santa Maria della Consolazione at Todi (1472), which consists of a square nave with immense semicircular apses, one on each side. The nave is covered with a dome raised on a drum, and carried on pendentives, and the apses with hemispherical vaults butt against the nave walls and form externally a very fine group. Bramante was the architect of the chapel in the cloisters of San Pietro-in-Montorio, Rome (1472),

a small circular building covered with a dome and surrounded with a peristyle of columns of the Doric order; and of the dome of the church of Santa Maria delle Grazie in Milan, as also of the three apses, which are decorated with pilasters and baluster shafts with circular medallions enclosing busts, all in terra cotta. Before passing to his work at St Peter's there are some other early churches we must notice. The Certosa, near Pavia, was begun in 1396, and in one sense suggests the revival of classic architecture, in that all its arches have semicircular heads. The magnificent façade of the church was commenced in 1473 from the designs of Borgognone, a Milanese architect: it is one of the few examples in Italy of large size in which the transition is noticeable, for although there are no Gothic details the design follows that of the middle ages, and instead of great pilasters of the Corinthian order, buttresses with niches containing statues divide the façade and accentuate the internal divisions of the church; the open galleries above the entrance doorway crossing the upper storey of the central portion are all derived from well-known Lombardic features. The upper part of the façade is inferior to the lower, Borgognone's design having been departed from. The enrichment of the whole front, from the lower plinth to the string course under the first gallery, with bas-reliefs, panelled pilasters, niches, medallions and other decorative accessories, all in white marble, so completely covers the whole surface that scarcely any portion is left plain, which to a certain extent detracts from its effect as a whole; but there is an endless variety of design, and the baluster or candelabrum shafts dividing the windows and the friezes and cresting above their cornices, are of great beauty. The circular rose window above, with its enclosing frontispiece of later date, shows the coming influence of the later Italian style. The cloisters adjoining are surrounded with a light arcade, with enrichments in the spandrils and frieze, all in terra cotta.

The cathedral of Como is also a transitional example, where buttresses are employed all round the church, and it is only in the finials which surmount them, the great projecting cornice which crowns the structure, and the doorways and windows, that we find classical details; the doorways recall the porches of the Lombard churches, and are of great beauty in design, the south doorway being said to be by Bramante. Another example, remarkable for its elaborately carved front and porch, is the church of Santa Maria dei Miracoli at Brescia (1487–1490) by Ludovici Beretta, which both externally and internally is one of the richest specimens of the early Italian Renaissance. The church dedicated to Santa Maria dei Miracoli in Venice (1481–1489), by Pietro Lombardo, is another transitional example in which the Byzantine influence of St Mark's is recognizable in the semicircular pediments of its façade and of the exterior of the chancel, and Lombardic influence in its external decorations with pilaster strips and blind arcades. The interior is one of the gems of the Renaissance, on account of its splendid decoration with marble linings and fine cinque-cento carving. Similar semicircular pediments are found in the façade of the church of San Zaccharia at Venice (1515), but are purely decorative because the roof behind is not semicircular like that of the Miracoli. The decoration of the main front, here all in marble, is of an entirely different design, and is subdivided into a series of storeys, the lower panelled, the first storey with arcades and the upper ones with pilasters. An earlier example (1461) in San Bernardino at Perugia is of a far higher standard, and its enrichment with bas-reliefs by the Florentine sculptor Agostino di Duccio (*c.* 1418–*c.* 1490) gives it the first place for its conception and execution. Among others, the church of Spirito Santo, Bologna, in terra cotta; the church of Santa Giustina, Padua (1532); the sacristy of San Satiro, Milan (1479), by Bramante; and the sacristy of the church of Santo Spirito, Florence (1489–1496), by Sangallo, are all interesting examples of the early Renaissance in Italy.

In 1505, on the advice of Michelangelo, Bramante was instructed to prepare designs for a new church in Rome dedicated to St Peter, to take the place of the early basilica, which, built in haste, began to show serious signs of failure. Already, fifty years earlier, Pope Nicholas V. had commenced a new building, the erection of which was stopped by his death in 1454. The scheme was revived by Julius II., and the foundation stone of the new structure was laid in 1506. On Bramante's death in 1514, Raphael, Peruzzi and Sangallo were successively appointed, and the last named prepared a new design, which, however, was not carried out, as he found it necessary first to strengthen the piers of the dome provided by Bramante and to remedy the defects of his successors. In 1546 Michelangelo, then seventy-two years of age, was entrusted with the continuance of the work, and he made radical changes, chiefly in the design of the dome. Comparison of the plans of Bramante and Sangallo with that actually carried out by Michelangelo shows that he not only increased the size of the piers to carry his dome, but the outer walls of the north, south and west apses, and omitted the aisles which surrounded the latter (fig. 51). He would seem to have availed himself of the foundation walls already built and of Bramante's piers to carry the dome, which had been raised up to the cornice, but otherwise the architectural features of the whole building externally and internally were carried out from Michelangelo's own designs. Sangallo had suggested for the exterior a series of superimposed orders with three storeys; Michelangelo elected to have one order only with an attic storey. The building gained thereby in dignity, but it lost in scale, for the huge pilasters of the Corinthian order (87 ft. high) look considerably smaller, in spite of the two storeys of windows between them. These windows also, which from their design are apparently about 10 to 12 ft. high, actually measure 20 ft. in height. The same defect exists in the interior, where the Corinthian order, over 100 ft. in height to the top of the cornice (Plate III., fig. 69), calls for a similar increase in the dimensions of all the sculptured decorations; the figures in the spandrils being 20 ft. high, and the cherubs supporting the holy water spouts 10 ft. Otherwise the scheme realizes the conception which Bramante proposed from the first, viz. to raise the dome of the Pantheon on the top of the basilica of Constantine;

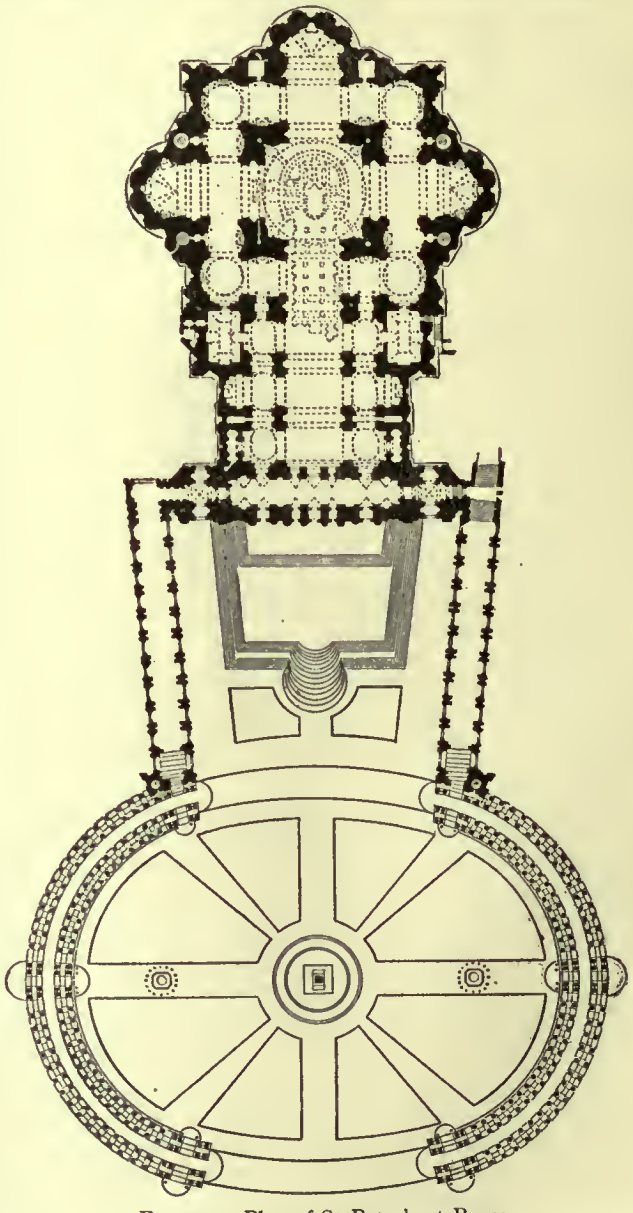


FIG. 51.—Plan of St Peter's at Rome.

the latter being represented by the magnificent barrel vault (75 ft. in span) of the nave, transepts and choir; the former by the great hemispherical dome, 140 ft. in diameter, which, including the drum, is 162 ft. from the top of the cornice above the pendentives to the soffit of the dome. The dome is built in two shells with connecting ribs on the same principle as Brunelleschi's dome in Florence, and was nearly completed before Michelangelo's death in 1563, and the lantern in 1590 from the model which he had made. In 1605 the east end of the old basilica was taken down, and three more bays were added, thus converting the Greek cross of Michelangelo's design into the Latin cross originally conceived by Bramante. The nave and the eastern vestibule were completed in 1620, and the great semicircular portico was added by Bernini in 1667. The immense height of the east façade, and its prolongation in front of Michelangelo's chief feature, the dome, hides the design of a great portion of the latter, so that it can only be seen either from a great distance

(Plate III., fig. 68), or from behind the western apse, where the relative grouping with the great apses can be properly appreciated. A second well-known work by Michelangelo is the new sacristy of the church of San Lorenzo, Florence (1523–1529), designed to contain the monuments of Giuliano and Lorenzo de' Medici, the architectural design of which is poor.

Antonio di Sangallo was the architect of the church of San Biagio at Montepulciano (1518), with a cruciform plan, and dome in the centre, and a campanile at the south-west angle somewhat similar to those of Wren in London.

The church of Santa Maria-di-Carignano (1552) at Genoa, by Galeazzo Alessi, is finely situated but unsatisfactory in its design, the lower part being stunted in its proportions and its order to a different scale from that in the campanile towers and the dome. The most beautiful interior is that of the Annunziata in the same town, by Giacomo della Porta (1587); the arches of its nave arcade are carried on Corinthian columns of marble, of fine proportion, and the nave is covered with a barrel vault with penetrations admitting the light from clerestory windows. The churches of San Giorgio Maggiore (1556–1579), San Francesco della Vigna (1562), and Il Redentore (1577), all in Venice, were designed by Palladio, the interior of the latter being the finest; the façade of the first named is the best-proportioned, but whether its design is due to Palladio, or to Scamozzi, who built it in 1610, is not known. A far finer church in its picturesque grouping and the originality of its design is that of Santa Maria della Salute on the Grand Canal (1631), by Baldassare Longhena; the church is octagonal on plan, with aisles round, giving access to six recesses with altars and to an important eastern chapel with central dome. The central octagon is covered with a lofty dome with immense corbel buttresses of vigorous and fine design. The entrance portal of the west front is perhaps the best example of the period in Italy. Longhena also designed the Santa Maria degli Scalzi (1680), completed by Sardi in 1689, the latter being responsible for the heavy front of San Salvatore (1663), as also of the rich but somewhat debased church, in the Jesuit style, Santa Maria Zobenigo (1680–1683).

Secular Architecture.—In the application of the leading features of classical architectural design to palaces and mansions, the Italians had a much easier field on which to exercise their originality, as the requirements were very different from those which obtained in the middle ages. Moreover, the classic style lent itself more readily to the horizontal lines given by string courses, cornices and ranges of windows, which naturally exist in dwelling-houses on account of the various storeys. As in ecclesiastical, so in secular architecture, the first introduction of the Revival takes place in Florence, which was then the principal art centre of Italy, and the earliest examples are in a sense transitional, in that they are based on the earlier medieval work. As in the Palazzo Vecchio (1298) in Florence, and the Ricciarelli palace at Volterra (*c.* 1320), the rusticated masonry which gives them so fine a character forms the chief characteristic of the Riccardi and Strozzi palaces, the only changes being the substitution of a classic cornice of considerable projection in the place of the machicolations of the Palazzo Vecchio, and the employment of circular arches in the windows in the place of the pointed and curved arches.

The earliest example, the Riccardi palace (1430), by Michelozzo (fig. 52), built for Cosimo de' Medici, is certainly the finest, owing partly to its size but more especially to the magnificent bossed and rusticated masonry of the ground storey and the bold projecting cornice, which crowns so admirably the whole structure. The lower two storeys of the main front of the Pitti palace were built by Brunelleschi in 1435, the return wings and court not being carried out till after 1550 from the designs of Ammanati; compared with the other Tuscan palaces the cornice is extremely poor and the whole front too monotonous. The beautiful court of the Palazzo Vecchio was reconstructed and decorated by Michelozzo in 1434. The Strozzi palace (1489), by Benedetto da Maiano and S. Pollajuolo, (Cronaca), comes next to the Riccardi as regards general design, but in comparison with it the windows are too small, and the want of a much bolder rustication, as provided in the latter, is much felt. Other examples of the same type are the Gondi (1481) and the Antinori palaces, by G. di Sangallo, and the Casa Larderel, all in Florence; the Spanochi (1470) and the Piccolomini (1460) palaces in Siena, and the Piccolomini palace (1490) in Pienza. In the Guadagni palace at Florence, by S. Pollajuolo, there is a third storey, consisting of an open gallery, which gives the depth of shadow otherwise afforded by the projecting cornice. In the Ruccellai palace (1460), by Alberti, the design is spoilt by the introduction of the classic pilasters at regular intervals on each storey, which suggest no structural object and have too little projection to give any effect of light and shade, so that it is only on account of the purity of their details that they are worth notice. The Pandolphini palace, the design of which is attributed to Raphael, carried out after his death by Sangallo, is a simple and unpretentious building of fine proportions: the Pall Mall façade of Sir Charles Barry's Travellers' Club in London is a reproduction of this palace. The Bartolini palace (1520), by Baccio d' Agnolo, is said to have been the first astylar example in which the Classic orders were employed only to decorate the entrance door and windows, but this had already been done in 1488 in the Scuola di San Marco in Venice.

Throughout the greater part of the 15th century, the Venetian Gothic style still held its own in the palaces of Venice, so that it is only towards the close of the century we find the first actual results of the Classic Revival. The earlier palaces may be looked upon as transitional work, in which Gothic principles rule the design while the details are borrowed from classic sources. The intimate acquaintance with the proportions of the Classic orders and their ornamental detail shows that the designers of the earliest Renaissance palaces must have acquired their knowledge outside Venice. Among these designers we find the names of members of the Lombardi family (which, as the name suggests, come from Lombardy), who for three or four generations, either as architects or sculptors, would seem to have been the chief founders of the Renaissance style in Venice. One of these, Pietro Lombardo, has already been referred to as the designer of the church of the Miracoli, and to him is due the Vendramini-Calerghi palace on the Grand Canal (Plate IV., fig. 71), built

From a photo by Alinari.

FIG. 52.—Riccardi Palace, Florence.

in 1481, which in some respects is the finest example in Venice. It should be observed that all these palaces on the Grand Canal have an architectural frontage only, the flanks being built in plain masonry or brick stuccoed over, and with very poor, if any, dressings to the windows. This is well exemplified in the Vendramini palace, where there are gardens on each side, showing the total want of correlation between the rich architectural front and the poverty of the flanks.

In a still earlier example, the Dario palace, one of the flanks borders on a side canal, so that its brick construction, partly covered with stucco, contrasts strangely with the rich marbles encrusting the main front. In the Dario palace the transition from Gothic to Renaissance is more clearly seen, as the only changes made are the substitution of circular window-heads for the Ogee Venetian arch, the projecting cornice with modillions, and more or less pure classic details. In the Vendramini palace the employment of the orders, to break up or subdivide the wall surface, has become a recognized treatment, based on the theatre of Marcellus and the Colosseum at Rome. On the ground storey there are panelled pilasters only, but on the first and second storeys three-quarter detached columns of the Corinthian order are employed, and the entablature is doubled in height with a bold projecting cornice, so as to crown properly the whole building.

The semicircular-headed windows of the palace are filled with moulded tracery carried on columns in the centre of each, which must be looked upon as the classic version of the arcade of the Ducal palace. This feature is found in other early Renaissance work in Venice, as in the Scuola de San Rocco (1517), and the Cornaro Spinelli palace (1480). In the latter, probably also by Pietro Lombardo, there are pilasters only on the groins of the main front, and the window-heads are enclosed in square-headed frames. In the Scuola de San Marco (1488), by Lombardo, we find another type of window, single and lofty, with pilaster strips each side carrying an entablature with pediment. The same window decoration is found on the south and west fronts of the court of the Ducal palace and the external south front, and also in the Camerlenghi palace (1525), by Bergamasco and in other examples of early 16th-century work. In the Scuola de San Rocco the columnar decoration assumes much greater importance, and, in imitation of the triumphal arches of Septimus Severus and Constantine in Rome, the column is completely detached, with a wall-respond behind. Among other examples to be noted are the Cornaro-della-Grande palace (1532), by Sansovino, which is very inferior to his other work in Venice; the Grimani palace (1554), by San Michele (who also designed the fortifications of the Lido); the Zecca or mint (1537), the small loggetta (1540) at the foot of the campanile of St Mark's and now destroyed, and the Procuratie Nuove (completed by Scamozzi in 1584), all by Sansovino; the Balbi palace (1582), by Vittoria; and the Ponte Rialto (1588), by Antonio da Ponte. Sansovino's greatest work in Venice was the library of St Mark's, which was commenced in 1531; in this he has shown not only remarkable powers of design but great boldness in the projection of his columns, cornices and other architectural features. The upper frieze has been increased in height, so as to admit of the introduction of small windows to light an upper storey, and this gives much greater importance and dignity to the entablature crowning the whole structure. Two of the most imposing palaces on the Grand Canal, but of later date, are the Pesaro (1679) and the Rezzonico (1680), both by Longhena, the architect of the Salute church. The former is too much overcharged with ornament, but it has one advantage, the classic superimposed orders of the main front being repeated on the flank overlooking the side canal, with pilasters substituted for the detached columns of the main front. The Rezzonico palace is much quieter in design, and finer in its proportions, but even there the cherubs in the spandrils are too pronounced in their relief.

In Rome there are no important examples of the 15th century, with the exception of the so-called "Venetian palace," which still retains externally the features of the feudal castle, such as machicolations, small windows and rusticated masonry. This was owing probably to the comparative poverty of the city, which had to recover from the disasters of the 14th century. The earliest example of the Renaissance is that of the Cancellaria palace (1495–1505), by Bramante, the architect of the church at Todi; this was followed by a second and less important example, the Giraud or Torlonia palace (1506). The former is an immense block, 300 ft. long and 76 ft. high, in three storeys, with coursed masonry and slightly bevelled joints, the upper two storeys decorated with Corinthian pilasters of slight projection and crowned with a poor cornice, so that its general effect is very monotonous, and the design is only relieved by the purity of its details, such as those of the window and balcony on the return flank. In 1506 Bramante was instructed to carry out the court of the Vatican, of which the great hemicycle at one end, designed in imitation of similar features in the Roman thermae, is an extremely fine example; to what extent he was responsible for the court of the Loggie, decorated by Raphael, is not known. The Villa Farnesina (1506), best known for its fresco decorations by Raphael and his pupils; the Ossoli palace (1525); and the Massimi palace (1532–1536), with magnificent interiors, were all built by Baldassare Peruzzi. The finest example in Rome is the Farnese palace, commenced in 1530 from the designs of Antonio di Sangallo; the design is astylar, as the employment of the orders is confined to the window dressings, the angles of the front having rusticated quoins; the upper storey, with the magnificent cornice which crowns the whole building, was designed by Michelangelo, and in the upper storey he introduced a feature borrowed from the Roman thermae, brackets supporting the three-quarter detached columns flanking the windows. The brilliance of the design is not confined to the exterior, and the entrance vestibule and the great central court are the finest examples in Rome. Here the upper storey added by Michelangelo is inferior to the two lower storeys by Sangallo.

The museum in the Capitol at Rome, by Michelangelo (1546), is one of those examples in which the principles of design are violated by the suppression of the horizontal divisions of the storeys which it should have been an object to emphasize. By carrying immense Corinthian pilasters through the ground and first storeys, Michelangelo, it is true, obtained the entablature of the order as the chief crowning feature, and so far the result is a success, but in other hands it led to the decadence of the style. Among other examples in Rome which should be mentioned are the Villa Madama by Giulio Romano (1524); the Nicolini palace (1526) by Giacomo Sansovino; the Villa Medici (1540) by Annibale Lippi; the Chigi palace (1562) by G. de la Porta; the Spada palace (1564) by Mazzoni; the Quirinal palace (1574) by Fontana (the architect who raised the obelisk in the Piazza di San Pietro); and the Borghese palace (1590) by Martino Lunghi.

We now return to about the middle of the 16th century, to the period when the great architects Barozzi da Vignola and Andrea Palladio of Vicenza commenced their career, and by their works and publications exercised a great and important influence on European architecture.

The villa of Pope Julius (1550), and the Costa palace, Rome, are good examples of Vignola's style, always very pure and of good proportions, but his principal work was that of the Caprarola palace (1555–1559), about 30 m. from Rome, which he built for the cardinal Alessandro Farnese. The plan is pentagonal with a central circular court, and it is raised on a lofty terrace; the palace is in two storeys with rusticated quoins to the angle wings, and the Doric and Ionic orders, superimposed, separating arcades on the lower storeys and windows on the upper. The arcade of the central court is of admirable proportions and detail, second only to that of the Farnese palace.

Palladio in his earlier career measured and drew many of the remains of ancient Rome, and more particularly the thermae (the drawings of which are in the Burlington-Devonshire Collection), but he does not seem to have carried out any buildings there. His most important work, and the one which established his reputation, is that known as the basilica at Vicenza (1545–1549), which he enclosed with an arcaded loggia in two storeys of fine design and proportion, and extremely vigorous in its details. He built a large number of palaces in his native town, among which the Tiene (1550) and the Colleone Porto are the simplest and best, the latter being the model on which the front of Old Burlington House (London) was rebuilt in 1716. In the Valmarana, the Consiglio and the Casa del Diavolo he departed from his principles, in carrying the Corinthian pilasters through two floors, and by returning the cornice round the order he destroyed its value as a crowning feature. Among other works of his are the Chiericate (1560), Trissino (1582) and Barbarano (1570) palaces; the Olympic theatre (1580), which was completed after his death; and the Rotonda Capra near Vicenza, reproduced by Lord Burlington at Chiswick.

Though he laid down no rules for the guidance of others, the works of San Michele are superior to those of Palladio, with the exception, perhaps, of the basilica at Vicenza and the library at Venice. In the Bevilacqua palace (1527), at Verona, there is far greater variety of design than in Palladio's work, and the Pompei palace (1530) and the two gateways at Verona (1533 and 1552) are all bold and simple designs. In the same town is an extremely beautiful example of the early Renaissance, the Loggia del Consiglio (1476) by Fra Giocondo; a similar example with open gallery on the ground storey exists at Padua, where there is also the Giustiniani palace (1524) by Falconetto, an interesting example of a master not much known. The town hall of Brescia (1492) was built from the designs of Tommaso Formentone, who employed for the carving of the medallions on the lower storey, and the pilasters with their capitals and the friezes, various artists of high merit, so that the building takes its rank as one of the finest in north Italy, but independently of their collaboration the design of the first floor is in design and execution equal to Greek work. The upper storey and its circular windows are said to have been added by Palladio, and they are so commonplace and out of scale that by contrast they increase the artistic value of Formentone's work.

The so-called Palazzo de' Diamanti at Ferrara, built in 1493 for Sigismondo d' Este, is decorated externally with a peculiar kind of rustication, in which the square face of the stones is bevelled towards the centre in imitation of diamond facets: the quoins of the palace have panelled pilasters richly carved, and similar pilasters flank the entrance door; the windows, with simple architrave mouldings and cornices on ground storey and pediments on the first storey, constitute the only architectural features of a novel treatment.

At Bologna there are two or three palaces of interest,—the Bevilacqua by Nardi (1484), chiefly remarkable for its central court surrounded with arcades, there being two arches on the upper storey to one on the lower, which presents a pleasant contrast and gives scale to the latter; the Fava palace (1484), in which on one side of the court are elaborately carved corbels carrying arches supporting an upper wall; and the Albergati palace (1521), by Peruzzi, in which the architectural decoration is confined to the entrance doorway windows flanked with pilasters and cornices in pediments and the entablatures of the ground and upper storeys, all the features being in stone on a background of simple brick construction. The Casa Tacconi is similarly treated. Many of the streets in Bologna have arcades on which the upper part of the house is built, and there is an endless variety in the capitals of these arcades.

If the palaces of Genoa are disappointing as regards their external design, this is in some measure compensated for by the magnificence of their entrance vestibules, which (with the staircases and the arcades in the courts beyond) are built in white marble, and have probably suggested the title of the "marble palaces of Genoa." Many of these palaces are situated in narrow streets, so that no general view can be obtained of them, which may account for their exterior being erected in inferior materials with stucco facing. The ground storey of the palaces is almost always raised about 6 to 8 ft. above the street level,

so that the first flight of steps leading up to the court forms a prominent feature in every palace; the ceilings of the entrance vestibule are also mostly decorated with arabesque work in stucco, or with painted devices, &c. The palaces in the town are lofty, and as a rule crowned with fine cornices, and there are no examples of pilasters being carried through the floors; the palaces and villas in the vicinity of Genoa are of less height, and owe much of their magnificence to the terraces on which they are erected. They have no special qualities except in slight variations of the external wall surface decoration, consisting of the applied orders on the several storeys. Among the best examples are the Palazzo Cataldi, formerly Palazzo Carega (1560), in which there are no pilasters, but rusticated quoins at the angles and windows with moulded dressings and pediments. The entrance vestibules of the Durazzo-Pallavicini, Rosso (1558) and Balbi (1610) palaces are in each case their finest features. The Pallavicini palace, and the Pallavicini, Spinola, Giustiniani and Durazzo villas, are all fairly well designed and in good proportions, but with no original treatment. Two of the palaces are flanked by open loggias with arcades, from which fine views are obtained, giving them a special character; that of the Durazzo palace being on the first floor, and of the Doria Tursi on the ground storey. The University (1623) and the Ducal palaces have very magnificent entrance vestibules, the former with lions on the lower ramp of the staircase.

Many of the finest palaces at Genoa are by Galeazzo Alessi, but in none of them has he approached the design of the Marino or municipal palace at Milan, in which he produced a remarkable work; the internal courtyard surrounded with arcades carried on coupled columns is an original combination which is not excelled in any other court in Italy, and the exterior façades are very fine.

The internal courtyard of the hospital at Milan (243 ft. by 220 ft.), with an arcade in two storeys, was designed by Bramante and begun in 1457; only one side was completed by him, but in 1621, in consequence of a large benefaction, the remainder was completed by Ricchini according to the original design; the proportions of the arcade are extremely pleasing, and it forms now one of the chief monuments of the town. Ricchini was the architect of the Litta palace, one of the largest in Milan.

There still remains to be mentioned one of the early examples of the Renaissance, the triumphal arch which was erected in 1470 at Naples to commemorate the entry of Alphonso of Aragon into the town. It is built against the walls of the old castle in four storeys, and connected with bas-reliefs and statues. The largest palace in Italy, that of the Caserta at Naples, with a frontage of 766 ft., built in 1752 by Vanvitelli, is one of the most monotonous designs, rivalled in that respect only by the Escurial in Spain. (R. P. S.)

Renaissance Architecture in France

The classical revival of the 15th century in Italy was too important a movement to have remained long without its influence extending to other countries. In France this was accelerated by the campaigns of Charles VIII., Louis XII. and Francis I., which led to the revelation of the artistic treasures in Italy; the result being the importation of great numbers of Italian craftsmen, who would seem to have been employed in the carving of decorative architectural accessories, such as the panels and capitals of pilasters, niches and canopies, corbels, friezes, &c., either in tombs, as for instance in those of Charles of Anjou at Le Mans (1472) and at Solesmes (1498), of Francis, duke of Brittany (1501), and of the children of Charles VIII. (1506) at Tours, and of Cardinal d'Amboise in Rouen cathedral, the figures in all these cases being carved by French sculptors. They were also employed in architectural buildings, where the design and execution were by French master-masons, and the Italians were called in to carve the details, as in the choir screens of Chartres, Albi and Limoges cathedrals, the portal of St. Michel at Dijon, the eastern chapels of St Pierre at Caen, and numerous other churches throughout France; or for mansions like the Hôtel d'Alluye at Blois, the Hôtel d'Allemand at Bourges, and the châteaux of Meillant (1503), Châteaudun and Nantouillet (1519). The great centre of the artistic regeneration was at first at Tours, so that in Touraine, and generally on the borders of the Loire and the Cher at Amboise, Blois, Gaillon, Chenonceaux, Azay-le-Rideau and Chambord, are found the principal examples; later, Francis I. transferred the court to Paris, and the château of Madrid, and the palaces of Fontainebleau, St Germain-en-Laye, and the Louvre, follow the change. In all these châteaux the Italian craftsman would seem to have been under the direction of the master-mason or architect, because the whole scheme of the design and its execution is French, and only the decoration Italian. In cases where the Italian was not called in, the Gothic flamboyant style flourishes in full vigour with no suggestion of foreign influence, as in the palais de justice at Rouen, the church of Brou (Ain), 1505–1532, the Hôtel de Cluny, Paris, and the rood-screen of the church of the Madeleine at Troyes (1531).

Between the last phase of Flamboyant Gothic and the introduction of the pure Italian Revival there existed a transitional period, known generally as the "Francis I. style," which may be subdivided under three heads:—the Valois period, comprising the reigns of Charles VIII. and Louis XII. (1483–1515); the Francis I. period (1515–1547); and the Henry II. and Catherine de' Medici period (1547–1589). The first two are characterized by the lofty roofs, dormers and chimneys, by circular or square towers at the angles of the main building with decorative machicolations and hourds, by buttresses set anglewise, which run up into the cornice, and square-headed windows with mullions and transoms. In the second period the machicolations are converted into corbels carrying semicircular arcaded niches in which shells are carved; the buttresses become pilasters with Renaissance capitals; and the Gothic detail, which in the first period is mixed up with the Renaissance, disappears altogether. In the third period Italian design begins to exert its influence in the regular interspacing of the pilasters or columns with due proportion of height to diameter, in the completion of the order with the regular entablature, and its employment generally in a more structural manner than in the earlier work.

The two first periods are well represented in the château of Blois, where, in the east wing built by Louis XII., square-headed windows alternate with three central arches, the buttresses are set anglewise running into the cornice, and pillars and angle shafts are carved with chevrons, spiral flutings, or cinque-cento arabesque; the cornices of the towers containing staircases project and are carried on arched niches supported on corbels (the new interpretation of the machicolations of the feudal castle); above the cornice is a balustrade with pierced flamboyant tracery, and the dormer windows retain their Gothic detail. In the north wing of Francis I. all these Gothic ornamental details disappear, and are replaced by the Renaissance. Panels and pilasters take the place of the buttresses—the panels sometimes enriched with cinque-cento arabesque; shells are carved in the arched niches of the cornice, and modillions and dentil courses are introduced; the balustrade is pierced with flowing Renaissance foliage interspersed with the salamanders and coronets; the same high roofs are maintained, but the dormer windows and chimneys, still Gothic in design, are entirely clothed with Renaissance detail.

The finest feature of the façade of this north wing, facing the court, is the magnificent polygonal staircase tower in its centre (Plate VIII., fig. 84); four great piers rise from ground to cornice, between which the rising balustrade is fitted; the whole feature Gothic in design, but Renaissance in all its details. The splendid carving of the panels of the piers and the niches with their canopies was probably done by Italian artists. The figures in these niches are said to be by Jean Goujon. The great dormers and chimneys have not the refinement in their design which characterizes the lower portion, and may be of later date. The north front of the château is raised on the foundation walls of the old castle, part of which is encased in it, and this may account for the slight irregularities in the widths of the bays. The design differs from that of the south front, the windows all being recessed behind three-centre arched openings; the open loggia at the top, which is admirable in effect, is a subsequent alteration.

Before passing to the Louvre and Tuileries, representing the third period, we must refer to some other important early châteaux and buildings. Some of these, such as the châteaux of Madrid and Gaillon, are known chiefly from du Cerceau's work, as they were destroyed at the Revolution. Of the latter building, the entrance gateway is still *in situ*; there are some portions in the court of the École des Beaux-Arts at Paris, consisting of a second entrance gateway, a portico and some large panels. The gateway shows a singular mixture of Gothic and Renaissance; the centre portion, with the gateway and great niche over, is debased classic, the side portions retaining the buttresses, mouldings, panels and other features belonging to the latest phase of Flamboyant Gothic.

Of buildings still existing, the hôtel de ville of Orleans (1497) is a good example of early transition work, in which Gothic and Renaissance work is intermingled, and it is interesting to compare it with the hôtel de ville at Beaugency, built by the same architect, Viart, some twenty-five years later. There is the same principle in design, much improved in the later example, but all the Gothic details have disappeared.

In the château of Chenonceaux (1515–1524) we find a compromise between the two styles; Gothic corbels, piers and three-centre arches are employed, varied with debased classic mouldings, shells and capitals; here, as at Azay-le-Rideau (1520), the château was

not transformed like those at Langeais and Rochefoucauld, where what was externally a 14th-century castle developed internally into a 16th-century mansion; both Chenonceaux and Azay-le-Rideau were built as residences, and yet in both are displayed those features which belong to the fortified castle; at the angles of the main structure in both cases are circular towers, in the latter case crowned with machicolations and hourds, which, however, are purely decorative, pierced with windows, and broken at intervals with dormer windows, a feature which gives it the aspect of an attic storey. The lofty roofs and conical terminations to these angle towers, with dormer and chimney, give the same picturesque aspect to the grouping as that which was afforded in the fortified castle, where, however, they originated in the necessity for defence. The entrance portals of both châteaux are beautiful features, absolutely Gothic in design, and only transformed by cinque-cento detail.

In the château of Chambord (1526) we find the same defensive features introduced, in the shape of great circular towers at the angles, but here with more reason, as the château was intended more for display than habitation. The château itself, about 200 ft. square, has circular towers at the angles, and in the centre a spiral staircase with double flight, leading to great halls on each side, which give access to the comparatively small rooms in the angles of the square and the towers beyond, and to the roof, which would seem to have been the chief attraction, as there is a fine view therefrom; and the elaborate octagonal lantern over the staircase, the dormer windows, chimneys and lanterns on the conical roofs of the towers, are all elaborately carved. There are three storeys to the building, subdivided horizontally by string courses, and terminated with a fine cornice carrying a balustrade, and vertically by a series of pilasters of the Corinthian order. The varied outline of this building, with the alternation of blank panels and windows between the pilasters, relieves what might otherwise have been its monotony. The château is situated on the east side of a great court measuring about 500 ft. by 370 ft., with a moat all round. To the right and left of the central block the walls are carved up three storeys, and an attic, with open arcades inside, leading to the angle towers of the enclosure. At a later period Louis XIV. continued the unfinished structure by a one-storey building round. The carving of the capitals, corbels and other decorative work was all done by Italian artists, under the direction of some architect whose name is not known.

One of the gems of Francis I.'s work is the small hunting lodge originally built at Moret near Fontainebleau, to which at one time the king thought of adding, before he began his great palace there. This was taken down in 1826, and re-erected in the Cours-la-Reine at Paris. Though small, it is the purest example of the first Renaissance. Other examples are the hôtel de ville of Paray-le-Monial (1526); the Hôtel d'Anjou at Angers (1530), built by Pierre de Pincé; the Hôtel Bernuy at Toulouse (1530); the Hôtel d'Ecoville at Caen (1532); the Manoir of Francis I. at Orleans; the Hotel Bourgthéroulde at Rouen (1520–1532) and other buildings opposite Rouen cathedral, and what remains of the château known as the Manoir d'Ango (1525) at Varengeville, near Dieppe. The château of St Germain-en-Laye (1539–1544), the upper half of which is built in brick, belongs also to the early period, as also the hôtel de ville at Paris, built in 1533 by Domenico da Cortona, an Italian, who after spending some thirty years in France would seem to have caught the spirit of the French Renaissance so well as to be able to produce one of the most remarkable examples of the Francis I. style. In the existing building the original design has been copied from the building burnt down by the Communists in 1871.

From this we pass to the palace at Fontainebleau, begun by Francis I. in 1526, to which there have been so many subsequent additions and alterations that it is difficult to differentiate between them. The building owes its picturesque effect more to its irregular plan (as portions of an earlier structure were enclosed in it) than to any brilliant conceptions on the part of its architect. There is an endless variety of charming detail in the capitals, corbels and other decorative features, but the employment of pilaster strips purely as decorative features (without any such structural property as that in the Porte Dorée at the Cour Ovale) suggests that the Italian architect Serlio, to whom sometimes the work is ascribed, certainly had nothing to do with it.

On the other hand, there is every reason to believe that the designs made by Pierre Lescot for the Louvre, begun in 1546, were, as regards their style, largely based on the principles set forth in Serlio's work on architecture, published in 1540. The south-west angle of the court of the Louvre is the earliest example of the third period of the Renaissance, in which the orders are employed in correct proportions with columns or pedestals carrying entablatures with mouldings based on classic precedent. The portion built from Lescot's designs (Plate VIII., fig. 83) consists of the nine bays on the east and north sides, the latter not being completed till 1574, as the workmen would seem to have been transferred to the building of the Tuileries, begun in 1564.

The Corinthian order is employed for the ground and first storeys and an attic storey above, in which the pilaster capitals run into the bedmold of the upper cornice. Of the nine bays, the central and side bays are twice the width of the others, and project slightly with the cornices breaking round them; this feature, and the crowning of the western bays with a segmental pediment, give a variety to the design, which otherwise might have become monotonous by its repetition of similar features. The balustrade also is replaced by the *chêneau*, a cresting in stone, which hereafter is found in nearly all French buildings. The sculptor, Jean Goujon, would seem to have worked in complete harmony with the architect, thus producing what will always be considered as one of the *chef-d'œuvres* of French architecture.

The architect employed by Catherine de' Medici for the Tuileries was Philibert de l'Orme, who combined the taste of the architect with the scientific knowledge of the engineer. Only a portion of his design was carried out, and of that much disappeared in the 17th century, when his dormer windows were taken down and replaced by a second storey and an attic. Bullant and du Cerceau also added buildings on each side.

The Tuileries were built about 500 yds. from the Louvre, and Catherine de' Medici conceived the idea of connecting the two. The work, which began with the "Petite Galerie," with the south wing, as far as the Pavillon Lesdiguieres, was started in 1566, being of one storey only. The mezzanine and upper storey were not completed till the beginning of the 17th century. In 1603 the remainder of the south front and the Pavillon-de-Flore were completed by Jacques Androuet du Cerceau.

Of Philibert de l'Orme's work at Anet (1549), only the entrance gateway, the left-hand side of court, and the chapel remain, sufficient, however, to show that he had already at that early date mastered the principles of the Italian Revivalists. The chapel is in its way a remarkable design, but the hemispherical dome, pierced by elliptical winding arches inside, is not happy in its effect. The frontispiece which he created opposite the entrance, now in the court of the École des Beaux-Arts in Paris, shows great refinement in its details, but proportionally errs in many points. De l'Orme built also the bridge and gallery on the river Cher, forming an addition to the château of Chenonceaux.

Amongst other work of this period are the additions made by Bullant to the château de Chantilly, where he traversed the principles of classic design by running Corinthian pilasters through two storeys and cutting through the cornice of his dormer windows. At Écouen (1550) he destroyed the scale of the earlier buildings of 1532 by raising in front of the left wing of the court four lofty Corinthian columns with entablature complete, which he copied from the temple of Castor in Rome.

Among the early Renaissance work are the château of Ancy le Franc (Yonne), Italian in character, which may be by Serlio (1546); the Hôtel d'Assézat at Toulouse (1555), in which there is a strong resemblance to the court of the Louvre; the houses at Orleans, known as those of Agnes Sorel, Jeanne d'Arc and Diane de Poitiers (1552); and there is other work at Caen, Rouen, Toulouse, Dijon, Chinon, Périgueux, Cahors, Rodez, Beauvais and Amiens, dating up to the close of the 16th century. In this list might also be included the fine town hall of La Rochelle, the Hôtel Lamoignon in the rue des Francs-Bourgeois, Paris (1580), and the Hôtel de Vogüé at Dijon, which retained the Renaissance character, though built in the first year of the 17th century.

In the reigns of Henry IV. and Louis XIII. the first work of importance in Paris is that of the Place Royale, now the Place des Vosges; in this brick was largely employed, and the conjunction of brick and stone gave a decorative effect which dispensed with the necessity of employing the Classic orders. At Fontainebleau, where Henry IV. made large additions, the same mixture of brick and stone is found in the Galerie des Cerfs, and in the great service court (*cour des cuisines*). The example set was followed largely through the country, and numerous mansions and private houses in brick and stone still exist. Henry IV.'s most important work at Fontainebleau is the Porte Dauphine, of which the lower part, with rusticated columns and courses of masonry, does not quite accord in scale or character with the superstructure, in which is put some of the best work of the century.

Except perhaps for the monotony of the rusticated masonry which is spread all over the building, the palace of the Luxembourg, by Salomon de Brosse (1615), is an important work, in which he was probably instructed by Marie de'Medici to reproduce the general effect of the Pitti palace at Florence. The three storeys of the main block are well proportioned, but the absence of a boldly projecting cornice, such as is found in the Riccardi and Strozzi palaces, is a defect; the same architect reconstructed the great hall of the palace of justice at Paris, burnt in 1871 but now rebuilt to the same design.

In 1629 the building subsequently known as the Palais Royal was begun from the designs of Lemercier; but it has been so materially altered since that scarcely anything remains of his design, though the works carried out from his designs at the Louvre were of the greatest possible importance. The court of the latter, as begun by Pierre Lescot, was of small dimensions, corresponding with that of the palace of Philip Augustus, but Lemercier proposed to quadruple its dimensions. It is not certain whether he built the lower portion of the Pavillon d'Horloge, but he designed the upper part, with the caryatid figures sculptured by Jacques Sarrazin. On the north side of this pavilion he built a wing similar in length and design to that of Pierre Lescot, and continued the wing along the north side to the centre pavilion; this was continued by Levau, the architect of Louis XIV., round the other sides of the court. His design for the

east front, however, did not recommend itself to the king or to his minister Colbert, and a competition was held, the first place being given to the design by a physician, Dr Perrault. Prior to its being begun, however, Bernini was sent for, and he submitted other designs, fortunately not carried out, as they would have destroyed the court of the Louvre. In 1665 the works were begun on the design of Perrault, a grandiose frontispiece which appealed to Louis XIV., but in which no cognizance had been taken of the various rooms against which it was built; consequently no windows could be opened, and it forms now a useless peristyle. Moreover it was so much wider than the original building that on the north side it became necessary to add a new front. Fortunately the example set by Perrault of coupling columns together has rarely been followed since in France, so that in the Garde-Meuble on the south side of the Place de la Concorde, by Gabriel, we return again to the original classic peristyle. The works undertaken at the Louvre progressed but slowly, in consequence of the greater interest taken by Louis XIV. in the palace he was building at Versailles, an extension of the hunting-box built by his father Louis XIII., which he insisted should be maintained and incorporated as the central feature in the new building. But as it was comparatively small in dimensions, of simple design, and in brick and stone, it was quite unfit to become the central feature of the main front of the largest palace in Europe. To make it worse, the new wings built on either side were lofty and of more importance architecturally, and as they projected some 300 ft. in advance of the earlier building, they reduced it to still greater insignificance. But even then the architect, Jules Hardouin Mansart, might have redeemed his reputation by buildings of greater interest than those which now exist. The back elevation of the central block is 330 ft. wide, the returns 280 ft., and the length of the wings on each side 500 ft.; in other words he had nearly 1900 ft. run of façade, and it is simply a repetition of the same bays from one end to the other, in three storeys all of the same height, the lower one with semicircular arched openings, the first floor decorated with pilasters on columns of the Ionic order, and an attic storey above with balustrade. The slight projection given to the central and side bays of each block, just sufficient to allow of columns in the first floor as decorative features instead of pilasters, is of no value in fronts of such great dimensions. The great galleries inside have the same monotonous design as in the façades, relieved only by the rich decoration in the first case and the splendid masonry in the latter. There is one saving clause in the main front, the chapel by R. de Cotte on the right-hand side being externally and internally a fine structure, and the best ecclesiastical example of the period.

Among other buildings of the 17th century are those begun by Cardinal Mazarin in the rue de Richelieu, which now constitute the National library; the Hôtel de Toulouse (1626), now the Bank of France; the Hôtel de Sully (1630), by du Cerceau; the Hôtel de Beauvais (1654), by le Pautre; the Hôtel Lambert (also by le Pautre), in the Île St Louis; the château at Maisons, near St Germain-en-Laye, by François Mansart (1656); the Institute of France (1662), by Levau; two triumphal arches, of St Denis (1672), by Blondel, and St Martin (1674) by Bullet; the Hôtel des Invalides (1670), by Bruant; the Place des Victoires and the Place Vendôme (1695–1699), by Jules Hardouin Mansart, in which a series of large houses are grouped together in one design; the Trianon at Versailles (1676), and the château of Marly (1682), both by J. H. Mansart; and important monumental buildings in the principal provincial cities, such as Lyons, Bordeaux, Nantes and Tours.

In the 18th century those which are worthy of note are the Hôtel Soubise (1706), now the "Archives Nationales"; the fountain in the rue de Grenelle, a fine composition; the École Militaire (1752), by Gabriel; the École de Médecine (1769), by Gondouin; the mint (1772), by Antoine; the Place de la Concorde, with the Garde-Meuble, by Gabriel (1765); the Hôtel de Salm, now the Legion of Honour; the Place Stanislas at Nancy (1738–1766), in which are grouped the town hall, archbishop's palace, theatre and other public buildings, with triumphal arch and avenues leading to the palace of the duke Stanislaus (with magnificent wrought-iron enclosures and gates by Jean Lamour, the greatest craftsman of the century); the theatre at Bordeaux by Louis; and the Odéon, Paris (1789).

The ecclesiastical architecture of the French Renaissance comes at the end of our description owing to the far greater importance of the palaces, mansions and public monuments, and also because in the beginning of the 16th century France found herself in possession of a much larger number of cathedrals and large churches than she could maintain. Some of these are still unfinished, so that her first efforts would seem to have been directed to the completion of those already begun rather than to the erection of new ones, St Eustache in Paris being nearly the only exception of importance prior to the 17th century.

We have from time to time dwelt upon the important consideration which must not be lost sight of, viz. that nearly all the buildings erected in France up to the accession of Henry IV. were conceived and carried out in the spirit of the Flamboyant Gothic style, cinque-cento details mixed up with Gothic at first, then superseding them, and even when the influence of the Italian revivalists began to exert itself, still retaining much of her traditional methods of design. If this was the case in civil architecture, it was naturally more pronounced in the additions made to ecclesiastical structures, and the gradual development of the style may be more easily followed in the latter. These are, however, so numerous, and they are so universally spread throughout France, that only a few of the most interesting examples can be here given; for instance, the porch of St Michel at Dijon; the upper part of the western towers of the cathedrals of Orleans and Tours; the three eastern chapels of St Jacques, Dieppe, built at the cost of Jean Ango, a celebrated merchant-prince of Dieppe, to whose château at Varengeville we have already referred; the eastern chapels of St Peter's, Caen, from the designs of Hector Sohier (1521), both internally and externally of great interest; the west end of the church at Vétheuil (Seine-et-Oise); the magnificent work of the west front and tower of the church at Gisors; the upper part of the west front of the cathedral at Angers; the portals of the church at Auxonne (Fichot); the choir at Tillières; the lantern of the church of St Peter, Coutances (1541); the porch of the Dalbade at Toulouse; and the north front of the church of Ste Clotilde at Les Andelys, which dates from the age of Henry II.

The church of St Eustache at Paris, begun in 1533, but not completed till the end of the century, is a large cruciform Gothic structure with lofty double aisles on each side and carried round the choir, and rectangular chapels round the whole building, excepting the west end. Structurally also it possesses all the most characteristic features of the Gothic church, with nave arcades carried on compound piers, triforium and clerestory, vaulted throughout, and flying buttresses outside. Close examination shows that all the details are of the early cinque-cento work, panelled pilasters of varying proportions, but with Renaissance capitals, corbels, niches and canopies all grouped together in a Gothic manner, and quite opposed to the principles of the Italian revivalists; what is more remarkable is that though long before its completion these principles had already borne fruit in the Louvre and Tuileries, the original conception was adhered to, and the portals of the north and south transepts (the last features added, with the exception of the ugly west front of the 18th century) still retain the character of the early French Renaissance.

In St Étienne-du-Mont, sometimes claimed as a second example, the church is Flamboyant Gothic throughout, the chief additions being the magnificent rood-screen of 1600, and the west portal, in which the banded columns of the Bourbon period form the chief features.

Coming to churches of later date, Salomon de Brosse (*c.* 1565–1627), the architect of the Luxembourg palace, added in 1616 a fresh front to the church of St Gervais, finely proportioned and of pure Italian design, which contrasts favourably with the Jesuits' church of St Paul and St Louis (1627–1641), overladen with rococo ornament; then came the churches of the Sorbonne (1629), by Jacques Lemercier, and of the Val-de-Grace (1645), by François Mansart, the dome of the latter, though small, being a fine design; the church of the Invalides, also by Mansart, the dome of which is the most graceful in France; the cathedral of Nancy (1703–1742), by Jules Hardouin Mansart and Germain Boffrand (1667–1754), the principal front of which is flanked by two towers with octagonal lanterns which group so well with the central portion (of the usual design, in two stages with pilasters and coupled columns, carrying a third stage with circular pediment) that it is unfortunate it should be almost the only example of its kind; and lastly the church of Ste Geneviève, better known as the Panthéon (1755), by Jacques Germain Soufflot (1713–1780), the dome of which is based largely on that of St Peter's in Rome. The main building with its great portico is a simple and fine piece of design, and unlike St Peter's the dome is well seen from every point of view; the decoration of its walls with paintings by Puvis de Chavannes and other French artists has now rendered the interior one of the most interesting in France. (R. P. S.)

Renaissance Architecture in Spain

In Spain, as in France, the revival of classic architecture was engrafted on the Flamboyant style of the country, influenced here and there by Moorish work, so that the earlier examples of Spanish Renaissance constitute a transitional style which lasted till the accession of Philip II. (1558), who introduced what was then considered to be the purer Italian style of Palladio and Vignola. This, however, did not seem to have had much attraction for the Spaniards, owing to its coldness and formality, so that in the latter half of the 17th century a reaction took place in favour of the most depraved and decadent architecture in existence.

The magnificence of the earlier Renaissance work, which was introduced into Spain when she was at the zenith of her power, and (owing to the discovery of a new world) the possessor of enormous wealth, has scarcely yet been recognized, in consequence of the greater attraction of the Moorish architecture; there is

no doubt that its exuberant richness in the 16th century derives its inspiration from the latter, and especially so in patios or courts found in every class of building, ecclesiastical as well as civil. There is still, however, another characteristic in the early Renaissance of Spain, which is not found in Italy or France, and which again owes its source to Moorish work, where the external walls and towers consist of simple plain masonry, and the rich decoration, generally in stucco brilliantly coloured and gilded, is confined to the courts and to the interiors of their magnificent halls. The Italian method of decorating the external front of the palaces with flat pilasters of the various orders placed at regular intervals, the windows and doors forming features of second-rate importance, was not followed by the architects of the Spanish Renaissance, who retained the simple plain masonry and reserved their decorations for the entrance doorways and windows, emphasizing therefore these features, and by contrast increasing their value and interest.

Instead also of the huge *cornicione* which the Italians employed to give the shadows required to emphasize the crowning features of their palaces, the Spanish architects preferred to obtain a similar effect by an open arcaded upper storey, which, as Fergusson remarks, "forms one of the most pleasing architectural features that can be applied to palatial architecture, giving lightness combined with shadow exactly where wanted for effect and where they can be applied without any apparent interference with solidity." These galleries would seem to have been provided to serve as promenades to the occupants of the palace, and more especially for the ladies when it would have been unwise or imprudent for them to venture into the streets. There is one well-known example in France, in the château of Blois, which is so attractive a feature that it is singular it has not been more often adopted.

Instead also of the monotonous balustrade, which is invariably found in Italy, the Spanish architects introduced richly carved crestings, with finials at regular intervals, a feature probably borrowed from Flamboyant Gothic and Moorish.

The three periods into which the architectural phases of the Renaissance style in Spain are divided are:—(1) The Plateresque or Silversmiths' work, from the conquest of Granada to the reign of Philip II. (2) The purer Italian style, called by the Spanish the Greco-Roman, though it has no Greek elements in its design, being based on the work of Palladio and Vignola. This style prevailed until the end of the 17th century. (3) The Rococo or Churrigueresque style, so called from the name of the architect, José Churriguera (d. 1725), the chief leader of the movement, which lasted for about 100 years.

Ecclesiastical Architecture.—The cathedral of Granada, built from the designs of Diego de Siloé, is the earliest example of the Renaissance in Spain, and in some respects the most remarkable, not only for its plan, in which there is an entirely new feature, but for the scheme adopted in the vaulting, which covers the whole church, and shows that its architect had studied the earlier Gothic churches, and was well acquainted with the principles of thrust and counter-thrust developed in them. The cathedral is 400 ft. long by 230 ft. wide, and therefore of the first class as far as size is concerned. The western portion consists of nave and double aisles on each side, the outer aisle being carried round the whole church and giving access to the chapels which enclose the building. The principal feature of the cathedral is at the east end, where the place of the ordinary apse is occupied by a great circular area, 70 ft. in diameter, crowned by a lofty dome, in the centre of which in a flood of light stands the high altar. The vista from the nave through the great arch (37 ft. 6 in. wide and 97 ft. high) is extremely fine, and it is strange that it should be the only example of its kind. The west front was completed at a later date; the only feature of it belonging to the original church being the north-west tower, which, in its design, resembles the south-west tower of the church at Gisors in France. There are two other important Renaissance cathedrals at Jaen and Valladolid. The latter was built from a design of Juan de Badajoz in 1585 but never completed. On the south side of the cathedral is the chapel in which the Catholic kings lie buried, where there are two fine marble tombs enclosed by the *reja* or wrought-iron screen partly gilt, forged in 1522 by Maestre Bartholomé. The *sagrario* or parish church, also on the south side, is a small version of the scheme of design employed in the cathedral.

In Spain, as in France, magnificent portals have been added to cathedrals and churches, and these are amongst the finest works of the Renaissance period. The more remarkable of these are the portals of the cathedral of Malaga, a deeply recessed porch, enriched with slender shafts and niches between; of Santa Engracia at Saragossa; and of Santo Domingo and the cathedral at Salamanca. Externally the Renaissance domes over the crossings of Spanish cathedrals are poor, but this is compensated for by the lofty steeples which form striking features. The western towers of the cathedral at Valladolid; the tower of the Seo in Saragossa, which bears some resemblance to Wren's steeples in the setting back of the several storeys and the crowning with octagonal lanterns; the tower of the cathedral Del Pilar at Saragossa, and that at Santiago, are all interesting examples of the Spanish Renaissance.

One of the most beautiful features of the Spanish Renaissance is found in the magnificent *rejas* or wrought-iron grilles, richly gilt, which form the enclosures of the chapels. Besides the example at Granada, others are found at Seville, where is the masterpiece of Sancho Muñoz (1528); at Palencia (1582); Cuenca (1557), where there are three fine examples; Toledo; Salamanca; and other cathedrals. The iron pulpit at Avila, the eagle lectern at Cuenca and the staircase railing at Burgos are all remarkable works in metal.

Secular Architecture.—With the exception of the magnificent portals, the finest works of the Renaissance in Spain as in France are to be found in the secular buildings, but with this difference, that the best examples in France are those built in the country or in comparatively small provincial towns, whereas in Spain they are all in the midst of the larger towns, and further they are not confined to palaces and châteaux; monasteries and universities coming in for an equal share in the great architectural development.

The characteristic style of the Spanish architecture of the Renaissance period is due probably to the influence of the earlier Moorish work, where the value of the rich Alhambresque decorations in the entrance doorways and windows, and the patios or courts, is enhanced by contrast with the plain masonry of their walls and towers. This influence had already been felt in the Spanish flamboyant Gothic panelling and tracery; when translated into Renaissance, and probably, at first, executed by Italian artists, it displayed a variety and beauty in its design scarcely inferior to some of the best work in Italy. And this development, taking place at a time when Spain was overflowing with wealth, resulted in that exuberant richness we find in the entrance doorways and windows, the external galleries of the upper storey, and the rich cresting surmounting the cornice.

Comparison with the contemporary and even earlier work in Italy, where the principal thought of the architect would seem to have been to break the wall surface by an unmeaning series of flat pilasters, and then fill in the windows as features of secondary importance, will show that the Spanish architect recognized more fully the true principle of design, and although, in the profiles of their mouldings, and the execution of the sculpture decorating their pilasters and friezes, Spanish work in contrast with Italian looks somewhat coarse, in general picturesqueness it is far in advance of the palaces of Rome, Florence, and even Venice, and has not yet received the recognition which it deserves.

The earliest palace built in the Renaissance style is that which adjoins the Alhambra at Granada, and was begun by the emperor Charles V. for his own residence in 1527, but never completed. The building is nearly an exact square of 205 ft., with a great circular court in the centre, nearly 100 ft. in diameter. This central court was enclosed by a colonnade with Doric columns, and an upper storey with columns of the Ionic order. From the unfinished condition of the palace and the absence of roofs, it is difficult to decide what the form of the latter might have been. But the design, begun by Pedro Machuca and continued by Alonso Berruguete (1480–1561), is so remarkable that it ought to be better known. Its proximity to the Alhambra, however, deprives it of the attention which otherwise it deserves for the purity of its details and for its good proportion.

A second palace, the Alcazar at Toledo, was begun in 1540 by Charles II., but little else than the bare walls remain, as it was destroyed by fire in 1886, after having been twice rebuilt. In its design it belongs to the true Spanish type of the Renaissance, with the simple ashlar masonry of its walls and the accentuation of the principal entrance doorway and the windows. In this palace also the plan is square, about 110 ft., with a square courtyard (240 ft.).

The third palace built, the Escorial, some 20 m. to the north-east of Madrid, is the most renowned—more, however, on account of its immense size than for its design. It was built for Philip II. and begun in 1563 from the designs of Juan Bautista de Toledo, being completed by his pupil, Juan de Herrera, in 1584. The principal front is 680 ft. in width, the depth of the palace 540 ft., with the king's residence in the rear. The plan is a fine conception, and consists of a large entrance court in the centre, with the church in the rear, having on the right the Colegio and on the left the monastery, with numerous courts in each case. The church is 320 ft. long by 220 ft. wide, the principal portion being the intersection of the nave and transept, which is covered by a dome. The coro is placed above the entrance vestibule, which is 100 ft. long and 27 ft. high, imperfectly lighted, but by contrast emphasizing the dimensions and the splendour of the church beyond. Externally the grouping is fine; the lofty towers at the angles, the central composition of the main front, and at the rear of the court the front of the church

with its corner towers and the great dome, all form an exceedingly picturesque group, and it is only when one begins to examine the work in detail that its poverty in design reveals itself. Instead of accentuating the windows of the principal storeys and giving them appropriate dressings, the fronts are pierced with innumerable windows, which give the appearance of a factory, and the angle towers, nine storeys high, look like ordinary "sky-scrapers," without any of the dignity and importance which the architectural design of a palace requires. The same applies to the great entrance courts five storeys high with an attic, all of the most commonplace design. Internally the church is fine, but it is dwarfed by the immense size of the Doric pilasters, 62 ft. high, all in plain stone masonry, the coldness of which is emphasized by the rich colouring of the vaulted ceilings and the elaboration of the pavement, all in coloured marbles. The palace is regarded by the Spaniards as the Versailles of Spain, and if it had been possible to have interchanged some of the features, to transfer to Versailles some of the towers, and to break up the wall surface of the Escorial with the superimposed order of pilasters, which became monotonous by their repetition at Versailles, both palaces would have gained.

The palace at Madrid is the last of the series, and although it was begun at a much later period, by Philip V. in 1737, from the designs of the Italian architect Sachetti, it is a fine and simple composition, consisting of a lofty ground storey with coursed masonry, carrying semi-detached columns of the Ionic order, rising through three storeys, the whole crowned by an entablature and a bold balustrade. The slightly projecting wings at each end of the main front and the central frontispiece give that variety and play of light and shade of which one regrets the absence in the Cancellaria palace at Rome.

We must, however, retrace our steps to the beginning of the 16th century, to take up the early buildings of the style; the palace of the Conde de Monterey at Salamanca, built in 1530 from the designs of Alonso de Covarrubias, is a fine example. The masonry of the ground and first floors is of the simplest character, the decoration being confined to the entrance doorways and to the windows of the important rooms. It is on the second floor that the design becomes enriched with an open arcade and entablature above, crowned with a rich cresting. In the wings at the angles, and in the central block, the buildings are carried up an additional storey, the plain masonry of which gives value to the open galleries between. On these wings and the central block are other galleries crowned with entablature and cresting. These features therefore form towers, which break the sky-line. There is still another treatment peculiar to the Spanish Renaissance, in which the example of the Moorish palaces would seem to have been followed, viz. the elaborate carving of the pilasters and their capitals, of the panelling and the horizontal friezes, which is extremely minute and finished in the lower storeys, but increases in scale and projection towards the upper storeys. This is very notable in the entrance gateway of the university of Salamanca (Plate V., fig. 73), where the carved arabesque in the panelling above the doors is of the finest description, equal to what might be found in cabinet work, whilst that of the upper portion immediately under the cornice is at least twice the scale of that below and is in bold relief.

The principal buildings characteristic of the Spanish Renaissance, in chronological order, are:—the hospital of Santa Cruz at Toledo, built in 1504–1514, and the Hospicio de los Reyes at Santiago (1504), both from the designs of Enrique de Egas, the former with a magnificent portal rising through two storeys and a gallery with an open arcade above; the Irish college at Salamanca, built (1521) from the designs of Pedro de Ibarra, Alonso de Covarrubias, and Berruguete; the convent of San Marcos, Leon, by Juan de Badajoz (1514–1545)—here, however, the whole façade is panelled out in imitation of late Gothic work, Renaissance pilasters and devices taking the place of the buttresses set angle-wise and flamboyant panelling; the Colegio de San Ildefonso at Alcalá de Henares (formerly the seat of the university), built in 1557–1584 by Rodrigo Gil de Ontañon.

Of municipal buildings the Lonja or exchange at Toledo (1551), built in brick-work, is somewhat Florentine in style.

The town hall of Seville (1527–1532), by Diego de Riaño and Martin Garuza, may be taken as the most gorgeous example in Spain (Plate V., fig. 74). The front facing the square is very simple, compared with the façade in the street at the rear, and here again we find, in the ornamental carving of the windows and door mouldings on the ground floor, a different scale from that adopted on the first floor, where the shafts are enriched with a superabundance of carved ornament in strong relief. There is still one other feature of great importance in Spain, the magnificent galleries of the patios or courts found in all the important buildings. It is from these galleries that access is obtained to the rooms on the first floor. They have sometimes arcades on the first floor, and columns with bracket-capitals on the upper storey. There is an infinite variety of design in these capitals, the brackets on each side of which lessen the bearing of the architrave.

The earliest Renaissance example of these patios (1525) is in the Irish college at Salamanca; it was carved by Berruguete, Alonso de Covarrubias being the architect. In the same town is the Casa de la Salinas, another example with fine sculpture. In the Casa Polentina (1550) at Avila, and the Casa de Miranda at Burgos, columns with bracket-capitals are employed on both storeys. Rich examples are found in the Casa de la Infanta and Casa Zaporta (1580), both at Saragossa. Of late examples the patio of the Lonja at Seville by Juan de Herrera resembles in its style the courtyard of the Farnese palace at Rome; and the same style obtains in the court of the Escorial, built at a time when the purer Italian style was introduced into Spain. These courts, though cold in design, compared with the earlier Renaissance type, are of fine proportion. Two other examples are found in the bishop's palace at Alcalá de Henares, one of which has a magnificent staircase. (R. P. S.)

Renaissance Architecture in England

In England, as in France, the influence of the Classic Revival was first seen in connexion with tombs and church work, though not nearly to the same extent as in France, where throughout the country the work of the Italian sculptor is to be found not only in churches but in country mansions. On the other hand, two if not three of the Italian artists who came over to England were men of some reputation, such as Pietro Torrigiano, a Florentine sculptor who was invited over by Henry VIII. and entrusted with the tomb of Henry VII. in Westminster Abbey (1512–1518), and executed the tomb of John Young (in terra-cotta) in the Rolls chapel (1516). Another Italian was Giovanni da Maiano, who was also a Florentine, who modelled the busts of the emperors in the terra-cotta medallions over the entrance gates at Hampton Court, and probably the panel flanked by Corinthian pilasters, in which are modelled the arms of Cardinal Wolsey, also in terra-cotta. Benedetto da Rovezzano (1478–*c.* 1552), and Toto del Nunziata, Italian artists of note, were also employed in England, the first on the tomb of Cardinal Wolsey (now destroyed), and the second on the palace of Nonsuch, built by Henry VIII., which was pulled down in 1670. Other early Renaissance work is found at Christchurch Priory, in the Salisbury Chantry (1529), the design of which is Gothic and some of the details Italian, and in the tombs of the countess of Richmond in Westminster Abbey (1519), of the earl of Arundel in Arundel church, Sussex, of Henry, Lord Marney, at Layer Marney (1525), of the duke of Richmond (1537) and the duchess of Norfolk (1572) in Framlingham church; and of Queen Anne of Cleves (1557) in Westminster Abbey, attributed to Haveus of Cleves. The sedilia (in terra-cotta) of Wymondham church, Norfolk, the choir screen at St Cross, and Bishop Gardiner's chantry, Winchester, and the vaulted roof of Bishop West's chapel at Ely, all show the direct influence of the Italian cinque-cento style. The most beautiful example in England of Italian woodwork is the organ screen in King's College chapel, Cambridge (1534–1539), which, except for the coats of arms, the roses, portcullis and other English emblems, might be in some Italian church, so perfect is its design and execution. Of early domestic work, Sutton Place (1523–1525), near Guildford, Surrey, is a good example of transition work. The design is Tudor, but the window mullions and panels inserted throughout the structure, which is built in brick, are all enriched with cinque-cento details in terra-cotta, and probably executed by Italian craftsmen. Similar enrichments in the same material are found decorating the entrance tower (1522–1525) at Layer Marney, Essex.

Nearly all the examples above mentioned come within the first half of the 16th century. Passing into the second half and dealing with domestic architecture, we find the history of the introduction of classic work into England more complicated than in other countries, because in addition to the Italian, we have French, Flemish and German influences to reckon with, and it is sometimes difficult to decide from which source the features are borrowed. There were, however, two still more important considerations to be taken into account—firstly, the extremely conservative character of the English people, who were satisfied with the traditional work of the country, and the methods by which it was carried out, and secondly, the great progress in design which was made during the Elizabethan period, resulting in a phase which was peculiarly English and did not lend itself easily to classic embellishment.

Already in the last phase of Gothic work, to which the title of Tudor is generally given, important changes were being made in the planning of the larger country mansions, and features

were introduced which seemed to give an impetus towards their further development.

The most important of these features were the following:—the bow window, rectangular or polygonal, of which the earliest examples date from the reign of Edward IV. (1461–1483), such as Eltham Palace in Kent, Cowdray Castle in Sussex, and Thornbury Castle in Gloucestershire, and at a later period at Hampton Court; octagonal towers or turrets flanking the entrance gateway at each end of the main front; the projecting forward of the side wings so as to get better light to the rooms in them by having windows on both sides, such projections varying the otherwise monotonous effect of a uniform façade without breaks; the long gallery (generally on an upper floor), which was an important characteristic of the Elizabethan house; and last but not least, the adherence to the type of old Tudor window, with its moulded mullions and transoms but with square head.

One of the first modifications was the introduction of semicircular bow windows, as in Kirby Hall, Northamptonshire, followed by a second example at Burton Agnes in Yorkshire (1602–1610), and a third at Lilford Hall in Northamptonshire (1635). They were carried up through three storeys at Kirby Hall, the upper storey in the roof; three storeys at Burton Agnes with balcony and balustrade; and two storeys at Lilford Hall—these features being extremely simple but fine in effect, and the windows with moulded mullions and transoms lending themselves naturally to the curve.

The projecting bays and bow windows seemed to have such an attraction for the builders of these country mansions that at Burton Agnes (with a rectangular plan of 120 ft. by 80 ft.) there are no fewer than thirteen of them, which break up the wall surface and give a picturesque group externally, whilst internally they add to the fine effect of the rooms. At Barlborough Hall, Derbyshire, with a frontage of 80 ft., there is a central rectangular bay forming the entrance porch and carried up above the roof, and two large octagonal bow windows which rise as towers with an extra storey. In all these mansions the only influence which the Revival seems to have exerted was in the introduction of an entablature, which sometimes takes the place of the Gothic string course, balustrades which crown the building, but with no projecting cornice, and gables with curved outlines and Renaissance panels or scrolls. The fact is that, with prominent features so widely differing from those which were represented on the perspective drawings attached to the earlier publications of the five orders, such as those of Serlio (1537) and Vredeman de Vries of Antwerp (1577), the only course left open to the master-mason was to decorate the principal entrance with columns and pilasters of the Classic orders, sometimes superposed one upon the other.

To the further development of this singular introduction of the Classic orders we shall return; for the moment it will be better to follow a chronological sequence and take up the principal examples of the country mansion, some of which were from the first intended to be Classic buildings. Of the house built at Gorhambury in Hertfordshire (1563) for Sir Nicholas Bacon, the father of Lord Bacon, too little remains to render its design intelligible, except that it still retains in its lofty window the Tudor pointed arch; but in Longleat in Wiltshire, built by Sir John Thynne (1567–1580), we have a typical example, the design of which departs from the English type, though it would seem to have been carried out according to the traditional custom of entrusting the whole work to a master-mason, and furnishing him with sketch designs of some kind suggesting the required arrangements of the plan, the principal features of the exterior elevation and the internal disposition. This custom was adhered to far into the 18th century at Oxford and Cambridge, where the alterations and additions to some of the colleges, such as the chapel of Clare College, Cambridge (1763), were carried out by master-masons or builders who were supplied with sketch designs and sometimes even the materials for the buildings they had to carry out, notwithstanding the existence of properly trained architects, who from the first half of the 17th century were usually entrusted with the preparation of the necessary designs for new structures of any considerable importance.

The name of the designer of Longleat is not known; the master-mason was Robert Smithson, who in 1580 went to Wollaton in Nottinghamshire and constructed the mansion there. Longleat is so Italian in style that it must have been conceived by some one who had been in Italy, because it departs from the usual English type. The plan is rectangular, with a frontage of 220 ft. by 180 ft. deep, an entrance porch in the centre, with two projecting bays on each side carried up through the three storeys, and three similar bays on the flanks. The whole block is crowned with a parapet, the centre portion of which is pierced with a balustrade, but the main cornice bears no resemblance to the Italian feature, being only that of the entablature of the upper order. The projecting bays are decorated with pilasters of the Doric, Ionic and Corinthian orders, each with its proper entablature. These classic features would seem to have been copied from a work by John Shute, painter and architect, who had been sent to Italy by the duke of Northumberland in 1551, and in 1563 brought out his *Chief Groundes of Architecture*, the first practical work published in English on architecture. Shute died in the same year, but two other editions appeared in 1579 and 1584, which shows that it must have had an extensive circulation and probably exercised the greatest influence on English architecture. A second book on the orders, already referred to as published in 1577 by Jan Vredeman de Vries of Antwerp, was not of the same type, for instead of confining his work, like Shute and Serlio, to a simple representation of the Classic orders, he introduced, on the shafts of his columns and on the pedestals, designs of the most debased rococo type, with additional plates suggesting their application to various buildings. Robert Smithson, or his client Sir Fr. Willoughby, apparently obtained a copy of this book, and the result is seen (Plate VI., fig. 76) in the mansion built at Wollaton (1580–1588), in which we find the first examples of elaborately decorated pedestals; crestings on the angle towers, the design of which is known as strap-work; and medallions with busts in them, enclosed with twisted curves similar to those which flowers and leaves take when thrown into the fire. The plan and the scheme of the design of Wollaton is, however, so far superior to the usual type, that it may fairly be ascribed to John Thorpe, an architect or surveyor, of whose drawings there is a large collection in the Soane Museum, representing many of the more important mansions of the Elizabethan era; some of his own design, others either plans measured from existing buildings upon which he was called in to report or copies from other sources, and some reproduced from published works such as Vredeman de Vries's pattern book and Androuet du Cerceau's *Des plus excellents bastiments de France* (1576).

To John Thorpe is also attributed the design of Kirby Hall (1570–1572) in Northamptonshire, in which the plan of the feudal castle with great central court is still retained. This court is symmetrically designed, and was evidently considered to be the principal feature, the decoration being far richer than that of the exterior of the building.

Amongst other important mansions are Moreton Old Hall (1550–1559, partly rebuilt in 1602; see HOUSE, Plate III., fig. 11) in Cheshire, a fine house in half-timber; Knole House, Kent (1570), possibly also designed by John Thorpe; Charlecote Hall (1572) near Stratford-on-Avon; Burleigh House, Northamptonshire (1575), the most remarkable feature in which is the great tower in the court-yard, decorated with the Doric, Ionic and Corinthian orders superposed, the design apparently suggested by a similar feature in the château of Anet, France (published in du Cerceau); Apethorpe Hall, Northamptonshire (1580); Montacute House, Somersetshire (1580–1600); Castle Ashby, Northamptonshire (1583–1589); Brereton Hall, Cheshire (1575–1586), in brick and stone; Westwood Park, Worcestershire (1590); Wakehurst Place, Sussex (1590); Hardwick Hall, Derbyshire (1590–1597); Longford Castle, Wiltshire (1591–1612); Cobham Hall, Kent (1594); Dorton House, Buckinghamshire (1596); Speke Hall, Lancashire (1598), partly in half-timber work; Holland House, Kensington (1606; wings and arcades, 1624); Bolsover Castle, Derbyshire (1607–1613); Charlton House, Kent (1607); Bramshill, Hampshire (1607–1612), an interesting example of Jacobean architecture; Hatfield, Hertfordshire (1608–1611), with an extremely fine courtyard (north side in brick and stone, 1621); Audley End, Essex (1610–1616), a great portion of which was afterwards pulled down; Ham House, Surrey (1610), chiefly in brick; Pinkie House, at Musselburgh in Midlothian (1613); Aston Hall near Birmingham (1618–1635); Blickling Hall, Norfolk (1619); Heriot's hospital, Edinburgh (1628–1659); and Lanhydroc, Cornwall (1636–1641), which brings us down to the period of the pure Italian Revival introduced by Inigo Jones.

We have already referred to the reproduction of the Classic orders, superposed as an enrichment of the principal entrance doorways. In addition to Burton Agnes and Burleigh House, there are endless examples in mansions and country houses, but the most remarkable are those at Oxford: in the old Schools, where coupled columns flank the entrance gateway with the five orders superposed, and in Merton and Wadham Colleges, with four orders (the Tuscan being omitted), in neither case taking any cognizance of the levels of windows or string courses of the earlier building to which they were applied, or serving any structural purpose. The orders were all taken from one of the pattern books, and in the Schools and in Merton College the rococo ornament and strap-work found in Vredeman de Vries's work were copied with more or less fidelity to the original. There are, however, two or three buildings in Northamptonshire which are free from rococo work, and in their design form a pleasant contrast, as much to the elaboration of the buildings just described as to the cold formality of the works of the later Italian style. Lyveden new buildings (1577), the Triangular Lodge at Rushton, and the Market House at Rothwell, are all examples in which the orders from Serlio or John Shute are faithfully represented, and are of a refined character; in the first named the entablatures only of the orders are introduced. In Rushton Hall (1595) the cresting of the bow windows shows the evil influence of Vredeman de Vries's pattern-book and of numerous designs by him and other Belgian artists, which were printed at the Plantin press. Two other publications of a similar rococo type were brought out in Germany, one by Cammermayer (1564) and the other by Dietterlin (1594), both at Nuremberg; neither of them would seem to have been much known in England, but indirectly through German craftsmen they may have influenced some of the work of the Jacobean period, and more particularly the chimney pieces and the ceilings

of the gallery and other important rooms in which strap-work is found. Among the finer examples of ceilings of early date are those of Knole, Kent; Haddon Hall, Derbyshire; Sizergh Hall, Westmorland; South Wraxall Manor House, Wiltshire; the Red Lodge, Bristol; Chastleton House; and Canons Ashby—in the last three with pendants. Two of the best-designed ceilings of modest dimensions are those of the Reindeer Inn at Banbury and the Star Inn at Great Yarmouth. The principal decorative feature of the reception rooms was the chimney-piece, rising from floor to ceiling, in early examples being very simple—as those at Broughton House and Lacock Abbey—but at a later date overlaid with rococo strap-work ornament and misshapen figures, as at South Wraxall and Castle Ashby. One of the most beautiful chimney-pieces is in the ball-room at Knole, probably of Flemish design, but at Cobham Hall, Hardwick, Hatfield and Bolsover Castle are fine examples in which different-coloured marbles are employed, there being a remarkable series at the last-named place.

The long gallery has already been incidentally mentioned. Its origin has never been clearly explained; it was generally situated in an upper storey, and may have been for exercise, like the eaves galleries in Spain. The dimensions were sometimes remarkable; one at Ampthill (no longer existing) was 245 ft. long; and a second at Audley End, 220 ft. long and 34 ft. wide. Of moderate length, the best known are those of Haddon Hall, with rich wainscotting carried up to the ceiling, Hardwick, Knole, Longleat, Blickling Hall and Sutton Place, Surrey.

In early work the staircases were occasionally in stone with circular or rectangular newels, but the more general type was that known as the open well staircase, with balustrade and newels in timber. Of these the more remarkable examples are those at Hatfield; Benthall Hall, Shropshire; Sydenham House, Devonshire; Charterhouse, London; Ockwells Manor House, Berkshire; Blickling, Norfolk; and the Old Star Inn at Lewes, Sussex.

One of the important features in the old halls was the screen separating the hall from the passage, over the latter being a gallery; the front of the screen facing the hall was considered to be its chief decoration, and was accordingly enriched with columns of the Classic orders, and balustrade or cresting over. The screens of Charterhouse (London), Trinity College (Cambridge), Wadham College (Oxford), and the Middle Temple Hall (London), are remarkable for their design and execution. The great hammer-beam roof (1562–1572) in the last named is the finest example of the Renaissance in existence (see ROOFS, Plate I., fig. 25).

With the exception of chantry or other chapels added to existing buildings, there was only one church built in the period we are now describing, St John's at Leeds. This church is divided down the centre by an arcade of pointed arches, virtually constituting a double nave, and the rood-screen is carried through both. The window tracery and the arcade show how the master-mason adhered to the traditional Gothic style, but the rood-screen, notwithstanding its rococo decoration, is a fine Jacobean work, eclipsed only by the magnificent example at Croscombe, which, with the pulpit and other church accessories, dating from 1616, constitutes the most complete example of that period.

Inigo Jones.

The pure Italian style, as it is sometimes called, was introduced into France probably by Serlio, and the result of its first influence is shown in the Louvre, begun in 1546. It entered Spain about 20 years later, under the rule of Philip II., and Germany about the same time, creating about 100 years later a reaction in Spain in favour of a less cold and formal style, and scarcely taking any root in Germany. In England its first appearance does not take place till 1619, when Inigo Jones, after his second visit to Rome, designed an immense palace, measuring 1150 ft. by 900 ft., of which the only portion built was the Banqueting House in Whitehall (Plate VI., fig. 75); a fine design, in which the emphasizing of the central portion by columns in place of pilasters is an original treatment not found in Italy, but of excellent effect. Unfortunately many subsequent designs of Inigo Jones were either not carried out or have since been destroyed; but nothing approached this admirable work in Whitehall.

Among his buildings still remaining are St Paul's, Covent Garden (1631), a simple and massive structure which requires perhaps an Italian sun to make it cheerful; York Stairs Water-gate (1626); the front of Wilton House, near Salisbury (1633); the Queen's House, Greenwich (1617), a very poor design; Coleshill, Berkshire; Raynham Park, Norfolk, with weakly-designed gables and an entrance doorway with curved broken pediment, which can scarcely be regarded as pure Italian; and Ashburnham House, Westminster (the staircase of which is extremely fine), carried out after his death by his pupil John Webb, who, at Thorpe Hall, near Peterborough (1656), shows that he possessed some of his master's qualities in his employment of simple and bold details.

Wren.

Sir Christopher Wren, who follows, was by far the greatest architect of the Italian school, though curiously enough he had never been in Italy. His first work was the library of Pembroke College, Cambridge (1663–1664), followed by the Sheldonian theatre at Oxford, in the construction of the roof of which, with a span of 68 ft., he showed his great scientific knowledge. In 1665 he went to Paris, where he stopped six months studying the architectural buildings there and in its vicinity, and where he came across Bernini, whose designs for destroying the old Louvre (fortunately not carried out) were being started. On his return Wren occupied himself with designs for the rebuilding of the old St Paul's, but these were rendered useless by the great fire of the 22nd of September 1666, which opened out his future career. His plan for the reconstruction of the city was not followed, owing to the opposition of the owners of the sites, but he began plans for the rebuilding of the churches and of St Paul's cathedral. In his treatment of the former, where he was obliged to limit himself to the old sites, often very irregular, and in most cases to the old foundations, he adopted, perhaps quite unconsciously, one of the principles of ancient Roman architecture, and made the central feature the key of his plan, fitting the aisles, vestries, porches, &c., into what remained of the site; this central feature varied according to its extent and proportions, and sometimes from a desire to work out a new problem. The central dome was a favourite conception, the finest example of which is that of St Stephen's, Walbrook (1676); other domed churches are St Mary-at-Hill, St Mildred's, Bread Street, St Mary Abchurch (1681), where the dome virtually covers the whole area of the church, and St Swithin's, Cannon Street, an octagonal example. In St Anne and St Agnes, Aldersgate, the crossing is covered with an intersecting barrel vault; and in this small church, about 52 ft. square with four supporting columns, he manages to get nave, transept and choir with aisles in the angles. In those churches where there was sufficient length, the ordinary arrangement of nave and aisle is adopted, with an elliptical barrel vault over the nave, sometimes intersected and lighted from clerestory windows, the finest example of these being St Bride's, Fleet Street; other examples are St Mary-le-Bow (Cheapside), Christchurch (Newgate) and St Andrew's (Holborn). In St James's, Piccadilly, of which the site was a new one, the plan of nave and aisles with galleries over, and a fine internal design with barrel-vaulted ceiling, was adopted; the exterior is very simple, which suggests that Wren attached much more importance to the interior. It should be pointed out that in all these cases, the vaults, to which we have referred, were in lath and plaster, and consequently covered over with slate roofs, and as a rule the exteriors (which are rarely visible) were deemed to be of less importance. This is, however, made up for by the position selected for the towers, and in their varied design those of St Mary-le-Bow, St Bride's (Fleet Street) and St Magnus (London Bridge) are perhaps the finest of a most remarkable series.

The foundation stone of St Paul's cathedral was laid in 1675, and the lantern was finished in 1710. The silhouette of the dome (Plate II., fig. 66), which is, of course, its principal feature, is far superior to those of St Peter's at Rome, or the Invalides or Panthéon at Paris, and the problem of its construction with the central lantern was solved much more satisfactorily than in any other example. Wren realized that the attempt to render a dome beautiful internally as well as externally could only be obtained by having three shells in its construction; the inner one for inside effect, the outer one to give greater prominence externally, and the third, of conical form, to support the lantern.

In plan, Wren's design (fig. 53) was in accordance with the traditional arrangement of an English cathedral, with nave, north and south transepts and choir, in all cases with side aisles, and a small apse to the choir. The great dome over the crossing is, like the octagon at Ely, of the same width as nave and aisles together. It resembles the plan of that cathedral also in the four great arches opening into nave, transepts and choir, with smaller arches between. Instead of the great barrel vault of St Peter's, Rome, Wren introduced a series of cupolas over the main arms of the cathedral, which enabled him to light the same with clerestory windows; these are not visible on the exterior, as they are masked by the upper storey which Wren carried round the whole structure, in order, probably, to give it greater height and importance; by its weight, however, it serves to resist the thrust of the vaults transmitted by buttresses across the aisles. The grouping of the two lanterns on the west front

with the central dome is extremely fine; the west portico is not satisfactory, but the semicircular porticoes of the north and south transepts are very beautiful features. Greater importance is given to the cathedral by raising it on a podium about 12 ft. above the level of the pavement outside, which enables the crypt under the whole cathedral to be lighted by side windows.

The principal examples of the churches which followed are those of St George's, Bloomsbury; St Mary Woolnoth; Christ Church, Spitalfields, by Nicholas Hawksmoor; and St Mary-le-Strand (1714), and St Martin's-in-the-Fields (1721), by James Gibbs. Gibbs's interiors are second only to those of Wren, while Hawksmoor's are very weak; in both cases, however, the exteriors are finely designed. Amongst subsequent works are St John's, Westminster, and St Philip's, Birmingham (1710), by Thomas Archer; St George's, Hanover Square (1713–1714), by John James; All Saints' church, Oxford, by Dean Aldrich; St Giles-in-the-Fields (1731), by Henry Flitcroft; and St Leonard's, Shoreditch (1736), by George Dance.

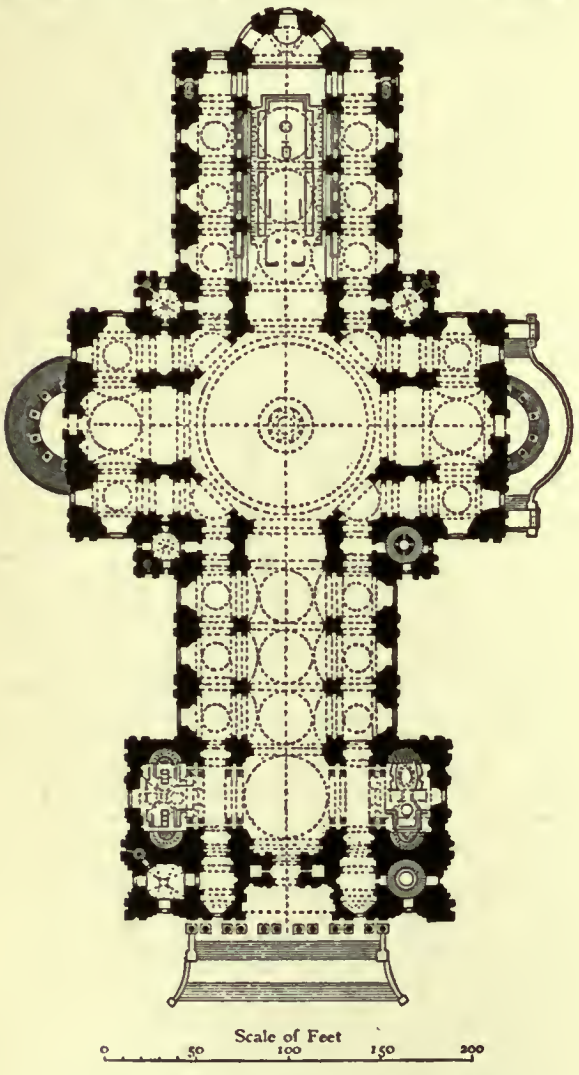


FIG. 53.—Plan of St Paul's Cathedral, London.

Sir Christopher Wren's chief monumental work was Greenwich hospital, in the arrangement of which he had to include the Queen's House, and a block already begun on the west side. His solution was of the most brilliant kind, and seen from the river the grouping of the several blocks with the colonnade and cupolas of the two central ones is admirable.

Wren's next great work was the alterations and additions to Hampton Court palace, begun in 1689, the east front facing the park (Plate VI., fig. 77), the south front facing the river, the fountain court and the colonnade opposite the great hall. Chelsea hospital (1682–1692), the south front (now destroyed) to Christ's hospital (1692), and Winchester school (1684–1687), are all examples in brick with stone quoins, cornices, door and window dressings, which show how Wren managed with simple materials to give a monumental effect. The library which he built in Trinity College, Cambridge (1678), with arcades on two storeys divided by three-quarter detached columns of the Doric and Ionic orders, is based on the same principle of design as those in the court of the Farnese palace at Rome by Sangallo, a part of the palace which is not likely to have been known by him.

The results of the Italian Revival in domestic architecture were not altogether satisfactory, for although it is sometimes claimed that the style was adapted by its architects to the traditional requirements and customs of the English people, the contrary will be found if they are compared with the work of the 16th century. The chief aim seems to have been generally to produce a great display of Classic features, which, even supposing they followed more closely the ancient models, were quite superfluous and generally interfered with the lighting of the chief rooms, which were sacrificed to them. In fact there are many cases in which one cannot help feeling how much better the effect would be if the great porticoes rising through two storeys were removed. This is specially the case in Sir John Vanbrugh's mansion, Seaton Delaval, in Northumberland (1720); his other works, Blenheim (1714) and Castle Howard (1702), are vulgarized also by the employment of the large orders. The same defect exists in Stoneleigh Abbey, Leamington, where the orders carried up through two and three storeys respectively destroy the scale of the whole structure.

Among other mansions, the principal examples are Houghton in Norfolk (1723), a fine work, the villa at Mereworth in imitation of the Villa Capra near Vicenza, and the front of old Burlington House (1718), copied from the Porto palace at Vicenza, by Colin Campbell; Holkham in Norfolk and Devonshire House, London, by William Kent; Ditchley in Oxfordshire, and Milton House near Peterborough, by Gibbs; Chesterfield House, London, by Isaac Ware; Wentworth House in Yorkshire (1740), and Woburn Abbey in Bedfordshire (1747), by Henry Flitcroft; Spencer House, London (1762), by John Vardy; Prior Park and various works in Bath by John Wood; the Mansion House, London, by George Dance; Wardour in Wiltshire, Kedleston Hall in Derbyshire, and Worksop in Nottinghamshire (1763), by James Paine; Gopsall Hall, Ely House, Dover Street, London (1772), and Heveringham Hall in Suffolk, by Sir Robert Taylor, to whose munificence we owe the Taylor Buildings at Oxford; Harewood House in Yorkshire (1760), Lytham Hall in Lancashire, and (part of) Wentworth House in Yorkshire, by John Carr; and Luton Hoo (1767), now largely reconstructed, and Sion House (1761), the best-known mansions by Robert Adam, who with his brothers built the Adelphi and many houses in London. Adam designed a type of decoration in stucco for ceilings and mantelpieces, the dies of which are still in existence and are utilized extensively in modern houses. His labours were not confined to buildings, but extended to their decoration, furniture and fittings.

The works of Sir William Chambers were of a most varied nature, but his fame is chiefly based on Somerset House in the Strand, London (1776), with its façade facing the river, a magnificent work second only to Inigo Jones's Whitehall, but infinitely more extensive and difficult to design. He was also the author of a work on *The Decorative Part of Civil Architecture*, which is still the standard work on the subject in England. His pupil, James Gandon, won the first gold medal given by the Royal Academy in 1769, and his principal work was the Custom House in Dublin (1781). Newgate prison (1770), a remarkable building now destroyed, was the chief work carried out by George Dance, jun.

Other buildings not yet mentioned are the Alcove and Banqueting Hall (Orangery) of Kensington Palace, by Wren; the Radcliffe library, Oxford, by Gibbs, an extremely fine work both externally and internally; Queen's College, Oxford, by Hawksmoor; the county hall, Northampton, by Sir Roger Norwich; the town hall, Abingdon (1677), designer unknown; the Ashmolean museum, Oxford (1677), by T. Wood; Clare College, Cambridge, and St Catherine's Hall, Cambridge (1640–1679), by Thomas and Robert Grumboll, master-masons; the custom house, King's Lynn (1681), by Henry Bell; Nottingham Castle, designed by the duke of Newcastle in 1674 and carried out by March, his clerk of works—the central portion is finely proportioned, and it is only in the pilasters at the quoins that one recognizes the amateur; two houses in Cavendish Square, London (1717), on the north side, by John James; Lord Burlington's villa (1740) at Chiswick, by William Kent, which with its internal decorations is still perfect; the celebrated Palladian Bridge at Wilton, by R. Morris; and last but not least, in consequence of its great influence on modern architecture, Sparrowe's house at Ipswich (1567–1662), the timber oriel windows of which are now so often reproduced. (R. P. S.)

RENAISSANCE ARCHITECTURE IN GERMANY

The classical revival does not seem to have taken root in Germany much before the middle of the 16th century, some forty to fifty years later than in France, from which country it is said to have been introduced, and in some of the early work there is a great similarity to French examples, but without the refinement and variety of detail which one finds in the châteaux of the Loire and in many of the French towns. In the rood-screen of the cathedral at Hildesheim (1546), the court of the town hall at Görlitz (1534), the portal of the Petershof at Halberstadt

(1552), and the entrance gateway of the castle at Brieg (1553), one is able to recognize certain ornamental details and a similar superposition of pilasters in several storeys to that which is found in various towns in Normandy and on the Loire. In both countries the new style was engrafted on the last phase of the Gothic period, so forming at first a transitional style, which lasted about fifty years. Thus the lofty roofs which prevailed in the 15th century are developed further, but with this great divergence in the two countries. In France there are rarely gable ends, in Germany they are not only the chief characteristic feature of the main front, but are introduced in the side elevations in the shape of immense dormers with two or three storeys and rising the full height of the roof, as in the castle at Hämelschenburg near Hameln. Throughout Germany, therefore, the gable end and the dormer gable became the chief features on which they lavished all their ornamental designs, the main walls of the building being as a rule either in plain masonry, rubble masonry with stucco facing, or brick and stone. Other prominent features are the octagonal and circular oriel windows rising through two or three storeys at the corners of their buildings—rectangular bow windows in two or three storeys, which were allowed apparently to encroach on the pavement, and octagonal turrets or towers instead of circular as in France. In the vicinity of the Harz mountains, where timber was plentiful, a large proportion of the factories, houses and even public buildings, are erected in half-timber work with elaborate carving of the door and window jambs, projecting corbels, &c. At Hildesheim, Wernigerode, Goslar, &c., these structures are sometimes of immense size and richly decorated. Among early examples in stone, the porch added to the town hall of Cologne (1571), the projecting wings of the town halls at Halberstadt and Lemgo (1565), and the town halls at Posen (1550), Altenburg (1562–1567) and Rothenburg (1572–1590), are all picturesque examples more or less refined in design. In the last-named example the purer Italian style has exercised its influence in the principal doorway and in the arcaded gallery on the east front. This same influence shows itself in the courtyard of the town hall at Nuremberg, where the arcades of the two upper storeys might be taken for those of the courts of the palaces at Rome.

Amongst other 16th-century work there are two entrance gates at Danzig, the Hohe Tor (1588), a fine massive structure, and the Langgasse Tor (1600), more or less pure Italian in style. At Augsburg, the arsenal (1603–1607), by the architect Elias Holl (1573–1646), is of a bold and original design, and the town hall has magnificent ceilings and wainscotting round the walls of the principal halls. This brings us to the castle of Heidelberg (Plate VII., figs. 78, 79 and 80), which is looked upon by the Germans as the chef d'œuvre of the Renaissance in Germany. As seen from the great court it forms an interesting study, there being the work of three periods: in the centre the picturesque group of the older building (*c.* 1525), on the right the Otto-Heinrichs-Bau (1556–1559), and on the left the Friedrichs-Bau (1602–1607). Of the two the latter is the finer. The architect of the Otto-Heinrichs-Bau would seem to have been undecided whether to give greater prominence and projection to his pilasters and cornices or to his windows with their dressings and pediments, so he has compromised the matter by making them both about the same, and the effect is most monotonous. In the Friedrichs-Bau, which is a remarkable work, the pilasters are of great projection, with bold cornices and simple windows well set back, while the tracery of the ground-floor windows is a pleasant relief from the constant repetition of pilaster window dressings. The gables also of the Friedrichs-Bau break the horizontal sky-line agreeably. A more minute examination of the decorative details, however, betrays the advent of a peculiar rococo style of a most debased type, which throughout the 17th century spread through Germany, and the repetition of the same details suggests that it was copied from some of the pattern books which were published towards the end of the 16th century, comprising heterogeneous designs for title pages, door heads, frontispieces, and even extending to new versions of the orders, which apparently appealed to the German mason and saved him the trouble of invention. These books, compiled by de Vries and Dietterlin, emanated from the Low Countries, and their influence extended to England during the Elizabethan period. At all events in Germany it would seem to have arrested the purer Italian work, which we have already noticed, and henceforth in the gable ends one finds the most extraordinary accumulation of distorted forms which, though sometimes picturesque, disfigure the German work of the 17th century. An exception might perhaps be made in favour of the Peller'sche Haus in Nuremberg (1625), one of the best houses of modest dimensions in Germany. The façade in the Aegidien-Platz is a fine composition: inside is a very picturesque court and staircase, and the painted ceiling and the wainscotting of one of the rooms in woods of different colours, though not very pure in style, are of excellent design and execution.

Some of the most characteristic work of this type exists at Hameln, where the façades of the Rattenfängerhaus (1602), the Hochzeitshaus (1610), and many other buildings, are covered with the most extraordinary devices, leaving scarcely a foot of plain masonry as a relief. The south front of the town hall of Bremen (1612) is in the same style (Plate IV., fig. 70), relieved, however, by the fine large windows of the great hall and the arcade in front, in which there is some picturesque detail. Later in the century the degradation increases until it reaches its climax in the Zwinger palace at Dresden (1711), the most terrible rococo work ever conceived, if we except some of the Churrigueresque work in Spain.

Among the most pleasing features in Germany are the fountains which abound in every town; of these there are good examples at Tübingen, Prague, Hildesheim, Ulm, Nuremberg, already famed for its Gothic fountains, Mainz and Rothenburg. In the latter town, built on an eminence, they are of great importance for the supply of the town, and some of them are extremely picturesque and of good design.

Up to the present we have said nothing about the ecclesiastical buildings in Germany, for the reason that the period between the Reformation and the conclusion of the Thirty Years' War was not favourable to church building. The only example worth mentioning is the church of St Michael at Munich (1583–1597), and that more for its plan than for its architecture. It has a wide nave covered with a barrel vault, and a series of chapels forming semicircular recesses on each side, the walls between acting as buttresses to the great vault. The transept is not deep enough to have any architectural value, but if at the east end there had been only an apse it would have been a better termination than the long choir. The Liebfrauenkirche at Dresden (1726–1745) has a good plan, but internally is arranged like a theatre with pit, tiers of boxes, and a gallery, all in the worst possible taste, and externally the dome is far too high and destroys the scale of the lower part of the church. An elliptical dome is never a pleasing object, and in the church of St Charles Borromeo, at Vienna, there are no other features to redeem its ugliness. The Marienkirche at Wolfenbüttel (1608–1622) has a fine Italian portal; its side elevation is spoilt by the series of gable dormers, which are of no possible use, as the church (of the *Hallenkirchen* type) is well lighted through the aisle windows. The portal of the Schlosskapelle (1555) at Dresden is a fine work in the Italian style; and lastly the church at Bückeburg, in a late debased style, is redeemed only by the fact that it is built in fine masonry and that the joints run through all the rococo details. (R. P. S.)

Renaissance Architecture in Belgium and Holland

The Gothic development in the 15th century in Belgium, as evidenced in her magnificent town halls and other public buildings, not only supplied her requirements in the century following, but hindered the introduction of the Classic Revival, so that it is not till the second half of the 16th century that we find in the town hall of Antwerp a building which is perhaps more Italian in design than any work in Germany. There are, however, a few instances of earlier Renaissance, such as the Salm Inn (1534) at Malines; the magnificent chimneypiece, by Conrad van Noremberger of Namur, in the council chamber of the palais de justice at Bruges (1529); and the palais de justice of Liége (1533), formerly the bishop's palace, in the court of which are features suggesting a Spanish influence. The influence of the cinque-cento style of Italy may be noticed in the tomb of the count de Borgnival (1533) in the cathedral of Breda, and in the choir stalls of the church at Enkhuisen on the borders of the Zuyder Zee, both in Holland, and in the choir stalls of the cathedral of Ypres in Belgium; the carving of these bears so close a resemblance to cinque-cento work in design and execution that one might conclude they were the work of Italian artists, but their authors are known to have been Flemish, who must, however, have studied in Italy. Again, in the stained-glass windows of the church of St Jacques at Liége, the details are all cinque-cento, with circular arches on columns, festoons of leaves and other ornament, all apparently derived from Italian sources, but necessarily executed by Flemish painters, as stained-glass windows of that type are not often found in Italian churches.

Of public buildings in Belgium, the most noted example is that of the town hall at Antwerp, designed by Cornelius de Vriendt (1564). It has a frontage of over 300 ft. facing the Grande Place, and is an imposing structure in four storeys, arcaded on the lower storey and the classic orders above, with mullioned windows between on the

three other storeys, the uppermost storey being an open loggia, which gives that depth of shadow obtained in Italy by a projecting cornice. It is almost the only building in Belgium without the usual gable, the centre block being carried up above the eaves and terminated with an entablature supporting at each end a huge obelisk, and in the centre what looks like the miniature representation of a church. The only other classic building is the Renaissance portion of the town hall at Ghent, which is very inferior to the older Gothic portion.

What is wanting in the town halls, however, is amply replaced by the magnificence of the houses built for the various gilds, as for instance those of the Fishmongers at Malines (1580), of the Brewers, the Archers, the Tanners and the Cordeliers (rope-makers) at Antwerp, and, in the Grande Place at Brussels, the gilds of the Butchers, the Archers, the Skippers (the gable end of which represents the stern of a vessel with four cannons protruding), the Carpenters and others. Besides these, and especially in Antwerp, are to be found a very large series of warehouses, which in the richness of their decoration and their monumental appearance vie with the gilds in the evolution of a distinct style of Renaissance architecture—a type from which the architect of the present day might derive more inspiration than from the modest brick houses of Queen Anne's time.

In domestic architecture, the best-preserved example of the 16th and 17th centuries is the Musée Plantin at Antwerp, the earliest portion of which dates from 1535. This was bought by Ch. Plantin, who was employed by Philip of Spain to print all the breviaries and missals for Spain and the Netherlands; the fortune thus acquired enabled him and his successors to purchase from time to time adjoining properties which they rebuilt in the style of the earlier buildings. After 1637 the buildings followed the style of the period, but up to that date they were all erected in brick with stone courses and window dressings round a central court. Internally the whole of the ancient fittings are retained, including those of the old shop, the show-rooms, reception rooms and the residential portion of the house, with the wainscotting and Spanish leather on the walls above, panelled ceilings, chimney-pieces, stained glass, &c., the most complete representation of the domestic style of Belgium.

Of ecclesiastical architecture in the Renaissance style there are scarcely any examples worth noting. The tower of the church of St Charles Borromeo at Antwerp (1595–1610) is a fine composition similar in many respects to Wren's steeples, and the nave of St Anne's church at Bruges is of simple design and good proportion. The Belgian churches are noted for their immense pulpits, sometimes in marble and of a somewhat degraded style. The finest features in them are the magnificent rood-screens, in which the tradition of the Gothic examples already quoted seems to have been handed down. In the cathedral at Tournai is a fine specimen by Cornelius de Vriendt of Antwerp (1572), and there is a second at Nieuport, both similar in design to the example from Bois-le-Duc now in the Victoria and Albert Museum; and in the church of St Leonard at Léau is a tabernacle in stone, over 50 ft. high, in seven stages, with numerous figures by Cornelius de Vriendt (1550).

In Holland, nearly all the principal buildings of the Renaissance date from the time of her greatest prosperity when the Dutch threw off their allegiance to the Spanish throne (1565). With the exception of the palace at Amsterdam (1648–1655), an immense structure in stone with no architectural pretensions, there are no buildings in Holland in which the influence of the purer style of the Italian revival can be traced. Internally the great hall of the palace and the staircase in the Louis XIV. style are fine examples of that period.

The earliest Renaissance town hall is that of the Hague (1564), situated at the angle of two streets, which is an extremely picturesque building, in fact one of the few in which the architect has known how to group the principal features of his design. The Renaissance addition made to the old town hall of Haarlem is a characteristic example of the Dutch style. The walls are in red brick, the decorative portions, consisting of superimposed pilasters with mullioned and transomed windows, cornices and gable end, all being in stone. Inside this portion of the town hall, which is now a gallery and museum, is an ancient hall (not often shown to visitors) in which all the decorations and fittings date from the 17th century. There is a second example of an ancient hall in the Stadthuis at Kampen, one of the dead cities of the Zuyder Zee, which served originally as a court of justice, and retains all its fittings of the 16th century, including a magnificent chimneypiece in stone, some 25 ft. high and dated 1543.

The town hall at Bolsward in Friesland is another typical specimen of Dutch architecture, in which the red brick, alternating with stone courses running through the semi-detached columns which decorate the main front, has given variety to the usual treatment of such features. The external double flight of steps with elaborate balustrade, and the twisted columns which flank the principal doorway, are extremely picturesque, if not quite in accordance with the principles of Palladio or Vignola.

A similar flight of steps with balustrade forms the approach to the entrance doorway (on the first floor) of the town hall at Leiden, where the rich decoration of the centre block and its lofty gable is emphasized by contrast with the plain design of the chief front.

In the three chief cities in Holland, the Hague, Amsterdam and Rotterdam, there are few buildings remaining of 17th-century work, so that they must be sought in the south at Dordrecht and Delft, or in the north at Leiden, Haarlem, Alkmaar, Hoorn, Enkhuisen, or, crossing the Zuyder Zee into Friesland, in Leeuwarden, Bolsward, Kampen and Zwolle, the dead cities. In all these towns ancient buildings have been preserved, there being no resaon to pull them down. Of the entrance gateways at Hoorn there is an example left, of which the lower portion might be taken for a Roman triumphal arch, so closely does it adhere to the design of those monuments, extending even to a long Latin inscription in the frieze. The tower (1531–1652), built to protect the entrance to the harbour, has no gateway. There are some old buildings in Kampen, in one of which the entrance gateway is a simple and fine composition in brick and stone, the chief characteristics of the gateways here being the enormously high roofs of the circular towers flanking them. A finer and more picturesque grouping of roofs exists in the entrance gateway (Amsterdam Gate) at Haarlem, which is perhaps, however, eclipsed by those of the Waaghuis at Amsterdam with its seven conical roofs.

The Waaghuisen, or weighing-houses for cheeses, are, next to the town halls, the most important buildings in Holland, and in fact vie with them in richness of design. The example at Alkmaar possesses not only an imposing front with gable in three storeys, but a lofty tower with belfry. At Deventer the main building is late Gothic (1528), in brick and stone, with an external double flight of steps and balustrades added in 1643.

The Fleesch Halle (meat-market) at Haarlem, also in brick and stone, is of a very rococo style, but notwithstanding all its vagaries presents a most picturesque appearance.

The domestic architecture of Holland and the shop fronts retain more of their original dispositions than will be found in any other country. At Hoorn, Enkhuisen and other towns, there has virtually been no change during the last 200 years. In the more flourishing towns as Amsterdam and Rotterdam, the increasing prosperity of the inhabitants led them in the latter portion of the 17th and in the 18th centuries to adapt features borrowed from the French work of Louis XIV. and Louis XV., without, however, their refinement, luxuriance or variety, so that although substantial structures they are extremely monotonous in general effect. (R. P. S.)

Mahommedan Architecture

Before proceeding with "modern architecture," to which the styles now discussed have gradually led us, we have still another important architectural style to describe, in Mahommedan architecture. The term "Mahommedan" has been selected in preference to "Saracenic," because it includes a much wider field, and enables us to bring in many developments which could not well come under the latter title. It was the Mahommedan religion which prescribed the plan and the features of the mosques, and it was the restriction of that faith which led to the principal characteristics of the style. The term "Saracenic" could hardly be applied to the architecture of Spain, Persia or Turkey.

The earliest mosques at Mecca and Medina, which have long since passed away, were probably of the simplest kind; there were no directions on the subject in the Koran, and, as Fergusson remarks, had the religion been confined to its native land, it is probable that no mosques worthy of the name would have ever been erected. In the first half-century of their conquest in Egypt and Syria the Mahommedans contented themselves with desecrated churches and other buildings, and it was only when they came among the temple-building nations that they seemed to have felt the necessity of providing some visible monument of their religion. The first requirement was a structure of some kind, which should indicate to the faithful the direction of Mecca, towards which, at stated times, they were to turn and pray. The earliest mosque, built by Omar at Jerusalem, no longer exists, but in the mosque of 'Amr at Cairo (fig. 54), founded in 643 and probably restored or added to at various times, we find the characteristic features which form the base of the plans of all subsequent mosques. These features consist of (*a*) a wall built at right angles to a line drawn towards Mecca, in which, sunk in the wall, was a niche indicating the direction towards which the faithful should turn; (*b*) a covered space for shelter from the sun or inclement weather, which was known as the prayer chamber; (*c*) in front of the prayer chamber, a large open court, in which there was a fountain for ablution; and (*d*) a covered approach on either side of these courts and from the entrance. The materials employed in the earlier mosque were all taken from ancient structures, Egyptian, Roman and Byzantine, but so arranged as to constitute the elements of a new style. The columns employed were not always of sufficient size, and therefore in order to obtain a greater height, above the capitals were square dies, carrying ranges of arches, all running in the direction of Mecca; to resist the thrust, wood ties were built in under the arches, so that the structure was of the lightest appearance. The same principle was observed in the mosque of Kairawan, in Tunisia (675), and in the mosque of Cordova (786–985), copied from it. Similar wooden ties are found in the mosque of El Aksa and the Dome of the Rock at

Jerusalem (built 691), so that they became one of the characteristics of the style. For constructional reasons, however, this method of building was not always adhered to, and in the mosque of Tulun (fig. 55) in Cairo (879), the first mosque in Egypt, built of original materials, we find an important departure. The arcades, instead of running at right angles to the Mecca wall, are built parallel with it, on account of the great thrust of the arches, all built in brick (fig. 56). The wood ties would have been quite insufficient to resist the thrust, and in the case of this mosque were probably used to carry lanterns.

The mosque of Tulun is the earliest example in which the pointed arch appears throughout, and it forms the leading and most characteristic constructional feature of the style in its subsequent developments in every country, except in Barbary and Spain, where the circular-headed horse-shoe arch seems to be preferred. As it is also the earliest mosque in which the decoration applied is that which was by inference laid down in the Koran, some allusion to the restrictions therein contained, and the consequent result, may not be out of place. The representation of nature in any form was absolutely forbidden, and this applied generally to foliage of all kinds, and plants, the representation of birds or animals, and above

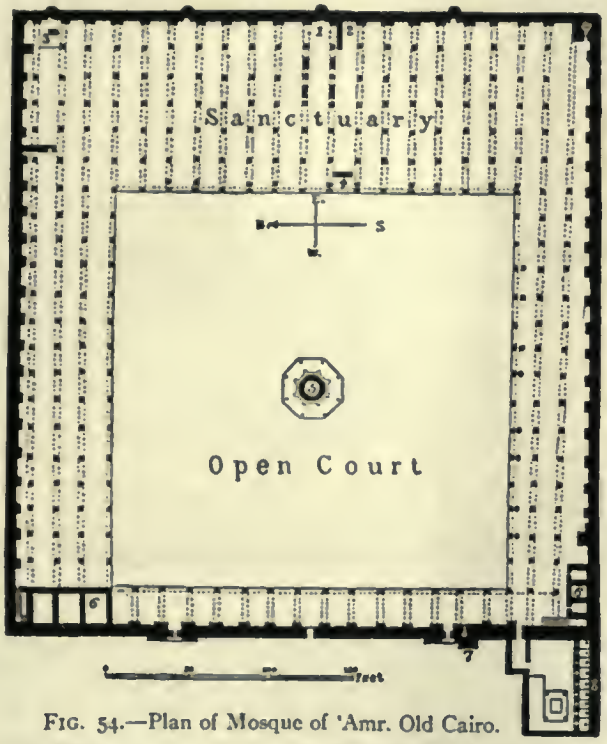
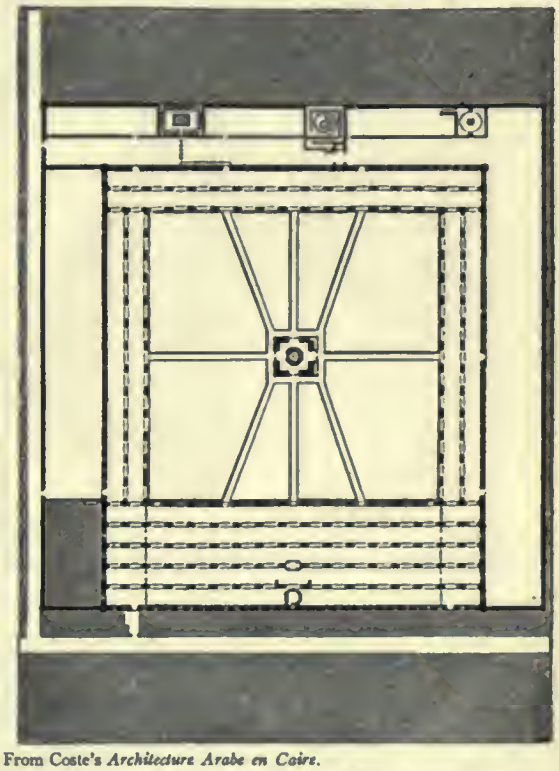


FIG. 54.—Plan of Mosque of 'Amr. Old Cairo.

1. Kibla.
2. Mimbar.
3. Tomb of 'Amr.
4. Dakka.
5. Fountain for Ablution.
6. Rooms built later.
7. Minaret.
8. Latrines.

all of the human figure. The only exceptions to the rule would seem to be those found in the very conventional representations of lions carved over the gateways of Cairo and Jerusalem and in the courts of the Alhambra. It was this restriction which produced the extremely beautiful conventional patterns which are carried round the arches of the mosque of Tulun, and are found in the friezes, string-courses and the capitals of the shafts, and when these patterns form the background of the text of the Koran in high relief, in the splendid Arabic characters, it would be difficult to find a more beautiful decorative scheme in the absence of natural forms. As the mosque of Tulun was built by a Coptic architect, and its decoration is evidently the result of many years of previous developments, it is probably to the Copts that its evolution was due. The second type of decoration is that which is given by geometrical forms, and either in pavements or wall decorations in marble, or in the framing of woodwork in ceilings, or in doorways, the most elaborate and beautiful combinations were produced. The third type of decoration is one which in a sense is found in the origin of most styles, but which, restricted as the Mahommedans were to conventional representations, received a development of far greater importance, and in one of its forms—that known as stalactite vaulting—constitutes the one feature in the style which is not found in any other, and which, from the western coast of Spain to the east of India, at once differentiates it from any other style.

A complete account, with illustrations of the origin of the stalactite will be found in the *Journal of the Royal Institute of British Architects* (1898). The earliest example is found in the tomb of Zobeide, the favourite wife of Harun al-Rashid, at Bagdad, built at the end of the 8th century. This tomb, octagonal in plan, and of modest dimensions, was vaulted over by a series of niches in nine stages or levels rising one above the other, and brought forward on the inside, so that the ninth course completed the covering of the tomb. It was built in this way to save centreing, each niche when completed being self-supporting. There is a second tomb at Bagdad, of later date—the tomb of Ezekiel,—constructed in the same way, except that in each stage the niches are built not one over the other but astride between the two, and this is the way in which in subsequent developments it always appears to have been built. Its application to the pendentives of the portals of the mosque at Tabriz and Sultaniya was the next development; and when some two centuries later it is found in Europe, in the palaces of the Ziza at Palermo, dating from about the beginning of the 11th century, it has lost its brick constructive origin, and, being cut in slabs of stone, has become simply a decorative feature. Its earliest example in Egypt is in the tomb of ash-Shafi'i at Cairo, built by Saladin about 1240. Here and in all subsequent examples throughout Egypt and Syria it is always carved in stone. In the Alhambra another material was employed, the elaborate vaults being built with a series of small



From Coste's *Architecture Arabe en Caire.*

FIG. 55.—Plan of Mosque of Tulun, Cairo.

moulds in stucco. In the ceilings of the mosques at Cairo it was frequently carved in wood, and consequently lost all trace of its origin.

Two other decorative features, but having a constructive origin, are (1) the alternating of courses of stone of different colour, probably derived from Byzantine work, where bands of brick were employed; and (2) the elaborate forms given to the voussoirs of the arches of the Mecca niche.

Having now described the principles which ruled the plans of the mosques and formed the *motifs* of their architectural design, it remains to take the principal examples in the various countries where the style was developed.

Although the tendency of modern research points to Persia as the country in which the first development of the art took place, and we have already referred to two tombs at Bagdad, in which the earliest examples of a stalactite vault are found, so far as remains are concerned nothing can be traced earlier than the work of Ghazan Khan (1294), whose mosque at Tabriz, half in ruins, is the earliest example.

It is to Egypt therefore we turn first. There still exist—and sometimes in good preservation—mosques and other buildings in Cairo of every period showing the development of the Mahommedan style, from the 9th to the 17th century. Owing to the magnificent material at their command—for unfortunately more of it was taken from the ancient Egyptian monuments than from the quarries—a much purer style was evolved than in Persia; and owing to the absence of rain those ephemeral structures built in brick and covered with stucco, which in other countries would long have passed away, retained the crispness of their flowing ornament, which is still as sharp and well defined as when executed. We have already referred

to two of the earlier mosques, those of 'Amr in Old Cairo and of Tulun. The next in date, and built also in brick, is the mosque El Hakim (*c.* 1003). The mosque of El Azhar ("the Splendid") was founded about 970, but entirely rebuilt in 1270 and enlarged in 1470. It is the university, and its Liwan or prayer chamber is the largest in Cairo, there being 380 columns carrying its roof.

The mosque of al-Zahir (founded 1264) is now occupied as barracks. In one of its entrance porches the arches are decorated with the well-known zigzag or chevron ornament, and a second porch with cushion voussoirs, features found elsewhere only in Sicily, so that the mosque was probably built by masons brought from thence. Then follows a series of mosques: Kalaun (1287); al-Nāsir (1299–1303); and 69 ft. wide, a greater span than any Gothic cathedral, and only exceeded in dimensions by the great hall of the palace at Ctesiphon built by the Sassanian dynasty. The mosque covers a large area, and would seem to have been occupied by four religious sects, whose rooms, situated on the outer side, are lighted by windows in eight or ten storeys, giving the appearance of a factory. Its entrance portal, 60 ft. to 70 ft. high, is the finest in Egypt, and is only exceeded in dimensions by those of the Persian and Indian mosques. The vestibule is covered by a dome with stalactite pendentives, and is perhaps the most complete and perfect example in Cairo. Beyond the prayer chamber is the tomb of the founder, which is covered by a dome. This, according to Poole, was not originally a feature in

FIG. 56.—Court of the Mosque of Tulun, Cairo. (From Coste.)

Merdani (1338); all based on the same plan as those described with a large courtyard surrounded by porticoes. The mosque of al-Nāsir has a portal with clustered piers and pointed and moulded orders. This is said to have been brought over as a trophy from Acre, but it is more probable that Syrian masons were imported to carry on the style introduced by the Crusaders.

The mosque of Sultan Hasan (1357–1360) marks an important change in the scheme of its plan, which served afterwards as a

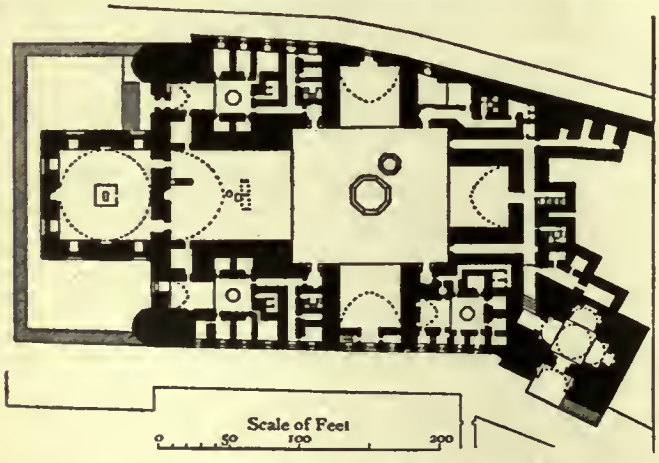


FIG. 57.—Plan of the Mosque of the Sultan Hasan.

future model (fig. 57). It consists of a central court, 117 ft. by 105 ft. open to the sky, and instead of the covered porticoes on each side there are immense recesses covered over with pointed vaults. The prayer chamber is 90 ft. deep, 90 ft. high to the apex of the vault

Saracenic mosques. A dome, he says, has nothing to do with prayer and therefore nothing with a mosque. It is simply the roof of a tomb, and only exists when there is at least a tomb to be covered. The greater number of the mosques in and outside Cairo are mausoleums, which accounts for the large number of domes found there.

Of the tombs of the caliphs, outside Cairo, the most important is the tomb of ash-Shafi'ī, reputed to have been built by Saladin but now quite changed by restoration. The tomb of Barkuk, in which the courtyard plan of Sultan Hasan is retained, has porticoes round it, which are of much more solid construction than those in earlier examples, and carry small domes. The two great domes on the east side and the minarets on the west are among the finest in Cairo. The tomb-mosque of Kait Bey (*c.* 1470), though comparatively small, is the finest in design and most elegant of its type in Egypt. Here the central court is covered by a cupola lantern (fig. 58), and the ceiling over the prayer chamber and other recesses is framed in timber and elaborately painted and gilded. The tomb is at the south-east corner, and is covered with a dome in stone, beautifully carved with conventional designs. In some of the mosques by the side of the portal is a fountain enclosed with bronze grilles, and above it a small room sometimes used as a school with open arcades on two sides. This feature in the mosque of Kait Bey, with the portal on its right, the lofty minaret beyond, and the great dome at the farther end, makes it the most picturesque in aspect of any Cairene mosque. (For plan see MOSQUE, fig. 3.)

It was in Egypt that the minaret received its highest development. The earliest example is that of the mosque of Tulun, which is of unusual shape, and has winding round it an inclined plane or staircase of easy ascent which can be made on horseback. The original design of this scheme was probably derived from the mosque of Samara, a town 60 m. north of Bagdad, where the minaret built *c.* 850 has a spiral ascent round it, recalling that of the Assyrian ziggurat as at Khorsabad. The general design of the Cairo minarets would seem to have been universally adhered to from the 12th century onwards, but the upper storeys are all varied in detail, there being virtually no two alike. As a rule the lower portion of the minaret forms part of the main wall of the mosque, and was carried up square a few feet

Photo, L. L. Paris.

FIG. 78.—HEIDELBERG CASTLE, FRIEDRICHSBAU.

Photo, L. L. Paris.

FIG. 79.—HEIDELBERG CASTLE, OTTO-HEINRICHSBAU.

Photo L. L. Paris.

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FIG. 80.—HEIDELBERG CASTLE, OTTO-HEINRICHSBAU.

ARCHITECTURE

Photo, J. Valentine, Ltd.

FIG. 81.—PORCH, PETERBORO' CATHEDRAL.

Photo, G. W. Wilson & Co.

FIG. 82.—ELY CATHEDRAL.

Photo, Neurdein.

FIG. 83.—THE LOUVRE—PAVILLON HENRI II.
(*Portion of Lescot's work on left.*)

Photo, Neurdein.

FIG. 84.—GRAND STAIRCASE, CHÂTEAU OF BLOIS.

above the cresting. It then became octagonal on plan, the sides decorated with niches or geometrical ornaments in bold relief. This, the first independent storey, was crowned by a stalactite cornice carrying the balcony (fig. 59), from which the *muezzin* (call-to-prayer) was chanted. In the early and fine examples the balustrade round it consisted of vertical posts with panels between, pierced with geometric ornaments, and all in stone. The second storey, also octagonal, was set back sufficiently to allow a passage round, and this was crowned by a similar stalactite cornice and balustrade. A third storey, sometimes circular on plan, completed the tower, which was crowned with a bulbous terminal. In one of the mosques, that of El Azhar, the first storey is square on plan, and the second storey has twin towers with lofty bulbous finials. The elaboration of the carved ornament on the various storeys of the minarets is of considerable beauty. Among the most remarkable, other than those already referred to, are the minarets of the mosque of al-Bordeni, of Kalaun, al-Nazir, Mu'ayyad (built on the semi-circular bastion wall of the Zuwela Gate), Sultan Barkuk (1348), and numerous other mosques or tombs outside Cairo.

The earlier domes were quite plain, hemispherical, with buttresses

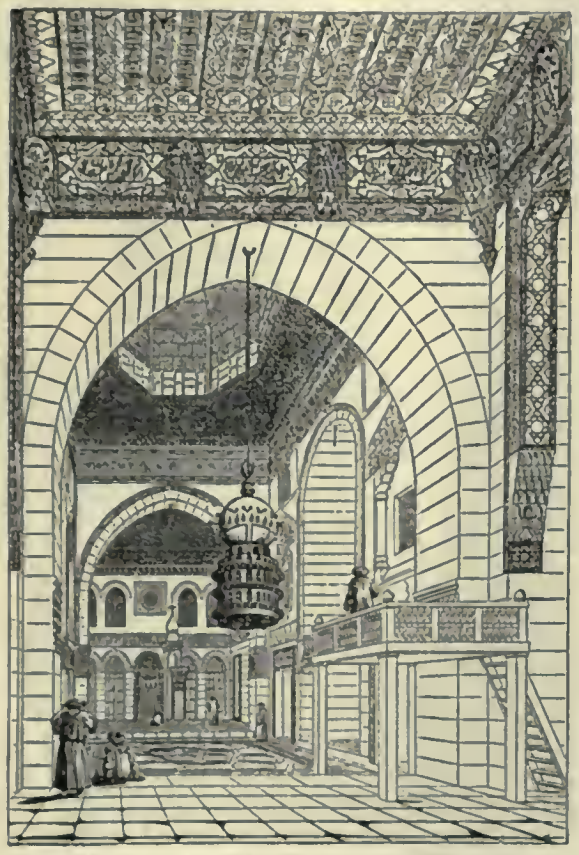


FIG. 58.—Interior of Kait Bey Mosque. (From Coste.)

round the base, similar to those of St Sophia at Constantinople. In the later domes it was found that by raising the upper portion so as to take the form in section of a pointed arch, they could be built in horizontal courses of masonry up to about two-thirds of their height, the upper portion forming a lid without any thrust. It is probably owing to this method of construction that they still exist in such large numbers. The outer surfaces are decorated in various ways with geometrical designs, star patterns, chevrons, diapers, &c. Domes built in brick were covered with stucco and divided up into godroons.

We have already referred to the lofty portal of the mosque of Sultan Hasan; portals of smaller dimensions form the principal entrance to all the mosques and private houses. The recessed portion rises to twice or three times the height of the door, and its pointed or cusped head is always filled by a rich stalactite vault.

The descriptions of the disposition of plan, and the principles which have governed the plans of the Cairene mosques, apply equally to those in Syria, so that it now only remains necessary to quote the chief examples. Of these the earliest is the Dome of the Rock, incorrectly called the mosque of Omar, which was built by Abdalmalik in 691, partly with materials taken from the buildings destroyed by Chosroes. At first it consisted of a central area enclosing the sacred rock, covered with a dome and with aisles round carried on columns and piers, and like the smaller Dome of the Chain open all round, but the climate of Syria is very different from that in Egypt, and consequently at a later period (813–833) the sultan Mamun built the walls which now enclose the whole structure. Many restorations have taken place since, and the dome with its rich internal decoration is attributed to Saladin (1189). The magnificent Persian tiles which encase the walls, the marble casing of some of the piers, and the stained glass, form part of the works of Suleiman (1520–1560).

The great mosque of Damascus occupied the site of an ancient church dedicated to St John the Baptist, which for a time was divided between the Christians and the Mahommedans. But in 705 the caliph al-Walid took possession of the whole church, which he rebuilt, retaining, however, the whole of the south wall, portions of which belonged to a Roman temple. This, which by chance happened to face south, became the Mecca wall, the niche being sunk in one of the doorways of the original temple. Its plan, therefore, is a variation of those we have already described. It consists of a transept with dome over the centre, three aisles of equal width, running both east and west, and a great court on the north side surrounded by arcades. The great transept is virtually the prayer chamber. The new building was erected by Byzantine masons sent from Constantinople, and decorated with marbles and mosaic by Greek artists. The mosque was almost entirely destroyed by fire in 1893, but has since been rebuilt.

The mosque of El Aksa in the sacred enclosure in Jerusalem, and south of the Dome of the Rock, was commenced by Abdalmalik

FIG. 59.—Exterior of Kait Bey Mosque, Cairo. (From Coste.)

(691), who used up materials taken from the church of St Mary, built by Justinian on Mount Sion, which had been destroyed by Chosroes. There have been so many restorations and rebuildings since, owing to destructive earthquakes and other causes, that it is difficult to give the precise dates of the various portions. The columns of the nave and aisles are extremely stunted in proportion, and their capitals are of a very debased type, copied by inferior artists from Byzantine models. They carry immense wood beams cased, and above them a range of pointed arches, among the earliest examples used throughout a mosque, and probably dating from the rebuilding (774–785). The Crusaders made various additions in the rear, but the great entrance porch is said to have been added by Saladin, after 1187, and was built probably by Christian masons who were allowed to remain in the country.

The numerous minarets at Jerusalem and Damascus in general design follow those of Egypt, but instead of the incised work are generally encased with marble in geometric patterns.

The great mosque at Mecca, from which it was thought at one time the plan of the Egyptian and other mosques was taken, is necessarily different from all others, because the Ka'ba or Holy Stone, towards which all the niches in all other mosques turn, stood in its centre. The arcades which surround the court were nearly all rebuilt in the 17th century, as the whole mosque was washed away by a torrent in 1626.

The mosque of Kairawan in Tunisia was built in 675. It occupies an area of 427 ft. deep and 225 ft. wide, with a prayer chamber at the Mecca end of 17 aisles and 11 bays deep, more than twice, therefore, that of 'Amr in Old Cairo. The columns to the prayer chamber,

all taken from ancient buildings, are 22 ft. high in the central aisle and 15 ft. in all the others. They carry horse-shoe arches, which, as in the mosque of 'Amr, are all tied together by wood beams inserted at the springing of the arches.

The mosque of Cordova was built by Abdarrahman (Abd-ar-Rahman) in 786–789 in imitation of the mosque of Kairawan. There were eleven aisles of twenty-one bays, the centre one slightly wider than the other. The materials were taken from earlier buildings, and, as the columns and caps were not considered high enough, above the horse-shoe arches are built a second row of arches which carry the barrel vaults. To this mosque Hakim added twelve more bays in depth at the Mecca end (962), and in 985 Mansur added eight more aisles of thirty-three bays on the east side. Part of the open court on the north side dates from Abdarrahman's foundation (690) and part from Mansur.

In the mosque of Cordova we find the earliest example of the cusped arch, in the additions made by Hakim in 961; in order to obtain a greater height above the columns, it became necessary to employ the expedient of raising arch above arch in order to obtain the height they required for the ceilings; and as these arches formed purely decorative features, which might otherwise have become monotonous, variety was given by introducing the cusped form of arch and interlacing them one within the other. It is probably this elaborate design which suggested the plaster decorations of the screens above the arches in the court of the Alhambra. Though commenced in 1245, the existing palace of the Alhambra was built in the first half of the 14th century, at a time when the style was fully developed. There are two great courts at right angles to one another, the most important of which was the Court of the Lions, so called from the fountain in the centre, with twelve conventional representations of that animal carrying the basins. This court is surrounded by an arcade with stilted arches carried on slender marble columns with extremely rich decoration above, partly in stucco painted and gilt. The hall of the Abencerrages (35 ft. square) has a polygonal dome covered with arabesque (fig. 60). Two other halls are roofed with lofty stalactite vaults of great intricacy, richly gilded and of remarkable effect (fig. 61), but the employment of stucco instead of stone, as in Egypt, has led to an abuse in the wealth of enrichment, which is only partly redeemed by the plain masonry of the towers and walls enclosing the palace. The Giralda at Seville is the only example of a tower, but it does not seem to have served the purpose of a minaret.

FIG. 60.—Capital and Springing of Arch, from the Hall of Abencerrages, Alhambra.

With the exception of the tombs of Zobeide and Ezekiel near Bagdad, and a hospital at Erzerum of the 12th century, built by the Seljukian dynasty, the Mahommedan style in Persia dates from the 13th century, *i.e.* if Ghazan Khan built the mosque at Tabriz in 1294. The plan is that of a Byzantine church with a central dome, aisles and sanctuary. The portal consists of a lofty niche vaulted with semi-domes and stalactite pendentives, similar in many respects to the well-known example of Sultan Hasan in Cairo, built sixty years later. It is built in brick and covered internally and externally with glazed bricks of various colours, wrought into most intricate patterns with interlacing ornament and with Cufic inscriptions. The dazzling and perfect beauty in point of colour is not to be surpassed, but from the architectural point of view it possesses the fatal sin of not showing its construction. The bricks and tiles are only a veneer, and though in certain features (such as the portal and the dome) the construction is at least suggested, the tendency is to trust to decoration alone to produce architectural effects. (But see TABRIZ.)

The great mosque at Isfahan (1585) is a good illustration of the danger attending a too free use of surface decoration. Strip the walls of their tiles, and nothing is left except square box-like forms with pointed arched openings of different form. The interior, however, owing to the variety of its features, and the varied play of light and shade given in the hemispherical vaults of its transepts and niches and the vaulted aisles, constitutes one of the most beautiful monuments of Mahommedan art.

Apart from the great development of Mahommedan architecture in India (see INDIAN ARCHITECTURE), there remains now to be described only one other phase of the style, that found in Constantinople.

Prior to the conquest of Constantinople in 1445, two mosques were built by the Turks at Brusa in Asia Minor. The plan of Ulu Jami, the great mosque, follows the original courtyard type. Yeshil Jami, the Green mosque (1430), built on the site of a Byzantine church, is cruciform on plan. In both of them the Persian influence is shown, in the magnificent towers with which they are covered, the marble casing and the stalactite vaults.

After the conquest of Constantinople, the supreme beauty of St Sophia, and the adaptability of its plan to the requirements of the Mahommedan faith, caused it to be accepted as the model on which all the new mosques were based. The first two erected were the Bayezid (1497–1515) and the Selim mosques (1520–1526). In the former the dome and its pendentives are carried on octagonal piers. and the dome, 108 ft. in diameter, is greater than in any subsequent example. The finest mosque, and the example in which we find the complete development of the Turkish style, is that erected by

FIG. 61.—Pendentive, from the Court of the Lions, Alhambra.

Suleiman the Magnificent in 1550–1555. This mosque, designed by Sinan, an Armenian architect, is still quite perfect. The plan follows very closely its model, St Sophia, and consists of a central dome, 86 ft. in diameter and 156 ft. high, carried on pendentives, resting on great arches which are slightly pointed, with great apses on the east and west sides, and three smaller apses in each, the arches of which are all circular. The principal change in design is that found in the north and south walls, under the arches carrying the dome; in St Sophia they were subdivided into two storeys with galleries overlooking the church, but in the Suleimanic mosque the galleries are set back in the outer aisles, and the screen walls consist of a wide central and two side pointed arches, and voussoirs alternately of black and white marble. The tympana above this is pierced with eighteen windows filled with geometric tracery. Stalactite work is employed in the pendentive of the smaller apses and in the capitals of the columns carrying the pointed arches. The columns are of porphyry, the shafts, 28 ft. high, being taken from the Hippodrome and probably brought originally from Egypt. The walls are cased with marble up to the springing of the dome, but the magnificent mosaics of St Sophia are here replaced by vulgar colouring and plaster decoration of a rococo style, due probably to recent restorations. The mosque is preceded by a forecourt, surrounded by an arcade on all sides and containing a fountain, and in the garden in the rear is the tomb of the founder and his wife.

The Shah-Zadeh mosque, known as the prince's mosque, was also built by Sultan Suleiman, from the designs of Sinan, the same

Armenian architect who built the Suleimanic mosque. Here, instead of confining the great apses to the east and west sides, they are introduced on the north and south sides in place of the screen, and produce a monotonous and poor effect. The same design is found in the Ahmedin mosque, built 1608, and with the same result. Externally, however, they are both fine, owing to the variety of domes, semi-domes and other curved forms of roof.

The minarets of the Turkish mosques are very inferior to those of Cairo. They are of great height, generally semicircular, with narrow balconies round the upper part, and crowned with extinguisher roofs. To a certain extent, however, they contrast very well with the domes and semi-domes of St Sophia and those of the mosques built by the Turks.

In the mosque of Osman, built 1748–1757, we find the first trace of Western influence in its rococo design, but here, as in the mosque of Mehemet Ali in Cairo, built in 1837, the scheme is so good that, notwithstanding the great falling off in design, and, in the latter mosque, the construction, the effect of the interior is very fine.

Amongst other architectural features, the fountains in the courtyards of the mosques and those which decorate the public squares are extremely pleasing in design. The latter are square on plan with polygonal angles, elaborate niches with stalactite heads, with overhanging eaves on each side; the ornament is very varied and the colour sometimes very attractive. The roofs have sometimes most picturesque outlines. (R. P. S.)

Modern Architecture

The beginning of the 19th century may be considered to mark the beginning of the modern era in architecture. The 19th century is the period *par excellence* of architectural "revivals." The great Renaissance movement in Italy already described was something more than a mere revival. It was a new spirit affecting the whole of art and literature and life, not an architectural movement only; and as far as architecture is concerned it was not a mere imitative revival. The great Italian architects of the Renaissance, as well as Wren, Vanbrugh and Hawksmoor in England, however they drew their inspiration from antique models, were for the most part original architects; they put the ancient materials to new uses of their own. The tendency of the 19th-century revivals, on the other hand, except in France, was distinctly imitative in a sense in which the architecture of the great Renaissance period was not. Correctness of imitation, in the English Gothic revival especially, was an avowed object; and conformity to precedent became, in fact, except with one or two individual architects, almost the admitted test of excellence.

Fig. 85.—Bank of Ireland, Dublin.

Classical revival in British architecture.

The earliest classical London building of note in the 19th century is Soane's Bank of England, which as a matter of date belongs in fact to the end of the 18th century; but its architect lived well into the 19th century, and the bank may be classed with this section of the subject. Soane had to make something architectural out of the walls of a very extended building of only one storey, in which external windows were not admissible; and he did so by applying a classical columnar order to the walls and introducing sham window architraves. The latter are indefensible, and weaken the expression of the building; the columnar order was the received method at the time of making a building (as was supposed) "architectural," and the building has grace and dignity, and could hardly be taken for anything except a bank, although a more robust and massive treatment would have been more expressive of the function of the building, as a kind of fortress for the storage of money. It was only some years later that the Greek revival took some hold of English architects (the Bank of England is rather Roman than Greek); the impetus to it was probably given by the "Elgin marbles"; Stuart and Revett's great work on the *Antiquities of Athens* had been issued a good while previously, the three first volumes being dated respectively 1762, 1787 and 1794; but the appearance of the fourth volume in 1816 was no doubt influenced by the transportation to London of the Elgin marbles, and the sensation created by them. One of the first architectural results was the erection, at an immense cost in comparison with its size, of the church of St Pancras in London (1819–1822), designed by Inwood, who published a fine and still valuable monograph on the Erechtheum, and showed his enthusiasm for Greek architecture by copying the Erechtheum order and doorways for his façade, and erecting over it a tower composed of the Temple of the Winds with an octagonal imitation of the monument of Lysicrates imposed above it. This use of Greek monuments was architecturally absurd, though at the time it was no doubt the offspring of a genuine enthusiasm.

A better use was made of the study of Greek architecture by William Wilkins (1778–1839), who was in his way a great architect, and whose University College (1827–1828), as designed by him, was a noble and dignified building, of which he only carried out the central block with the cupola and portico. The wings were somewhat altered from his design but not materially spoiled, but the university authorities permitted the vandalism of erecting a low building as a partial return of the quadrangle on the fourth side, for the purposes of a mechanical laboratory, which ruined the appearance of the building.[1] Wilkins's other well-known work is the National Gallery (1832–1838), which he was not allowed to carry out exactly as he wished, and in which the cupola and the "pepperpots" are exceedingly poor and weak. But his details, especially the profiles of his mouldings, are admirably refined, and show the influence of a close study of Greek work. Among other prominent English architects of the classic revival in England are Sir Robert Smirke and Decimus Burton (1800–1881). To Burton we owe the Constitution Hill arch and the Hyde Park screen. The latter is a very graceful erection of its kind; the arch has never been completed by the quadriga group which the architect intended as its crowning feature, though for many years it was allowed to be disfigured by the colossal equestrian statue of Wellington, completely out of scale and crushing the structure. Smirke is kept in memory by his fine façade of the British Museum, which has been much criticized for its "useless" colonnades and the wasted space under them. The criticism is hardly just; for classic colonnades have at least some affinity with the purposes of a museum of antique art, and it conveys the impression of being a frontispiece to a building containing something of permanent value and importance. The early classic revival set its mark also, in a very fine and unmistakable manner, on the capital of the sister island. Dublin is almost a museum of fine classic buildings of the period, among which the most remarkable is the present Bank of Ireland (fig. 85), originally begun as the Parliament House. The beginning of the building belongs to the 18th

[1] Wilkins made two designs for the whole building; one leaving the quadrangle entirely open on the fourth side, towards the street; the other showing a low open colonnaded screen connecting the ends of the two wings. He never for a moment contemplated closing in the quadrangle by buildings on the fourth side.

century, but it was not completed in its present form till 1805, and was the work of five successive architects, only one of them, James Gandon (1743–1823), a man of the first importance; but it was Gandon who in 1790 did most to give the building its effective outline on plan, by introducing one of the curved quadrant walls, the building being subsequently finished in accordance with this suggestion. It is a remarkable combination of symmetry and picturesqueness, and as a one-storey classic building is far superior to Soane's Bank of England, with which a comparison is naturally suggested. Gandon's custom house, with its fine central cupola, is another notable example. Edinburgh too can show examples of the classic revival, and bears the title of "modern Athens" as much from her architectural experiments as from her intellectual claims; she illustrates the application of Greek architecture to modern buildings in two really fine examples, the Royal Institution by W. H. Playfair (1789–1857), and the high school by Thomas Hamilton (1784–1858). It was a pity that she added to these the collection of curiosities on the Calton Hill.

FIG. 86.—Liverpool Branch of the Bank of England. (Cockerell.)

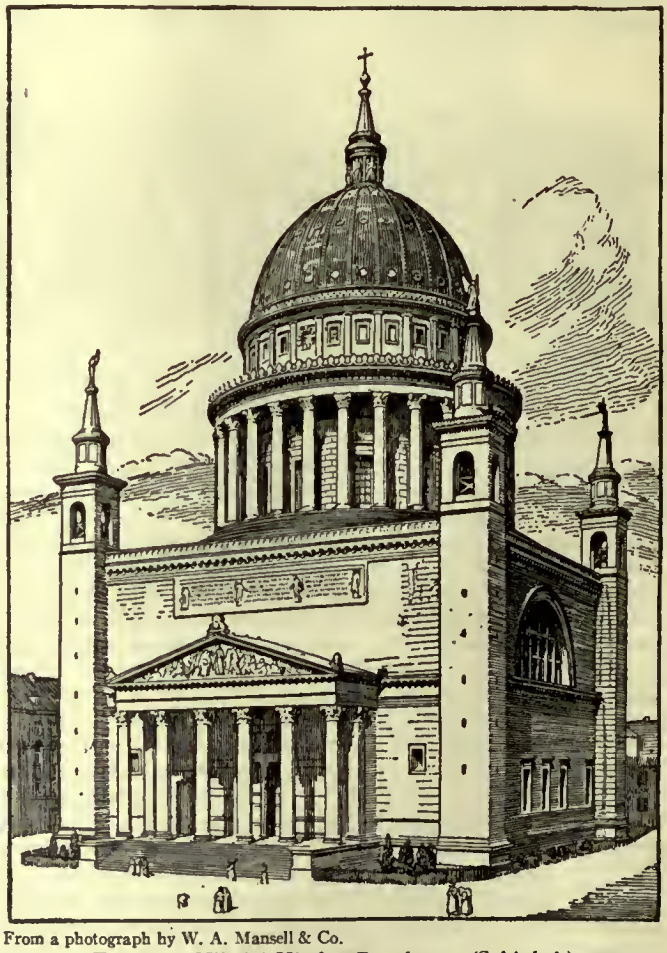
But before we quit the classic revival in England, there are two architects to be named who came a little later in the day, living in fact into the time of the Gothic revival, who were superior to any of the earlier classic practitioners: Harvey Lonsdale Elmes and C. R. Cockerell. Elmes, who died very young, seems to have been as completely a born architectural genius as Wren, and his great work, St. George's Hall at Liverpool, has done more than any other building in the world to glorify the memory of the classic revival. Granting all that may be said as to the unsuitability of Greek architecture to the English climate, one can hardly complain of any movement in architecture which gave the opportunity for the production of so grand an architectural monument. It is true that it is badly planned and lighted, and the exterior and interior do not agree with each other (the exterior is Greek, and the great hall is Roman); but if from our present point of view it is a mistake, it is certainly one of the finest mistakes ever made in architecture. Cockerell, who completed the interior of the building after Elmes's death, was an architect permeated with the principles and feeling of Greek architecture, who brought to his work a refinement of taste and perception in regard to detail which has rarely been equalled and never surpassed. Perhaps the very best example of his scholarly taste in the application of classic architecture to modern uses is to be found in his façade to the branch Bank of England at Liverpool (fig. 86).

From a photo by W. A. Mansell & Co.

FIG. 87.—Royal Theatre, Berlin. (Schinkel.)

Classical revival in Germany.

In Germany, and especially at Berlin and Munich, the Greek revival took hold of architecture in the early part of the century in a more decisive but also in a more academical spirit than in England. The movement is connected more especially with the name of one eminent architect, Karl Friedrich Schinkel, who must have been a man of genius to have so impressed his taste on his generation as he did in Berlin, where he was regarded as the great and central



From a photograph by W. A. Mansell & Co.

FIG. 88.—Nikolai Kirche, Potsdam. (Schinkel.)

power in the architecture of his day; yet his buildings are marked by learning and academical correctness rather than original genius. Elmes's St George's Hall, already referred to as one great English work of the classic revival, is by no means a mere piece of academical architecture; it exhibits in some of its details a great deal of originality, and in its general design a remarkably fine feeling for architectural grouping. In particular, the solid masses and the heavy square columns at the

Photo, Beer.

FIG. 115.—PARLIAMENT BUILDINGS, BUDAPEST. (STEINDL.)

Photo, Löwy

FIG. 116.—PARLIAMENT BUILDINGS, VIENNA. (HANSEN.)

Photo, Linde.

FIG. 117.—PARLIAMENT BUILDINGS, BERLIN. (WALLOT.)

Photo, F. G. O. Stuart.

FIG. 118.—HOUSES OF PARLIAMENT, LONDON. (BARRY.)

Photo, Emery Walker.

FIG. 119.—SCOTLAND YARD, LONDON. (SHAW.)

ends of his building, which seem like Greek architecture treated with Egyptian feeling, give support to, while they form a most effective contrast with, the richer and more delicate Corinthian order of the central portion. The only work of Schinkel's which shows something of the same feeling for contrast in architectural composition is one of his smaller buildings, the Königswache or Royal Guard-house, in which a Doric colonnaded portico is effectively flanked and supported by two great masses of plain wall. But in general Schinkel does not seem to have known what to do with the angles of his buildings, or to have realized the value of mass as a support to his colonnades. This is strikingly exemplified in his museum at Berlin, where the tall narrow piers at the angles have a very weak effect, and are quite inadequate as a support to the long open colonnade. His Royal theatre also (fig. 87), though the central portico is fine, is monotonous and weak in its two-storeyed repetition of the small order in the wings, and it has also the fault (which it shares, no doubt, with a great many theatres, large and small) that its exterior design gives no hint of the theatre form; it might just as well be a museum. His Nikolai Kirche (1830–1837) at Potsdam (fig. 88), which has considerable celebrity, though not so merely academical in character, and in fact possessed of a certain originality, has a fault of another kind, in its entire lack of architectural unity; the dome does not seem to belong to or to have any connexion with the substructure, while the portico is quite out of scale with the great block of building in its rear, and looks like a subsequent addition. The fault of the Schinkel school of architecture is an almost total want of what may be called architectural life; it is an artificial production of the studio. The same kind of cold classicism prevailed at Munich, where Leo von Klenze (1784–1864), though a lesser man than Schinkel, played somewhat the same part as the latter played at Berlin. His Propylaea (fig. 89), in which Greek and Egyptian influences are combined, is a characteristic example of his cold and scholastic style. His well-known *Ruhmeshalle*, with its boldly projecting colonnaded wings and the colossal statue of Bavaria in front of it, is in its way a fine architectural conception—perhaps finer and more consistent in its kind than any one work of Schinkel, though he evidently did not exercise so wide an influence on the German art of his day. A third eminent name in the German classic revival is that of Gottfried Semper (1803–1879), somewhat later in date (Schinkel was born in 1781), but more or less of the same school. Semper practised successively at Dresden and at Zürich, but finally settled in Vienna, where, however, he did not live to see the execution of his two most important designs, the museum and the Hofburg theatre, which were carried out by Baron Karl von Hasenauer (1833–1894) from his designs, or approximately so. Semper's theatre at Dresden, however, shows that he could recognize the practical basis of architecture, as the expression of plan, in a way that Schinkel could not; for in that building he frankly adopted the curve of the auditorium as the *motif* for his exterior design, thus producing a building which is obviously a theatre, and could not be taken for anything else, and putting some of that life into it which is so much wanting in Schinkel's rigid classicalities.

From a photograph by Ferd. Finsterlin.

FIG. 89.—Propylaea at Munich. (Von Klenze.)

In spite of the Romanizing influence of the First Empire, the classic revival did not leave by any means so academical a stamp on French as on German architecture of the early period of the century. French architects in the main have always had too much original genius to be entirely taken captive by a general movement of this kind. There is the weak classicism of Bernard Poyet's façade to the chamber of deputies, a very poor affair; and there are two important buildings in the guise of Roman peripteral temples, devoted respectively to business and to religion—the Bourse, by Alexandre Théodore Brongniart (1739–1813), and the Madeleine, begun under Napoleon, as a "Temple de la Gloire," by Pierre Vignon (1763–1828), and completed as a church in 1841 by Jean Jacques Huvé (1783–1852). Both of these are very well carried out externally, and enable us to judge of what would be the effect of a Roman temple of the kind. It must be admitted that the plain oblong mass of the Bourse has really been very much improved by the recent addition of the two wings, carried out by Cavel, though there was a great deal of opposition at first to meddling with so celebrated a building. Unfortunately, the exterior of the Bourse is a mere piece of architectural scenery, quite unconnected with the internal object and arrangement of the building. The Madeleine is a really fine exterior in its way; if a modern church was to put on the guise of a pagan temple, the task could hardly have been better carried out; and the interior might have been as fine if properly treated, but it has little artistic relation with the noble exterior, and is spoiled by poor architectural treatment and bad ornament. The church of St Vincent de Paul, by Jacques Ignace Hittorff (1792–1867), an architect who was one of the most learned students of Greek architecture of his day, is another important example of the French classical church of the period (Plate XII., fig. 125). In this the interior is more consistent with the exterior than is the case in the Madeleine; and by adding a tower at each angle of the façade, above the colonnaded portico, the architect gave it more the expression of a church, which the Madeleine wants. In the Arc de l'Étoile, by Jean François T. Chalgrin (1739–1811), we have a really great, even sublime work, which, though suggested by the Roman triumphal arches, is no mere copy, but bears the impress of the French genius in its details as well as in François Rude's grand sculptures on the east face, while its great scale places it above everything else of the kind in the world. It is only after ascending the interior and seeing the vaults carrying the roof that one fully realizes what a stupendous piece of work this is. Under Napoleon there was at least no jerry-building.[1]

French classicism.

[1] A remarkable instance of this is shown by the railway viaduct at Passy, a large and monumental piece of work in itself, which is built along the centre of the roadway of Napoleon's bridge. It was at first proposed to have a steel railway viaduct parallel with the old bridge, but it was found that the latter, both in respect of solidity and spacious dimensions, would fully bear the erection of the railway viaduct along its centre.

Returning to the consideration of architecture in England, we come, at about the close of the classic revival, to the name of the man who was undoubtedly the most remarkable English architect since Wren, Sir Charles Barry. To class him, as some would do, with the classic revival, would be a misapprehension. Barry was no revivalist; he never attempted to recreate Greek architecture on English soil. He adopted for most of his works what has been called, for want of a better name, the Italian style, which may really rather be called the common-sense style of a civilized society. The two first works which brought him into notice, the Travellers' and Reform clubs in London, were no doubt based on special Italian models, the Pandolfini and Farnese palaces; but a consideration of his whole career shows that he was in fact anything but a copyist. The comparison of him with Wren is justified by the fact that he was, like Wren, a born architect, in the sense that he grasped every problem presented to him from the true architect's point of view; with both of them architecture was not the dressing up of an exterior, but the fashioning of a building as a conception based on plan and section as well as on the desire to secure a certain external appearance; and, like Wren, he never failed to grasp the true requirements of a site and to adapt his architectural conception to it; a power perfectly different from that of merely producing agreeable elevations in this or that adopted style. Though very careful of his detail, he did not rely on detail, but on the general conception of an architectural scheme. This power was never so remarkably shown as in his grand scheme, unhappily never carried out, for the concentration of all the British government offices in one great architectural *ensemble*, which was to extend, on the west of Parliament Street and Whitehall, from Great George Street nearly to Charing Cross, the whole of the buildings to be carried out as one design, distributed into quadrangles, each of which was to be connected with one department of the administration, while all would have internal communication. Had this great idea been carried out we might at the present day have found some of the detail of the building unsatisfying to our taste, as we often find the detail in some of Wren's buildings, but we should have had a grand architectural achievement which would have made London pre-eminent among the capitals of the world. Nothing so great had been proposed in England since Inigo Jones's plan for Whitehall Palace, which also survives only in drawings, except the one noble bit of classic architecture known as the Banqueting House (Plate VI., fig. 75). It was one of the greatest misfortunes to London as a capital city that the government of the day could not rise to the height of Barry's ambitious scheme, in which there was nothing financially insuperable, since it was all designed to be carried out by portions at a time, as funds could be spared; but each government office built would in that way have been one step towards the completion of a great central idea; whereas the nation now spends the same money in erecting detached government buildings which have no architectural connexion with each other.

Barry's "common-sense" style, in England.

FIG. 90.—Halifax Town Hall. (Barry.)

Barry's two clubs before mentioned are almost ideals of club architecture—the architecture of a civilized society; his Bridgewater House is a building on a larger scale of the same type. That he had architectural ideas less staid and sober than these is shown, however, by the remarkable tower and spire of the Halifax Town Hall (fig. 90), his last work, which he did not live to see carried out, in which he contrived with remarkable success to give the Gothic spirit and multiplicity of effect to a tower which is nevertheless classic in detail. This tower is one of the most original and striking things in modern English architecture and shows how Barry's architectural ideas were developing up to the close of his life.

Barry's great building, the Houses of Parliament (Plate X., fig. 118), with which his name will always be more especially associated, comes accidentally, though not by natural development nor by his own choice, under the head of the Gothic revival. The style of Tudor Gothic was dictated to the competitors, apparently from a mistaken idea that the building ought to "harmonize" with the architecture of Henry VII.'s chapel adjacent to the site. Had Barry been left to himself, there is no doubt that the Houses of Parliament, with the same main characteristics of plan and grouping, would have been of a classic type of detail, and would possibly have been a still finer building than it is; and since the choice of the Gothic style in this case was not a direct consequence of the Gothic revival movement, it may be considered separately from that. The architectural greatness of the building consists, in the first place, in the grand yet simple scheme of Barry's plan, with the octagon hall in the centre, as the meeting-point for the public, the two chambers to north and south, and the access to the committee-rooms and other departments subordinate to the chambers. The plan (fig. 91) in itself is a stroke of genius, and has been more or less imitated in buildings for similar purposes all over the world; the most important example, the Parliament House of Budapest (Plate IX., fig. 115 and fig. 92), being almost a literal copy of Barry's plan. Thus, as in all great architecture, the plan is the basis of the whole scheme, and upon it is built up a most picturesque and expressive grouping, arising directly out of the plan. The two towers are most happily contrasted, as expressive of their differing purposes; the Victoria Tower is the symbol of the State entrance, a piece of architectural display solely for the sake of a grand effect; the Clock Tower is a utilitarian structure, a lofty stalk to carry a great clock high in the air; the two are differentiated accordingly, and the placing of them at opposite ends of the structure has the fortunate effect of indicating, from a distance, the extent of the plan. The graceful spire in the centre offers an effective contrast to the masses of the two towers, while forming the outward architectural expression of the octagon hall, which is, as it were, the keystone of the plan.

The detail is another consideration. Barry, having had a style forced upon him (most unwisely), which he had not studied much and with which he was not much in sympathy, associated Pugin with him to design a good deal of the detail; exactly how much is not certainly known; probably Pugin was responsible for all the interior detail and fittings; the exterior detail may have been only suggested or sketched by him. On this ground absurd attempts have been made, by people who do not seem to understand what architecture in the true sense means, to claim for Pugin what they call the "artistic merit" of the Houses of Parliament. The artistic merit consists in the whole plan, conception and grouping, which

HOUSES OF PARLIAMENT, WESTMINSTER

Plan of Principal Floor

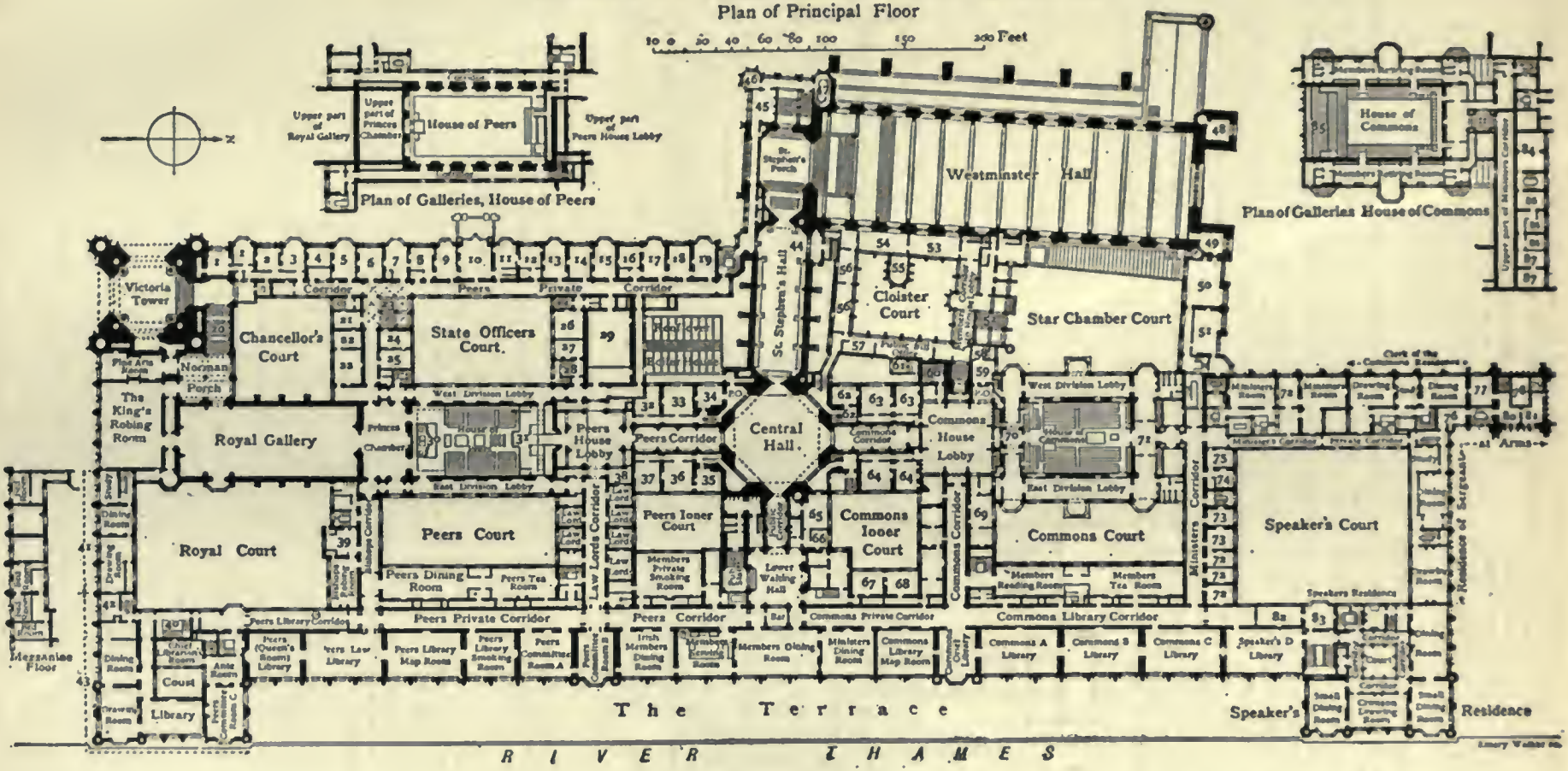


FIG. 91.

1. Reading Clerk.
2. Dressing Room.
3. Clerk of the Parliament.
4. Clerk Assistant's Dressing Room.
5. Clerk Assistant.
6. Clerk, House of Lords.
7. Messengers.
8. Waiting Room.
9. Lord Chancellor's Secretaries.
10. Lord Chancellor.
11. Lord Chancellor's Dressing Room.
12. Permanent Secretary.
13. Sergeant-at-Arms.
14. Yeoman Usher of the Black Rod.
15. Private Bill Office.
16. Chairman's Dressing Room.
17. Chairman of Committees.
18. Clerk to Private Bill and Taxing Office. [Counsel.
19. Chairman of Committees.
20. Royal Staircase.
21. Clerk to Public Bills.
22. Minutes.
23. Peers' Staircase.
24. Inner Office.
25. Printed Papers Office.
26. Private Bills and Taxing Office.
27. Earl Marshal.
28. Strangers' and Reporters' Stairs.
29. Peers' Standing Order Committee Room.
30. The Thrones.
31. Bar of the House.
32. Leader of the Opposition in the House of Lords.
33. Premier.
34. Telegraph.
35. Solicitor-General.
36. Attorney-General.
37. Lord Advocate.
38. Resident Superintendent.
39. Archbishops.
40. Principal Stairs.
41. Residence of the Yeoman Usher of the Black Rod.
42. Sitting Room.
43. Residence of the Clerk of Parliament.
44. Members' Entrance.
45. Dining Room of the Deputy Sergeant-at-Arms.
46. Turret Room.
47. Private Stairs of the Deputy Sergeant-at-Arms.
48. Journal Office Stores.
49. Police.
50. Ministers.
51. Opposition Ministers.
52. Members' Entrance Stairs.
53. Members' Conference Room. [taries.
54. Members' Private Secre-
55. Members' Small Conference Room.
56. Votes and Proceedings.
57. Accountant and Chief Public Bill Office.
58. Old Treasury Stairs.
59. Post Master.
60. Strangers' Stairs.
61. Cistern Tower.
62. Irish Whips.
63. Government Whips.
64. Opposition Whips.
65. Deputy Sergeant-at-Arms.
66. Clerk to Deputy Sergeant-at-Arms.
67. Speaker's Counsel.
68. Speaker's Counsel's Clerk.
69. Vote Office.
70. Bar Lobby.
71. Speaker's Lobby.
72. Ministers.
73. Clerk Assistant.
74. Train Bearers.
75. Speaker's Retiring Room.
76. Old Prison Rooms Lobby.
77. Sergeant-at-Arms' Smoking Room.
78. Clock Weight Shaft.
79. Air Shaft.
80. Smoking Room Lobby.
81. Butler.
82. Speaker's Secretary.
83. Audience Room.
84. *Times* Reporters.
85. Strangers' Gallery.
86. Waste Paper.
87. Mess.

are entirely Barry's, and which represent something beyond Pugin's grasp; the detail is in fact the weak element in the building. That Pugin's Gothic detail is better than Barry's would have been is very likely the case; but had Barry been left unfettered to work out the detail in his own school, the result would probably have been still better. Even as it is, however, the Houses of Parliament is one of the finest buildings in the world, ancient or modern, and it is to be regretted that Englishmen generally seem to be so little aware of this.

We may now turn to consider the Gothic Revival movement itself, of which Pugin was one of the most important pioneers. New ideas, however, as to the importance of Gothic architecture had been in the air before he came on the scene, and quite early in the century John Britton's *Architectural Antiquities of Great Britain* and *Cathedral Antiquities*, with their beautiful steel engravings by Le Keux, had done much to call attention to the neglected beauty of English medieval churches; and Thomas Rickman's remarkable and (for its day) masterly analysis of the variations of style in Gothic architecture, which first appeared in 1817, and went through edition after edition in succeeding years, gave the first intelligent direction to the study of the subject. Pugin supplied to the movement

The Gothic Revival, England.

building. The result has been gently but effectively satirized by Browning in " Bishop Blougram's Apology ":—

> " It's different preaching in Basilicas
> To doing duty in some masterpiece
> Like this of brother Pugin's, bless his heart.
> I doubt if they're half-baked, those chalk rosettes,
> Ciphers and stucco-twiddlings everywhere;
> It's just like breathing in a limekiln, eh?"

It is too true; and there is something pathetic in Pugin's career, in this passionate and sincere pursuit after a revival of the medieval spirit in life and in architecture—a pursuit which towards the close of his life he himself evidently more than half suspected to have been a fallacy.

The full tide of the Gothic revival is connected more especially with the name of Sir Gilbert Scott. He was hardly a pure enthusiast like Pugin; he was a shrewd man of the world, the commencement of whose professional career coincided with the rising tide of ecclesiological reform, and he had the ability to make the best of the opportunity. He appears to have had, even as a child, an inborn interest in church architecture and in

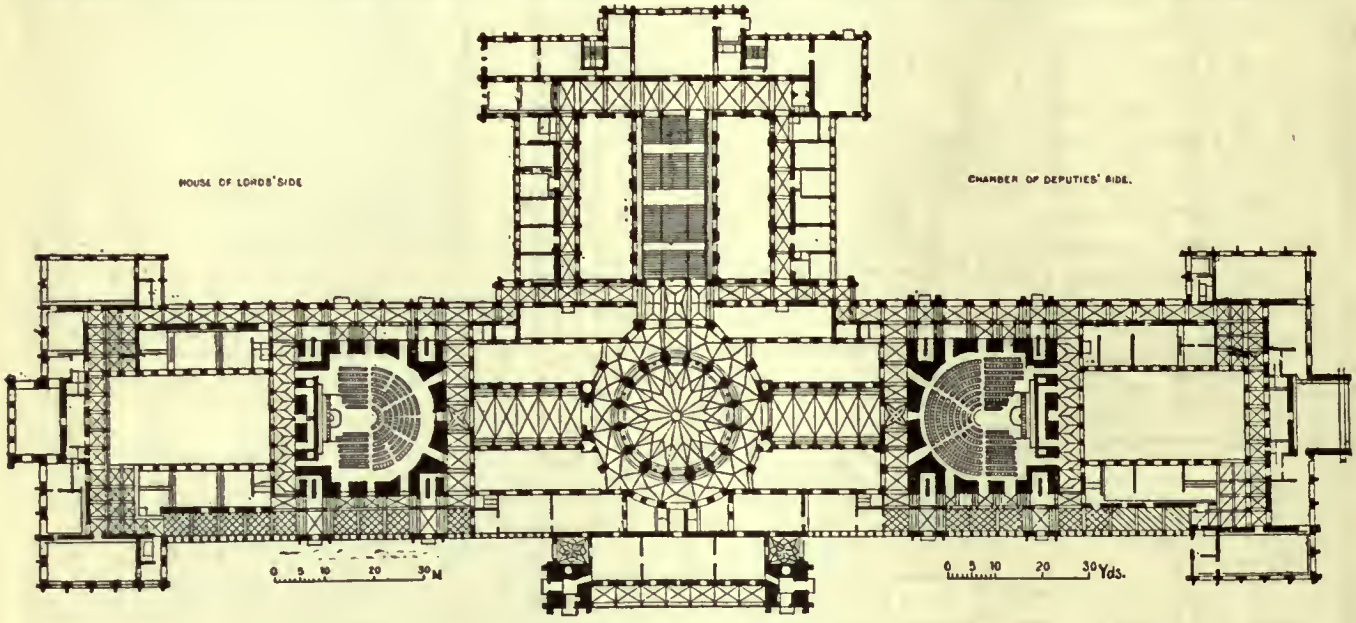


FIG. 92.—Plan of the Parliament House, Budapest. (Steindl.)

not analysis, but passion. He had the merit of having perceived, when quite a youth, that one thing wanted was better craftsmanship, and that craftsmanship in the medieval period was something very different from what it was in the early Victorian period; he set up an atelier of craftsmen, and was the real pioneer of what may be called the Arts and Crafts movement in England. An enthusiast by nature, he flung his whole soul into the task of reviving, as he believed, the glory of English medieval architecture; nothing else in architecture was worth thinking of; Classic and Renaissance were only worth sarcasm. The result in his works was a curious inconsistency. Pugin was not in the true sense a great architect; his mind was not practical enough to grasp an architectural problem as a whole, plan and building combined; in fact, he was no master of plan, and does not seem to have troubled himself much about it. But he had a remarkable perception of interior effect; whenever you go into one of his churches you recognize the desire to realize the greatest effect of height, the most soaring effect of lines, possible within the actual vertical measurements. But in his passion for this soaring expression he seems to have entirely lost sight of the essential quality of solidity and genuineness of material in the medieval architecture which he was trying to emulate or to outvie. So long as he could get his effect of height, his poetic interior, he was content to have thin walls and plaster vaults and ornaments; or, in other words, he spent upon height what should first have been spent upon solid and monumental Gothic detail (witness the description, in his *Memoirs*, of his astonishment and interest, at the age of eleven, at the first sight of capitals of the Early English type), and he acquired by unremitting study a knowledge of English Gothic architecture in its every detail which few architects have ever equalled. His numerous churches were, intentionally and confessedly, as close reproductions as possible of medieval architecture, generally that of the Early Decorated period; and if it were desirable that modern church architecture should consist in the reproduction of medieval churches, the task could not have been carried out with more learning and exactitude than it was by him. It was this minute and accurate knowledge of medieval church architecture which made him such a power when the idea of restoring English cathedrals became popular. He had an acquired instinct in tracing out the existence of details which had been overlaid by modern repairs or plasterwork; in going over a cathedral to decide on a scheme of restoration he seemed to know it as an anatomist knows the suggestions of a fossil skeleton; and in the course of his restorations he unearthed many points in the architectural history of the buildings which but for him would never have been elucidated. We now recognize that much of this " restoration " was a mistake, which destroyed the real interest of the cathedrals; and it is unhappily a mistake which cannot be undone. But the violent reproaches which have been heaped upon Scott's memory on this account are rather unjust. It is forgotten that he was doing what at the time every one

considered to be the right thing; cathedral bodies vied with each other in restoration, and were enthusiastic in the cause; there were few if any dissenting voices; and in regard to the interiors of the cathedrals which were in modern use as places of worship, much that he did really required to be done to put them into decent condition. His churches have ceased to be interesting now, as is usually the case with copied architecture; but when they were built they were exactly what every one wanted and was asking for. And he produced at all events one original work which is a great deal better than it is now the fashion to think—the Albert Memorial. It is injured by the statue, for which the commission went to the wrong sculptor; but Scott's idea of producing, as he phrased it, "a shrine on a great scale," was really a fine one, and finely carried out. The most important objection to it is one which popular criticism does not recognize, viz. that the vault is tied by concealed iron ties, and would hardly be safe without them. But apart from that it is a fine conception, and Scott was right in regarding it as his best work.

G. E. Street, who was a pupil of Scott, was a greater enthusiast for medieval architecture (which, with him, as with Pugin, included medieval religion) than even Scott, and an architect of greater force and individuality. He was especially devoted to the early Transitional type of Gothic, and in all his buildings there is apparent the feeling for the solidity and monumental character, and the reticence in the use of ornament, which is characteristic of the Transitional period. His churches are noteworthy for their monumental character; and he had a remarkable faculty for giving an appearance of scale and dignity to the interiors of comparatively small churches. Hence his modern-medieval churches retain their interest more than Scott's, but in respect of secular architecture his taste was hopelessly medievalized, and his great building, the law courts in London, can only be regarded as a costly failure; it is not even beautiful except in regard to some good detail; it is badly planned; and the one fine interior feature, the great vaulted hall, is rendered useless by not being on the same floor with the courts, so that instead of being a *salle des pas perdus* it is a desert. Street's career is a warning how real architectural talent and vigour may be stultified by a sentimental adherence to a past phase of architecture. No modern architect had more fully penetrated the spirit of Gothic architecture, and his nave of Bristol cathedral is as good as genuine medieval work, and might pass for such when time-worn; but that is rather archaeology than architecture.

The competition for the law courts was one of the great architectural events of the middle of the century, and made or raised the reputation even of some of the unsuccessful competitors. Edward Barry (the son of Sir Charles) gained the first place for "plan," which the advisers of the government had foolishly separated from "design" (as if the plan of a building could be considered apart from the architectural conception!), giving first marks for plan, and second for design. E. Barry therefore had really gained the competition, "design," which was awarded to Street, counting second; but Street managed to push him out, and it is a nemesis on him for this by no means loyal proceeding that the building he contrived to get entirely into his own hands has served to injure rather than benefit his reputation. William Burges (1827–1881), an ardent devotee of French early Gothic, produced a design in that style, which, though quite unsuitable practically, is a greater evidence of architectural power than is furnished by any of his executed buildings. J. P. Seddon (1828–1906), an old adherent of Rossetti and the pre-Raphaelite brotherhood, an architect of genius who never got his opportunity, produced a design which was wildly picturesque in appearance but in reality more practical than might be thought at first sight, and his proposal for a great Record tower for housing official records was a really fine and original idea.

Among the ecclesiastical buildings of the Gothic revival those of William Butterfield (1814–1900), much less numerous than those of Scott and Street, have a special interest as the work of a revival architect who was something more than a mere archaeologist. All Saints, Margaret Street (1859), is the production of an architectural artist using medieval materials to carry out a conception of his own, and hence, like Babbacombe church and others by the same hand, it has an interest for the present day which Scott's churches have not. His Keble College chapel rather failed from an exaggeration of the use of polychromatic materials, which in some of his other churches he had used with moderation and with good effect. J. L. Pearson was another distinguished architect of the later period of the Gothic revival who was able to put something of his own into modern Gothic churches. No one was more learned in medieval architecture than he was; and as of Street's nave of Bristol, so we may say of Pearson's nave of Truro, that it is as good as medieval Gothic; indeed Truro nave is finer in character than some of the ancient cathedral naves, and represents pure Gothic at its best. But in the exteriors of his churches, as at Truro and in the churches of Kilburn and Red Lion Square, Pearson evolved a Gothic of his own which is Pearsonesque and not merely archaeological. James Brooks (1825–1901) also deserves an honoured place in the chronicle of the Gothic revival for being the first to show how large town churches might be erected in brick (fig. 93), in which largeness of scale and a certain grandeur

FIG. 93.—Exterior of modern English Church. (James Brooks.)

of effect could be obtained without extravagant cost, and in which it was practically demonstrated that architecture in the true Gothic spirit could be produced without depending on ornament.

Alfred Waterhouse began his remarkable career as an adherent of the Gothic revival, and merits separate mention inasmuch as he was the only one of the Gothic revivalists who from the first set himself to adapt Gothic to secular uses and to make out of it a modern Gothic manner of his own. His first success was made with the Manchester law courts, a design more purely Gothic than his later works, and an admirably planned building (the only good point in the national law courts plan, the access to the public galleries, is taken from it); his special style was more developed in the Manchester town hall, a building typical both of the defects and merits of his secular Gothic style. This style of his received the compliment, for a good many years, of an immense amount of imitation; in fact, during that earlier period of his work it may be said to have influenced every secular building that was erected in the medieval style all over England. His Gothic detail was, however, not very refined, and he has been subject to the same kind of retrospective injustice which has fallen on Scott, critics in both instances forgetting that what they do not like *now* was what every one liked *then*, and could not have enough of. Waterhouse was a master of plan, and a man of immense business and administrative ability, without which he could not have carried out the

number of great building schemes which fell into his hands, and he had much more of the qualities of a great architect than are to be found in the works of some of his latter-day critics. His later works, one or two of which will be referred to, do not come under the head of the Gothic revival.

France. In France, the Gothic revival, which so strongly affected the whole school of English architecture for thirty or forty years, took little hold. Its most remarkable monument is the church of Ste Clotilde at Paris, built about the middle of the century from the designs of Ballu. In size it equals a second-class cathedral, and is a fine monument, though it does not show that complete knowledge of medieval Gothic which we find in the churches of Scott, Street, Pearson and G. F. Bodley. But as with the Classic, so with the Gothic revival—the leading French architects of the period had too much personal architectural feeling to be carried along in the wake of a "movement." Two very important Paris churches, built just after the middle of the century, illustrate well this independence of spirit. The one is the domed church of St Augustin in the Boulevard Malesherbes (Plate XII., fig. 122), designed by Victor Baltard (1805–1874). It may be called a Classic church treated in a quasi-Byzantine manner. A remarkable point about it is that, standing between the divergence of two streets at an acute angle, the outer walls of the nave follow the line of the two streets, the church thus expanding towards the centre; internally the colonnades are parallel, the chapels outside of them increasing in depth from the entrance of the nave towards the centre—a very clever device for reconciling exterior and interior effect. The other church referred to, built about the same time, is La Trinité (Plate XII., fig. 123) by Théodore Ballu (1817–1885)—a church which is Renaissance in detail and yet distinctly Gothic in its general effect and in the multiplicity of its detail, somewhat recalling in this sense Barry's Halifax tower before referred to. The sense in which there has really been a general movement in church architecture in France has been in the direction of a kind of modernized Byzantine, of which one of the earliest and best examples is the church of St Pierre de Montrouge, by Joseph Auguste E. Vaudremer (Plate XII., fig. 124). A later and more important example is the cathedral of Marseilles, by Léon Vaudoyer (1803–1872) and Henry Espérandieu (1829–1874), a mingling of Romanesque and Byzantine, and in many respects a fine building (Plate XIII., fig. 126). This modern feeling in favour of a Byzantine type of church architecture culminated in the great church of the Sacré Cœur on Montmartre, at Paris, begun in the early 'eighties from the designs of Paul Abadie (1812–1884). This grand building stands on a most effective site, and is of a monumental solidity seldom met with in modern architecture; it is more pure and consistent in style than many of the smaller churches of the same school of architecture. These latter are not for the most part very attractive; they represent in general a kind of Frenchified Byzantine detail which exhibits neither Byzantine spirit nor French grace and finish; and on the whole it may be said that church architecture is the field in which the French architects of the 19th century were least successful.

As regards secular buildings, on the other hand, the Paris of the middle portion of the 19th century can show some of the most unquestionable architectural successes of the period. The modern portions of the Palais de Justice by Louis Joseph Duc (1802–1879)—not Viollet-le-Duc, as is often mistakenly asserted in guide-books—and of the École des Beaux-Arts, by Jacques Félix Duban (1797–1870), are among the best examples of the application of classic forms of architecture to modern buildings; and the Bibliothèque Ste Geneviève (Plate XIII., fig. 128), by Henri Labrouste (1801–1875), was in its day (about 1850) a new creation in applied classic architecture; a building in which the exterior design was entirely subservient to and expressive of the requirements of a library, a large portion of the wall being left unpierced for the storage of books, windows being only inserted where they did not interfere with this object; and the manner in which these walls are treated so as to produce a decorative architectural effect without having recourse to sham colonnades and sham window openings, was entirely new at the time in modern work. It is instructive to compare this design with that of the Bank of England, as examples of the right and the wrong way of treating buildings in which much blank wall space was required. The new buildings of the Louvre (Plate XIV., fig. 129), built under Napoleon III. from the designs of Louis Tullius Joachim Visconti (1791–1853), are not to be passed over, though they have too much of the showy and flaunting character which belonged to both the society and the art of the Second Empire; a fault which also destroys some of the value of the Grand Opera house, a remarkable work by a remarkable architect (Jean Louis Charles Garnier), and typical, more than any other structure, of the epoch in which it was built. Some of its effect it owes to the admirable painting and sculpture with which it is decorated, but the grand staircase is a fine architectural conception (see GARNIER).

Recent English architecture. In England and in the United States, the last quarter of the 19th century was a period of unusual interest and activity in architectural development. While other nations have been content to carry on their architecture, for the most part, on the old scholastic lines which had been prevalent since the Renaissance, in the two countries named there has been manifest a spirit of unrest, of critical inquiry into the basis and objects of architecture; an aspiration to make new and original creations in or applications of the art, without example in any other period in the modern history of architecture. In England, the "note"—heard with increasing shrillness of *crescendo* towards the very last year of the century—was the cry for originality, for throwing off the trammels of the past, for rendering architecture more truly a direct expression of the conditions of practical requirement and of structure. This was no doubt to some extent the effect of a reaction. During the greater part of the century architectural strength, as has been already shown, had been spent in revivals of past styles. Churches indeed, up to the close of the century, continued to be built, for the most part, in revived Gothic; but this was owing to special clerical influence, which saw in Gothic a style specially consecrated to church architecture, and would be satisfied, as a rule, with nothing else. Efforts have been made by architects to modify the medieval church plan into something more practically suited to modern congregational worship, by a system of reducing the side aisles to mere narrow passages for access to the seats, thus retaining the architectural effect of the arcade, while keeping it out of the way of the seated congregation; and there have been occasional reversions to the ancient Christian basilica type of plan, or sometimes, as in the church in Davies Street, London, attempts to treat a church in a manner entirely independent of architectural precedent; but in the main, Gothic has continued to rule for churches. Apart from this special class of building, however, revived Gothic began to droop during the 'seventies. All had been copied that could be copied, and the result, to the architectural mind, was not satisfaction but satiety. Gothic began to be regarded as "played out." The immediate result, however, was not an organized attempt to think for ourselves, and make our own style, but a recourse to another class of precedent, represented in the type of early 18th-century building which became known as "Queen Anne," and which, like Gothic before it, was now to be recommended as "essentially English," as in fact it is. It can hardly, however, be called an architectural style; it would have no right to figure in any work illustrating the great architectural styles of the world. It was, in fact, the last dying phase of the English Renaissance; the architecture of the classic order reduced to a threadbare condition, treated very simply and in plain materials, in many cases shorn of its columnar features, and reflecting faithfully enough the prim rationalistic taste in literature and art of the England of the 18th century. Though not to be dignified as a *style*, it was, however, a recognizable and consistent *manner* in building; it made extensive use of brick, a material inexpensive and at the same time very well suited to the English climate and atmosphere; and it was generally carried out in very solid proportions, and with very good workmanship. To a generation tired of imitating a great

"Queen Anne."

Photo, Valentine & Sons, Dundee.

FIG. 120.—NATURAL HISTORY MUSEUM, SOUTH KENSINGTON. (WATERHOUSE.)

Photo, M. Gerbeault.

FIG. 121.—LAW COURTS, BRUSSELS. (POELAERT.)

Photo, Neurdein.

FIG. 122.—CHURCH OF ST AUGUSTIN, PARIS. (BALTARD.)

Photo, Neurdein.

FIG. 123.—CHURCH OF LA TRINITÉ, PARIS. (BALLU.)

Photo, A. Lévy.

FIG. 124.—CHURCH OF ST PIERRE DE MONTROUGE, PARIS. (VAUDREMER.)

Photo, Neurdein.

FIG. 125.—CHURCH OF ST VINCENT DE PAUL, PARIS. (HITTORFF.)

style at second hand, this unpretending and simple model was a welcome relief, and led to the erection of a considerable number of modern buildings, dwelling-houses especially, the obvious

FIG. 94.—Chelsea Town Hall. (J. M. Brydon.)

aim of which was to look as like 18th-century buildings as possible. A typical example is the large London house by Norman Shaw, at the corner of Queen's Gate and Imperial Institute Road. The Chelsea town hall (fig. 94), by J. M. Brydon (1840–1901), is a good example of a public building in the revived Queen Anne style.

A change of front from copying a great style like the medieval to copying what is at best a bastard one, if a style at all, might not seem to promise very much for the emancipation of modern architecture; yet there turned out to be one element of progress in it, resting on the fact that the comparatively simple detail of the 18th-century buildings formed a kind of vernacular of building workmanship, which could be comprehended and carried out by good artisans as a recognized tradition. Now to reduce architecture to good sound building and good workmanship seemed to promise at any rate a better basis to work upon than the mere imitation of classic or medieval detail; it might conceivably furnish a new starting-point. This was the element of life in the Queen Anne revival, and it had, as we shall see, an influence beyond the circle of the special revivers of the style. But almost concurrently with, or following hard upon, the "Queen Anne" movement arose the idea of a modern architecture, founded on a free and unfettered treatment of the materials of our earlier Renaissance architecture, as illustrated in buildings of the Stuart period. This new ideal was styled "free classic," and it gave the prevailing tone to English architecture for the last fifteen years of the century, though it had its commencement in certain characteristic buildings a good many years earlier than that. In 1873, for instance, there arose a comparatively small front in Leadenhall Street, under the name of "New Zealand Chambers" (fig. 95), designed by Norman Shaw, which excited more attention, and had more influence on contemporary architecture than many a building of far greater size and importance. This represented the playful and picturesque possibilities of "free classic." Its more restrained and refined achievements were early exemplified in G. F. Bodley's design for the front of the London School Board offices on the Thames Embankment,[1] a comparatively small building which also exercised a considerable influence. There were no details here, however, but what could be found in Stuart (or, as it is more often called, Jacobean) architecture, but the building, and the prominence of its architect's name, helped to draw attention to the possibilities of the style, and it has been discovered that free classic is susceptible of a great deal of original treatment based on Renaissance elements. As an example we may cite a street front built some twenty years later by another academician-architect, viz. the offices of the Chartered Accountants in the City, by J. Belcher. More dignified and more monumental than New Zealand Chambers, more original than the School Board offices, this front contains some details and a general treatment which may be said to be absolutely new; it affords another example of a piece of street architecture which attracted a great deal of attention, and has had an effect quite disproportionate to its size and importance as a building; and it gives a general measure of the progress of the "free classic" idea. During the last decade of the century "free classic" was almost the recognized style in English architecture, and has been illustrated in many town halls and other large and important buildings, among which the Imperial Institute is a prominent example (fig. 96).

"Free classic."

Concurrently with this tendency towards a free classic style there has arisen another movement which has had a considerable influence on English architecture, viz. an increased perception of the importance of decorative arts—sculpture, painting, mosaic, etc.—in alliance with architecture, and of the architect and the decorative artist working together and in harmony. This is no more than what has long been understood and acted on in France, but it has been a new light to modern English architecture, in which, until a comparatively recent period, decorative painting was hardly

The allied arts.

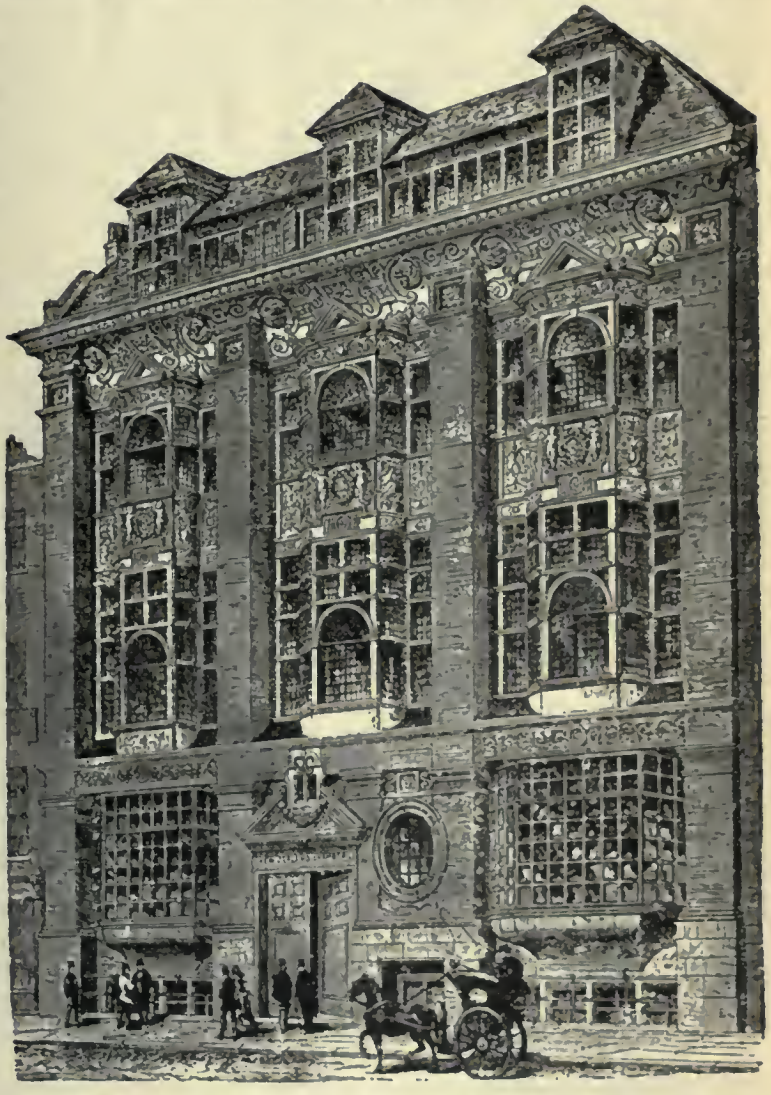


FIG. 95.—New Zealand Chambers. (R. Norman Shaw, R.A.)

[1] The western half of the present front; the design was duplicated afterwards, on the extension of the building, but Bodley originated it.

thought of, and decorative sculpture, where it was introduced, was too often, or indeed generally, the mere work of some trading firm of masons. But of late years sculpture has taken a far more prominent place in connexion with architecture; it has become a habit with the best architects to rely largely on the introduction of appropriate and symbolic sculpture to add to the interest of their buildings, and to associate with them eminent sculptors, who, instead of regarding their work only in the light of isolated statues or groups for the exhibition room and the art gallery, are willing to give their best efforts to produce high-class sculpture for the decoration of an architectural design which forms the framework to it.

Notice should be taken, however, of another movement in

FIG. 96.—Staircase, Imperial Institute. (Collcutt.)

English architecture during the closing years of the 19th century.

The craftsmanship ideal.

Reference has already been made to one idea which prompted the culture of the "Queen Anne" type of architecture: that it presented a simple vernacular of construction and detail, in which solid workmanship was a more prominent element than elaboration of what is known as architectural style. To a small group of clever and enthusiastic architects of the younger generation it appeared that this idea of reducing architecture to the common-sense of construction might be carried still further; that as all the revivals of styles since the Renaissance had failed to give permanent satisfaction and had tended to reduce architecture to a learned imitation of the work of former epochs, the real chance for giving life to architecture as a modern art was to throw aside all the conventionally accepted insignia of architectural style—columns, pilasters, cornices, buttresses, etc.—and to begin over again with mere workmanship—wall-building and carpentry—and trust that in process of time a new decorative detail would be evolved, indebted to no precedent. The building artisans, in fact, were collectively to take the place of the architect and the form of the building to be evolved by a natural process of growth. This was a favourite idea also with William Morris, who insisted that medieval art—the only art which he recognized as of any value (Greek, Roman and Renaissance being alike contemptible in his eyes)—was essentially an art of the people, and that in fact it was the modern architects who stood in the way of our having a genuine architecture of the 19th century. Considering how much of merely formal, conventional and soulless architecture has been produced in our time under the guidance of the professional architect, it is impossible to deny that there is an element of truth in this reasoning; at all events, that there have been a good many modern architects who have done more harm than good to architecture. But when we come to follow out this reasoning to its logical results, it is obvious that there are serious flaws in it. Morris's idea that medieval architecture alone was worthy the name, we may, of course, dismiss at once; it was the prejudice of a man of genius whose sympathies, both in matters social and artistic, were narrow. Nor can we regard the medieval cathedrals as artisan's architecture. The name of "architect" may have been unknown, but that the personage was present in some guise, the very individuality and variety of our English cathedrals attest. Peterborough front was no mere mason's conception. And when we come to consider modern conditions of building, it is perfectly obvious that with the complicated practical requirements of modern building, in regard to planning, heating, ventilation, etc., the planning of the whole in a complete set of drawings, before the building is begun, is an absolute necessity. We are no longer in medieval times; modern conditions require the modern architect. The real cause of failure, as far as modern architecture is a failure, lies partly in the fact that it is practised too much as a profession or business, too little as an art; partly in the deadening effect of public indifference to art in Britain. If the public really desired great and impressive works of architecture they would have them; but neither the British public nor its mouthpiece the government, care anything about it. Their highest ambition is to get convenient and economical buildings. And as to the theory of the new school, that we should throw overboard all precedent in architectural detail, that is intellectually impossible. We are not made so that we can invent everything *de novo*, or escape the effect on our minds of what has preceded us; the attempt can only lead to baldness or eccentricity. Every great style of architecture of the past has, in fact, been evolved from the detail of preceding styles; and some of the ablest and most earnest architects of the present day are, indeed, urging the desirability of clinging to traditional forms in regard to detail, as a means of maintaining the continuity of the art. This does not by any means imply the absence of original architecture; there is scope for endless origination in the plan and the general design of a building. The Houses of Parliament is a prominent example. The detail is a reproduction of Tudor detail, but the plan and the general conception are absolutely original, and resemble those of no other pre-existing building in the world.

United States.

It is necessary to take account of all these movements of opinion and principle in English architecture to appreciate properly its position and prospects at the time with which we are here dealing. Turning now from England to the United States, which, as already observed, is the only other important country in which there has been a general new movement in architecture, we find, singular to say, that the course of development has in America been almost the reverse of what has taken place in England. The rapidity of architectural development in America, it may be observed, since about 1875, has been something astonishing; there is no parallel to it anywhere else. Before then the currently accepted architecture of the American Republic was little more than a bad repetition of the English Gothic and Classic types of revived architecture. At the present day no nation, except perhaps France, takes so keen an interest in architecture and produces so many noteworthy buildings; and it may be observed that in the United States the public and the official authorities seem really to have some enthusiasm on the subject, and to desire fine buildings. But the stirring of the dry bones began in America where it ended in England. The first symptoms of an original spirit operating in American architecture showed themselves in domestic architecture, in town and country houses, the latter especially; and the form which the movement took

was a desire to escape conventional architectural detail and to return to the simplest form of mere *building*; rock-faced masonry, sometimes of materials picked up on the site; chimneys which were plain shafts of masonry or brickwork; woodwork simply hewn and squared; but the whole arranged with a view to picturesque effect (figs. 97 and 98). This form of American

FIG. 97.—American Type of Country-House Architecture.

house became an incident in the course of modern architecture; it even had a recognizable influence on English architects. About the same time an impetus of a more special nature was given to American architecture by a man of genius, H. H. Richardson, who, falling back on Romanesque and Byzantine types of architecture as a somewhat unworked field, evolved

FIG. 98.—American Seaside Villa. (Bruce Price.)

from them a type of architectural treatment so distinctly his own (though its *origines* were of course quite traceable) that he came very near the credit of having personally invented a style; at all events he invented a manner, which was so largely admired and imitated that for some ten or fifteen years American architecture showed a distinct tendency to become "Richardsonesque"

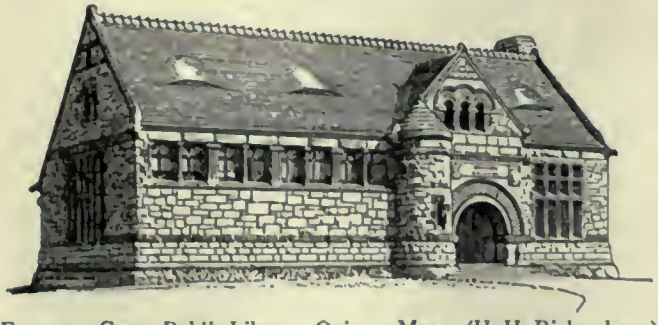


FIG. 99.—Crane Public Library, Quincy, Mass. (H. H. Richardson.)

(see also Plate XVI., fig. 137). As with all architectural fashions, however, people got tired of this, and the influence of another very able American architect, Richard M. Hunt, coupled perhaps with the proverbial philo-Gallic tendencies of the modern American, led to the American architects, during the last decade of the 19th century, throwing themselves almost entirely into the arms, as it were, of France; seeking their education as far as possible in Paris, and adopting the theory and practice of the École des Beaux-Arts so completely that it is often impossible to distinguish their designs, and even their methods of drawing, from those of French architects brought up in the strictest régime of the "École." By this French movement the Americans have, on the one hand, shared the advantages and the influence of what is undoubtedly the most complete school of architectural training in the world; but, on the other hand, they have foregone the opportunity which might have been afforded them of developing a school or style of their own, influenced by the circumstances of their own requirements, climate and materials. Figs. 133 and 134, Plate XV., show examples of recent American architecture of the European classic type. Thus, in the two countries which in this period have shown the most activity and restlessness in their architectural aspirations, and given the most original thought to the subject, England has constantly tended towards throwing off the yoke of precedent and escaping from the limits of a scholastic style; while America, commencing her era of architectural emancipation with an attempt at first principles and simple but picturesque building, has ended by a pretty general adoption of the highly-developed scholastic system of another country. The contrast is certainly a curious one. Only one original contribution to the art has been made by America in recent days —one arising directly out of practical conditions, viz. the "high buildings" in cities; a form of architecture which may be said to have originated in the fact that New York is built on a peninsula, and extension of the city is only possible vertically and not horizontally. The tower-like buildings (see Plate XV., fig. 131, and STEEL CONSTRUCTION, Plate II., figs. 3 and 4), served internally by lifts, to which this condition of things has given rise, form a really new contribution to architecture, and have been handled by some of the American architects in a very effective manner; though, unfortunately, the rage for rapid building in the cities of the United States has led to the adoption of the false architectural system of running up such structures in the form of a steel framing, cased with a mere skin of masonry or terra-cotta, for appearance' sake, which in reality depends for its stability on the steel framing. It must be admitted, however, to be a new contribution to architecture, and renders New York, as seen from the harbour, a "towered city" in a sense not realized by the poet.

English progress.

Some sketch of the state of recent architectural thought or endeavour in England seemed essential to the subject, since it is there that what may be called the philosophy of architecture has been most debated, and that thought has had the most obvious and most direct effect on architectural style and movement. That this has been the case has no doubt been largely due to the influence of Ruskin, who, though his architectural judgment was on many points faulty and absurd in the extreme, had at any rate the effect of setting people thinking—not without result. In other countries architecture continued to pursue, up to the close of the century, the scholastic ideal impressed upon it by the Renaissance, without exciting doubt or controversy unless in a very occasional and partial manner, and without any changes save those minor ones arising from changing habits of execution and use of material. In Germany there appears to be a certain tendency to a greater freedom in the use of the materials of classic architecture, a certain relaxation of the bonds of scholasticism; but it has hardly assumed such proportions as to be ranked as a new movement in architecture.

English churches.

The last years of the 19th century witnessed the progress to an advanced stage of the most remarkable piece of English church architecture of the period, the Roman Catholic cathedral at Westminster, by J. H. Bentley (1839–1902), a building which is not a Gothic revival, but goes back to earlier (Byzantine) precedents; not, however, without a considerable element of novelty and originality in the design, especially in some of the exterior detail. The interior was intended for decoration in applied marble and mosaic, yet even as a shell of brickwork, with its solid domes and the

immense masses of the piers, it is one of the most impressive and monumental interiors of modern date.

In ordinary church architecture, though there is still a good deal of mere imitation medieval work carried out, England has not been without examples of a new and original application of Gothic materials. The interior of the church of St Clare, Liverpool, by Mr Leonard Stokes (fig. 100), is a good example of the modified treatment of the three-aisled medieval plan already referred to, the side aisles being reduced to passages; and also of the tendency in recent years to simplify the treatment of Gothic, in contrast to the florid and over-carved churches of the Gothic revival. The churches of James Brooks, as already noted, have shown many examples of a solid plain treatment of Gothic, yet with a great deal of character; and J. D. Sedding (1838–1891) built some showing great originality, among which the interior of his church of the Holy Redeemer, Clerkenwell, affords also an interesting example of the modern free treatment of forms derived from classic architecture.

FIG. 100.—Interior, St Clare's, Liverpool. (Leonard Stokes.)

The event of most importance in English church architecture at the beginning of the 20th century was the commencement of a modern cathedral at Liverpool. In the early 'eighties the proposal for a cathedral had led to an important competition between three sets of invited architects, Sir William Emerson, Messrs Bodley and Garner and James Brooks. Nothing, however, resulted, except the production of three very fine sets of drawings. Subsequently the subject was taken up again with more energy, and a sketch competition invited for a cathedral on a new site (the one originally intended being no longer available); from among the sketch competitors five were invited to join in a final competition, viz. Messrs Austin and Paley, C. A. Nicholson, Gilbert Scott (grandson of Sir Gilbert Scott), Malcolm Stark and W. J. Tapper. Mr Scott's design was selected (May 1903) and the building of it commenced not long after. It is a design in revived Gothic, of the orthodox type as to detail, though containing some points of decided originality in the general treatment. The condition proposed in the first instance by the committee, that the designs sent in must be in the Gothic style, gave rise to a strong protest, in the architectural journals and elsewhere, on the ground that the revival of ancient styles was a mistaken and exploded fallacy; and in deference to this expression of opinion the committee officially withdrew the limitation as to style. That, in view of their obvious bias, they would confine their selection to designs in the Gothic style, was, however, a foregone conclusion. It is much to be regretted that the opportunity was not taken to evolve a modern and Protestant type of cathedral, with a central area and a dome as its principal feature.

English public buildings.

In the architecture of public buildings one of the earliest incidents in this latest period was the completion of the Albert Hall, which, though the work of an engineer, and commonplace in detail, is in the main a fine and novel architectural conception, and a practical success (considering its abnormal size) as a building for musical performances. Had its constructor been bold enough to roof it with a solid masonry dome, with an "eye" in the centre (as in the Pantheon) instead of a huge dish-cover of glass and iron, there would have been little to find fault with in its general conception. It was also the first modern English building of importance to be decorated externally with symbolical figure composition, in the shape of the large frieze in coarse mosaic of terra-cotta, which is carried round the upper portion of the exterior, and which, if not very interesting in detail, at all events fulfils very well its purpose as a piece of decorative effect. The subject of the government offices in London forms in itself an important chapter in recent architectural history. The home and foreign office block was finished in 1874; a sumptuous, but weak and ill-planned building designed by Scott, *invita Minerva*, in a style alien to his own predilections. In 1884 took place the great competition for the war and admiralty offices conjointly, won by a commonplace but admirably drawn design, presenting some good points in planning. The building was to stand between Whitehall and St James's Park, with a front both ways. The competition came to nothing, and the successful architects were eventually employed to build the new admiralty as it now stands, a mean and commonplace building with no street frontage, in which economy was the main consideration, and totally discreditable to the greatest naval power in the world. In 1898–1899 it was at last resolved to build a war office and other government offices much needed, and an irregular site opposite the Horse Guards was selected for the war office and one in Great George Street for the others. In this case there was no competition, but the government selected two architects after inquiry as to their works ("classic" architecture being a *sine qua non*); W. Young (d. 1900) for the war office, and J. M. Brydon for the Great George Street block. The war office site is inadequate and totally unsymmetrical, the boundary of the building being settled by the boundary of the street curb, and the inner courtyards are of very mean proportions compared with the great courtyard of the home and foreign office. Both architects produced grandiose designs, but in regard to the war office at least the government threw away a great opportunity.

There can only be further enumerated a few of the more important buildings erected in England during the later years

Photo, Neurdein.

FIG. 126.—CATHEDRAL, MARSEILLES. (VAUDOYER AND ESPERANDIEU.)

Photo, Neurdein.

FIG. 127.—MAIRIE, XTH ARRONDISSEMENT, PARIS. (ROUYER.)

Photo, A. Lévy.

FIG. 128.—BIBLIOTHÈQUE STE GENEVIÈVE, PARIS. (LABROUSTE.)

Photo, L. L. Paris.

FIG. 129.—PAVILLON RICHELIEU, THE LOUVRE, PARIS. (VISCONTI.)

Photo, Neurdein.

FIG. 130.—PETIT PALAIS, PARIS. (GIRAULT.)

of the 19th century, and mention made of the general course which architecture has taken in regard to special classes of buildings. The Natural History Museum (Plate XI., fig. 120), completed in 1881 by Alfred Waterhouse, may stand as a type

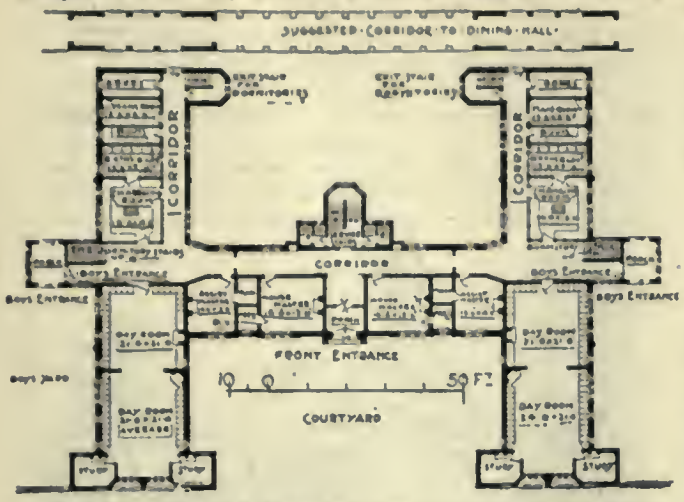


FIG. 101.—Plan of a Master's House, New Christ's Hospital. (Webb and Bell.)

of the taste for the employment of terra-cotta, with all its dangerous facilities in ornamental detail, of which that architect specially set the example. Detail is certainly overdone here, but the building is strikingly original; a point not to be overlooked in these days of architectural copying. The Imperial Institute, the result of a competition among six selected architects, represents also a type of architecture which its architect, T. E. Collcutt, may be said to have matured for himself, and which has been extensively imitated; a refined variety of free classic, always quiet and delicate in detail, though perhaps rather wanting in architectonic force. The next great architectural competition was that for the completion of the South Kensington Museum, the bare brick exterior of which, waiting for architectural completion, had long been a national disgrace. The competition produced some fine and striking designs, some of them perhaps more so than the selected one by Sir Aston Webb, whose fine plan, however, justified the selection. Another competition which excited general interest was that in 1894, for the rebuilding on a country site of Christ's

FIG. 103.—Oxford Town Hall. (Hare.)

Hospital schools, also gained by Aston Webb (in collaboration with Ingress Bell), by a design which, in its arrangement of schoolhouses in detached blocks (fig. 101), but in a symmetrical grouping, opened up a new idea in public-school planning, and struck a blow at the picturesque but insanitary quadrangle system. Among notable public buildings of the period ought to be mentioned Norman Shaw's New Scotland Yard, built in a style neither classic nor Gothic, but partaking of the elements of both (Plate X., fig. 119). A competition in 1908 for the design of the new county hall for the London County Council, to be "English Renaissance" in style, was won by a young architect, till then unknown, Mr Ralph Knott.

In recent years there has been a great movement for building town halls; towns rather vying with each other in this way. Of late nearly all of these have been carried out in some variety of free classic. Among the more important in point of scale is that of Sheffield, by E. W. Mountford (1856–1908) (fig. 102); among smaller ones, those of Oxford, by H. T. Hare (fig. 103); and Colchester, by John Belcher, are particularly good examples of recent architecture of this class, the former distinguished also by an exceptionally good plan. The merit of excellent planning also belongs to Aston Webb and Ingress Bell's Birmingham law courts, one of the modern terra-cotta buildings of somewhat too florid detail, though picturesque as a whole. Among public halls the M'Ewan Hall at Edinburgh, completed in 1898 from the designs of Sir Rowand Anderson, deserves mention as one of the most original and most carefully designed of recent buildings in Great Britain.

FIG. 102.—Sheffield Town Hall. (Mountford.)

The various new buildings erected in connexion with the university of Oxford, those by T. G. Jackson (b. 1835) especially, form an important incident in modern English architecture. Mr Jackson succeeded to a remarkable degree in designing new buildings which are in harmony with the old architecture of the university city; sometimes perhaps a little too imitative of it, but at any rate he has the credit of having added rather

extensively to Oxford without spoiling it; while his school buildings in different parts of the country have a refinement and domesticity of feeling which is the true note of school architecture. Among buildings of an educational class, the move in technical education has led to the erection of a good many large polytechnic and similar institutions, which in many cases have been well treated architecturally; the Northampton Institute at Clerkenwell (fig. 104), by Mountford, being perhaps one of the

FIG. 104.—Northampton Institute, Clerkenwell. (Mountford.)

boldest and most effective of recent public buildings. In the building of hospitals and asylums much has been done, and great progress made in the direction of hygienic and practical planning and construction, but the tendency has been (perhaps rightly) towards making this practical efficiency the main consideration and reducing architectural treatment to the simplest character. St Thomas's hospital at Lambeth exemplifies the treatment of hospital architecture at the commencement of the last quarter of the 19th century; the separate pavilion system had been already adopted on practical grounds, but the building is treated

FIG. 105.—Cragside. (R. Norman Shaw.)

in a sumptuous architectural style, as if representing so many detached mansions—a treatment which would now be deprecated as an expenditure foreign to the main purpose of the building. One recent hospital, however, that at Birmingham, by W. Henman, combining architectural effect with the latest hygienic improvements, was the first large hospital in Great Britain in which the system of mechanical ventilation was completely and consistently carried out.

In theatre building there has been an immense improvement in regard to planning, ventilation and fireproof construction, but little to note in an architectural sense, since theatres in England are never designed by eminent architects, the financial and practical aspects being alone considered.

In domestic architecture the tendency has been to quit picturesque irregularity for a more formal and more dignified treatment. Such a house as Norman Shaw's "Cragside," built in the earlier part of our period (fig. 105), however its picturesque treatment may still be admired, would hardly be built now on a large scale; its architect himself has of late years shown a preference for a symmetrical and regular treatment of house architecture sometimes to the extent of making the mansion look too like a barrack. In street architecture, however, the tendency has been towards a more characteristic and more picturesque treatment; nor is there any class of building in which the improvement in English architecture has been more marked and more unquestionable. Many of the new residential streets in the west end of London present a really picturesque *ensemble*, and many shops and other commercial street buildings have been erected with

English domestic and street architecture.

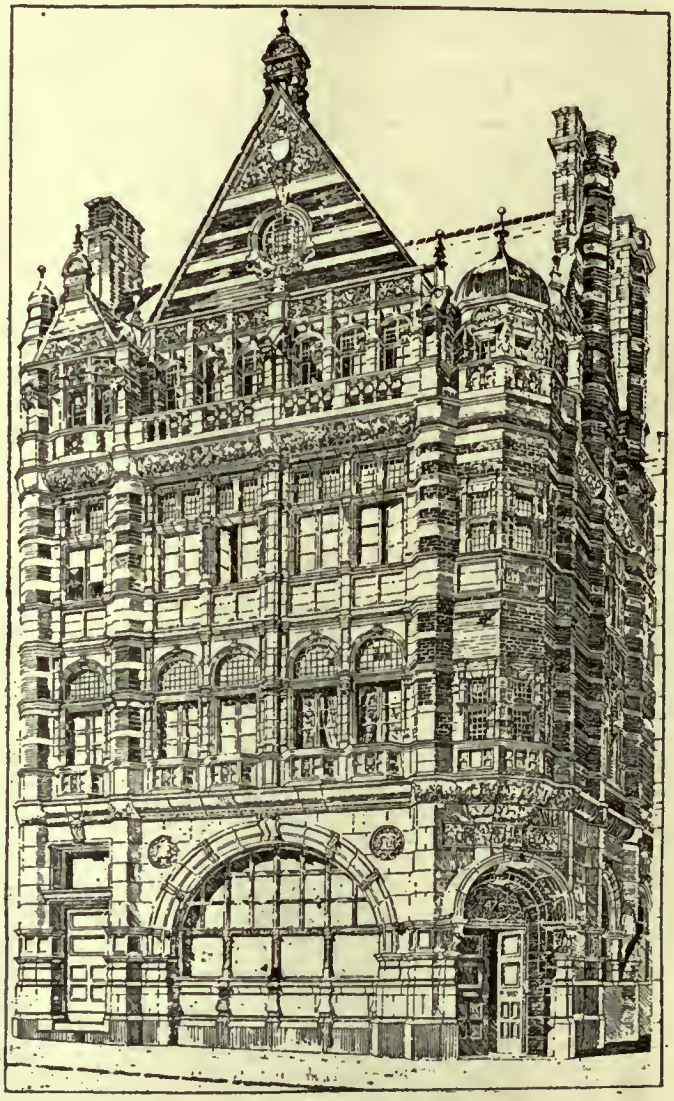


FIG. 106.—London City & Midland Bank, Ludgate Hill Branch. (Collcutt.)

admirable fronts from the designs of some of the best architects of the day. Norman Shaw's building at the corner of St James's Street and Pall Mall was one of the first, and is still one of the best examples of modern street architecture, though surpassed by the same architect's more recent building opposite, at the south-west angle of St James's Street—one of the finest and most monumental examples of street architecture in London. Among other examples may be cited T. E. Collcutt's London City & Midland Bank in Ludgate Hill (fig. 106) and R. Blomfield's narrow house-front in Buckingham Gate (fig. 107). The introduction of sculpture in street fronts is also beginning to receive attention; and a simple house-front recently erected in Margaret Street, London, from the design of Beresford Pite (fig. 108), is an excellent example of the use of sculpture in

connexion with ordinary street architecture. It is significant of the increased attention accorded to street architecture, that the most important architectural event in England at the very close of the 19th century, was the outlay of £2000 by the London County Council, in fees to eight architects for designs for the front of the proposed new streets of Kingsway and Aldwych. The idea was to treat these streets as comprehensive architectural designs with a certain unity of effect. Unfortunately this idea

FIG. 107.—House in Buckingham Gate, London. (R. Blomfield.)

was abandoned for merely commercial reasons, it being feared that there would be a difficulty in letting the sites if tenants were required to conform their frontages to a general design. In the case of Aldwych, which is a crescent street, this decision was fatal. A crescent loses all its effect unless treated as a complete and symmetrical architectural design.

The competition for the Queen Victoria Memorial, consisting of a processional road from Whitehall to Buckingham Palace, culminating in a sculptural trophy in front of the palace, attracted a great deal of attention in 1901. Of the five invited competitors—Sir Aston Webb (b. 1849), T. G. Jackson, Ernest George (b. 1839), Sir Thomas Drew (b. 1838), and Sir Rowand Anderson (b. 1834) the two latter representing Ireland and Scotland respectively,—Sir Aston Webb's design was selected, and unquestionably showed the best and most effective manner of laying out the road, as well as a very pleasing architectural treatment of the semicircular forecourt in front of the palace, with pavilions and fountain-basins symmetrically spaced; but some of this was subsequently sacrificed on grounds of economy. The building, a triumphal arch flanked by pavilions, forming the entry to the processional road from Whitehall, is a dignified design.

Recent French architecture.

In France, still the leading artistic nation of the world, the art of architecture has been in a most flourishing and most active state in the most recent period. It is true that there is not the same variety as in modern English architecture, nor have there been the same discussions and experiments in regard to the true aim and course of architecture which have excited so much interest in England; because the French architects, unlike the English, know exactly what they want. They have a "school" of architecture; they adhere to the scholastic or academic theory of architecture as an art founded on the study of classic models; and on this basis their architects receive the most thorough training of any in the world. This predominance of the academic theory deprives their architecture, no doubt, of a good deal of the element of variety and picturesqueness; a French architect *pur sang*, in fact, never attempts the picturesque, unless in a country residence, and then the results are such that one wishes the attempt had not been made. But, on the other hand, modern French architecture at its best has a dignity and style about it which no other nation at present reaches, and which goes far to atone for a certain degree of sameness and repetition in its motives; and living under a government which recognizes the importance of national architecture, and is willing to spend public money liberally on it (with the full approbation of its public), the French architects have opportunities which English ones but seldom enjoy—the predominant aim with a British government being to see how little they can spend on a public building. The two great Paris exhibitions of 1889 and 1900 may be regarded as important events in connexion with architecture, for even the temporary buildings erected for them showed an amount of architectural interest and originality which could be met with nowhere else, and which in each case left its mark behind it, though with a difference; for while in the 1889 exhibition the main object was to treat temporary structures—iron and concrete and terra-cotta—in an undisguised but artistic manner, in those of the 1900 exhibition the effort was to create an architectural *coup d'œil* of apparently monumental structures of which the actual construction was disguised. In spite of some eccentricities the amount of invention and originality shown in these temporary buildings was most remarkable; but fortunately the exhibition left something more permanent behind it in the shape of the two art-palaces and the new bridge over the Seine. The two palaces are triumphs of modern classic architecture; the larger one (by MM. Thomas, Louvet and Deglane) is to some extent spoiled by the apparently unavoidable glass roof; the smaller one, by M. Girault, escapes this drawback, and, still more refined than its greater opposite, is one of the most beautiful buildings of modern times; the central portion is shown in Plate XIV., fig. 130. The architectural pylons, with their accompanying sculpture, which flank the entries to the bridge, are worthy of the best period of French Renaissance. Thus much, at least, has the 1900 exhibition done for architecture.

FIG. 108.—House in Margaret Street, London. (Beresford Pite.)

At the beginning of the last quarter of the 19th century stands one of the most important of modern French buildings, the Paris hôtel de ville, commenced shortly after the war, from the designs of MM. Ballu and Deperthes, planned on an immense scale, and on the stateliest and most monumental lines: the plan is given in fig. 109. The central block is, externally, a restoration of the old hôtel de ville, the remainder carried out in an analogous but somewhat more modern style. The interior has been the scene of sumptuous pictorial decoration, in which all the first artists of the day were employed—unfortunately in too scattered a manner and on no predominant or consistent scheme. One of the most characteristic architectural efforts of the French has consisted in the erection of the various smaller hôtels-de-ville or mairies, in the city and suburban districts of the capital; as at Pantin, Lilas, Suresnes and in various arrondissements within the city proper (Plate XIII., fig. 127). Nothing shows the quality of modern French architecture better, or perhaps more favourably, than this series of district town halls; all have a distinctly municipal character and a certain family resemblance of style amid their diversity of details; all are refined specimens of pre-eminently civilized architecture. Among the greater architectural efforts of France is the immense block of the new Sorbonne, by M. Nénot, a building sufficient in itself for an architectural reputation. Among smaller French buildings of peculiar merit may be mentioned the Musée Galliera, in the Trocadéro quarter of Paris, designed by M. Ginain—a work of pure art in architecture such as we should nowadays look for in vain out of France; the École de Médecine, by the same refined architect (fig. 110); and the chapel in rue Jean Goujon (Guilbert), erected as a memorial to the victims of the bazaar fire, again a notable instance of a work of pure thought in architecture—a new conception out of old materials. The new Opéra Comique (Bernier) should also be mentioned, the rather disappointing result of a competition which excited great interest at the time. Street architecture has been carried out of late in Paris in a sumptuous style, with great stone fronts and a profusion of carved ornament, such as we know nothing of in England; and though there is a rather monotonous repetition of the same style and character throughout the new or newly built streets, it is impossible to deny the effect of palatial dignity they impart to the city. In the matter of country houses the French architect is less fortunate; when he attempts what he regards as the rural picturesque, his good taste seems entirely to desert him, and the *maison de campagne* is generally a mere riot of gimcrack bargeboards and finials. In Paris, the taste for the contortions of what is called *art nouveau* has led to the erection, here and there, of ugly and eccentric fronts with preposterous ornamental details; but the invasion of this element is only partial and will probably not prove other than a passing phase.

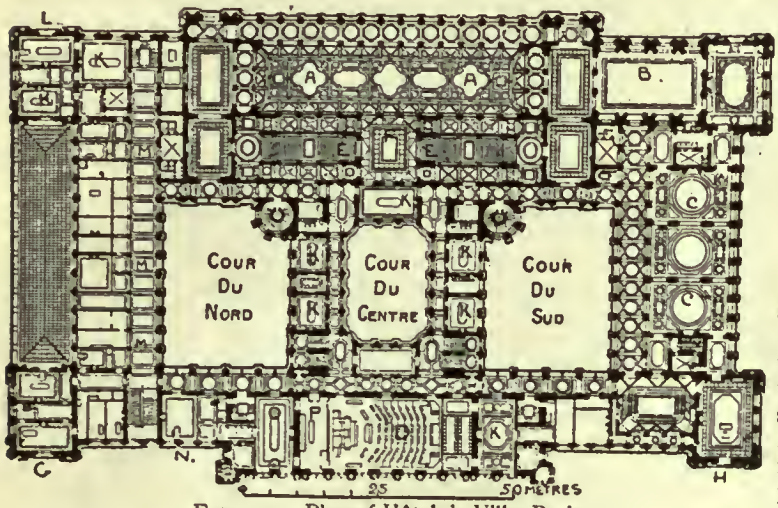


FIG. 109.—Plan of Hôtel de Ville, Paris.

A, Salle des Fêtes.
B, Salle à manger.
C, Salons de Réception.
D, Council Chamber.
E, Grand Staircase.
F, Salle des Cariatides.
G, General Secretary.
H, Prefect.
K, Committee Rooms.
L, Public Works.
M, Corridor.
N, President of Council.
O, Library.
P, Refreshment Room.

The great military success of Germany in 1870, and the founding of the German empire, gave, as is usual in such crises, a decided impetus to public architecture, of which the central and most important visible sign is the German Houses of Parliament (Plate IX., fig. 117), by Paul Wallot (b. 1841), whose design was selected in a competition. There is something essentially German in the quality of this national building; classic architecture minus its refinement. The detail is coarse; the finish of the end pavilions of the principal front absolutely unmeaning—mere architectural rodomontade; the central cupola of glass and iron, on a square plan, probably the ugliest central feature on any great building in Europe; and yet there is undeniable power about the whole thing; it is the characteristic product of a conquering nation not reticent in its triumph. The new cathedral at Berlin, by Julius Raschdorff (b. 1823), is the other most important German work of the period (fig. 111); a building very striking and unusual in plan, but absolutely commonplace in its architectural detail; school classic of the most ordinary type, without even any of those elements of originality which are to be found in the Houses of Parliament. A curious feature in the plan (fig. 112) is that the building, alone of any cathedral we can recall, has its principal general entrance at the side, the end entrance being reserved for a special imperial cortège on special occasions, the cathedral also serving the second purpose of an imperial mausoleum. Theatre building has been carried on very largely in Germany, and among its productions the Lessing theatre at Berlin (fig. 113) (Hermann von der Hude and Julius Hennicke, d. 1892) is a favourable example of German

Germany.

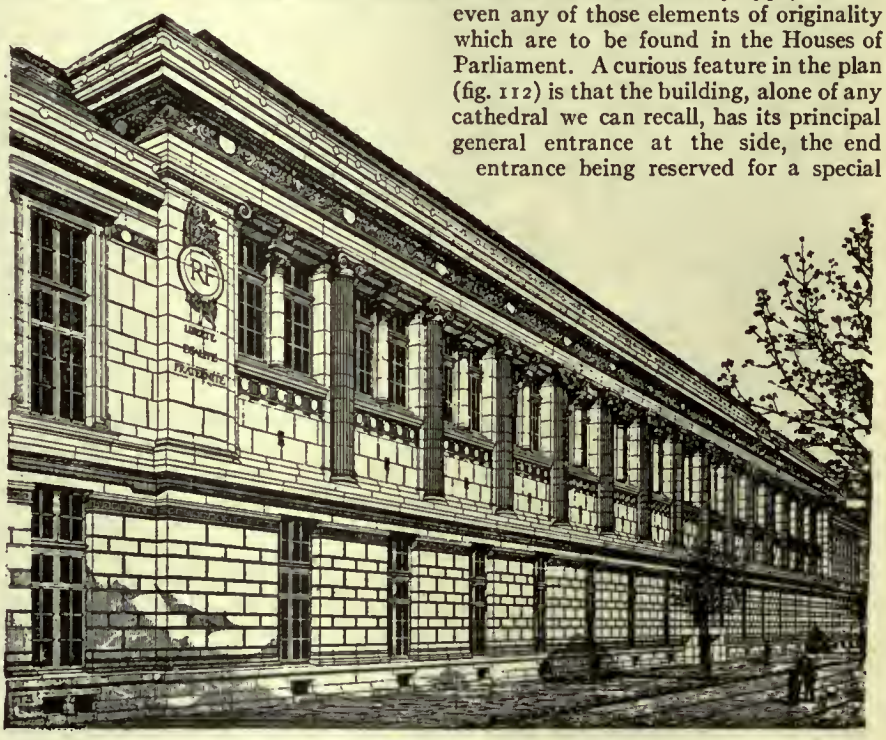


FIG. 110.—École de Médecine, Paris. (Ginain.)

classic at its best, besides being, like most modern German theatres, very well planned (fig. 114). Hamburg has had its new municipal buildings (Grotjan), a florid Renaissance building with a central tower, showing in its general effect and grouping a good deal of Gothic feeling. Mention may also be made of the Imperial law courts (Reichsgerichtsgebäude) at Leipzig, designed by Ludwig Hoffmann (b. 1852) and finished in 1895, a building

FIG. 111.—Cathedral at Berlin. (Raschdorff.)

genius in architecture, who had the good fortune to be appreciated and given a free hand by his government. The design is based on classic architecture, but with a treatment so completely individual as to remove it almost entirely from the category of imitative or revival architecture; somewhat fantastic it may be, but as an original architectural creation it stands almost alone among modern public buildings. In Vienna the scholastic classic style has been retained with much more purity and refinement than in the German capital, and the Parliament Houses (Plate IX., fig. 116), by Theophil Hansen (1813–1891), if they show no originality of detail, have the merit of original and very effective grouping. Budapest, on the other hand, which has almost sprung into existence since 1875

Other countries.

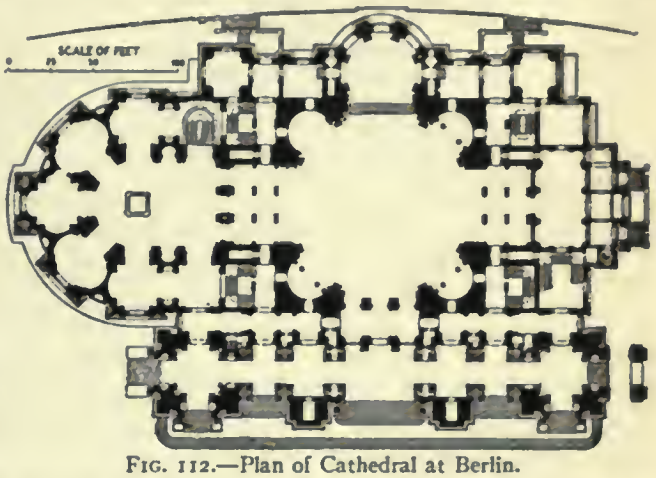


FIG. 112.—Plan of Cathedral at Berlin.

with no more charm about it, externally, than the Berlin Parliament Houses, but with some good interior effects. The new post offices in Germany have been an important undertaking, and are, at all events, buildings of more mark than those in England. There has also been a great deal of new development in street architecture, which shows an immense variety, and a constantly evident determination to do something striking; but

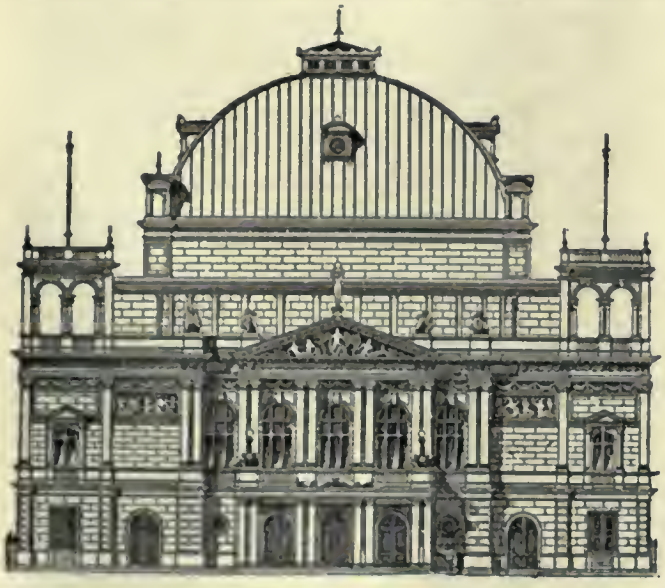


FIG. 113.—Lessing Theatre, Berlin. (Von der Hude and Hennicke.)

we find in it neither the dignity of Parisian street architecture nor the refinement of modern London work; there is an element of the bombastic about it.

No modern building on the European continent is more remarkable than the Brussels law courts (Plate XI., fig. 121) from the designs of Joseph Poelaert (1816–1879), an original

as the rival of the Austrian capital, has erected a great Parliament building of florid character (Plate IX., fig. 115), in a style in which the Gothic element is prevalent, though the central feature is a dome. The plan (see fig. 92) is obviously based on that of the Westminster building; the exterior design, however, has the merit of clearly indicating the position of the two Chambers as part of the architectural design, the want of which is the one serious defect of Barry's noble structure. In Italy modern architecture is at a very low ebb; the one great work of this period was the building of the façade to the Duomo at Florence, from the design of de Fabris, who did not live to see its completion. As the completion in modern times of a building of world-wide fame, it is a work of considerable interest, and, on the whole, not unworthy of its position; that it should harmonize quite satisfactorily with the ancient structure was hardly to be expected. It was probably the completion of this façade which led the city of Milan to start a great architectural competition, in the early

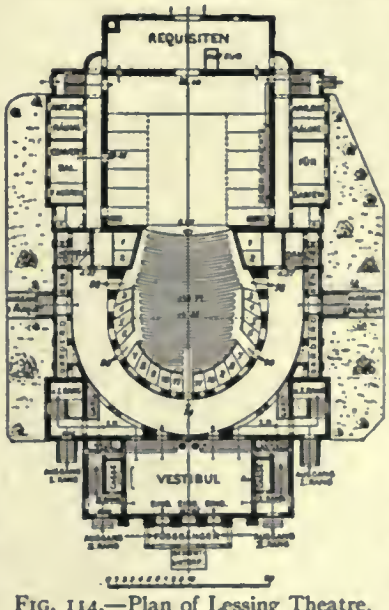


FIG. 114.—Plan of Lessing Theatre, Berlin.

'eighties, for the erection of a new façade to its celebrated cathedral, not because the façade had never been completed, but because it had been spoiled and patched with bad 18th-century work. The ambition was a legitimate one, and the competition, open to all the world, excited the greatest interest; but the young Italian architect, Brentano, to whom the first premium

was awarded, died shortly afterwards, and other causes, partly financial, led to the postponement of the scheme, though it is understood that there is still an intention of carrying out Brentano's design under the direction of the official architectural department of the city.

In summing up the present position of modern architecture, it may be said that architecture is now a more cosmopolitan art than it has been at any previous period. The separate development of a national style has become in the present day almost an impossibility. Increased means of communication have brought all civilized nations into close touch with each other's tastes and ideas, with the natural consequence that the treatment of a special class of building in any one country will not differ very materially from its treatment in another; though there are nuances of local taste in detail, in manner of execution, in the materials used. And the civilized countries have almost with one consent returned, in the main, to the adoption of a school of architecture based on classic types. The taste for medievalism is dying out even in Great Britain, which has been its chief stronghold.

Conclusion.

What course the future of modern architecture will take it is not easy to prophesy. What is quite certain is that it is now an individual art, each important building being the production, not of an unconsciously pursued national style, but of a personal designer. As far as there is a ruling consensus in architectural taste, this will tend to become, like dress and manners, more and more cosmopolitan; and it seems probable that it will be based more or less on the types left us by Classic and Renaissance architecture. There are, however, two influences which may have a definite effect on the architecture of the near future. One of these is the possible greater *rapprochement* between architecture and engineering, of which there are already some signs to be seen; architects will learn more of the kind of structural problems which are now almost the exclusive province of the engineer, and there will be a demand that engineering works shall be treated, as they well may be, with some of the refinement and expression of architecture. The other influence lies in the closer connexion, which is already taking place, between architecture and the allied arts, so that an important building will be regarded and treated as a field for the application of decorative sculpture and painting of the highest class, and as being incomplete without these. It is in this closer union of architecture with the other arts that there lies the best hope for the architecture of the future.

AUTHORITIES.—The literature of architecture as a modern art is limited, the most important publications of recent times being mainly devoted to the study and illustration of ancient architecture. The following, however, may be named:—James Fergusson, *History of Modern Architecture* (2nd ed., London, 1873); T. G. Jackson, *Modern Gothic Architecture* (London, 1873); J. T. Micklethwaite, *Modern Parish Churches* (London, 1874); E. R. Robson, *School Architecture* (London, 1874); J. J. Stevenson, *House Architecture* (London, 1880); E. E. Viollet-le-Duc, *How to Build a House* (London, 1874); *Lectures on Architecture* (London, 1881); H. C. Burdett, *Hospitals and Asylums of the World* (London, 1892–1893); Professor Oswald Kuhn, *Krankenhäuser* (Stuttgart, 1897); E. O. Sachs, *Modern Opera-Houses and Theatres* (London, 1897–1899); E. Wyndham Tarn, *The Mechanics of Architecture* (London, 1893); R. Norman Shaw, R.A., T. G. Jackson, R.A., and others, *Architecture, a Profession or an Art* (London, 1892); W. H. White, *The Architect and his Artists* (London, 1892); *Architecture and Public Buildings in Paris and London* (London, 1884); H. H. Statham, *Architecture for General Readers* (London, 1895); *Modern Architecture* (London, 1898); Herrmann Muthesius, *Die englische Baukunst der Gegenwart* (Berlin and Leipzig, 1900); Der Architekten Verein zu Berlin, *Berlin und Seine Bauten* (Berlin, 1896). The real literature of modern architecture, however, is to be found mainly in the articles and illustrations in the best periodical architectural publications of various countries. Among these Italy has none worth mention, and France, with all her architectural enthusiasm, has had no first-class architectural periodical since the extinction, about 1890, of the *Revue générale de l'architecture*, conducted for more than fifty years by the late César Daly, and in its day the first periodical of its class in the world. Among the best periodical publications are: *The Architectural Record* (quarterly), (New York); *The Architectural Review* (monthly), (Boston); the *Allgemeine Bauzeitung* (quarterly), (Vienna); the *Berlin Architekturwelt* (monthly), (Berlin); *The Builder* (weekly), (London); *La Construction moderne* (weekly), (Paris). (H. H. S.)

ARCHITRAVE (from Lat. *arcus*, an arch, and *trabs*, *trabem*, a beam), an architectural term for the chief beam which carries the superstructure and rests immediately on the columns. In the ordinary entablature it is the lowest of the three divisions, the other two being the frieze and the cornice (see ORDER). The term is also applied to the moulded frame of a doorway.

ARCHIVE (Lat. *archivum*, a transliteration of Gr. ἀρχεῖον, an official building), a term (generally used in the plural "archives"), properly denoting the building in which are kept the records, charters and other papers belonging to any state, community or family, but now generally applied to the documents themselves (see RECORD).

ARCHIVOLT (from Lat. *arcus*, an arch, and *volta*, a vault), an architectural term applied to the mouldings of an architrave, when carried round an arched opening.

ARCHON (ἄρχων, ruler), the title of the highest magistrate in many ancient Greek states. It is only in Athens that we have any detailed knowledge of the office, and even in this one case the evidence presents problems of the first importance which are incapable of decisive solution. There is no doubt that the archons represented the ancient kings, whose absolutism, under conditions which we can only infer, yielded in process of time to the power of the noble families, supported no doubt by the fighting force of the state. As to the process by which this change was effected there are two accounts. Traditionally, the monarchy after the death of Codrus (?1068 B.C.) gave place to the life archon whose tenure of office was limited afterwards to ten years and then to one year. Aristotle's *Constitution of Athens* (*q.v.*) speaks of five stages: (1) the institution of the polemarch who took over the military duties of the king; (2) the institution of *the* archon to relieve the king of his civil duties; (3) the tenure of office was reduced to ten years (?752 B.C.); (4) the office was taken from the "royal" clan and thrown open to all Eupatridae (?712 B.C.); (5) office was made annual, and to the existing three offices were added the six thesmothetae whose duty it was to record judicial decisions. The value of this latter account is, of course, debatable, but it is at least compatible with the general trend of development from hereditary absolutism, civil, military and religious, in the person of the "king," to a constitutional oligarchy. The change was clearly effected by the devolution of the military and civil powers of the king to the polemarch and the archon, while the archon basileus (or king) retained control of state religion. It is equally clear that owing to the predominating importance of civil affairs, *the* archon became the chief state official and gave his name to the year (hence archon eponymus). It should be noticed that the analogy which has often been suggested between the early history of the archonship at Athens, and such cases as the mayors of the palace in French history, or the tycoon (shogun) and mikado in Japanese history, is misleading. In these cases it is the old royal house that retains the royal title and the semblance of power, while the real authority passes into new hands. In Athens, the new civil office is vested in the old royal family, while the old title along with its religious functions is transferred. The early history of the thesmothetae is not clear, but this much is certain that there is no adequate reason for supposing, as many historians do, that in early times, they, with the three chief archons, constituted a collective or collegiate magistracy. It is true Thucydides (i. 126) states that, in the time of the Cylonian conspiracy (?632 B.C.), "the nine archons were (*i.e.* collectively) the principal officials," but at the same time the responsibility for the action then taken attached to the Alcmaeonidae alone, because one of their number, Megacles, was at that time *the* archon (*i.e.* responsibility was personal, not collective). Again, the *Constitution of Athens* says that down to Solon's time the archons had no official residence, but that afterwards they used the Thesmotheteion. It is a reasonable inference from this statement that the thesmothetae had previously sat together apart from the superior archons and that it was only after Solon that collegiate responsibility began.

Evolution of the Office.—The history of the democratization of the archonship is beset with equal difficulty. In the early days,

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FIG. 131.—"FLAT-IRON" BUILDING, NEW YORK.
(For method of construction, see STEEL CONSTRUCTION, and Plate II., Fig. 4, of that article.)
II. 444.

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FIG. 132.—A NEWPORT, R.I., "COTTAGE": "THE BREAKERS."

FIG. 133.—THE METROPOLITAN CLUB, NEW YORK.

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FIG. 134.—THE UNIVERSITY CLUB, NEW YORK.

Photo, Detroit Publishing Co.

FIG. 135.—PUBLIC LIBRARY, BOSTON. (McKIM, MEAD & WHITE.)

Photo, Geo. P. Hall & Son.

FIG. 136.—PUBLIC LIBRARY, NEW YORK. (CARRÈRE & HASTINGS.)

Photo, Elmer Chickering.

FIG. 137.—TRINITY CHURCH, BOSTON. (H. H. RICHARDSON.)

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FIG. 138.—STATE CAPITOL, HARTFORD, CONNECTICUT.

the importance of the office (confined as it was to the highest class) must have been immense; there was no audit, no written law, no executive council. The popular assembly was ill-organized and probably summoned by the archons themselves. The only control came from the Areopagus which elected them and would generally be favourably disposed, and from the fact that the military and civil powers were not vested in the same hands. Although the institution of the popular courts by Solon had within it the germ of democratic supremacy, it is clear that the immediate result was small; thus, in the next decade *anarchia* was continuous and Damasias held the archonship for more than two years in defiance of the new constitution; the prolonged dissension in this matter shows that the office of archon still retained its supreme importance. Gradually, however, the archonship lost its power, especially in judicial matters, until it retained merely the right of holding the preliminary investigation and the formal direction of the popular courts. Its administrative powers, save those wielded by the polemarch (see below and cf. STRATEGUS), dwindled away into matters of routine. We know that Peisistratus ruled by controlling the archonship, which was always held by members of his family, and the archonship of Isagoras was clearly an important party victory; we know further the names of three important men who held the office between Cleisthenes' reform and the Persian War (Hipparchus, Themistocles (*q.v.*), Aristides) from which we infer that the office was still the prize of party competition. On the other hand, after 487 B.C. the list of archons contains no name of importance. Presumably this is due to the growing importance of the Strategus and to the institution of sortition (see below), which, whether as cause or effect, is presumably by the 5th century indicative of diminished importance. There can, on these assumptions, be no doubt that, from the early years of the 5th century B.C., the archonship was of practically no importance. Furthermore we find that (probably after the Persian War) the office is thrown open to the second class, and finally in 457 B.C. we meet an archon, Mnesitheides, of the third, or Zeugite, class. Plutarch (*Aristides*, 22) says that after the great struggle of the Persian War Aristides threw open the office to all the citizens. But in fact the members of the fourth class were not formally admitted even in the 4th century (though by a fiction they were allowed to pose for the time as Zeugites). Furthermore it is not till 457 that even a Zeugite archon is known, according to the *Constitution of Athens* (*c.* 26), which dates the change as five years after the death of Ephialtes and does not connect it with Aristides.

Sortition.—The next question constitutes perhaps the most important problem in Greek political development. At what date was election by lot, or sortition, introduced for the archonship? From the *Constitution of Athens* (*c.* 22) we gather that from the fall of the Tyranny to 487 B.C. the archons were *αἱρετοί*, not *κληρωτοί* (*i.e.* chosen by vote, not by lot), and that in 487, limited sortition was introduced, whereby fifty candidates were elected by each tribe, and from these the archons and their "secretary" were chosen by lot. But against this must be set the statement by the same authority that this double method was part of the Solonian reform. The solution of the dilemma is a matter of inference. Three indications favour the former view: (1) the "anarchia" which occurred so often between Solon and Peisistratus shows that the office was at that time a question of party (*i.e.* elective); (2) the statement that Solon invented sortition for the office is put as the basis of a comparison (*ὅθεν, σημεῖον*) and, therefore, may fairly be regarded as a hypothesis; (3) there is no indication that the change made in 487 B.C. was a return to an obsolete method, and on the same argument it is odd that Solon's alleged system should not have been revived at the end of the Tyranny. On the other hand Herodotus (vi. 109) states that, in 490, before the battle of Marathon, the polemarch was chosen by lot. If this be true, it follows that the office of polemarch must have lost its military importance, which was not the case, inasmuch as the polemarch at Marathon gave the casting vote in favour of immediate battle. Whether, therefore, Solon or Aristides was the first to introduce sortition, it is perfectly clear that the lot was not used between the Tyranny and 487 B.C. and that after 487 the lot was always used (see J. E. Sandys, *Constitution of Athens* c. 8 note 1, c. 22 § 5, note); in fact, at a date not known the mixed system of Aristides gave place to double sortition, in which the first nomination also was by lot. To enter here into the theory of the lot is impossible. It should, however, be observed that in the somewhat material atmosphere of constitutional Athens the religious significance of the lot had vanished; no important office in the 5th and 4th centuries was entrusted to its decision. The real effect of sortition was to equalize the chances of rich and poor without civil strife. Now it is perfectly clear that it could not have been this object which impelled Solon to introduce sortition; for in his time the archonship was not open to the lower classes, and, therefore, election was more democratic than sortition, whereas later the case was reversed. It should further be mentioned that, before the discovery of the Aristotelian *Constitution* in 1891, Grote, C. F. Hermann, Busolt and others had maintained that the lot was not used in Athens before the time of Cleisthenes; and in spite of the treatise, it must be admitted that there is no satisfactory evidence, historical or inferential, that their theory was unsound.

Qualifications and Functions.—It remains to give a brief analysis of the qualifications and functions of the archons after the year 487 B.C. After election (in the time of Aristotle in the month Anthesterion; in the 3rd century in Munychion) a short time had to elapse before entering on office to allow of the *dokimasia* (examination of fitness). In this the whole life of the nominee was investigated, and each had to prove that he was physically without flaw. Failure to pass the scrutiny involved a certain loss of civic rights (*e.g.* that of addressing the people). The successful candidate had to take an oath to the people (that he would not take bribes, &c.) and to go through certain preliminary rites. Any citizen could bring an impeachment (*eisangelia*) against the archons. Any delinquency involved a trial before the Heliaea. Finally an examination took place at the end of the year of office, when each archon had to answer for his actions with person and possessions; till then he could not leave the country, be adopted into another family, dispose of his property, nor receive any "crown of honour." A similar investigation took place with regard to the assessors (*paredri*) whom the three senior archons chose to assist them. The archons at the end of their year of office (some say on entering upon office) became members of the Areopagus, which was, therefore, a body composed of ex-archons of tried probity and wisdom. The archons as a body retained some duties such as the appointment of jurymen, the sortition of the *athlothetae*, &c. (but see Gilbert's *Antiquities*, Eng. trans., p. 251, n. 1). On entering upon office the archon (archon eponymus) made proclamation by his herald that he would not interfere with private property. His official residence was the Prytaneum where he presided over all questions of family, *e.g.* the protection of parents against children and *vice versa*, protection of widows, wardship of heiresses and orphans, divorce; in religious matters he superintended the Dionysia, the Thargelia, the processions in honour of Zeus the Saviour and Asclepius. The archon basileus superintended the holy places, the mysteries, the Lampadephoria (Torch race), &c., questions of national religion and certain cases of bloodguiltiness. His official residence was the Stoa Basileios, and his wife, as officially representing the wife of Dionysus, was called Basilinna. The polemarch, who was at any rate titular commander down to about 487 B.C. (see above; and Herod. vi. 109, *ἐνδέκατος ψηφιδοφόρος*), became in the 5th century a sort of consul who watched over the rights of resident aliens (*metoeci*) in their family and legal affairs. He offered sacrifices to Artemis Agrotera and Enyalios, superintended *epitaphia* and arranged for the annual honours paid to the tyrannicides. His official residence was the Epilyceum (formerly called the Polemarcheion).

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ARCHPRIEST (Lat. *archipresbyter*, Gr. ἀρχιπρεσβύτερος), in the Christian Church, originally the title of the chief of the priests in a diocese. The office appears as early as the 4th century as that of the priest who presided over the presbyters of the diocese and assisted the bishop in matters of public worship, much as the archdeacon helped him in administrative affairs. Where, as in Germany, the dioceses were of vast extent, these were divided into several archpresbyterates. Out of these developed the rural deaneries, the office of archpriest being ultimately merged in that of rural dean, with which it became synonymous. It thus became strictly subordinate to the jurisdiction of the archdeacon. In Rome itself, as the office of archdeacon grew into that of cardinal-camerlengo, so that of archpriest of St Peter's developed into that of the cardinal-vicar. In England from 1598 until the appointment of a vicar-apostolic in 1623 the Roman Catholic clergy were placed by the pope under an "archpriest" as superior of the English mission. In the Lutheran Church in Germany the title archpriest (*Erzpriester*) was in some cases long retained as the equivalent of that of superintendent, sometimes also still called dean (*Dechant*), his functions being much the same as those of the rural dean.

ARCHYTAS (*c.* 428–347 B.C.), of Tarentum, Greek philosopher and scientist of the Pythagorean school, famous as the intimate friend of Plato, was the son of Mnesagoras or Histiaeus. Equally distinguished in natural science, philosophy and the administration of civic affairs, he takes a high place among the versatile savants of the ancient Greek world. He was a man of high character and benevolent disposition, a fine flute-player, and a generous master to his slaves, for whose children he invented the rattle. He took a prominent part in state affairs, and, contrary to precedent, was seven times elected commander of the army. Under his leadership, Tarentum fought with unvarying success against the Messapii, Lucania and even Syracuse. After a life of high intellectual achievement and uninterrupted public service, he was drowned (according to a tradition suggested by Horace, *Odes*, i. 28) on a voyage across the Adriatic, and was buried, as we are told, at Matinum in Apulia. He is described as the eighth leader of the Pythagorean school, and was a pupil (not the teacher, as some have maintained) of Philolaus. In mathematics, he was the first to draw up a methodical treatment of mechanics with the aid of geometry; he first distinguished harmonic progression from arithmetical and geometrical progressions. As a geometer he is classed by Eudemus, the greatest ancient authority, among those who "have enriched the science with original theorems, and given it a really sound arrangement." He evolved an ingenious solution of the duplication of the cube, which shows considerable knowledge of the generation of cylinders and cones. The theory of proportion, and the study of acoustics and music were considerably advanced by his investigations. He was said to be the inventor of a kind of flying-machine, a wooden pigeon balanced by a weight suspended from a pulley, and set in motion by compressed air escaping from a valve.[1] Fragments of his ethical and metaphysical writings are quoted by Stobaeus, Simplicius and others. To portions of these Aristotle has been supposed to have been indebted for his doctrine of the categories and some of his chief ethical theories. It is, however, certain that these fragments are mainly forgeries, attributable to the eclecticism of the 1st or 2nd century A.D., of which the chief characteristic was a desire to father later doctrines on the old masters. Such fragments as seem to be authentic are of small philosophical value. It is important to notice that Archytas must have been famous as a philosopher, inasmuch as Aristotle wrote a special treatise (not extant) *On the Philosophy of Archytas*. Some positive idea of his speculations may be derived from two of his observations: the one in which he notices that the parts of animals and plants are in general rounded in form, and the other dealing with the sense of hearing, which, in virtue of its limited receptivity, he compares with vessels, which when filled can hold no more. Two important principles are illustrated by these thoughts, (1) that there is no absolute distinction between the organic and the inorganic, and (2) that the argument from final causes is no explanation of phenomena. Archytas may be quoted as an example of Plato's perfect ruler, the philosopher-king, who combines practical sagacity with high character and philosophic insight.

See G. Hartenstein, *De Arch. Tar. frag.* (Leipzig, 1833); O. F. Gruppe, *Über d. Frag. d. Arch.* (1840); F. Beckmann, *De Pythag. reliq.* (Berlin, 1844, 1850); Egger, *De Arch. Tar. vit., op. phil.*; Ed. Zeller, *Phil. d. Griech.*; Theodor Gomperz, *Greek Thinkers*, ii. 259 (Eng. trans. G. G. Berry, Lond., 1905); G. J. Allman, *Greek Geometry from Thales to Euclid* (1889); Florian Cajori, *History of Mathematics* (New York, 1894); M. Cantor, *Gesch. d. gr. Math.* (1894 foll.). The mathematical fragments are collected by Fr. Blass, *Mélanges Graux* (Paris, 1884). For Pythagorean mathematics see further PYTHAGORAS.

ARCIS-SUR-AUBE, a town of eastern France, capital of an arrondissement in the department of Aube, on the left bank of the Aube, 23 m. N. of Troyes on the Eastern railway to Châlons-sur-Marne. Pop. (1906) 2803. Fires in 1719, 1727 and 1814 destroyed the ancient buildings, and it is now a town built in modern style with wide and regular streets. A château of the 18th century occupies the site of an older one in which Diana of Poitiers, mistress of Henry II., resided. The only other building of interest is the church, which dates from the 15th century. In front of it there is a statue of Danton, a native of the town. Arcis-sur-Aube has a tribunal of first instance. Its industries include important hosiery manufactures, and it carries on trade in grain and coal. The town communicates with Paris by means of the Aube, which becomes navigable at this point.

A battle was fought here on the 20th and 21st of March 1814 between Napoleon and the Austro-Russian army under Schwarzenberg (see NAPOLEONIC CAMPAIGNS).

ARCOLA, a village of northern Italy, 16 m. E.S.E. of Verona, on the Alpone stream, near its confluence with the Adige below Verona. The village gives its name to the three days' battle of Arcola (15th, 16th and 17th of November 1796), in which the French, under General Napoleon Bonaparte, defeated the Austrians commanded by Allvintzy (see FRENCH REVOLUTIONARY WARS).

ARCOS DE LA FRONTERA, a town of southern Spain, in the province of Cadiz; on the right bank of the river Guadalete, which flows past Santa Maria into the Bay of Cadiz. Pop. (1900) 13,926. The town occupies a ridge of sandstone, washed on three sides by the river, and commanding fine views of the lofty peak of San Cristobál, on the east, and the fertile Guadalete valley, celebrated in ancient Spanish ballads for its horses. At the highest point of the ridge is a Gothic church with a fine gateway, and a modern tower overlooking the town. The fame of its ten bells dates from the wars between Spaniards and Moors in which "Arcos of the Frontier" received its name. After its capture by Alphonso the Wise of Castile (1252–1284), the town was a Christian stronghold on the borders of Moorish territory. Another church contains several Moorish banners, taken in 1483 at the battle of Záhara, a neighbouring village. The ruined citadel, the theatre, and the palace of the dukes of Arcos are the only other noteworthy buildings. Roman remains have been found in the vicinity, and the ridge of Arcos is honeycombed with rock-hewn chambers, said to be ancient cave-dwellings.

See *Galeria de Arcobricenses illustres* (Arcos, 1892), and *Riqueza y cultura de Arcos de la Frontera* (Arcos, 1898); both by M. Mancheño y Olivares.

ARCOSOLIUM (from Lat. *arcus*, arch, and *solium*, a sarcophagus), an architectural term applied to an arched recess used as a burial place in a catacomb (*q.v.*).

ARCOT, the name of a city and two districts of British India in the presidency of Madras. Arcot city is the principal town in the district of North Arcot. It occupies a very prominent place in the history of the British conquest of India, but it has now lost its manufactures and trade and preserves only a few mosques and tombs as traces of its former grandeur. It is a station on the line of railway from Madras to Beypur, but has ceased to be

[1] If this be the proper translation of Aulus Gellius, *Noctes Atticae*, x. 12. 9, "... simulacrum columbae e ligno ... factum; ita erat scilicet libramentis suspensum et aura spiritus inclusa atque occulta concitum." (See AERONAUTICS.)

a military cantonment. The most famous episode in its history is the capture and defence of Arcot by Clive. In the middle of the 18th century, during the war between the rival claimants to the throne of the Carnatic, Mahommed Ali and Chanda Sahib, the English supported the claims of the former and the French those of the latter. In order to divert the attention of Chanda Sahib and his French auxiliaries from the siege of Trichinopoly, Clive suggested an attack upon Arcot and offered to command the expedition. His offer was accepted; but the only force which could be spared to him was 200 Europeans and 300 native troops to attack a fort garrisoned by 1100 men. The place, however, was abandoned without a struggle and Clive took possession of the fortress. The expedition produced the desired effect; Chanda Sahib was obliged to detach a large force of 10,000 men to recapture the city, and the pressure on the English garrison at Trichinopoly was removed. Arcot was afterwards captured by the French; but in 1760 was retaken by Colonel Coote after the battle of Wandiwash. It was also taken by Hyder Ali when that invader ravaged the Carnatic in 1780, and held by him for some time. The town of Arcot, together with the whole of the territory of the Carnatic, passed into the hands of the British in 1801, upon the formal resignation of the government by the nawab, Azim-ud-daula, who received a liberal pension.

The district of North Arcot is bounded on the N. by the districts of Cuddapah and Nellore; on the E. by the district of Chingleput; on the S. by the districts of South Arcot and Salem; and on the W. by the Mysore territory. The area of North Arcot is 7386 sq. m., and the population in 1901 was 2,207,712, showing an increase of 4% in the decade. The aspect of the country, in the eastern and southern parts, is flat and uninteresting; but the western parts, where it runs along the foot of the Eastern Ghats, as well as all the country northwards from Trivellam to Tripali and the Karkambadi Pass, are mountainous, with an agreeable diversity of scenery. The elevated platform in the west of the district is comparatively cool, being 2000 ft. above the level of the sea, with a mean maximum of the thermometer in the hottest weather of 88°. The hills are composed principally of granite and syenite, and have little vegetation. Patches of stunted jungle here and there diversify their rugged and barren aspect; but they abound in minerals, especially copper and iron ores. The narrow valleys between the hills are very fertile, having a rich soil and an abundant water-supply even in the driest seasons. The principal river in the district is the Palar, which rises in Mysore, and flows through North Arcot from west to east past the towns of Vellore and Arcot, into the neighbouring district of Chingleput, eventually falling into the sea at Sadras. Although a considerable stream in the rainy season, and often impassable, the bed is dry or nearly so during the rest of the year. Other smaller rivers of the district are the Paini, which passes near Chittore and falls into the Palar, the Sonamukhi and the Chayaur. These streams are all dry during the hot season, but in the rains they flow freely and replenish the numerous tanks and irrigation channels. The administrative headquarters are at Chittore, but the largest towns are Vellore (the military station), Tirupati (a great religious centre), and Wallajapet and Kalahasti (the two chief places of trade).

The district of South Arcot is bounded on the N. by the districts of North Arcot and Chingleput; on the E. by the French territory of Pondicherry and the Bay of Bengal; on the S. by the British districts of Tanjore and Trichinopoly; and on the W. by the British district of Salem. It contains an area of 5217 sq. m.; and its population in 1901 was 2,349,894, showing an increase of 9% in the decade. The aspect of the district resembles that of other parts of the Coromandel coast. It is low and sandy near the sea, and for the most part level till near the western border, where ranges of hills form the boundary between this and the neighbouring district of Salem. These ranges are in some parts about 5000 ft. high, with solitary hills scattered about the district. In the western tracts, dense patches of jungle furnish covert to tigers, leopards, bears and monkeys. The principal river is the Coleroon which forms the southern boundary of the district, separating it from Trichinopoly. This river is abundantly supplied with water during the greater part of the year, and two irrigating channels distribute its waters through the district. The other rivers are the Vellar, Pennar, and Gadalum, all of which are used for irrigation purposes. Numerous small irrigation channels lead off from them, by means of which a considerable area of waste land has been brought under cultivation. Under the East India Company, a commercial resident was stationed at Cuddalore, and the Company's weavers were encouraged by many privileges. The manufacture and export of native cloth have now been almost entirely superseded by the introduction of European piece goods. The chief seaport of the district of South Arcot is Cuddalore, close to the site of Fort St David. The principal crops in both districts are rice, millet, other food grains, oil-seeds and indigo.

ARCTIC (Gr. Ἄρκτος, the Bear, the northern constellation of *Ursa Major*), the epithet applied to the region round the North Pole, covering the area (both ocean and lands) where the characteristic polar conditions of climate, &c., obtain. The Arctic Circle is drawn at 66° 30′ N. (see POLAR REGIONS).

ARCTINUS, of Miletus, one of the earliest poets of Greece and contributors to the epic cycle. He flourished probably about 744 B.C. (Ol. 7). His poems are lost, but an idea of them can be gained from the *Chrestomathy* written by Proclus the Neo-Platonist of the 5th century or by a grammarian of the same name in the time of the Antonines. The *Aethiopis* (Αἰθιοπίς), in five books, was so called from the Aethiopian Memnon, who became the ally of the Trojans after the death of Hector. As the opening shows, it took up the narrative from the close of the *Iliad*. It begins with the famous deeds and death of the Amazon Penthesileia, and concludes with the death and burial of Achilles and the dispute between Ajax and Odysseus for his arms. The title thus only applied to part of the poem. The *Sack of Troy* (Ἴλιου Πέρσις) gives the stories of the wooden horse, Sinon, and Laocoon, the capture of the city, and the departure of the Greeks under the wrath of Athene at the outrage of Ajax on Cassandra. The *Little Iliad* (Ἰγιὰς μικρά) of Lesches formed the transition between the *Aethiopis* and the *Sack of Troy*.

Kinkel, *Epicorum Graecorum Fragmenta* (1877); Welcker, *Der epische Cyclus*; Müller, *History of the Literature of Ancient Greece*; Lang, *Homer and the Epic* (1893); Monro, *Journal of Hellenic Studies* (1883); T. W. Allen in *Classical Quarterly*, April 1908, pp. 82 foll.

ARCTURUS, the brightest star in the northern hemisphere, situated in the constellation Boötes (*q.v.*) in an almost direct line with the tail (ζ and η) of the constellation Ursa Major (Great Bear); hence its derivation from the Gr. ἄρκτος, bear, and οὖρος, guard. Arcturus has been supposed to be referred to in various passages of the Hebrew Bible; the Vulgate reads Arcturus for stars mentioned in Job ix. 9, xxxvii. 9, xxxviii. 31, as well as Amos v. 8. Other versions, as also modern authorities, have preferred, *e.g.*, Orion, the Pleiades, the Scorpion, the Great Bear (cf. *Amos* in the "International Critical Comment." series, and G. Schiaparelli, *Astronomy in the O.T.*, Eng. trans., Oxford, 1905, ch. iv.). According to one of the Greek legends about Arcas, son of Lycaon, king of Arcadia, he was killed by his father and his flesh was served up in a banquet to Zeus, who was indignant at the crime and restored him to life. Subsequently Arcas, when hunting, chanced to pursue his mother Callisto, who had been transformed into a bear, as far as the temple of Lycaean Zeus; to prevent the crime of matricide Zeus transported them both to the heavens (Ovid, *Metam.* ii. 410), where Callisto became the constellation Ursa Major, and Arcas the star Arcturus (see LYCAON and CALLISTO).

ARCUEIL, a town of northern France, in the department of Seine, on the Bièvre, 2½ m. N.E. of Sceaux on the railway from Paris to Limours. Pop. (1906) 8660. The town has an interesting church dating from the 13th to the 15th century. It takes its name from a Roman aqueduct, the *Arcus Juliani* (Arculi), some traces of which still remain. In 1613–1624 a bridge-aqueduct over 1300 ft. long was constructed to convey water from the spring of Rungis some 4 m. south of Arcueil, across the Bièvre to the Luxembourg palace in Paris. In 1868–1872

another aqueduct, still longer, was superimposed above that of the 17th century, forming part of the system conveying water from the river Vanne to Paris. The two together reach a height of about 135 ft. Bleaching, and the manufacture of bottle capsules, patent leather and other articles are carried on at Arcueil; and there are important stone-quarries.

ARCULF, a Gallican bishop and pilgrim-traveller, who visited the Levant about 680, and was the earliest Christian traveller and observer of any importance in the Nearer East after the rise of Islam. On his return he was driven by contrary winds to Britain, and so came to Iona, where he related his experiences to his host, the abbot Adamnan (679-704). This narrative, as written out by Adamnan, was presented to Aldfrith the Wise, last of the great Northumbrian kings, at York about 701, and came to the knowledge of Bede, who inserted a brief summary of the same in his *Ecclesiastical History of the English Nation*, and also drew up a separate and longer digest which obtained great popularity throughout the middle ages as a standard guide-book (the so-called *Libellus de locis sanctis*) to the Holy Places of Syria. Arculf is the first to mention the column at Jerusalem, which claimed to mark the exact centre of the Inhabited Earth, and later became one of the favourite Palestine wonders. Besides a valuable account of the principal sacred sites of Judaea, Samaria and Galilee as they existed in the 7th century, he also gives important information as to Alexandria and Constantinople, briefly describes Damascus and Tyre, the Nile and the Lipari volcanoes, and refers to the caliph Moawiya I. (A.D. 661–680), whom he pictures as befriending Christians and rescuing the "sudarium" of Christ from the Jews. Arculf's record is especially useful from its plans, drawn from personal observation by the traveller himself, of the churches of the Holy Sepulchre and of Mount Sion in Jerusalem, of the Ascension on Olivet and of Jacob's well at Sichem. It is also a useful witness to the prosperity and trade of Alexandria after the Moslem conquest: it tells us how the Pharos was still lit up every night; and it gives us (from Constantinople) the first form of the story of St George which ever seems to have attracted notice in Britain.

Thirteen MSS. of the original Arculf-Adamnan narrative exist, and fully 100 of Bede's abridgment: of the former, the most important, containing all the plans, are (1) Bern, Canton Library, 582, of 9th cent.; (2) Paris, National Library, Lat. 13,048, of 9th cent.; a third MS., London, B. Mus., Cotton, Tib. D. V., of 8th–9th cents., though damaged by fire and lacking the illustrations, is of value for the text, being the oldest of all. Among editions the first is of 1619, by Gretser; the best, that of 1877, by Tobler, in *Itinera et Descriptiones Terrae Sanctae*; we may also mention that of 1870, by Delpit, in his *Essai sur les anciens pèlerinages à Jérusalem*; see also Delpit's remarks upon Arculf in the same work, pp. 260-304; Beazley, *Dawn of Modern Geography*, i. 131-40 (1897).

ARDASHIR, the modern form of the Persian royal name ARTAXERXES (*q.v.*), "he whose empire is excellent." After the three Achaemenian kings of this name, it occurs in Armenia, in the shortened form Artaxias (Armenian, Artashes or Artaxes), and among the dynasts of Persia who maintained their independence during the Parthian period (see PERSIS). One of these, (1) Artaxerxes or ARDASHIR I. (in his Greek inscriptions he calls himself Artaxares, and the same form occurs in Agathias ii. 25, iv. 24), became the founder of the New-Persian or Sassanian empire. Of his reign we have only very scanty information, as the Greek and Roman authors mention only his victory over the Parthians and his wars with Rome. A trustworthy tradition about the origin of his power, from Persian sources, has been preserved by the Arabic historian Tabari (Th. Nöldeke, *Geschichte der Perser und Araber zur Zeit der Sasaniden, aus der arabischen Chronik des Tabari*, 1879). He was the second son of Pāpak (Bābek), the offspring of Sassan (Sāsān), after whom the dynasty is named. Pāpak had made himself king of the district of Istakhr (in the neighbourhood of Persepolis, which had fallen to ruins). After the death of Pāpak and his oldest son Shapur (Shāhpuhr, Sapores), Ardashir made himself king (probably A.D. 212), put his other brothers to death and began war against the neighbouring dynasts of Persis. When he had conquered a great part of Persis and Carmania, the Parthian king Artabanus IV. interfered. But he was defeated in three battles and at last killed (A.D. 226). Ardashir now considered himself sovereign of the whole empire of the Parthians and called himself "King of Kings of the Iranians." But his aspirations went farther. In Persis the traditions of the Achaemenian empire had always been alive, as the name of Ardashir himself shows, and with them the national religion of Zoroaster. Ardashir, who was a zealous worshipper of Ahuramazda and in intimate connexion with the magian priests, established the orthodox Zoroastrian creed as the official religion of his new kingdom, persecuted the infidels, and tried to restore the old Persian empire, which under the Achaemenids had extended over the whole of Asia from the Aegean Sea to the Indus. At the same time he put down the local dynasts and tried to create a strong concentrated power. His empire is thus quite different in character from the Parthian kingdom of the Arsacids, which had no national and religious basis but leant towards Hellenism, and whose organization had always been very loose. Ardashir extirpated the whole race of the Arsacids, with the exception of those princes who had found refuge in Armenia, and in many wars, in which, however, as the Persian tradition shows, he occasionally suffered heavy defeats, he succeeded in subjugating the greater part of Iran, Susiana and Babylonia. The Parthian capital Ctesiphon (*q.v.*) remained the principal residence of the Sassanian kingdom, by the side of the national metropolis Istakhr, which was too far out of the way to become the centre of administration. Opposite to Ctesiphon, on the right bank of the Tigris, Ardashir restored Seleucia under the name of Weh-Ardashir. The attempt to conquer Mesopotamia, Armenia and Cappadocia led to a war with Rome, in which he was repelled by Alexander Severus (A.D. 233). Before his death (A.D. 241) Ardashir associated with himself on the throne his son Shapur, who successfully continued his work.

Under the tombs of Darius I. at Persepolis, on the surface of the rock, Ardashir has sculptured his image and that of the god Ahuramazda (Ormuzd or Ormazd). Both are on horseback; the god is giving the diadem to the king. Under the horse of the king lies a defeated enemy, the Parthian king Artaban; under the horse of Ormuzd, the devil Ahriman, with two snakes rising from his head. In the bilingual inscription (Greek and Pahlavi), Ardashir I. calls himself "the Mazdayasnian [*i.e.* "worshipper of Ahuramazda"] god Artaxares, king of the kings of the Arianes (Iranians), of godly origin, son of the god Papak the king." (See Sir R. Ker Porter, *Travels* (1821–1822), i. 548 foll.; Flandin et Coste, *Voyage en Perse*, iv. 182; F. Stolze and J. C. Andreas, *Persepolis*, pl. 116; Marcel Dieulafoy, *L'Art antique de la Perse*, 1884–1889, v. pl. 14). A similar inscription and sculpture is on a rock near Gur (Firuzabad) in Persia. On his coins he has the same titles (in Pahlavi). We see that he, like his father and his successors, were worshipped as gods, probably as incarnations of a secondary deity of the Persian creed.

Like the history of the founder of the Achaemenian empire, that of Ardashir has from the beginning been overgrown with legends; like Cyrus he is the son of a shepherd, his future greatness is predicted by dreams and visions, and by the calculations of astronomers he becomes a servant at the court of King Artabanus and then flies to Persia and begins the rebellion; he fights with the great dragon, the enemy of god, &c. A Pahlavi text, which contains this legend, has been translated by Nöldeke (*Geschichte des Artachshīr i Pāpakān*, 1879). On the same tradition the account of Firdousi in the Shahnama is based; it occurs also, with some variations, in Agathias ii. 26 f. Another work, which contained religious and moral admonitions which were put into the mouth of the king, has not come down to us. On the other hand the genealogy of Ardashir has of course been connected with the Achaemenids, on whose behalf he exacts vengeance from the Parthians, and with the legendary kings of old Iran.

(2) ARDASHIR II. (379–383). Under the reign of his brother Shapur II. he had been governor (king) of Adiabene, where he persecuted the Christians. After Shapur's death, he was raised to the throne by the magnates, although more than seventy years old. Having tried to make himself independent from the court,

and having executed some of the grandees, he was deposed after a reign of four years.

(3) ARDASHIR III. (628–630), son of Kavadh II., was raised to the throne as a boy of seven years, but was killed two years afterwards by his general, Shahrbaraz. (ED. M.)

ARDEA, a town of the Rutuli in Latium, 3 m. from the S.W. coast, where its harbour (*Castrum Inui*) lay, at the mouth of the stream now known as Fosso dell' Incastro, and 23 m. S. of Rome by the Via Ardeatina. It was founded, according to legend, either by a son of Odysseus and Circe, or by Danae, the mother of Perseus. It was one of the oldest of the coast cities of Latium, and a place of considerable importance; according to tradition the Ardeatines and Zacynthians joined in the foundation of Saguntum in Spain. It was the capital of Turnus, the opponent of Aeneas. It was conquered by Tarquinius Superbus, and appears as a Roman possession in the treaty with Carthage of 509 B.C., though it was later one of the thirty cities of the Latin league. In 445 B.C. an unfair decision by the Romans in a frontier dispute with Aricia led, according to the Roman historians, to a rising; the town became a Latin colony 442 B.C., and shortly afterwards it appears as the place of exile of Camillus. It had the charge of the common shrine of Venus in Lavinium. It was devastated by the Samnites, was one of the 12 Latin colonies that refused in 209 B.C. to provide more soldiers, and was in 186 used as a state prison, like Alba and Setia. In imperial times the unhealthiness of the place led to its rapid decline, though it remained a colony. In the forests of the neighbourhood the imperial elephants were kept. A road, the Via Ardeatina, led to Ardea direct from Rome; the gate by which it left the Servian wall was the Porta Naevia; a large tomb behind the baths of Caracalla lay on its course. The gate by which it left the Aurelian wall has been obliterated by the bastion of Antonio da Sangallo (Ch. Hülsen in *Römische Mitteilungen*, 1894, 320).

The site of the primitive city, which later became the citadel, is occupied by the modern town; it is situated at the end of a long plateau between two valleys, and protected by perpendicular tufa cliffs some 60 ft. high on all sides except the north-east, where it joins the plateau. Here it is defended by a fine wall of *opus quadratum* of tufa, in alternate courses of headers and stretchers. Within its area are scanty remains of the podium of a temple and of buildings of the imperial period. The road entering it from the south-west is deeply cut in the rock. The area of the place was apparently twice extended, a further portion of the narrow plateau, which now bears the name of Civita Vecchia, being each time taken in and defended by a mound and ditch; the nearer and better-preserved is about ½ m. from the city and measures some 2000 ft. long, 133 ft. wide and 66 ft. high, the ditch being some 80 ft. wide. The second, ½ m. farther north-east, is smaller. In the cliffs below the plateau to the north are early rock habitations, and upon the plateau primitive Latin pottery has been found. In 1900 a group of tombs cut in the rock was examined; they are outside the farther mound and ditch, and belong, therefore, to the period after the second extension of the city.

See O. Richter, in *Annali dell' Istituto* (1884), 90; J. H. Parker in *Archaeologia*, xlix. 169 (1885); A. Pasqui, in *Notizie degli scavi*, (1900) 53. (T. As.)

ARDEBIL, or ARDABIL, chief town of a district, or sub-province, of same name, of the province of Azerbaijan in north-western Persia, in lat. 38° 14′ N., and long. 48° 21′ E., and at an elevation of 4500 ft. It is situated on the Baluk Su (Fish river), a tributary of the Kara Su (Black river), which flows northwards to the Aras, and in a fertile plain bounded on the west by Mount Savelan, a volcanic cone with an altitude of 15,792 ft. (Russian triangulation), and on the east by the Talish mountains (9000 ft.). Ardebil has a population of about 10,000, and post and telegraph offices. Its trade, principally in the hands of Armenians, is still important, but is chiefly a transit trade between Russia and Persia by way of Astara, a port on the Caspian 30 m. north-east of Ardebil. It is surrounded by a ruinous mud wall flanked by towers; a quarter of a mile east of it stands a mud fort, 180 yds. square, constructed according to European system of fortification. Inside the city are the famous sepulchres and shrines of Shaikh Safi ud-din and his descendant Shah Ismail I. (1502–1524) the first Shiah shah of Persia and founder of the Safavi dynasty. Plans and photographs of the shrines were taken in 1897 by Dr F. Sarre of Berlin and published in 1901 (*Denkmäler Persischer Baukunst*; 65 large folio plates).

European and Chinese merchants resided at Ardebil in the middle ages, and for a long time the city was a great emporium for central Asian and Indian merchandise, which was forwarded to Europe via Tabriz, Trebizond and the Black Sea, and also by way of the Caucasus and the Volga. Since the beginning of the 16th century, when Persia fell under the sway of the Safavis, the place has been much frequented by pilgrims who come to pay their devotions at the shrine of Shaikh Safi. This shrine is a richly endowed establishment with mosques and college attached, and had a fine library containing many rare and valuable MSS. presented by Shah Abbas I. at the beginning of the 17th century, and mostly carried off by the Russians in 1828 and placed in the library at St Petersburg. The grand carpet which had covered the floor of one of the mosques for three centuries was purchased by a traveller about 1890 for £100, and was finally acquired by the South Kensington Museum for many thousands. This beautiful carpet measures 34 ft. by 17 ft. 6 in., and contains 380 hand-tied knots in the square inch, which gives over 32,500,000 knots to the whole carpet (W. Griggs, *Asian Carpet Designs*). (A. H.-S.)

ARDÈCHE, an inland department of south-eastern France, formed in 1790 from the Vivarais, a district of Languedoc. Pop. (1906) 347,140. Area, 2145 sq. m. It is bounded N.W. by the department of Loire, E. by the Rhone which divides it from Isère and Drôme, S. by Gard and W. by Lozère and Haute-Loire. The surface of Ardèche is almost entirely covered by the Cévennes mountains, the main chain, continued in the Boutières mountains, forming its western boundary. Its centre is traversed from south-east to north-west by the Coiron range which extends from the Rhone to the Mont Mézenc (5755 ft.), the highest point in the department, and the oldest of its many volcanoes. These mountains separate the southern half of the department, which comprises the basin of the Ardèche, from the northern half which is watered by numerous smaller tributaries of the Rhone, the chief of which are the Érieux and the Doux. A few rivers belong to the Atlantic side of the watershed, the chief being the Loire, which rises on the western borders of the department, and the Allier, which for a short distance separates it from Lozère. Nearly all the rivers of the department are of torrential swiftness and subject to sudden floods. The scenery through which they flow is often of great beauty and grandeur. Natural curiosities are the Pont d'Arc, over the Ardèche, and the Chaussée des Géants, near Vals. The climate in the valley of the Rhone is, in general, warm, and sometimes very hot; but westward, as the elevation increases, the cold becomes more intense and the winters longer. Some districts, especially in summer, are liable to sudden alterations in the temperature. Rye, wheat and potatoes are the chief crops cultivated. Good red and white wines are grown in the hilly region bordering the Rhone valley, the white wine of St Péray being highly esteemed. The principal fruits are the chestnut, which is largely exported, the olive and the walnut. In the rearing of silk-worms, Ardèche ranks second to Gard among French departments, and great numbers of mulberry trees are grown for the purposes of this industry. The many goats and sheep of Ardèche make it one of the chief sources of supply of skins for glove-making. Mines of coal, iron, lead and zinc are worked, and the quarries furnish hydraulic lime (Le Teil) and other products. Besides flour-mills, distilleries and saw-mills, there are important silk-mills and leather-works and paper-factories. Annonay is the principal industrial town. The department exports wine, cattle, lime, mineral waters, silk, paper, &c. Hot springs are numerous, and some of them, as those of Vals, St Laurent-les-Bains, Celles and Neyrac, are largely resorted to. Ardèche is served by the Paris-Lyon-Méditerranée railway and has some 43 m.

of navigable waterway. The department is divided into the arrondissements of Privas, Largentière and Tournon, with 31 cantons and 342 communes. It forms the diocese of Viviers and part of the archiepiscopal province of Avignon. It is in the region of the XV. army corps, and within the circumscription of the *académie* (educational division) of Grenoble. Its court of appeal is at Nîmes. Privas, the capital, Annonay, Aubenas, Largentière and Tournon are the principal towns. Bourg-St Andéol, Thines, Mélas and Cruas have interesting Romanesque churches. Mazan has remains of a Cistercian abbey founded in the 12th century to which its vast church belongs. Viviers is an old town with a church of various styles of architecture and several old houses.

ARDEE, a market-town of Co. Louth, Ireland, in the south parliamentary division, on the river Dee, 48 m. N. by W. from Dublin on a branch of the Great Northern railway. Pop. (1901) 1883. It has some trade in grain and basket-making. The town is of high antiquity, and its name (Ather-dee) is taken to signify the ford of the Dee. A form Ath-Firdia, however, is connected with the ancient story of the warrior Cuchullain of Ulster, who, while defending the ford against the men of Connaught, was forced to slay many with whom he was on friendly terms, and among them the warrior Firdia, whom he regarded with special affection. A castle of the lords of the manor was built early in the 14th century, and remains, as does another adjacent fortified building of the same period. Roger de Peppart, lord of the manor early in the 13th century, founded the present Protestant church and a house of Crutched Friars. There was also a house of Carmelite Friars, but neither of these remains. Ardee received its first recorded charter in 1377. It had a full share in the several Irish wars, being sacked by Edward Bruce (1315) and by O'Neill (1538); and it was taken by the Irish and recaptured by the English in the wars of 1641, and was occupied later by the forces of James II. and of William III. It returned two members to the Irish parliament. A large rath, or encampment, with remains of fortifications, stands to the south of the town.

ARDEN, FOREST OF, a district in the north of Warwickshire, England, the "woodland" as opposed to the "felden," or "fielden," *i.e.* open country, in the south, the river Avon separating the two. Originally it was part of a forest tract of far wider extent than that within the confines of the county, and now, though lacking the true character of a forest, it is still unusually well wooded. The undulating surface ranges for the most part from 250 to 500 ft. in elevation. Wide lands in this district were held in the time of Edward the Confessor by Alwin, whose son Thurkill of Warwick, or "of Arden," founded the family of the Warwickshire Ardens who in Queen Elizabeth's time still held several of the manors ascribed to Thurkill in *Domesday*. Shakespeare, whose mother Mary Arden claimed to be of this family, knew the district well, living as he did at Stratford; and its natural characteristics, then still unchanged, inspired his pictures of forest life in *As You Like It*. The name of the Forest of Arden, besides remaining a convenient designation of a well-marked physical area, is preserved in such place-names as Henley-in-Arden and Hampton-in-Arden.

ARDENNES, a district covering some portion of the ancient forest of Ardenne, and extending over the Belgian province of Luxemburg, part of the grand duchy, and the French department of Ardennes. Bruzen Lamartinière states in his *Dictionnaire Géographique* that the Gauls and Bretons called it by a word signifying "the forest," which was turned into Latin as *Arduenna silva*, and he thinks it quite probable that the name was really derived from the Celtic word *ardu* (dark, obscure). The Arduenna Silva was the most extensive forest of Gaul, and Caesar (*Bello Gallico*, lib. vi. cap. 29) describes it as extending from the Rhine and the confines of the Treviri as far as the limits of the Nervii. In book v. the Roman conqueror describes his campaign against Indutiomarus and the Treviri in the Ardenne forest. Strabo gave it still greater extent, treating it as covering the whole region from the Rhine to the North Sea. It is safer to give it the more reasonable dimensions of Caesar, and to accept the verdict of later commentators that it never extended west of the Scheldt. At the division of the empire of Charlemagne between the three sons of Louis the Débonnaire, effected by the pact of Verdun in 843, the forest had become a district and is called therein *pagus Arduensis*. It was part of the division that fell to Lothair, and several of the charters of 843 expressly specify certain towns as being situated in this *pagus*. In the 10th century the district had become a *comitatus*, subject to the powerful count of Verdun, who changed his style to that of count of Ardenne.

The Belgian Ardennes may be said now to extend from the Meuse above Dinant on the west to the grand duchy of Luxemburg and Rhenish Prussia as far north as the Baraque de Michel on the east, and from a line drawn eastward from Dinant through Marche, Durbuy and Stavelot to the Hautes Fagnes on the north, to the French frontier roughly marked by the Semois valley in the south. Within these limits there are still some of the finest woods in Europe, which seem to have come down to us almost intact from the days of the Arduenna of Caesar. Notable among these portions of the great forest are the woods of St Hubert, the woods round La Roche, and those of the Amerois, Herbeumont, and Chiny on the Semois. In the grand duchy the forest has almost entirely disappeared, but owing to the compulsory law of replanting in Belgium this fate does not seem likely to attend the Belgian Ardennes.

In addition to being a forest the Ardennes is a plateau, and it offers to the geologist a most interesting field of investigation. The greater part of the Ardennes is occupied by a large area of Devonian beds, through which rise the Cambrian masses of Rocroi and Stavelot, and a few others of smaller size. Upon the folded slates and schists which constitute these inliers the Devonian rests with marked unconformity; but north of the ridge of Condroz Ordovician and Silurian beds make their appearance. Near Dinant carboniferous beds are infolded among the Devonian. Along the northern margin lies the intensely folded belt which constitutes the coalfield of Namur, and, beneath the overlying Mesozoic beds, is continued to the Boulonnais, Dover and beyond. The southern boundary of this belt is formed by a great thrust-plane, the *faille du midi*, along which the Devonian beds of the south have been thrust over the carboniferous beds of the coalfield.

The Ardennes are the holiday ground of the Belgian people, and much of this region is still unknown except to the few persons who by a happy chance have discovered its remoter and hitherto well-guarded charms. There is still an immense quantity of wild game to be found in the Ardennes, including red and roe deer, wild boar, &c. The shooting is preserved either by the few great landed proprietors left in the country, or by the communes, who let the right of shooting to individuals. Occasionally it is still stated in the press that wolves have been seen in the Ardennes, but this is a mere fiction. The last wolf was destroyed there in the 18th century.

ARDENNES, a department of France on the N.E. frontier, deriving its name from that of the forest, and formed in 1790 from parts of Champagne, Picardy and Hainault. Pop. (1906) 317,505. Area, 2028 sq. m. It is bounded N. and N.E. by Belgium, E. by the department of Meuse, S. by that of Marne, and W. by that of Aisne. In shape it is quadrilateral with a cape-like prolongation into Belgium on the north. The slope of the department is from north-east to south-west, though its longest river, the Meuse, entering it in the south-east, pursues a winding course of 111 m. in a north-westerly, and afterwards through deep gorges in a northerly, direction. The other principal river, the Aisne, crosses the southern border and takes a northerly, then a westerly course, separating the region known as Champagne Pouilleuse from the more elevated plateau of Argonne which forms the central zone of the department and stretches to the left bank of the Meuse. The highest points of the department are found in the wooded highlands of the Ardennes which, with an altitude varying between 980 and 1640 ft., cover the north and north-east. The climate is comparatively mild in the south-west, but becomes colder and more rainy towards the north and north-east. Agriculture is carried on to

most advantage in the Champagne and Argonne. Wheat and oats are the predominant cereals. Potatoes, rye, lucerne and other kinds of forage are also important crops. Pasturage is found chiefly on the banks of the Aisne and Meuse and on the plateau of Rocroi in the north. Horse-raising is carried on in the neighbourhood of Buzancy in the south, and at Bourg-Fidèle in the north. Fruit-growing is confined to the west and central districts. The working of slate is very important, especially in the neighbourhood of Fumay, and quarries producing freestone, lime-stone and other minerals are found in several places. Flour-mills, saw-mills, sugar-works, distilleries and leather-works are scattered over the department, but iron-founding and various branches of metal-working which are active along the valley of the Meuse (Nouzon, &c.) are the chief industries. To these may be added wool-weaving, centred at Sedan, and minor industries such as the manufacture of basket-work, wooden shoes, &c. Coal and raw wool are prominent imports, while iron goods, cloth, timber, live-stock, alcohol and the products of the soil are exported. Various branches of the Eastern railway traverse the department. The Meuse is canalized within the department, and the Canal des Ardennes, uniting that river with the Aisne, and the lateral canal of the Aisne are together about 65 m. long. Ardennes is divided into five arrondissements: Mézières, Rocroi, Rethel, Vouziers and Sedan, with 31 cantons and 503 communes. The department forms part of the ecclesiastical province of Reims and of the circumscriptions of the appeal-court of Nancy and the VI. army corps. In educational matters, it is included in the *académie* (educational area) of Lille. Mézières, the capital, Charleville, Rocroi, Sedan and Rethel are the chief towns. Outside them its finest examples of architecture are the churches of Mouzon (13th century) and Vouziers (15th century).

ARDGLASS (" Green Height "), a small town of Co. Down, Ireland, in the east parliamentary division, at the head of a rocky bay, in a picturesque situation between two hills, 32 m. S. by E. of Belfast on a branch of the Belfast & Co. Down railway. Pop. (1901) 501. Soon after the Norman invasion it became of the first importance as a port, a fact attested by the remains of no fewer than five castles in close proximity, which give the town a picturesque aspect. There are also an ancient church crowning the eastern hill, and a curious fortified warehouse (called the New Works), dating probably from the 14th century, when a trading company was established here under a grant from Henry IV. Ardglass was a royal burgh and sent a representative to the Irish parliament. The chief industry is the herring fishery. Ships of 500 tons may enter the harbour at all times. In summer Ardglass is a frequented resort of visitors; good bathing and a golf links contribute to its attractions.

ARDITI, LUIGI (1822–1903), Italian musical composer and conductor, was born in Piedmont, and studied music at the Conservatoire in Milan, starting professionally as a violinist, and touring with Bottesini, the double-bass player, in the United States in 1847. He began composing at an early age, and in 1840 produced an overture, followed by an opera *I Briganti* in 1841, and other works. He paid frequent visits to America, conducting the opera in New York, where he produced his *La Spia* in 1856. In 1858 he became conductor of the opera at Her Majesty's theatre in London, and both in London and abroad he became famous in this capacity, having the reputation of being Madame Patti's favourite conductor. His vocal waltz *Il Bacio* was often sung by her. In 1896 he published his *Reminiscences*, and after a long and active musical life he died at Brighton on the 1st of May 1903.

ARDMORE, a township and the county-seat of Carter county, Oklahoma, U. S. A., just S. of the Arbuckle Mountains, about 120 m. S. by E. of Guthrie. Pop. (1900) 5681; (1907) 8759 (2122 being negroes, and 108 Indians); (1910) 8618. It is served by the Chicago, Rock Island & Pacific, the St Louis & San Francisco, and the Gulf, Colorado & Santa Fé railways. Ardmore is the market-town and distributing point for the surrounding agricultural region, which is the home of a large part of the Chickasaw and Choctaw nations. It is situated 890 ft. above the sea in a cotton and grain producing region; in which cattle are raised and fruit and vegetables grown; coal, oil, natural gas and rock asphalt (which is used for paving the streets of Ardmore) are found in the vicinity. Ardmore is an important cotton market, and has cotton gins, a cotton compress, machine shops, bridge works, foundries, bottling works and manufactories of cotton-seed oil, brick, concrete, flour, brooms, mattresses and dressed lumber. At Ardmore are the Saint Agnes Academy, a Catholic school for girls, and Saint Agnes College for boys, a conservatory of music, Hargrove College, and the Selvidge Commercial College. Near Ardmore is a summer school on the Chautauqua (*q.v.*) system. Ardmore was founded in 1887, and was incorporated in 1898.

ARDRES, a town of northern France in the department of Pas-de-Calais, 10½ m. by rail S.S.E. of Calais, with which it is also connected by a canal. Pop. (1906) 1269. The " Field of the Cloth of Gold," where Henry VIII. of England and Francis I. of France met in 1520, was at Balinghem in the immediate neighbourhood. The town is an important market for cattle.

ARDROSSAN, a seaport, burgh of barony, and police burgh of Ayrshire, Scotland, 32 m. from Glasgow by the Glasgow & South-Western railway, and 29½ m. by the Lanarkshire & Ayrshire branch of the Caledonian railway. Pop. (1901) 6077. The rise of Ardrossan was due to the enterprise of Hugh, 12th earl of Eglinton, who began the construction of the present town and harbour in 1806. The harbour was intended to be in connexion with a canal from Glasgow to Ardrossan, but this was only completed as far as Johnstone. Owing to the costliness of the undertaking, and the death of the earl in 1819, the works were suspended after an outlay of £100,000, but his successor completed the scheme on a reduced scale at an expense of another £100,000. The dock accommodation has since been considerably extended, and the town enjoys great prosperity. Steamers run every week-day to Arran and Belfast, and during summer there is a service also to Douglas in the Isle of Man. The exports consist principally of coal and iron from collieries and iron-works in the neighbourhood; and the imports of timber, ores and general goods. Shipbuilding thrives and the fisheries are important. The town is governed by a provost and council.

SALTCOATS (pop. 8120), a mile to the south, is a popular seaside resort, with a brisk trade, due to its proximity to Ardrossan and Stevenston; the making of salt, once a leading industry, has ceased.

Ardrossan dates from an early period. The name Arthur of Ardrossan is found in connexion with a charter dated 1226; and Sir Fergus of Ardrossan accompanied Edward Bruce in his Irish expedition in 1316, and in 1320 signed the appeal to the pope, made by the barons of Scotland, against the aggressions of England. The family of Ardrossan is now merged, by marriage, in that of the earl of Eglinton and Winton. The castle where Wallace surprised the English garrison and threw their corpses into the dungeon, grimly styled " Wallace's Larder," was finally destroyed by Cromwell, who is said to have used part of its masonry for the construction of the fort at Ayr; but its ruins still exist.

AREA, a Latin word, originally meaning a threshing-floor, namely a raised space in a field exposed on all sides to the wind; now applied in English (1) to a plot of ground on which a structure is to be erected, (2) to the court or sunk space in the front or rear of a building, (3) to the superficial space covered by a district, country, &c., or by a building or court.

ARECIBO, a city and port on the north coast of Porto Rico, at the mouth of a small stream called the Rio Grande de Arecibo, and contiguous to one of the most fertile regions of the island. Pop. (1899) 8008; of the tributary district, about 30,000; (1910) 9612. It is connected with San Juan, Mayaguez and Ponce by railway. It is a well-built and active commercial city, and has a large export trade in coffee and sugar. The harbour is an open roadstead, very dangerous to shipping in northerly winds, and the discharge and loading of cargoes is effected by means of lighters at considerable risk and expense. Arecibo was founded in 1788.

AREMBERG, or ARENBERG,' formerly a German duchy of the Holy Roman Empire in the circle of the Rhine Palatinate, between Jülich and Cologne, and now belonging to the Prussian administrative district of Coblenz. The hamlet of Aremberg is at the foot of a basalt hill 2067 ft. high, on the summit of which are the ruins of the castle which was the original seat of the family of Aremberg.

The lords of Aremberg first appear early in the 12th century, but had died out in the male line by 1279. From the marriage of the heiress Mathilda (1282–1299) with Engelbert II., count of La Marck (d. 1328), sprang two sons. The elder of these, Adolf II, (d. 1347), inherited the countship of La Marck; the second, Engelbert III. (d. 1387), the lordship of Aremberg, which he increased by his marriage with Marie de Looz, heiress of Lumain. The lordship of Aremberg remained in his family till 1547, when it passed, by his marriage with Margaret, sister of the childless Robert III., to John of Barbançon, of the great house of Ligne, who assumed the name and arms of Aremberg, and was created a count of the Empire by Charles V. He was governor of Friesland, and for a while commanded the Spanish and Catholic forces against the "beggars," falling at the battle of Heiligerlee in 1568. His son Charles (d. 1618) greatly increased the possessions of the house by his marriage with Ann of Croy, heiress of Croy and of Chimay-Aerschot, and in 1576 was made prince of the Empire by Maximilian II. His grandson, Philip Francis, was made duke in 1644 by the emperor Ferdinand III., and was succeeded by his brother Charles Eugene (d. 1681), who married Marie Henriette de Vergy de Cusance, heiress of Perwez (d. 1700). Their son, Duke Philip Charles Francis, was killed in 1691 fighting against the Turks, and was succeeded by Leopold (1754), a distinguished soldier of the War of the Spanish Succession, and patron of Rousseau and Voltaire. His son Charles (d. 1778) was an Austrian field-marshal during the Seven Years' War, and married Louise Margaret of La Marck-Lumain, heiress of the countship of Schleiden and lordship of Saffenberg. By the peace of Luneville (February 1801), the next duke, Louis Engelbert, lost the greater part of his ancestral domain, but received in compensation Meppen and Recklinghausen. On the establishment of the confederation of the Rhine, his son Prosper Louis (to whom, becoming blind, he had ceded his domains in 1803) became a member (1806), and showed great devotion to the interests of France; but in 1810 he lost his sovereignty, Napoleon incorporating Meppen with France and Recklinghausen with the grand-duchy of Berg, and indemnifying him by a rent of 240,702 francs. In 1815 he received back his possessions, which were mediatized by the congress of Vienna, Recklinghausen falling to Prussia and Meppen to Hanover. On account of the one portion he became a peer of the Westphalian estates, and by the other a member of the upper house in Hanover. George IV. of England (9th May 1826) elevated the duke's Hanoverian possessions to a dukedom under the title of Aremberg Meppen. His brother Auguste Raymond, Comte de la Marck (1753–1833), became famous during the early stages of the French Revolution for his friendship with Mirabeau (*q.v.*). Duke Prosper Louis died in 1861, and was succeeded by his son Engelbert (d. 1875), who was followed in his turn by his son Engelbert (b. 1872).

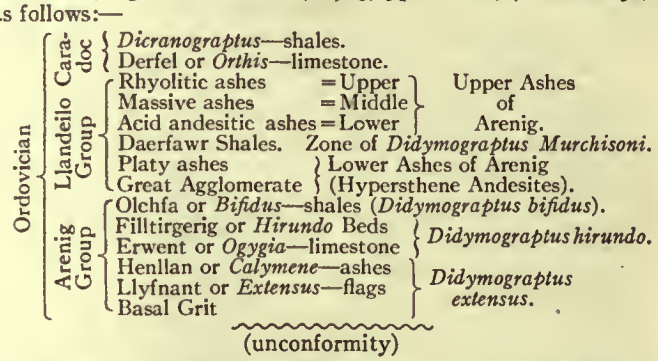
The duke of Aremberg is one of the wealthiest of the great continental nobles. His feudal domain in Germany covers an area of over 1100 sq. m., besides which he has large estates in Belgium and France. The duke has residences in Brussels, where he has a famous collection of pictures, and at the château of Klemenswerth near Meppen.

ARENA (Lat. for "sand"), the central area of an amphitheatre on which the gladiatorial displays took place, its name being derived from the sand with which it was covered. The word is applied sometimes to any level open space on which spectacles take place.

ARENDAL, a seaport of Norway, in Nedenaes *amt* (county), on the south coast, 46 m. N.E. from Christiansand. Pop. (1900) 11,155. It rises picturesquely above the mouth of the river Nid, with a good harbour protected by an island from the open waters of the Skagerrack. The town itself occupies several islets, and some of the houses are supported above the water on piles. The chief exports are timber (very largely exported to Great Britain), wood-pulp, sealskins and felspar. In 1879 Arendal ranked second (after Christiania) as a ship-owning port; in 1899 it had dropped to the fifth place. In and near the town are factories for wood-pulp, paper, cotton and joinery; and at Fevig, 8 m. north-east, a shipbuilding yard and engineering works. The neighbourhood is remarkable for the number of beautiful and rare minerals found there; one of these, a variety of epidote, was formerly called Arendalite. Louis Philippe stayed here for some time during his exile.

ARENIG GROUP, in geology, the name now applied by British geologists to the lowest stage of the Ordovician System in Britain. The term was first used by Adam Sedgwick in 1847 with reference to the "Arenig Ashes and Porphyries" in the neighbourhood of Arenig Fawr, in Merioneth, North Wales.

The rock-succession in the Arenig district has been recognized by W. G. Fearnsides ("On the Geology of Arenig Fawr and Moel Llanfnant," *Q.J.G.S.* vol. lxi., 1905, pp. 608–640, with maps) as follows:—



The above succession is divisible into: (1) a lower series of gritty and calcareous sediments, the "Arenig Series," as it is now understood; (2) a middle series, mainly volcanic, with shales, the "Llandeilo Series"; and (3) the shales and limestones of the Bala or Caradoc Stage. It was to the middle series (2) that Sedgwick first applied the term "Arenig."

In the typical region and in North Wales generally the Arenig series appears to be unconformable upon the Cambrian rocks; this is not the case in South Wales. The Arenig series is represented in North Wales by the Garth grit and Ty-Obry beds, by the Shelve series of the Corndon district, the Skiddaw slates of the Lake District, the Ballantrae group of Ayrshire, and by the Ribband series of slates and shales in Wicklow and Wexford. It may be mentioned here that the "Llanvirn" Series of H. Hicks was equivalent to the *bifidus*-shales and the Lower Llandeilo Series.

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AREOI, or AREOITI, a secret society which originated in Tahiti and later extended its influence to other South Pacific islands. To its ranks both sexes were admitted. The society was primarily of a religious character. Members styled themselves descendants of Oro-Tetifa, the Polynesian god, and were divided into seven or more grades, each having its characteristic tattooing. Chiefs were at once qualified for the highest grade, but ordinary members attained promotion only through initiatory rites. The Areois enjoyed great privileges, and were considered as depositaries of knowledge and as mediators between God and man. They were feared, too, as ministers of the taboo and were entitled to pronounce a kind of excommunication for offences against its rules. The chief religious purpose of the society was the worship of the generative powers of nature, and the ritual and ceremonies of initiation were grossly licentious. But the

Areois were also a social force. They aimed at communism in all things. The women members were common property; the period of cohabitation was limited to three days, and the female Areois were bound by oath at initiation to strangle at birth any child born to them. If, however, the infant was allowed to survive half an hour only, it was spared; but to have the right of keeping it the mother must find a male Areoi willing to adopt it. The Areois travelled about, devoting their whole time to feasting, dancing (the chief dance of the women being the grossly indecent *Timorodee* mentioned by Captain Cook), and debauchery, varied by elaborate realistic stage presentments of the lives and loves of gods and legendary heroes.

AREOPAGUS (Ἄρειος Πάγος), a bare, rocky hill, 370 ft. high, immediately west of the northern rim of the acropolis of Athens. The ancients interpreted the name as "Hill of Ares." Though accepted by some modern scholars, this derivation of the word is rendered improbable by the fact that Ares was not worshipped on the Areopagus. A more reasonable explanation connects the name with *Arae*, "Curses," commonly known as *Semnae*, "Awful Goddesses," whose shrine was a cave at the foot of the hill, of which they were the guardian deities (Aeschyl. *Eumen.* 417, 804; Schol. on Lucian, vol. iii. p. 68, ed. Jacobitz; Paus. i. 28. 6).

The Boulē, or Council, of the Areopagus (ἡ ἐν Ἀρείῳ Πάγῳ βουλή), named after the hill, is to be compared in origin and fundamental character with the council of chiefs or elders which we find among the earliest Germans, Celts, Romans, and other primitive peoples. Under the kings of Athens it must have closely resembled the Boulē of elders described by Homer; and there can be no doubt that it was the chief factor in the work of transforming the kingship into an aristocracy, in which it was to be supreme. It was composed of ex-archons. Aristotle attributes to it for the period of aristocracy the appointment to all offices (*Ath. Pol.* viii. 2), the chief work of administration, and the right to fine or otherwise punish in cases, not only of violation of laws, but also of immorality (*ibid.* iii. 6; cf. Isoc. vii. 46; Androtion and Philochorus, in Müller, *Frag. Hist. Graec.* i. 387. 17, 394. 60).[1] This evidence is corroborated by the remnants of political power left to it in later time, after its importance had been greatly curtailed, and by the designation Boulē, which in itself indicates that the body so termed was once a state council. In a passage bearing incidentally upon the early constitution of Athens, Thucydides (i. 126. 8) informs us that at the time of the Cylonian insurrection the Athenians, we may suppose in their assembly (Ἐκκλησία), commissioned the archons with absolute power to deal with the trouble at their discretion. From this passage, if we accept the Aristotelian view as to the early supremacy of the Areopagitic council, we must infer that a modification of the aristocracy in a popular direction had at that time already taken place.

In addition to its political functions, the council from the time of Draco, if not earlier, exercised jurisdiction in certain cases of homicide (see below, *ad fin.*). The assumption that in their criminal jurisdiction the Areopagites were called Ephetae till after the legislation of Draco (cf. Philoch. 58, in Müller, *ibid.* 394) would explain the otherwise obscure circumstances that, according to Plutarch (*Sol.* 19), Draco (*q.v.*) in his laws mentioned only the Ephetae, and that Pollux (viii. 125) included the Areopagus among the localities in which sat the Ephetae.[2] The same assumption would supply a reason for the notion entertained by many writers of later time that the Areopagitic council was instituted by Solon (*q.v.*)—a notion partly explained also by the desire of political thinkers to ascribe to Solon the making of a complete constitution. Conformably with the view here presented we may suppose that the name "Boulē of the Areopagus" developed from the simple term "Boulē" in order to distinguish it from the new Boulē (*q.v.*), or Council of Four Hundred. The popular reforms of Solon (594 B.C.), so far as they were carried into effect, tended practically to limit the Council of the Areopagus, though constitutionally it retained all its earlier powers and functions, augmented by the right to try persons accused of conspiracy against the state (Arist. *Ath. Pol.* viii. 4). In the exercise of its duty as the protector of the laws it must have had power to inhibit in the Four Hundred, or in the Ecclesia, a measure which it judged unconstitutional or in any way prejudicial to the state, and in the levy of fines for violation of law or moral usage it remained irresponsible. As censor of the conduct of citizens it inquired into every man's source of income and punished the idle (Plut. *Sol.* 22).

The tyrants (560–510 B.C.) left to the council its cognizance of murder cases (Demosth. xxiii. 66; Arist. *Ath. Pol.* xvi. 8) and probably the nominal enjoyment of all its prerogatives; but their method of filling the archonship with their own kinsmen and creatures gradually converted the Areopagites into willing supporters of tyranny. Though hostile, therefore, to the policy of Cleisthenes, their council seems to have suffered no direct abridgment of power from his reforms. After his legislation it gradually changed character and political sentiment by the annual admission of ex-archons who had held office under a popular constitution. In 487 B.C., however, the introduction of the lot as a part of the process of filling the archonship (see ARCHON) began to undermine its ability. This deterioration was necessarily slow; it could not have advanced far in 480 B.C., when on the eve of the battle of Salamis, as we are informed (Arist. *Polit.* viii. 4, p. 1304a, 17; *Ath. Pol.* xxiii. 25; Plut. *Them.* 10; Cic. *Off.* i. 22, 75), the council of the Areopagus succeeded in manning the fleet by providing pay for the seamen, thereby regaining the confidence and respect of the people. The patriotic action of the council and its attendant popularity enabled it to recover considerable administrative control, which it continued to exercise for the next eighteen years, although its deterioration in ability, becoming every year more noticeable, as well as the rapid rise of democratic ideas, prevented it from fully re-establishing the supremacy which Aristotle, with some exaggeration, attributes to it for this period. Its prestige was seriously undermined by the conduct of individual members, whose corrupt use of power was exposed and punished by Ephialtes, the democratic leader. Following up this advantage, Ephialtes (462 B.C.), and less prominently Archestratus and Pericles (*q.v.*), proposed and carried measures for the transfer of most of its functions to the Council of Five Hundred, the Ecclesia, and the popular courts of law (Arist. *Ath. Pol.* xxv. 2, xxvii. 1, xxxv. 2; Plut. *Per.* 9). Among these functions were probably jurisdiction in cases of impiety, the supervision of magistrates and the censorship of the morals of citizens, the inhibition of illegal and unconstitutional resolutions in the Five Hundred and the Ecclesia, the examination into the fitness of candidates for office, and the collection of rents from the sacred property (cf. Wilamowitz-Möllendorff, *Arist. u. Ath.* ii. 186-197; Busolt, *Griech. Gesch.* (2nd ed.) iii. 269-294; G. Gilbert, *Const. Antiq. of Sparta and Athens*, Eng. trans., 154 f.). It retained

[1] Neither Herodotus nor Thucydides tells us anything as to its powers; but their silence on this point need not surprise us, as they had no especial occasion for referring to the subject, and in general it may be said that before the 4th century B.C. writers took little interest in the constitutional history of the remote past. The statement of Thucydides (i. 126. 8) that at the time of the Cylonian insurrection the nine archons attended to a great part of the business of government does not contradict the Aristotelian view, for their administration may well have been under Areopagitic supervision (see also ARCHON); and, as is stated in the text, the supremacy of the council may have already suffered considerable limitation. The *Eumenides* of Aeschylus is a glorification of the institution, though for obvious reasons it is there represented as an essentially judicial body.

[2] It is possible also to explain the alleged absence of reference to the Areopagitic council in the Draconian laws by the supposition that Solon, while leaving untouched the Draconian laws concerned with the cases of homicide which came before the Ephetae, substituted a law of his own regarding wilful murder, which fell within the jurisdiction of the Areopagites. This view finds strong support in the circumstance that the copy of the Draconian laws (*C.I.A.* i. 61), made in pursuance of a decree of the people of the year 409–408 B.C., does not contain the provision for cases of premeditated homicide; cf. G. de Sanctis, *Ἀτθίς*, 135. The relation of the Ephetae to the court of the Areopagus is obscure; cf. Philippi, *Der Areopag und die Epheten* (Berlin, 1874); Busolt, *Griechische Geschichte* (2nd ed.), ii. 138 ff.

jurisdiction in cases of homicide and the care of sacred olive trees. From this time to the establishment of the Thirty (462–404 B.C.) the Areopagitic council, degraded still further by the opening of the archonship to the Zeugitae (457 B.C.) and by the absolute use of the lot in filling the office, was a political nullity. The first indication of a revival of its prestige is to be traced in the action attributed to it by Lysias during the siege of Athens (404 B.C.) (in *Eratosth.* 69: πραττούσης μὲν τῆς ἐν Ἀρείῳ Πάγῳ βουλῆς σωτηρία). After the surrender of Athens and the appointment of the Thirty, the repeal of the laws of Ephialtes and Archestratus prepared the way for the rehabilitation of the council as guardian of the constitution by the restored democracy (Arist. *Ath. Pol.* xxxv. 2; decree of Tisamenus, in Andoc. i. 84; cf. Din. i. 9). Although under the new conditions the Areopagites could not hope to recover their full supremacy, they did exercise considerable political influence, especially in crises. In the time of Demosthenes, accordingly, we find them annulling the election of individuals to offices for which they were unfit (Plut. *Phoc.* 16), exercising during a crisis a disciplinary power extending to life and death over all the Athenians "in conformity with ancestral law," procuring the banishment of one, the racking of another, and the infliction of capital punishment on several of the citizens. This authority seems to have been delegated to them by the assembly with reference either to individual cases or temporarily to the whole body of Athenians (Din. i. 10, 62 f.; Aeschin. iii. 252; Lyc. *Leoc.* 52; Demosth. xviii. 132 f.; Plut. *Demosth.* 14). Religion, too, was their care (Pseud. Demosth. lix. 80 f.). Lycurgus (*ibid.*) even goes so far as to claim that by their action during the crisis after Chaeroneia they had saved the state. After the period of the great orators their influence continued to grow. Demetrius of Phalerum empowered them to assist the *gynaeconomi* in supervising festivals held in private houses (*Philoch.* in Müller, *ibid.* i. 408. 143). Under Roman supremacy in addition to earlier functions they had jurisdiction in cases of forgery, tampering with the standard measures, and probably other high crimes, the supervision of buildings, and the care of religion and of education (Cic. *Fam.* xiii. 1; *All.* v. 9; Tac. *Ann.* ii. 55; Plut. *Cic.* 24; *C.I.G.* i. 123. 9; *C.I.A.* ii. 476; iii. 703, 714, 716; Acts xvii. 19). Their council acquired, too, in conjunction with the assembly, with or without the co-operation of the Five Hundred (or Six Hundred), the right to pass decrees and to represent their city in foreign relations (*C.I.A.* iii. 10, 31, 40, 41, 454, 457, 458). From the overthrow of the Thirty to the end of their history they enjoyed a high reputation for ability and integrity (Isoc. vii.; Demosth. xxiii. 65 f.; Val. Max. viii. 1. *Amb.* 2; Gell. xii. 7; Lucian, *Bis Acc.* iv. 12. 14). About A.D. 400 their council came to an end (Theodoret, *Curat.* ix. 55).

With regard to the jurisdiction of the council in cases of homicide, the procedure, so far as it may be gathered from the orators and other sources, was as follows:—accusations were brought by relatives within the circle of brothers' and sisters' children, supported by the wider kin and the phratry (Demosth. xliii. 57). On receiving the accusation the king-archon by proclamation warned the accused to keep away from temples and other places forbidden to such persons. He made three investigations of the case in the three successive months, and brought it to trial in the fourth month. As he was forbidden to hand a case over to his successor, it resulted that in the last three months of the year no accusations of homicide could be brought (Ant. vi. 42). After the examination he assigned the case to the proper court, and presided over it during the trial, which took place in the open air, that the judges and the accuser might not be polluted by being brought under the same roof with the offender (Ant. v. 11). The accuser and the accused, standing on two white stones termed "Relentlessness" (Ἀναίδεια) and "Outrage" (Ὕβρις) respectively (Paus. i. 28. 5), bound themselves to the truth by most solemn oaths (Demosth. xxiii. 68). Each was allowed two speeches, and the trial lasted three days. After the first speech the accused, unless charged with parricide, was at liberty to withdraw into exile (Poll. viii. 117). If condemned, he lost his life, and his property was confiscated. A tie vote acquitted (Aeschyl. *Eumen.* 735; Ant. v. 51; Aeschin. iii. 252). See further GREEK LAW.

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AREQUIPA, a coast department of southern Peru, bounded N. by the departments of Ayacucho and Cuzco, E. by Puno and Moquegua, S. and W. by Moquegua and the Pacific. It is divided into seven provinces. Area, 21,947 sq. m.; pop. (1896) 229,007. It is traversed by an important railway line from Mollendo (Islay) to Puno, on Lake Titicaca, 325 m. long, with extensions to Santa Rosa, Peru and La Paz, Bolivia. The highest point reached by this line is 14,660 ft. The department includes an arid, sand-covered region on the coast traversed by deep gorges formed by river courses, and a partly barren, mountainous region inland composed of the high Cordillera and its spurs toward the coast, between which are numerous highly fertile valleys watered by streams from the snow-clad peaks. These produce cotton, rice, sugar-cane, wheat, coffee, Indian corn, barley, potatoes and fruit. The mountainous region is rich in minerals, and there is a valuable deposit of borax near the capital, Arequipa.

AREQUIPA, a city of southern Peru, capital of the department of the same name, about 90 m. N.E. by N. of its seaport Mollendo (107 m. by rail), and near the south-west foot of the volcano Misti which rises to a height of 19,029 ft. above sea-level. The population was estimated at 35,000 in 1896. The city is provided with a tram line, and is connected with the coast at Mollendo (Islay) by a railway 107 m. long. and with Puno, on Lake Titicaca, by an extension of the same line 218 m. long. The city occupies a green, fertile valley of the Rio Chile, 7753 ft. above the sea, surrounded by an arid, barren desert. It is built on the usual rectangular plan and the streets are wide and well paved. The edifices in general are low, and are massively built with thick walls and domed ceilings to resist earthquakes, and lessen the danger from falling masonry. The material used is a soft, porous magnesian limestone, which is well adapted to the purpose in view. Arequipa is the seat of a bishopric created in 1609–1612, and possesses a comparatively modern cathedral, its predecessor having been destroyed by fire in 1849. It has several large churches, and formerly possessed five monasteries and three nunneries, which have been closed and their edifices devoted to educational and other public purposes. The religious element has always been a dominating factor in the life of the city. A university, founded in 1825, three colleges, one of them dating from colonial times, a medical school, and a public library, founded in 1821, are distinguishing features of the city, which has always taken high rank in Peru for its learning and liberalism, as well as for its political restlessness. The city's water-supply is derived from the Chile river and is considered dangerous to new arrivals because of the quantity of saline and organic matter contained. The climate is temperate and healthy, and the fertile valley (10 m. long by 5 m. wide) surrounding the city produces an abundance of cereals, fruits and vegetables common to both hot and temperate regions. Pears and strawberries grow side by side with oranges and granadillas, and are noted for their size and flavour. The trade of the city is principally in Bolivian products—mineral ores, alpaca wool, &c.—but it also receives and exports the products of the neighbouring

Peruvian provinces, and the output of the borax deposits in the neighbourhood. Arequipa was founded by Pizarro in 1540, and has been the scene of many events of importance in the history of Peru. It was greatly damaged in the earthquakes of 1582, 1609, 1784 and 1868, particularly in the last. It was captured by the Chileans in 1883, near the close of the war between Chile and Peru.

ARES, in ancient Greek mythology, the god of war, or rather of battle, son of Zeus and Hera. (For the Roman god, identified with Ares, see MARS.) As contrasted with Athena, who added to her other attributes that of being the goddess of well-conducted military operations, he personifies brute strength and the wild rage of conflict. His delight is in war and bloodshed; he loves fighting for fighting's sake, and takes the side of the one or the other combatant indifferently, regardless of the justice of the cause. His quarrelsomeness was regarded as inherited from his mother, and it may have been only as an illustration of the perpetual strife between Zeus and Hera that Ares was accounted their son. According to a later tradition, he was the son of Hera (Juno) alone, who became pregnant by touching a certain flower (Ovid, *Fasti*, v. 255). All the gods, even Zeus, hate him, but his bitterest enemy is Athena, who fells him to the ground with a huge stone. Splendidly armed, he goes to battle, sometimes on foot, sometimes in the war chariot made ready by his sons Deimos and Phobos (Panic and Fear) by whom he is usually accompanied. In his train also are found Enyo, the goddess of war who delights in bloodshed and the destruction of cities; his sister, Eris, goddess of fighting and strife; and the Keres, goddesses of death, whose function it is especially to roam the battle-field, carrying off the dead to Hades. In later accounts (and even in the *Odyssey*) Ares' character is somewhat toned down; thus, in the "Homeric" hymn to Ares, he is addressed as the assistant of Themis (Justice), the enemy of tyrants, and leader of the just. It is to be noted, however, that in this little poem he is to some extent confounded with the planet named after him (Ares, or Mars).

The primitive character of Ares has been much discussed. He is a god of storms; a god of light or a solar god; a chthonian god, one of the deities of the subterranean world, who could bring prosperity as well as ruin upon men, although in time his destructive qualities obscured the others. In this last aspect he was one of the chief gods of the Thracians, amongst whom his home was placed even in the time of Homer. In Scythia an old iron sword served as the symbol of the god, to which yearly sacrifices of cattle and horses were made, and in earlier times (as apparently also at Sparta) human victims, selected from prisoners of war, were offered. Thus Ares developed into the god of war, in which character he made his way into Greece. This theory may have been nothing more than an instance of the Greek tendency to assign a northern or "hyperborean" home to deities in whose character something analogous to the stormy elements of nature was found. But it appears that the Thracians and Scythians in historical times (Herodotus i. 59) worshipped chiefly a war god, and that certain Thracian settlements, formed in Greece in prehistoric times, left behind them traces of the worship of a god whom the Greeks called Ares. The story of his imprisonment for thirteen months by the Aloïdae (*Iliad*, v. 385) points to the conquest of this chthonian destroyer of the fields by the arts of peace, especially agriculture, of which the grain-fed sons of Aloeus (the thresher) are the personification.

In Homer Ares is the lover of Aphrodite, the wife of Hephaestus, who catches them together in a net and holds them up to the ridicule of the gods. In what appears to be a very early development of her character, Aphrodite also was a war goddess, known under the name of Areia; and in Thebes, the most important seat of the worship of Ares, she is his wife, and bears him Eros and Anteros, Deimos and Phobos, and Harmonia, wife of Cadmus, the founder of the city (Hesiod, *Theog.* 933). In the legend of Cadmus and his family Ares plays a prominent part. His worship was not so widely spread over Greece as that of other gods, although he was honoured here and there with festivals and sacrifices. Thus, at Sparta, under the name of Theritas, he was offered young dogs and even human beings. The Dioscuri were said to have brought his image from Colchis to Laconia, where it was set up in an old sanctuary on the road from Sparta to Therapnae. At Athens, he had a temple at the foot of the Areopagus, with a statue by Alcamenes. It was here, according to the legend, that he was tried and acquitted by a council of the gods for the murder of Halirrhothius, who had violated Alcippe, the daughter of Ares by Agraulos. The figure of Ares appears in various stories of ancient mythology. Thus, he engages in combat with Heracles on two occasions to avenge the death of his son Cycnus; once Zeus separates the combatants by a flash of lightning, but in the second encounter he is severely wounded by his adversary, who has the active support of Athena; maddened by jealousy, he changes himself into the boar which slew Adonis, the favourite of Aphrodite; and stirs up the war between the Lapithae and Centaurs. His attributes were the spear and the burning torch, symbolical of the devastation caused by war (in ancient times the hurling of a torch was the signal for the commencement of hostilities). The animals sacred to him were the dog and the vulture.

The worship of Ares being less general throughout Greece than that of the gods of peace, the number of statues of him is small; those of Ares-Mars, among the Romans, are more frequent. Previous to the 5th century B.C. he was represented as full-bearded, grim-featured and in full armour. From that time, apparently under the influence of Athenian sculptors, he was conceived as the ideal of a youthful warrior, and was for a time associated with Aphrodite and Eros. He then appears as a vigorous youth, beardless, with curly hair, broad head and stalwart shoulders, with helmet and chlamys. In the Villa Ludovisi statue (after the style of Lysippus) he appears seated, in an attitude of thought; his arms are laid aside, and Eros peeps out at his feet. In the Borghese Ares (also taken for Achilles) he is standing, his only armour being the helmet on his head. He also appears in many other groups, with Aphrodite, in marble and on engraved gems of Roman times. But before this grouping had recommended itself to the Romans, with their legend of Mars and Rhea Silvia, the Greek Ares had again become under Macedonian influence a bearded, armed and powerful god.

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ARETAEUS, of Cappadocia, a Greek physician, who lived at Rome in the second half of the 2nd century A.D. We possess two treatises by him, each in four books, in the Ionic dialect: *On the Causes and Indications of Acute and Chronic Diseases*, and *On their Treatment*. His work was founded on that of Archigenes; like him, he belonged to the eclectic school, but did not ignore the theories of the "Pneumatics," who made the heart the seat of life and of the soul.

Editions by Kühn (1828), Ermerius (1848). English translations: Wigan (1723); Moffat (1786); Reynolds (1837); Adams (1856). See Locher, *Aretaeus aus Kappadocien* (1847).

ARETAS (Arab. Hāritha), the Greek form of a name borne by kings of the Nabataeans resident at Petra in Arabia. (1) A king in the time of Antiochus IV. Epiphanes (2 Macc. v. 8). (2) The father-in-law of Herod Antipas (Jos. *Ant.* xviii. 5. 1, 3). In 2 Cor. xi. 32 he is described as ruler of Damascus (*q.v.*) at the time of Paul's conversion. Herod Antipas had married a daughter of Aretas, but afterwards discarded her in favour of Herodias. This led to a war with Aretas in which Antipas was defeated.

An Aretas is mentioned in 1 Macc. xv. 22, but the true reading is probably Ariarathes (king of Cappadocia). See NABATAEANS.

ARÊTE (O. Fr. *areste*, Lat. *arista*, ear of corn, fish-bone or spine), a ridge or sharp edge; a French term used in Switzerland

to denote the sharp bayonet-like edge of a mountain (such as the Matterhorn), that slopes steeply upward with two precipitous sides meeting in a long ascending ridge. Hence the word has passed into common use to denote any sharp mountain edge denuded by frost action above the snowline, where the consequent angular ridges give the characteristic "house-roof structure" of these altitudes.

ARETHAS (*c.* 860–940), Byzantine theological writer and scholar, archbishop of Caesarea in Cappadocia, was born at Patrae. He was the author of a Greek commentary on the Apocalypse, avowedly based upon that of Andrew, his predecessor in the archbishopric. In spite of its author's modest estimate, Arethas's work is by no means a slavish compilation; it contains additions from other sources, and especial care has been taken in verifying the references. His interest was not, however, confined to theological literature; he annotated the margins of his classical texts with numerous scholia (many of which are preserved), and had several MSS. copied at his own expense, amongst them the Codex Clarkianus of Plato (brought to England from the monastery of St John in Patmos), and the Dorvillian MS. of Euclid (now at Oxford).

Most divergent opinions have been held as to the time in which Arethas lived; the reasons for the dates given above will be found succinctly stated in the article "Aretas," by A. Jülicher in Pauly-Wissowa's *Realencyclopädie der klassischen Altertumswissenschaft* (1896). The text of the commentary is given in Migne, *Patrologia Graeca*, cvi.; see also O. Gebhardt and A. Harnack, *Texte und Untersuchungen zur Geschichte der altchristlichen Litt.* i. pp. 36-46 (1882), and *Vita Euthymii* (patriarch of Constantinople, d. 917), ed. C. de Boor (1888); H. Wace, *Dictionary of Christian Biography*, i.; C. Krumbacher, *Geschichte der byzantinischen Litteratur* (1897); G. Heinrici in Herzog-Hauck, *Realencyklopädie* (1897).

ARETHUSA, in Greek mythology, a nymph who gave her name to a spring in Elis and to another in the island of Ortygia near Syracuse. According to Pausanias (v. 7. 2), Alpheus, a mighty hunter, was enamoured of Arethusa, one of the retinue of Artemis; Arethusa fled to Ortygia, where she was changed into a spring; Alpheus, in the form of a river, made his way beneath the sea, and united his waters with those of the spring. In Ovid (*Metam.* v. 572 foll.), Arethusa, while bathing in the Alpheus, was seen and pursued by the river god in human form; Artemis changed her into a spring, which, flowing underground, emerged at Ortygia. In the earlier form of the legend, it is Artemis, not Arethusa, who is the object of the god's affections, and escapes by smearing her face with mire, so that he fails to recognize her (see L. R. Farnell, *Cults of the Greek States*, ii. p. 428). The probable origin of the story is the part traditionally taken in the foundation of Syracuse by the Iamidae of Olympia, who identified the spring Arethusa with their own river Alpheus, and the nymph with Artemis Alpheiaia, who was worshipped at Ortygia. The subterranean passage of the Alpheus in the upper part of its course (confirmed by modern explorers), and the freshness of the water of Arethusa in spite of its proximity to the sea, led to the belief that it was the outlet of the river. Further, according to Strabo (vi. p. 270), during the sacrifice of oxen at Olympia the waters of Arethusa were disturbed, and a cup thrown into the Alpheus would reappear in Ortygia. In Virgil (*Ecl.* x. 1) Arethusa is addressed as a divinity of poetical inspiration, like one of the Muses, who were themselves originally nymphs of springs.

For Arethusa on Syracusan coins, see B. V. Head, *Historia Numorum*, pp. 151, 155.

ARETINO, PIETRO (1492–1556), Italian author, was born in 1492 at Arezzo in Tuscany, from which place he took his name. He is said to have been the natural son of Luigi Bacci, a gentleman of the town. He received little education, and lived for some years poor and neglected, picking up such scraps of information as he could. When very young he was banished from Arezzo on account of a satirical sonnet which he composed against indulgences. He went to Perugia, where for some time he worked as a bookbinder, and continued to distinguish himself by his daring attacks upon religion. After some years' wandering through parts of Italy he reached Rome, where his talents, wit and impudence commended him to the papal court. This favour, however, he lost in 1523 by writing a set of obscene sonnets, to accompany an equally immoral series of drawings by the great painter, Giulio Romano. He left Rome and was received by Giovanni de' Medici, who introduced him at Milan to Francis I. of France. He gained the good graces of that monarch, and received handsome presents from him. Shortly after this Aretino attempted to regain the favour of the pope, but, having come to Rome, he composed a sonnet against a rival in some low amour, and in return was assaulted and severely wounded. He could obtain no redress from the pope, and returned to Giovanni de' Medici. On the death of the latter in December 1526, he withdrew to Venice, where he afterwards continued to reside. He spent his time here in writing comedies, sonnets, licentious dialogues, and a few devotional and religious works. He led a profligate life, and procured funds to satisfy his needs by writing sycophantish letters to all the nobles and princes with whom he was acquainted. This plan proved eminently successful, for large sums were given him, apparently from fear of his satire. So great did Aretino's pride grow, that he styled himself the "divine," and the "scourge of princes." He died in 1556, according to some accounts by falling from his chair in a fit of laughter caused by hearing some indecent story of his sisters. The reputation of Aretino in his own time rested chiefly on his satirical sonnets or burlesques; but his comedies, five in number, are now considered the best of his works. His letters, of which a great number have been printed, are also commended for their style. The dialogues and the licentious sonnets have been translated into French, under the title *Académie des Dames*.

AREZZO (anc. *Arretium*), a town and episcopal see of Tuscany, Italy, the capital of the province of Arezzo, 54 m. S.E. of Florence by rail. Pop. (1901) town, 16,780; commune, 46,926. It is an attractive town, situated on the slope of a hill 840 to 970 ft. above sea-level, in a fertile district. The walls by which it is surrounded were erected in 1320 by Guido Tarlati di Pietramala, its warlike bishop, who died in 1327, and is buried in the cathedral; they were reconstructed by Cosimo I. de' Medici between 1541 and 1568, on which occasion the bronze statues of Pallas and the Chimaera, now at Florence, were discovered. The town itself is fan-shaped, the streets, which contain some fine old houses with projecting eaves and many towers, radiating from the citadel (Fortezza), which was constructed in 1502, and dismantled by the French in 1800. The cathedral, close by, is a fine specimen of Italian Gothic begun in 1277, but not completed internally until 1511, while the façade was not begun until 1880. The interior is spacious and contains some fine 14th-century sculptures, those of the high altar, which contains the tomb of St Donatus, the patron saint of Arezzo, being the best; very good stained-glass windows of the beginning of the 16th century by Guillaume de Marcillat, and some terra-cotta reliefs by Andrea della Robbia. Another fine church is S. Maria della Pieve, having a campanile and a façade of 1216, the latter with three open colonnades running for its whole length above the doors. The interior was restored to its original style in 1863–1865. The Romanesque choir and apse belong to the 11th century, the rest of the interior is contemporary with the façade. In the square behind the church is a colonnade designed by Vasari. In the cloisters of S. Bernardo, on the site of the ancient amphitheatre, is a remarkable view of medieval Rome. S. Francesco contains famous frescoes by Piero de' Franceschi, representing scenes from the legend of the Holy Cross, and others by Spinello Aretino, a pupil of Giotto. There are several other frescoes by the latter in S. Domenico. Among the Renaissance buildings the churches of S. Maria delle Grazie and the Santissima Annunziata may be noted. The collection of majolica in the municipal museum is very fine, and so is that of the Funghini family. In the middle ages Arezzo was generally on the Ghibelline side; it succumbed to Florence in 1289 at the battle of Campaldino, but at the end of the century recovered its strength under the Tarlati family. In 1336 it became subject to Florence for six years, and after intestine struggles, finally came under her rule in 1384. Among the natives of Arezzo the most famous are the Benedictine monk Guido of Arezzo, the inventor

of the modern system of musical notation (died *c.* 1050), the poet Petrarch, Pietro Aretino, the satirist (1492–1556), and Vasari, famous for his lives of Italian painters. The town never possessed a distinct school of artists.

See C. Signorini, *Arezzo, Città y Provincia, Guida illustrata* (Arezzo, 1904). (T. As.)

ARGALI, the Tatar name of the great wild sheep, *Ovis ammon*, of the Altai and other parts of Siberia. Standing as high as a large donkey, the argali is the finest of all the wild sheep, the horns of the rams, although of inferior length, being more massive than those of *Ovis poli* of the Pamirs. There are several local races of argali, among which *O. ammon hodgsoni* of Ladak and Tibet is one of the best known. There are likewise several nearly related central Asian species, such as *O. sairensis* and *O. littledalei*. (See SHEEP.)

ARGAO, a town on the east coast of Cebu, Philippine Islands, 36 m. S.S.W. of the town of Cebu. Pop. (1903) 35,448. Large quantities of a superior quality of cacao are produced in the vicinity, and rice and Indian corn are other important products. A limited amount of cotton is raised and woven into cloth. The language is Cebu-Visayan. Argao was founded in 1608.

ARGAUM, a village of British India in the Akola district of the Central Provinces, 32 m. north of Akola. The village is memorable for an action which took place on the 28th of November 1803 between the British army, commanded by Major-General Wellesley (afterwards duke of Wellington), and the Mahrattas under Sindhia and the raja of Berar, in which the latter were defeated with great loss. A medal struck in England in 1851 commemorates the victory.

ARGEI, the name given by the ancient Romans to a number of rush puppets (24 or 27 according to the reading of Varro, *de Ling. lat.* vii. 44, or 30 according to Dionysius i. 38) resembling men tied hand and foot, which were taken down to the ancient bridge over the Tiber (*pons sublicius*) on the 14th of May by the pontifices and magistrates, with the flaminica Dialis in mourning guise, and there thrown into the Tiber by the Vestal virgins. There were also in various parts of the four Servian regions of the city a number of *sacella Argeorum* (chapels), round which a procession seems to have gone on the 17th of March (Varro, *L.L.* v. 46-54; Jordan, *Röm. Topogr.* vol. ii. 603), and it has been conjectured that the puppets were kept in these chapels until the time came for them to be cast into the river. The Romans had no historical explanation of these curious rites, and neither the theories of their scholars nor the beliefs of the common people, who fancied that the puppets were substitutes for old men who used at one time to be sacrificed to the river, are worth serious consideration. Recently two explanations have been given: (1) that of W. Mannhardt, who by comparing numerous examples of similar customs among other European peoples arrived at the conclusion that the rite was of extreme antiquity and of dramatic rather than sacrificial character, and that its object was possibly to procure rain; (2) that of Wissowa, who refuses to date it farther back than the latter half of the 3rd century B.C., and sees in it the yearly representation of an original sacrifice of twenty-seven captive Greeks (taking Argei as a Latin form of Ἀργεῖοι) by drowning in the Tiber. This second theory is, however, not borne out by any Roman historical record.

See Wissowa's arguments in the article "Argei" in his edition of Pauly's *Realencyclopädie*. For the other view see W. Mannhardt, *Antike Wald und Feldkulte*, 178 foll.; W. W. Fowler, *Roman Festivals*, pp. 111 foll. (W. W. F.*)

ARGELANDER, FRIEDRICH WILHELM AUGUST (1799–1875), German astronomer, was born at Memel on the 22nd of March 1799. He studied at the university of Königsberg, and was attracted to astronomy by F. W. Bessel, whose assistant he became (October 1, 1820). His treatise on the path of the great comet of 1811 appeared in 1822; he was, in 1823, entrusted with the direction of the observatory at Åbo; and he exchanged it for a similar charge at Helsingfors in 1832. His admirable investigation of the sun's motion in space was published in 1837; and in the same year he was appointed professor of astronomy in the university of Bonn, where he died on the 17th of February 1875. He also published *Observationes Astronomicae Aboae Factae* (3 vols., 1830–1832); *DLX Stellarum Fixarum Positiones Mediae* (1835); and the first seven volumes of *Astronomische Beobachtungen auf der Sternwarte zu Bonn* (1846–1869), containing his observations of northern and southern star-zones, and his great *Durchmusterung* (vols. iii.-v., 1859–1862) of 324,198 stars, from the north pole to −2° Dec. The corresponding atlas was issued in 1863. His observations (begun in 1838) and discussions of variable stars were embodied in vol. vii. of the same series.

See E. Schönfeld in *Vierteljahrsschrift der Astronomischen Gesellschaft*, x. pp. 150-178.

ARGENS, JEAN BAPTISTE DE BOYER, MARQUIS D' (1704–1771), was born at Aix in Provence on the 24th of June 1704. He entered the army at the age of fifteen, and after a dissipated and adventurous youth settled for a time at Amsterdam, where he wrote some historical compilations and began his more famous *Lettres juives* (The Hague, 6 vols., 1738–1742), *Lettres chinoises* (The Hague, 6 vols., 1739–1472), and *Lettres cabalistiques* (2nd ed., 7 vols., 1769); also the *Mémoires secrets de la république des lettres* (7 vols., 1743–1478), afterwards revised and augmented as *Histoire de l'esprit humain* (Berlin, 14 vols., 1765–1768). He was invited by Prince Frederick (afterwards Frederick the Great) to Potsdam, and received high honours at court; but Frederick was bitterly offended by his marrying a Berlin actress, Mlle Cochois. Argens returned to France in 1769, and died near Toulon on the 11th of January 1771.

ARGENSOLA, LUPERCIO LEONARDO DE (1559–1613), Spanish dramatist and poet, was baptized at Barbastro on the 14th of December 1559. He was educated at the universities of Huesca and Saragossa, becoming secretary to the duke de Villahermosa in 1585. He was appointed historiographer of Aragon in 1599, and in 1610 accompanied the count de Lemos to Naples, where he died in March 1613. His tragedies—*Filis*, *Isabela* and *Alejandra*—are said by Cervantes to have "filled all who heard them with admiration, delight and interest"; *Filis* is lost, and *Isabela* and *Alejandra*, which were not printed till 1772, are ponderous imitations of Seneca. Argensola's poems were published with those of his brother in 1634; they consist of excellent translations from the Latin poets, and of original satires. His "echoing sonnets"—such as *Después que al mundo el rey divino vino*—lend themselves to parody; but his diction is singularly pure.

His brother, BARTOLOMÉ LEONARDO DE ARGENSOLA (1562–1631), Spanish poet and historian, was baptized at Barbastro on the 26th of August 1562, studied at Huesca, took orders, and was presented to the rectory of Villahermosa in 1588. He was attached to the suite of the count de Lemos, viceroy of Naples, in 1610, and succeeded his brother as historiographer of Aragon in 1613. He died at Saragossa on the 4th of February 1631. His principal prose works are the *Conquista de las Islas Molucas* (1609), and a supplement to Zurita's *Anales de Aragón*, which was published in 1630. His poems (1634), like those of his elder brother, are admirably finished examples of pungent wit. His commentaries on contemporary events, and his *Alteraciones populares*, dealing with a Saragossa rising in 1591, are lost. An interesting life of this writer by Father Miguel Mir precedes a reprint of the *Conquista de las Islas Molucas*, issued at Saragossa in 1891.

ARGENSON, the name, derived from an old hamlet situated in what is now the department of Indre-et-Loire, of a French family which produced some prominent statesmen, soldiers and men of letters.

RENÉ DE VOYER, seigneur d'Argenson (1596–1651), French statesman, was born on the 21st of November 1596. He was a lawyer by profession, and became successively *avocat*, councillor at the parlement of Paris, *maître des requêtes*, and councillor of state. Cardinal Richelieu entrusted him with several missions as inspector and intendant of the forces. In 1623 he was appointed intendant of justice, police and finance in Auvergne, and in 1632 held similar office in Limousin, where he remained till 1637. After the death of Louis XIII. (1643) he retained his administrative posts, was intendant of the forces at Toulon

(1646), commissary of the king at the estates of Languedoc (1647), and intendant of Guienne (1648), and showed great capacity in defending the authority of the crown against the rebels of the Fronde. After his wife's death he took orders (February 1651), but did not cease to take part in affairs of state. In 1651 he was appointed by Mazarin ambassador at Venice, where he died on the 14th of July 1651.

His son, MARC RENÉ DE VOYER, comte d'Argenson (1623–1700), was born at Blois on the 13th of December 1623. He also was a lawyer, being councillor at the parlement of Rouen (1642) and *maître des requêtes*. He attended his father in all his duties and succeeded him at the embassy at Venice. In 1655 he returned from his embassy ruined, and lost favour with Mazarin, who removed him from his office of councillor of state. He then gave up public affairs and retired to his estates, where he occupied himself with good works. In September 1656 he entered the Company of the Holy Sacrament, a secret society for the diffusion of the Catholic religion. Besides writing the *Annals* of the society, he composed many pious works, which were destroyed in the fire at the Louvre in 1871. Some of his correspondence with the once famous letter-writer, Jean Louis Guez de Balzac (1597–1654), has been published. He died in May 1700, leaving two sons, Marc René (see below), and François Élie (1656–1728), who became archbishop of Bordeaux.

See Fr. Rabbe, "Compagnie du Saint-Sacrement," in the *Revue historique* (Nov. 1899); Beauchet-Filleau, *Les Annales de la compagnie du Saint-Sacrement* (Paris, 1900); R. Allier, *La Cabale des dévots* (Paris, 1902).

MARC RENÉ DE VOYER, marquis de Paulmy and marquis d'Argenson (1652–1721), son of the preceding, was born at Venice on the 4th of November 1652. He became *avocat* in 1669, and lieutenant-general in the *sénéchaussée* of Angoulême (1679). After the death of Colbert, who disliked his family, he went to Paris and married Marguerite Lefèvre de Caumartin, a kinswoman of the comptroller-general Pontchartrain. This was the beginning of his fortunes. He became successively *maître des requêtes* (1694), member of the *conseil des prises* (prize court) (1695), *procureur-général* of the commission of inquest into false titles of nobility (1696), and finally lieutenant-general of police (1697). This last office, which had previously been filled by N. G. de la Reynie, was very important. It not only gave him the control of the police, but also the supervision of the corporations, printing press, and provisioning of Paris. All contraventions of the police regulations came under his jurisdiction, and his authority was arbitrary and absolute. Fortunately, he had, in Saint-Simon's phrase, "a nice discernment as to the degree of rigour or leniency required for every case that came before him, being ever inclined to the mildest measures, but possessed of the faculty of making the most innocent tremble before him; courageous, bold, audacious in quelling *émeutes*, and consequently the master of the people." During the twenty-one years that he exercised this office he was a party to every private and state secret; in fact, he had a share in every event of any importance in the history of Paris. He was the familiar friend of the king, who delighted in scandalous police reports; he was patronized by the duke of Orleans; he was supported by the Jesuits at court; and he was feared by all. He organized the supply of food in Paris during the severe winter of 1709, and endeavoured, but with little success, to run to earth the libellers of the government. He directed the destruction of the Jansenist monastery of Port Royal (1709), a proceeding which provoked many protests and pamphlets. Under the regency, the Chambre de Justice, assembled to inquire into the malpractices of the financiers, suspected d'Argenson and arrested his clerks, but dared not lay the blame on him. On the 28th of January 1718 he voluntarily resigned the office of lieutenant-general of police for those of keeper of the seals—in the place of the chancellor d'Aguesseau—and president of the council of finance. He was appointed by the regent to suppress the resistance of the parlements and to reorganize the finances, and was in great measure responsible for permitting John Law to apply his financial system, though he soon quarrelled with Law and intrigued to bring about his downfall. The regent threw the blame for the outcome of Law's schemes on d'Argenson, who was forced to resign his position in the council of finance (January 1720). By way of compensation he was created inspector-general of the police of the whole kingdom, but had to resign his office of keeper of the seals (June 1720). He died on the 8th of May 1721, the people of Paris throwing taunts and stones at his coffin and accusing him of having ruined the kingdom. In 1716 he had been created an honorary member of the Académie des Sciences and, in 1718, a member of the French Academy.

See the contemporary memoirs, especially those of Saint-Simon (de Boislisle's ed.), Dangeau and Math. Marais; Barbier's *Journal*; "Correspondance administrative sous Louis XIV." in *Coll. des doc. inéd. sur l'histoire de France*, edited by G. B. Depping (1850–1855); *Correspondance des contrôleurs-généraux des finances*, pub. by de Boislisle (1873–1900); *Correspondance de M. de Marville avec M. de Maurepas* (1896–1897); *Rapports de police de René d'Argenson*, pub. by P. Cottin (Paris, undated); P. Clément, *La police sous Louis XIV.* (1873).

RENÉ LOUIS DE VOYER DE PAULMY, marquis d'Argenson (1694–1757), eldest son of the preceding, was a lawyer, and held successively the posts of councillor at the parlement (1716), *maître des requêtes* (1718), councillor of state (1719), and intendant of justice, police and finance in Hainaut. During his five years' tenure of the last office he was mainly employed in provisioning the troops, who were suffering from the economic confusion resulting from Law's system. He returned to court in 1724 to exercise his functions as councillor of state. At that time he had the reputation of being a conscientious man, but ill adapted to intrigue, and was nicknamed "la bête." He entered into relations with the philosophers, and was won over to the ideas of reform. He was the friend of Voltaire, who had been a fellow-student of his at the Jesuit college Louis-le-grand, and frequented the Club de l'Entresol, the history of which he wrote in his memoirs. It was then that he prepared his *Considérations sur le gouvernement de la France*, which was published posthumously by his son. He was also the friend and counsellor of the minister G. L. de Chauvelin. In May 1744 he was appointed member of the council of finance, and in November of the same year the king chose him as secretary of state for foreign affairs, his brother, the comte d'Argenson (see below), being at the same time secretary of state for war. France was at that time engaged in the War of the Austrian Succession, and the government had been placed by Louis XV. virtually in the hands of the two brothers. The marquis d'Argenson endeavoured to reform the system of international relations. He dreamed of a "European Republic," and wished to establish arbitration between nations in pursuance of the ideas of his friend the abbé de Saint-Pierre. But he failed to realize any part of his projects. The generals negotiated in opposition to his instructions; his colleagues laid the blame on him; the intrigues of the courtiers passed unnoticed by him; whilst the secret diplomacy of the king neutralized his initiative. He concluded the marriage of the dauphin to the daughter of Augustus III., king of Poland, but was unable to prevent the election of the grand-duke of Tuscany as emperor in 1745. On the 10th of January 1747 the king thanked him for his services. He then retired into private life, eschewed the court, associated with Voltaire, Condillac and d'Alembert, and spent his declining years in working at the Académie des Inscriptions, of which he was appointed president by the king in 1747, and revising his *Mémoires*. Voltaire, in one of his letters, declared him to be "the best citizen that had ever tasted the ministry." He died on the 26th of January 1757.

He left a large number of manuscript works, of which his son, Antoine René (1722-1787), known as the marquis de Paulmy, published the *Considérations sur le gouvernement de France* (Amsterdam, 1764) and *Essais dans le goût de ceux de Montaigne* (*ib.* 1785). The latter, which contains many useful biographical notes and portraits of his contemporaries, was republished in 1787 as *Loisirs d'un ministre d'état*. Argenson's most important work, however, is his *Mémoires*, covering in great detail the years 1725 to 1756, with an introductory part giving his recollections since the year 1696. They are, as they were intended to be,

valuable "materials for the history of his time." There are two important editions, the first, with some letters, not elsewhere published, by the marquis d'Argenson, his great-grand-nephew (5 vols., Paris, 1857 et seq.); the second, more correct, but less complete, published by J. B. Rathery, for the Société de l'Histoire de France (9 vols., Paris, 1859 et seq.). The other works of the marquis d'Argenson, in MS., were destroyed in the fire at the Louvre library in 1871.

See Sainte-Beuve, *Causeries du lundi* (vols. xii. and xiv.); Levasseur, "Le Marquis d'Argenson" in the *Mémoires de l'Académie des Sciences Morales et Politiques* (vol. lxxxvii., 1868); and, especially, E. Zevort, *Le Marquis d'Argenson et le ministère des affaires étrangères* (Paris, 1880). See also G. de R. de Flassan, *Histoire de la diplomatie française* (2nd ed., 1811); Voltaire, *Siècle de Louis XV.*; E. Boutaric, *Correspondance secrète inédite de Louis XV.* (1866); E. Champion, "Le Marquis d'Argenson," in the *Révolution française* (vol. xxxvi., 1899); A. Alem, *D'Argenson économiste* (Paris, 1899); Arthur Ogle, *The Marquis d'Argenson* (1893).

MARC PIERRE DE VOYER DE PAULMY, comte d'Argenson (1696–1764), younger brother of the preceding, was born on the 16th of August 1696. Following the family tradition he studied law and was councillor at the parlement of Paris. He succeeded his father as lieutenant-general of police in Paris, but held the post only five months (January 26 to June 30, 1720). He then received the office of intendant of Tours, and resumed the lieutenancy of police in 1722. On the 2nd of January 1724 he was appointed councillor of state. He gained the confidence of the regent Orleans, administering his fortune and living with his son till 1737. During this period he opened his salon to the philosophers Chaulieu, la Fare and Voltaire, and collaborated in the legislative labours of the chancellor d'Aguesseau. In March 1737 d'Argenson was appointed director of the censorship of books, in which post he showed sufficiently liberal views to gain the approval of writers—a rare thing in the reign of Louis XV. He only retained this post for a year. He became president of the grand council (November 1738), intendant of the *généralité* of Paris (August 1740), was admitted to the king's council (August 1742), and in January 1743 was appointed secretary of state for war in succession to the baron de Breteuil. As minister for war he had a heavy task; the French armies engaged in the War of the Austrian Succession were disorganized, and the retreat from Prague had produced a disastrous effect. After consulting with Marshal Saxe, he began the reform of the new armies. To assist recruiting, he revived the old institution of local militias, which, however, did not come up to his expectation. In the spring of 1744 three armies were able to resume the offensive in the Netherlands, Germany and Italy, and in the following year France won the battle of Fontenoy, at which d'Argenson was present. After the peace in 1748 he occupied himself with the important work of recasting the French army on the model of the Prussian. He unified the types of cannon, grouped the grenadiers into separate regiments, and founded the École Militaire for the training of officers (1751). An edict of the 1st of November 1751 granted patents of nobility to all who had the rank of general officer. In addition to his duties as minister of war he had the supervision of the printing, postal administration and general administration of Paris. He was responsible for the arrangement of the promenade of the Champs Élysées and for the plan of the present Place de la Concorde. He was exceedingly popular, and, although the court favourites hated him, he had the support of the king. Nevertheless, after the attempt of R. F. Damiens to assassinate the king, Louis abandoned d'Argenson to the machinations of the court favourites and dismissed both him and his colleague, J. B. de Machault d'Arnouville (February 1757). D'Argenson was exiled to his estates at Les Ormes near Saumur, but he had previously found posts for his brother, the marquis d'Argenson, as minister of foreign affairs, for his son Marc René as master of the horse, and for his nephew Marc Antoine René as commissary of war. From the time of his exile he lived in the society of savants and philosophers. He had been elected member of the Académie des Inscriptions in 1749. Diderot and d'Alembert dedicated the *Encyclopédie* to him, and Voltaire, C. J. F. Hénault, and J. F. Marmontel openly visited him in his exile. After the death of Madame de Pompadour he obtained permission to return to Paris, and died a few days after his return, on the 22nd of August 1764.

MARC ANTOINE RENÉ DE VOYER, marquis de Paulmy d'Argenson (1722–1787), nephew of the preceding and son of René Louis, was born at Valenciennes on the 22nd of November 1722. Appointed councillor at the parlement (1744), and *maître des requêtes* (1747), he was associated with his father in the ministry of foreign affairs and with his uncle in the ministry of war, and, in recognition of this experience, was commissioned to inspect the troops and fortifications and sent on embassy to Switzerland (1748). In 1751 his uncle recognized him as his deputy and made over to him the reversion of the secretariate of war. He then worked on the great reform of the army, and after the dismissal of his uncle became minister of war (February 1757). But the outbreak of the Seven Years' War made this post exceedingly difficult to hold, and he resigned on the 23rd of March 1758. He was ambassador to Poland from 1762 to 1764, but failed to procure the nomination of the French candidate to that throne. From 1766 to 1770 he was ambassador at Venice. Failing to obtain the embassy at Rome, he retired at the age of forty-eight and devoted the rest of his life to indulging his tastes for history and biography. He brought together a large library, very rich in French poetry and romance, and undertook various publications with the help of his librarian. In 1775 he began his *Bibliothèque universelle des romans*, of which forty volumes appeared within three years, but subsequently handed over the publication to other editors. His great work, *Mélanges tirés d'une grande bibliothèque*, was published in 65 volumes (Paris, 1779–1788). At his death he forbade his library to be dispersed: it was bought by the comte d'Artois (afterwards Charles X.) and formed the nucleus of the present Bibliothèque de l'Arsenal at Paris (the marquis having been governor of the arsenal). He died on the 13th of August 1787.

See contemporary memoirs; also Dacier's eulogium in the *Académie des Inscriptions et Belles-Lettres* (November 1788); and Sainte-Beuve, *Causeries du lundi* (vol. xii.).

MARC RENÉ, marquis de Voyer de Paulmy d'Argenson (1721–1782), known as the marquis de Voyer, son of Marc Pierre de Voyer, the minister of war, was born in Paris on the 20th of September 1721. He served in the army of Italy and the army of Flanders in the War of the Austrian Succession, and was *mestre de camp* (proprietary colonel) of the regiment of Berry cavalry at the battle of Fontenoy (May 10, 1745), where he was promoted brigadier. He was associated with his father in his work of reorganizing the army, was made inspector of cavalry and dragoons (1749), and succeeded his father as master of the horse (1752). He introduced English horses into France. He was lieutenant-general of Upper Alsace in 1753 and governor of Vincennes in 1754, and served afterwards under Soubise in the Seven Years' War. He was wounded at Crefeld in 1758, and was promoted lieutenant-general (1759). He followed his father into exile at Les Ormes (1763), and in the last years of the reign of Louis XV. sided with the malcontents headed by Choiseul; but on the rupture with England he rejoined the service of the king (1775). He was appointed inspector of the sea-board, and put the roadstead of the island of Aix in a state of defence during the American War of Independence. He caught marsh-fever while attempting to drain the marshes of Rochefort, and died at Les Ormes on the 18th of September 1782.

MARC RENÉ MARIE DE VOYER DE PAULMY, marquis d'Argenson (1771–1842), son of the preceding, was born in Paris in September 1771. He was brought up by his father's cousin, the marquis de Paulmy, governor of the arsenal, and was made lieutenant of dragoons in 1789. Although, at the age of eighteen, he had succeeded to several estates and a large fortune, he embraced the revolutionary cause, joining the army of the North as Lafayette's aide-de-camp and remaining with it even after Lafayette's defection. Leaving France to take one of his sisters to England, he was denounced on his return as a royalist conspirator, on the charge of having in his possession portraits of the royal family. He then went to live in Touraine, married

the widow of Prince Victor de Broglie, and saved her and her children from proscription. He introduced new agricultural instruments and processes on his estates, and installed machinery imported from England in his ironworks in Alsace. He was an enthusiastic adherent of Napoleon, by whom he was appointed in May 1809 prefect of Deux-Nèthes. He helped to repel the English invasion of the islands of South Beveland and Walcheren (August 1809), and afterwards directed the defence works of Antwerp, but resigned this post (March 1813) in consequence of the complaints of the inhabitants and the exacting demands of the emperor. In May 1814 he refused the prefecture of Marseilles offered to him by the Bourbons, but was elected deputy from Belfort in 1815 during the Hundred Days. On the 5th of July 1815 he took part in the declaration protesting against any tampering with the immutable rights of the nation. He was a member of the *Chambre introuvable*, where he became one of the orators of the democratic party. He was one of the founders of the journal *Le censeur européen* and of the *Club de la liberté de la presse*, and was an uncompromising opponent of reaction. Not re-elected in 1824 on account of his liberal ideas, he returned to the chamber under the Martignac ministry (1828), and resolutely persisted in his championship of the liberty of the press and of public worship. On the death of his wife he voluntarily renounced his mandate (July 1829), and hailed the revolution of 1830 with great satisfaction. On the 3rd of November 1830 he was elected to the chamber as deputy from Châtellerault, and took the oath, adding, however, the reservation "subject to the progress of the public reason." His independent attitude resulted in his defeat in the following year at the Châtellerault election, but he was returned for Strassburg. He wished the incidence of the taxes to be arranged according to social condition, and advocated a single tax proportionate to income like the English income tax. He harped incessantly on this idea in his speeches and articles (see his letters in *La Tribune* of June 20, 1832). Although he was a proprietor of ironworks he opposed the protectionist laws, which he considered injurious to the workmen. He became the mouthpiece of the advanced ideas; subsidized the opposition newspapers, especially the *National*; received into his house F. M. Buonarroti, who in 1796 had been implicated in the conspiracy of "Gracchus" Babeuf (*q.v.*); and became a member of the committee of the Society of the Rights of Man. He was even sued in the courts for a pamphlet called *Boutade d'un homme riche à sentiments populaires*, and delivered a speech to the jury in which he displayed very daring social theories. But he gradually grew discouraged and retired from public affairs, refusing even municipal office, and living in seclusion at La Grange in the forest of Guerche, where he devoted his inventive faculty to devising agricultural improvements. He subsequently returned to Paris, where he died on the 1st of August 1842.

CHARLES MARC RENÉ DE VOYER, marquis d'Argenson (1796–1862), son of the preceding, was born at Boulogne-sur-Seine on the 20th of April 1796. He concerned himself little with politics. He was, however, a member of the council-general of Vienne for six years, but was expelled from it in 1840 in consequence of his advanced ideas and his relations with the Opposition. In 1848 he was elected deputy from Vienne to the Constituent Assembly by 12,000 votes. He was an active member of the Archaeological Society of Touraine and the Society of Antiquaries of the West, and wrote learned works for these bodies. He collaborated in preparing the archives of the scientific congress at Tours in 1847; brought out two editions of the MSS. of his great-grand-uncle, the minister of foreign affairs under Louis XV., under the title *Mémoires du marquis d'Argenson*, one in 1825, and the other, in 5 vols., in 1857–1858; and published *Discours et opinions de mon père, M. Voyer d'Argenson* (2 vols., 1845). He died on the 31st of Juy 1862.

ARGENTAN, a town of north-western France, capital of an arrondissement in the department of Orne, 27 m. N.N.W. of Alençon on the railway from Le Mans to Caen. Pop. (1906) 5072. It is situated on the slope of a hill on the right bank of the Orne at its confluence with the Ure. The town has remains of old fortifications, among them the Tour Marguerite, and a château, now used as a law-court, dating from the 15th century. The church of St Germain (15th, 16th and 17th centuries) has several features of architectural beauty, notably the sculptured northern portal, and the central and western towers. The church of St Martin, dating from the 15th century, has good stained glass. The handsome modern town-hall contains among other institutions the tribunal of commerce, the museum and the library. Argentan is the seat of a sub-prefect, has a tribunal of first instance and a communal college. Leather-working and the manufacture of stained glass are leading industries. There are quarries of limestone in the vicinity. Argentan was a viscounty from the 11th century onwards; it was often taken and pillaged. During the Religious Wars it remained attached to the Catholic party. François Eudes de Mézeray, the historian, was born near the town, and a monument has been erected to his memory.

ARGENTEUIL, a town of northern France in the department of Seine-et-Oise, on the Seine, 5 m. N.W. of the fortifications of Paris by the railway from Paris to Mantes. Pop. (1906) 17,330. Argenteuil grew up round a monastery, which, dating from A.D. 656, was by Charlemagne changed into a nunnery; it was afterwards famous for its connexion with Héloïse (see ABELARD), and on her expulsion in 1129 was again turned into a monastery. Asparagus, figs, and wine of medium quality are grown in the district; and heavy iron goods, chemical products, clocks and plaster are among the manufactures.

ARGENTINA, or the ARGENTINE REPUBLIC (officially, *Republica Argentina*), a country occupying the greater part of the southern extremity of South America. It is of wedge shape, extending from 21° 55′ S. to the most southerly point of the island of Tierra del Fuego in 55° 2′ 30″ S., while its extremes of longitude are 53° 40′ on the Brazilian frontier and 73° 17′ 30″ W. on the Chilean frontier. Its length from north to south is 2285 statute miles, and its greatest width about 930 m. It is the second largest political division of the continent, having an area of 1,083,596 sq. m. (Gotha measurement). It is bounded N. by Bolivia and Paraguay, E. by Paraguay, Brazil, Uruguay and the Atlantic, W. by Chile, and S. by the converging lines of the Atlantic and Chile.

Boundaries.—At different times Argentina has been engaged in disputes over boundary lines with every one of her neighbours, that with Chile being only settled in 1902. Beginning at the estuary of the Rio de la Plata, the boundary line ascends the Uruguay river, on the eastern side of the strategically important island of Martin Garcia, to the mouth of the Pequiry, thence under the award of President Grover Cleveland in 1894 up that small river to its source and in a direct line to the source of the Santo Antonio, a small tributary of the Iguassú, thence down the Santo Antonio and Iguassú to the upper Paraná, which forms the southern boundary of Paraguay. From the confluence of the upper Paraná and Paraguay the line ascends the latter to the mouth of the Pilcomayo, which river, under the award of President R. B. Hayes in 1878, forms the boundary between Argentina and Paraguay from the Paraguay river north-west to the Bolivian frontier. In accordance with the Argentine-Bolivian treaty of 1889 the boundary line between these republics continues up the Pilcomayo to the 22nd parallel, thence west to the Tarija river, which it follows down to the Bermejo, thence up the latter to its source, and westerly through the Quiaca ravine and across to a point on the San Juan river opposite Esmoraca. From this point it ascends the San Juan south and west to the Cerro de Granadas, and thence south-west to Cerro Incahuasi and Cerro Zapalegui on the Chilean frontier. The boundary with Chile, extending across more than 32° lat., had been the cause of disputes for many years, which at times led to costly preparations for war. The debts of the two nations resulted largely from this one cause. In 1881 a treaty was signed which provided that the boundary line should follow the highest crests of the Andes forming the watershed as far south as the 52nd parallel, thence east to the 70th meridian and south-east to Cape Dungeness at the eastern entrance to the Straits of Magellan. Crossing the Straits the line should follow

the meridian of 68° 44′, south to Beagle Channel, and thence east to the Atlantic, giving Argentina the eastern part of the Tierra del Fuego and Staten Island. By this agreement Argentina was confirmed in the possession of the greater part of Patagonia, while Chile gained control of the Straits of Magellan, much adjacent territory on the north, the larger part of Tierra del Fuego and all the neighbouring islands south and west.

When the attempt was made to mark this boundary the commissioners were unable to agree on a line across the Puna de Atacama in the north, where parallel ranges enclosing a high arid plateau without any clearly defined drainage to the Atlantic or Pacific, gave an opportunity for conflicting claims. In the south the broken character of the Cordillera, pierced in places by large rivers flowing into the Pacific and having their upper drainage basins on the eastern side of the line of highest crests, gave rise to unforeseen and very difficult questions. Finally, under a convention of the 17th of April 1896, these conflicting claims were submitted to arbitration. In 1899 a mixed commission with Hon. W. I. Buchanan, United States minister at Buenos Aires, serving as arbitrator, reached a decision on the Atacama line north of 26° 52′ 45″ S. lat., which was a compromise though it gave the greater part of the territory to Argentina. The line starts at the intersection of the 23rd parallel with the 67th meridian and runs south-westerly and southerly to the mountain and volcano summits of Rincón, Socompa, Llullaillaco, Azufre, Aguas Blancas and Sierra Nevada, thence to the initial point of the British award. (See *Geogr. Jour.*, 1899, xiv. 322-323.) The line south of 26° 52′ 45″ S. lat. had been located by the commissioners of the two republics with the exception of four sections. These were referred to the arbitration of Queen Victoria, and, after a careful survey under the direction of Sir Thomas H. Holdich, the award was rendered by King Edward VII. in 1902. (See *Geogr. Jour.*, 1903, xxi. 45-50.) In the first section the line starts from a pillar erected in the San Francisco pass, about 26° 50′ S. lat., and follows the water-parting southward to the highest peak of the Tres Cruces mountains in 27° 0′ 45″ S. lat., 68° 49′ 5″ W. long. In the second, the line runs from 40° 2′ S. lat., 71° 40′ 36″ W. long., along the water-parting to the southern termination of the Cerro Perihueico in the valley of the Huahum river, thence across that river, 71° 40′ 36″ W. long., and along the water-parting around the upper basin of the Huahum to a junction with the line previously determined. In the third and longest section, the line starts from a pillar erected in the Perez Rosales pass, near Lake Nahuel-Huapi, and follows the water-parting southward to the highest point of Mt. Tronador, and thence in a very tortuous course along local water-partings and across the Chilean rivers Manso, Puelo, Fetaleufu, Palena, Pico and Aisen, and the lakes Buenos Aires, Pueyrredón and San Martin, to avoid the inclusion of Argentine settlements within Chilean territory, to the Cerro Fitzroy and continental water-parting north-west of Lake Viedma, between 49° and 50° S. lat. The northern half of this line does not run far from the 72nd meridian, except in 44° 30′ S. where it turns eastward nearly a degree to include the upper valley of the Frias river in Chilean territory, but south of the 49th parallel it curves westward to give Argentina sole possession of lakes Viedma and Argentino. The fourth section, which was made particularly difficult of solution by the extension inland of the Pacific coast inlets and sounds and by the Chilean colonies located there, was adjusted by running the line eastward from the point of divergence in 50° 50′ S. lat. along the Sierra Baguales, thence south and south-east to the 52nd parallel, crossing several streams and following the crests of the Cerro Cazador. The Chilean settlement of Ultima Esperanza (Last Hope), over which there had been much controversy, remains under Chilean jurisdiction.

Physical Geography.—For purposes of surface description, Argentina may be divided primarily into three great divisions—the mountainous zone and tablelands of the west, extending the full length of the republic; the great plains of the east, extending from the Pilcomayo to the Rio Negro; and the desolate, arid steppes of Patagonia. The first covers from one-third to one-fourth of the width of the country between the Bolivian frontier and the Rio Negro, and comprises the elevated Cordilleras and their plateaus, with flanking ranges and spurs toward the east. In the extreme north, extending southward from the great Bolivian highlands, there are several parallel ranges, the most prominent of which are: the Sierra de Santa Catalina, from which the detached Cachi, Gulumpaji and Famatina ranges project southward; and the Sierra de Santa Victoria, south of which are the Zenta, Aconquija, Ambato and Ancaste ranges. These minor ranges, excepting the Zenta, are separated from the Andean masses by comparatively low depressions and are usually described as distinct ranges; topographically, however, they seem to form a continuation of the ranges running southward from the Santa Victoria and forming the eastern rampart of the great central plateau of which the Puna de Atacama covers a large part. The elevated plateaus between these ranges are semi-arid and inhospitable, and are covered with extensive saline basins, which become lagoons in the wet season and morasses or dry salt-pans in the dry season. These saline basins extend down to the lower terraces of Córdoba, Mendoza and La Pampa. Flanking this great widening of the Andes on the south-east are the three short parallel ranges of Córdoba, belonging to another and older formation. North of them is the great saline depression, known as the "salinas grandes," 643 ft. above sea-level, where it is crossed by a railway; north-east is another extensive saline basin enclosing the "Mar Chiquita" (of Córdoba) and the morasses into which the waters of the Rio Saladillo disappear; and on the north are the more elevated plains, partly saline, of western Córdoba, which separate this isolated group of mountains from the Andean spurs of Rioja and San Luis. The eastern ranges parallel to the Andes are here broken into detached extensions and spurs, which soon disappear in the elevated western pampas, and the Andes contract south of Aconcagua to a single range, which descends gradually to the great plains of La Pampa and Neuquen. The lower terrace of this great mountainous region, with elevations ranging from 1000 to 1500 ft., is in reality the western margin of the great Argentine plain, and may be traced from Oran (1017 ft.) near the Bolivian frontier southward through Tucumán (1476 ft.), Frias (1129 ft.), Córdoba (1279 ft.), Rio Cuarto (1358 ft.), Paunero (1250 ft.), and thence westward and southward through still unsettled regions to the Rio Negro at the confluence of the Neuquen and Limay.

The Argentine part of the great La Plata plain extends from the Pilcomayo south to the Rio Negro, and from the lower terraces of the Andes eastward to the Uruguay and Atlantic. In the north the plain is known as the Gran Chaco, and includes the country between the Pilcomayo and Salado del Norte and an extensive depression immediately north of the latter river, believed to be the undisturbed bottom of the ancient Pampean sea. The northern part of the Gran Chaco is partly wooded and swampy, and as the slope eastward is very gentle and the rivers much obstructed by sand bars, floating trees and vegetation, large areas are regularly flooded during rainy seasons. South of the Bermejo the land is more elevated and drier, though large depressions covered with marshy lagoons are to be found, similar to those farther north. The forests here are heavier. Still farther south and south-west there are open grassy plains and large areas covered with salt-pans. The general elevation of the Chaco varies from 600 to 800 ft. above sea-level. The Argentine "mesopotamia," between the Paraná and Uruguay rivers, belongs in great measure to this same region, being partly wooded, flat and swampy in the north (Corrientes), but higher and undulating in the south (Entre Rios). The Misiones territory of the extreme north-east belongs to the older highlands of Brazil, is densely wooded, and has ranges of hills sometimes rising to a height of 1000 to 1300 ft.

The remainder of the great Argentine plain is the treeless, grassy *pampa* (Quichua for "level spaces"), apparently a dead level, but in reality rising gradually from the Atlantic westward toward the Andes. Evidence of this is to be found in the altitudes of the stations on the Buenos Aires and Pacific railway running a little north of west across the pampas to Mendoza. The average elevation of Buenos Aires is about 65 ft.; of Mercedes, 70 m. westward, 132 ft.; of Junín (160 m.), 267 ft.; and of Paunero (400 m.) it is 1250 ft., showing an average rise of about 3 ft. in a mile. The apparently uniform level of the pampas is much broken along its southern margin by the Tandil and Ventana sierras, and by ranges of hills and low mountains in the southern and western parts of the territory of La Pampa. Extensive depressions also are found, some of which are subject to inundations, as along the lower Salado in Buenos Aires and along the lower courses of the Colorado and Negro. In the extreme west, which is as yet but slightly explored and settled, there is an extensive depressed area, largely saline in character, which drains into lakes and morasses, having no outlet to the ocean. The rainfall is under 6 in. annually, but the drainage from the eastern slopes of the Andes is large enough to meet the loss from evaporation and keep these inland lakes from drying up. At an early period this depressed area drained southward to the Colorado, and the bed of the old outlet can still be traced. The rivers belonging to this inland drainage system are the Vermejo, San Juan and Desaguadero, with their affluents, and their southward flow can be traced from about 28° S. lat. to the great lagoons and morasses between 36° and 37° S. lat. in the western part of La Pampa territory. Some of the principal affluents are the Vinchina and Jachal, of Zanjon, which flow into the Vermejo, the Patos, which flows into the San Juan, and the Mendoza, Tunuyan and Diamante which

flow into the Desaguadero, all of these being Andean snow-fed rivers. The Desaguadero also receives the outflow of the Laguna Bebedero, an intensely saline lake of western San Luis. The lower course of the Desaguadero is known as the Salado because of the brackish character of its water. Another considerable river flowing into the same great morass is the Atuel, which rises in the Andes not far south of the Diamante. (A description of the Patagonian part of Argentina will be found under PATAGONIA.)

Rivers and Lakes.—The hydrography of Argentina is of the simplest character. The three great rivers that form the La Plata system—the Paraguay, Paraná and Uruguay—have their sources in the highlands of Brazil and flow southward through a great continental depression, two of them forming eastern boundary lines, and one of them, the Paraná, flowing across the eastern part of the republic. The northern part of Argentina, therefore, drains eastward from the mountains to these rivers, except where some great inland depression gives rise to a drainage having no outlet to the sea, and except, also, in the "mesopotamia" region, where small streams flow westward into the Paraná and eastward into the Uruguay. The largest of the rivers through which Argentina drains into the Plata system are the Pilcomayo, which rises in Bolivia and flows south-east along the Argentine frontier for about 400 m.; the Bermejo, which rises on the northern frontier and flows south-east into the Paraguay; and the Salado del Norte (called Rio del Juramento in its upper course), which rises on the high mountain slopes of western Salta and flows south-east into the Paraná. Another river of this class is the Carcarañal, about 300 m. long, formed by the confluence of the Tercero and Cuarto, whose sources are in the Sierra de Córdoba; it flows eastward across the pampas, and discharges into the Paraná at Gaboto, about 40 m. above Rosario. Other small rivers rising in the Córdoba sierras are the Primero and Segundo, which flow into the lagoons of north-east Córdoba, and the Quinto, which flows south-easterly into the lagoons and morasses of southern Córdoba. The Luján rises near Mercedes, province of Buenos Aires, is about 150 m. long, and flows north-easterly into the Paraná delta. Many smaller streams discharge into the Paraguay and Paraná from the west, some of them wholly dependent upon the rains, and drying up during long droughts. The Argentine "mesopotamia" is well watered by a large number of small streams flowing north and west into the Paraná, and east into the Uruguay. The largest of these are the Corrientes, Feliciano and Gualeguay of the western slope, and the Aguapey and Miriñay of the eastern. None of the tributaries of the La Plata system thus far mentioned is navigable except the lower Pilcomayo and Bermejo for a few miles. These Chaco rivers are obstructed by sand bars and snags, which could be removed only by an expenditure of money unwarranted by the present population and traffic. In the southern pampa region there are many small streams, flowing into the La Plata estuary and the Atlantic; most of these are unknown by name outside the republic. The largest and only important river is the Salado del Sud, which rises in the north-west corner of the province of Buenos Aires and flows south-east for a distance of 360 m. into the bay of Samborombon. On the southern margin of the pampas are the Colorado and Negro, both large, navigable rivers flowing entirely across the republic from the Andes to the Atlantic. Many of the rivers of Argentina, as implied by their names (Salado and Saladillo), are saline or brackish in character, and are of slight use in the pastoral and agricultural industries of the country. The lakes of Argentina are exceptionally numerous, although comparatively few are large enough to merit a name on the ordinary general map. They vary from shallow, saline lagoons in the north-western plateaus, to great, picturesque, snow-fed lakes in the Andean foothills of Patagonia. The province of Buenos Aires has more than 600 lakes, the great majority small, and some brackish. The La Pampa territory also is dotted with small lakes. The Bebedero, in San Luis, and Porongos, in Córdoba, and others, are shallow, saline lakes which receive the drainage of a considerable area and have no outlet. The large saline Mar Chiquita, of Córdoba, is fed from the Sierra de Córdoba and has no outlet. In the northern part of Corrientes there is a large area of swamps and shallow lagoons which are believed to be slowly drying up.

Harbours.—Although having a great extent of coast-line, Argentina has but few really good harbours. The two most frequented by ocean-going vessels are Buenos Aires and Ensenada (La Plata), both of which have been constructed at great expense to overcome natural disadvantages. Perhaps the best natural harbour of the republic is that of Bahia Blanca, a large bay of good depth, sheltered by islands, and 534 m. by sea south of Buenos Aires; here the government is building a naval station and port called Puerto Militar or Puerto Belgrano, and little dredging is needed to render the harbour accessible to the largest ocean-going vessels. About 100 m. south of Bahia Blanca is the sheltered bay of San Blas, which may become of commercial importance, and between the 42nd and 43rd parallels are the land-locked bays of San José and Nueva (Golfo Nuevo)—the first as yet unused; on the latter is Puerto Madryn, 838 m. from Buenos Aires, the outlet for the Welsh colony of Chubut. Other small harbours on the lower Patagonian coast are not prominent, owing to lack of population. An occasional Argentine steamer visits these ports in the interests of colonists. The best-known among them are Puerto Deseado (Port Desire) at the mouth of the Deseado river (1253 m.), Santa Cruz, at the mouth of the Santa Cruz river (1481 m.), and Ushuaia, on Beagle Channel, Tierra del Fuego. North of Buenos Aires, on the Paraná river, is the port of Rosario, the outlet for a rich agricultural district, ranking next to the federal capital in importance. Other river ports, of less importance, are Concordia on the Uruguay river, San Nicolás and Campana on the Paraná river, Santa Fé on the Salado, a few miles from the Paraná, the city of Paraná on the Paraná river, and Gualeguay on the Gualeguay river.

Geology.—The Pampas of Argentina are generally covered by loess. The Cordillera, which bounds them on the west, is formed of folded beds, while the Sierras which rise in their midst, consist mainly of gneiss, granite and schist. In the western Sierras, which are more or less closely attached to the main chain of the Cordillera, Cambrian and Silurian fossils have been found at several places. These older beds are overlaid, especially in the western part of the country, by a sandstone series which contains thin seams of coal and many remains of plants. At Bajo de Velis, in San Luis, the plants belong to the "Glossopteris flora," which is so widely spread in South Africa, India and Australia, and the beds are correlated with the Karharbári series of India (Permian or Permo-Carboniferous). Elsewhere the plants generally indicate a higher horizon and are considered to correspond with the Rhaetic of Europe. Jurassic beds are known only in the Cordillera itself, and the Cretaceous beds, which occur in the west of the country, are of freshwater origin. As far west, therefore, as the Cordillera, there is no evidence that any part of the region was ever beneath the sea in Mesozoic times, and the plant-remains indicate a land connexion with Africa. This view is supported by Neumayr's comparison of Jurassic faunas throughout the world. The Lower Tertiary consists largely of reddish sandstones resting upon the old rocks of the Cordillera and of the Sierras. Towards the east they lie at a lower level; but in the Andes they reach a height of nearly 10,000 ft., and are strongly folded, showing that the elevation of the chain was not completed until after their deposition. The marine facies of the later Tertiaries is confined to the neighbourhood of the coast, and was probably formed after the elevation of the Andes; but inland, freshwater deposits of this period are met with, especially in Patagonia. Contemporaneous volcanic rocks are associated with the Ordovician beds and with the Rhaetic sandstones in several places. During the Tertiary period the great volcanoes of the Andes were formed, and there were smaller eruptions in the Sierras. The principal rocks are andesites, but trachytes and basalts are also common. Great masses of granite, syenite and diorite were intruded at this period, and send tongues even into the andesitic tuffs.

Silver, gold, lead and copper ores occur in many localities. They are found chiefly in the neighbourhood of the eruptive masses of the hilly regions. (See also ANDES.)[1]

Climate.—The great extent of Argentina in latitude—about 33°—and its range in altitude from sea-level westward to the permanently snow-covered peaks of the Andes, give it a highly diversified climate, which is further modified by prevailing winds and mountain barriers. The temperature and rainfall are governed by conditions different from those in corresponding latitudes of the northern hemisphere. Southern Patagonia and Tierra del Fuego, for instance, although they correspond in latitude to Labrador, are made habitable and an excellent sheep-grazing country by the southerly equatorial current along the continental coast. The climate, however, is colder than the corresponding latitudes of western Europe, because of the prevailing westerly winds, chilled in crossing the Andes. In the extreme north-west an elevated region, whose aridity is caused by the "blanketing" influence of the eastern Andean ranges, extends southward to Mendoza. The northern part of the republic, east of the mountains, is subject to the oscillatory movements of the south-east trade winds, which cause a division of the year into wet and dry seasons. Farther south, in Patagonia, the prevailing wind is westerly, in which case the Andes again "blanket" an extensive region and deprive it of rain, turning it into an arid desolate steppe. Below this region, where the Andean barrier is low and broken, the moist westerly winds sweep over the land freely and give it a large rainfall, good pastures and a vigorous forest growth. If the republic be divided into sections by east and west lines, diversities of climate in the same latitude appear. In the extreme north a little over a degree and a half of territory lies within the torrid zone, extending from the Pilcomayo about 500 m. westward to the Chilean frontier; its eastern end is in the low, wooded plain of the Gran Chaco, where the mean annual temperature is 73° F., and the annual rainfall is 63 in.; but on the arid, elevated plateau at its western extremity the temperature falls below 57° F., and the rainfall has diminished to 2 in. The character of the soil changes from the alluvial lowlands of the Gran Chaco, covered with forests of palms and other tropical vegetation, to the sandy, saline wastes of the Puna de Atacama, almost barren of vegetation and overshadowed by permanently

[1] For the geology of Argentina, see Stelzner, *Beiträge zur geologie der argentinischen Republik* (Cassel and Berlin, 1885); Brackebusch, *Mapa geológico del Interiore de la República Argentina* (Gotha, 1892); Valentin, *Bosquejo geológico de la Argentina* (Buenos Aires, 1897); Hauthal, "Beiträge zur Geologie der argentinischen Provinz Buenos Aires," *Peterm. Mitt.* vol. l., 1904, pp. 83-92, 112-117, pl. vi.

Reference to Provinces in Chile
1. Tacna
2. Tarapacá
3. Antofagasta
4. Atacama
5. Coquimbo
6. Aconcagua
7. Valparaiso
8. Santiago
9. O'Higgins
10. Colchagua
11. Curicó
12. Talca
13. Linares
14. Maule
15. Ñuble
16. Concepción
17. Arauco
18. Bio-Bio
19. Malleco
20. Cautin
21. Valdivia
22. Llanquihue
23. Chiloé
24. Magallanes
Reference to Departments in Uruguay.
1. Artigas
2. Salto
3. Rivera
4. Paysandú
5. Tacuarembó
6. Rio Negro
7. Durazno
8. Cerro Largo
9. Treinta-y-Tres
10. Soriano
11. Flores
12. Florida
13. Colonia
14. San José
15. Montevideo
16. Canelones
17. Minas
18. Maldonado
19. Rocha
BOLIVIA
PARAGUAY
BRAZIL
URUGUAY
CHILE
ARGENTINA
PACIFIC OCEAN
ATLANTIC OCEAN
Continuation of Chile northwards.
(Same Scale)
PERU
Falkland Islands
ARGENTINA, CHILE, PARAGUAY, AND URUGUAY.
Scale, 1:16,500,000
English Miles
0 50 100 200 300
State Capitals
Capitals of Provinces, Territories, and Departments
Railways
Swamps
Longitude W. of Greenwich
Emery Walker sc.

snow-crowned peaks. Between the 30th and 31st parallels, a region essentially sub-tropical in character, the temperature ranges from 66° on the eastern plains to 62·5° in Córdoba and 64° F. on the higher, arid, sun-parched tablelands of San Juan. The rainfall, which varies between 39 and 47 in. in Entre Rios, decreases to 27 in. in Córdoba and 2 in. in San Juan. The republic has a width of about 745 m. at this point, three-fourths of which is a comparatively level alluvial plain, and the remainder an arid plateau broken by mountain ranges. In the vicinity of Buenos Aires the climatic conditions vary very little from those of the pampa region; the mean annual temperature is about 63° (maximum 104°; minimum 32°), and the annual rainfall is 34 in.; snow is rarely seen. South of the pampa region, on the 40th parallel, the mean temperature varies only slightly in the 370 m. from the mouth of the Colorado to the Andes, ranging from 57° to 55°; but the rainfall increases from 8 in. on the coast to 16 in. on the east slope of the Cordillera. This section is near the northern border of the arid Patagonian steppes. In Tierra del Fuego (lat. 53° to 55°), the climatic conditions are in strong contrast to those of the north. Here the mean temperature is between 46° and 48° in summer and 36° and 38° in winter, rains are frequent, and snow falls every month in the year. The central and southern parts of the island and the neighbouring Staten Island are exceptionally rainy, the latter having 251½ rainy days in the year. The precipitation of rain, snow and hail is about 55 in.

The prevailing winds through this southern region are westerly, being moist below the 52nd parallel, and dry between it and the 40th parallel. In the north and on the pampas the north wind is hot and depressing, while the south wind is cool and refreshing. The north wind usually terminates with a thunderstorm or with a *pampero*, a cold south-west wind from the Andes which blows with great violence, causes a fall in temperature of 15° to 20°, and is most frequent from June to November—the southern winter and spring. In the Andean region, a dry, hot wind from the north or north-west, called the *Zonda*, blows with great intensity, especially in September–October, and causes much discomfort and suffering. It is followed by a cold south wind which often lowers the temperature 25°. The climate of the pampas is temperate and healthy, and is admirably suited to agricultural and pastoral pursuits. Its greatest defect is the cold southerly and westerly storms, which cause great losses in cattle and sheep. The Patagonian coast-line and mountainous region are also healthy, having a dry and bracing climate. In the north, however, the hot lowlands are malarial and unsuited to north European settlement, while the dry, elevated plateaus are celebrated for their healthiness, those of Catamarca having an excellent reputation as a sanatorium for sufferers from pulmonary and bronchial diseases.

Flora.—The flora of Argentina should be studied according to natural zones corresponding to the physical divisions of the country—the rich tropical and sub-tropical regions of the north, the treeless pampas of the centre, the desert steppes of the south, and the arid plateaus of the north-west. The vegetation of each region has its distinctive character, modified here and there by elevation, irrigation from mountain streams, and by the saline character of the soil. In the extreme south, where an Arctic vegetation is found, the pastures are rich, and the forests, largely of the Antarctic beech (*Fagus antarctica*), are vigorous wherever the rainfall is heavy. The greater part of Patagonia is comparatively barren and has no arboreal growth, except in the well-watered valleys of the Andean foothills. The water-courses and depressions of the shingly steppes afford pasturage sufficient for the guanaco, and in places support a thorny vegetation of low growth and starved appearance. The Antaretic beech and Winter's bark (*Drimys Winteri*) are found at intervals along the Andes to the northern limits of this zone. The pampas, which cover so large a part of the republic, have no native trees whatever, and no woods except the scrubby growth of the delta islands of the Paraná, and a fringe of low thorn-bushes along the Atlantic coast south to Mar Chiquita and south of the Tandil sierra, which, strictly speaking, does not belong to this region. The great plains are covered with edible grasses, divided into two classes, *pasto duro* (hard grass) and *pasto blando*, or *tierno* (soft grass)—the former tall, coarse, nutritious and suitable for horses and cattle, and the latter tender grasses and herbs, including clovers, suitable for sheep and cattle. The so-called "pampas-grass" (*Gynerium argenteum*) is not found at all on the dry lands, but in the wet grounds of the south and south-west. The *pasto duro* is largely composed of the genera *Stipa* and *Melica*. In the dry, saline regions of the west and north-west, where the rainfall is slight, there are large thickets of low-growing, thorny bushes, poor in foliage. The predominating species is the chañar (*Gurliaca decorticans*), which produces an edible berry, and occurs from the Rio Negro to the northern limits of the republic. Huge cacti are also characteristic of this region. On the lower slopes of the Andes are found oak, beech, cedar, Winter's bark, pine (*Araucaria imbricata*), laurel and calden (*Prosopis algarobilla*). The provinces of Santa Fé, Córdoba and Santiago del Estero are only partially wooded; large areas of plains are intermingled with scrubby forests of algarrobo (*Prosopis*), quebracho-blanco (*Aspido-sperma quebracho*), tala (*Celtis tala, Sellowiana, acuminata*), acacias and other genera. In Tucumán and eastern Salta the same division into forests and open plains exists, but the former are of denser growth and contain walnut, cedar, laurel, tipa (*Machaerium fertile*) and quebracho-colorado (*Loxopterygium Lorentzii*). The territories of the Gran Chaco, however, are covered with a characteristic tropical vegetation, in which the palm predominates, but intermingled south of the Bermejo with heavy growths of algarrobo, quebracho-colorado, urunday (*Astronium fraxinifolium*), lapacho (*Tecoma curialis*) and palosanto (*Guayacum officinalis*), all esteemed for hardness and fineness of grain. Other palms abound, such as the pindó (*Cocos australis*), mbocaya (*Cocos sclerocarpa*) and the yatai (*Cocos yatai*), but the predominating species north of the Bermejo is the caranday or Brazilian wax-palm (*Copernicia cerifera*), which has varied uses. The forest habit in this region is close association of species, and there are "palmares," "algarrobales," "chañarales," &c., and among these open pasture lands, giving to a distant landscape a park-like appearance. In the "mesopotamia" region the flora is similar to that of the southern Chaco, but in the Misiones it approximates more to that of the neighbouring Brazilian highlands. Among the marvellous changes wrought in Argentina by the advent of European civilization, is the creation of a new flora by the introduction of useful trees and plants from every part of the world. Indian corn, quinoa, mandioca, possibly the potato, cotton and various fruits, including the strawberry, were already known to the aborigines, but with the conqueror came wheat, barley, oats, flax, many kinds of vegetables, apples, peaches, apricots, pears, grapes, figs, oranges and lemons, together with alfalfa and new grasses for the plains. The Australian eucalyptus is now grown in many places, and there are groves of the paradise or paraiso tree (*Melia azedarach*) on the formerly treeless pampa. The cereals of Europe are a source of increasing wealth to the nation, and alfalfa promises new prosperity for pastoral industries.

Fauna.—The Argentine fauna, like its flora, has been greatly influenced by the character and position of the pampas. Whatever it may have been in remote geological periods, it is now extremely limited both in size and numbers. Of the indigenous fauna, the tapir of the north and the guanaco of the west and south are the largest of the animals. The pampas were almost destitute of animal life before the horses and cattle of the Spanish invaders were there turned out to graze, and the puma and jaguar never came there until the herds of European cattle attracted them. The timid viscacha (*Lagostomus trichodactylus*), living in colonies, often with the burrowing owl, and digging deep under ground like the American prairie dog, was almost the only quadruped to be seen upon these immense open plains. The fox, of which several species exist, probably never ventured far into the plain, for it afforded him no shelter. Immense flocks of gulls were probably attracted to it then as now by its insect life, and its lagoons and streams teemed with aquatic birds. The occupation of this region by Europeans, and the introduction of horses, asses, cattle, sheep, goats and swine, have completely changed its aspect and character. On the Patagonian steppes there are comparatively few species of animals. Among them are the puma (*Felis concolor*), a smaller variety of the jaguar (*Felis onça*), the wolf, the fox, the Patagonian hare (*Dolicholis patagonica*) and two species of wild cat. The huge glyptodon once inhabited this region, which now possesses the smallest armadillo known, the "quirquincho" or *Dasypus minutus*. The guanaco (*Auchenia*), which ranges from Tierra del Fuego to the Bolivian highlands, finds comparative safety in these uninhabitable solitudes, and is still numerous. The "ñandú" or American ostrich (*Rhea americana*), inhabiting the pampas and open plains of the Chaco, has in Patagonia a smaller counterpart (*Rhea Darwinii*), which is never seen north of the Rio Negro. On the arid plateaus of the north-west, the guanaco and vicuña are still to be found, though less frequently, together with a smaller species of viscacha (*Lagidium cuvieri*). The greatest development of the Argentine fauna, however, is in the warm, wooded regions of the north and north-east, where many animals are of the same species as those in the neighbouring territories of Brazil. Several species of monkeys inhabit the forests from the Paraná to the Bolivian frontier. Pumas, jaguars and one or two species of wild cat are numerous, as also the Argentine wolf and two or three species of fox. The coatí, marten, skunk and otter (*Lutra paranensis*) are widely distributed. Three species of deer are common. In the Chaco the tapir or anta (*Tapir americanus*) still finds a safe retreat, and the peccary (*Dycotyles torquatus*) ranges from Córdoba north to the Bolivian frontier. The capybara (*Hydrochoerus capybara*) is also numerous in this region. Of birds the number of species greatly exceeds that of the mammals, including the rhea of the pampas and condor of the Andes, and the tiny, brilliant-hued humming-birds of the tropical North. Vultures and hawks are well represented, but perhaps the most numerous of all are the parrots, of which there are six or seven species. The reptilians are represented in the Paraná by the jacaré (*Alligator sclerops*), and on land by the "iguana" (*Teius teguexim, Podinema teguixin*), and some species of lizard. Serpents are numerous, but only two are described as poisonous, the cascavel (rattlesnake) and the "vibora de la cruz" (*Trigonocephalus alternatus*).[1]

[1] Interesting details of the Argentine fauna may be found in Darwin's *Voyage of the Beagle*; W. H. Hudson's *Idle Days in Patagonia*, and *Naturalist in the La Plata*; G. Pelleschi's *Eight Months on the Gran Chaco*; R. Napp's *Argentine Republic*; and de Moussy's *Confédération argentine*.

Population.—In population Argentina ranks second among the republics of South America, having outstripped, during the last quarter of the 19th century, the once more populous states of Colombia and Peru. During the first half of the 19th century civil war and despotic government seriously restricted the natural growth of the country, but since the definite organization of the republic in 1860 and the settlement of disturbing political controversies, the population had increased rapidly. Climate and a fertile soil have been important elements in this growth. According to the first national census of 1869 the population was 1,830,214. The census of 1895 increased this total to 3,954,911, exclusive of wild Indians and a percentage for omissions customarily used in South American census returns. In 1904 official estimates, based on immigration and emigration returns and upon registered births and deaths, both of which are admittedly defective, showed a population increased to 5,410,028, and a small diminution in the rate of annual increase from 1895 to 1904 as compared with 1869–1895. The birth-rate is exceptionally high, largely because of the immigrant population, the greater part of which is concentrated in or near the large cities. In the rural districts of the northern provinces, the increase in population is much less than in the central provinces, the conditions of life being less favourable. According to the official returns,[1] the over-sea immigration for the forty-seven years 1857–1903 aggregated 2,872,588, while the departure of emigrants during the same period was 1,066,480, showing a net addition to the population of 1,806,108. A considerable percentage of these arrivals and departures represents seasonal labourers, who come out from Europe solely for the Argentine wheat harvest and should not be classed as immigrants. Unfavourable political and economic conditions of a temporary character influence the emigration movement. During the years 1880–1889, when the country enjoyed exceptional prosperity, the arrivals numbered 1,020,907 and the departures only 175,038, but in 1890–1899, a period of financial depression following the extravagant Celman administration, the arrivals were 928,865 and the departures 552,175. Another disturbing influence has been the high protective tariffs, adopted during the closing years of the century, which increased the costs of living more rapidly than the wages for labour, and compelled thousands of immigrants to seek employment elsewhere. The influence of such legislation on unsettled immigrant labourers may be seen in the number of Italians who periodically migrate from Argentina to Brazil, and *vice versa*, seeking to better their condition. Of the immigrant arrivals for the forty-seven years given, 1,331,536 were Italians, 414,973 Spaniards, 170,293 French, 37,953 Austrians, 35,435 British, 30,699 Germans, 25,775 Swiss, 19,521 Belgians, and the others of diverse nationalities, so that Argentina is in no danger of losing her Latin character through immigration. This large influx of Europeans, however, is modifying the population by reducing the Indian and *mestizo* elements to a minority, although they are still numerous in the mesopotamian, northern and north-western provinces. The language is Spanish.

Science and Literature.—Though the university of Córdoba is the oldest but one in South America, it has made no conspicuous contribution to Argentine literature beyond the historical works of its famous rector, Gregorio Funes (1749–1830). This university was founded in 1621 and the university of Buenos Aires in 1821, but although Bonpland and some other European scientists were members of the faculty of Buenos Aires in its early years, neither there nor at Córdoba was any marked attention given to the natural sciences until President Sarmiento (official term, 1868–1874) initiated scientific instruction at the university of Córdoba under the eminent German naturalist, Dr Hermann Burmeister (1807–1892), and founded the National Observatory at Córdoba and placed it under the direction of the noted American astronomer, Benjamin Apthorp Gould (1824–1896). Both of these men made important contributions to science, and rendered an inestimable service to the country, not only through their publications but also through the interest they aroused in scientific research. A bureau of meteorology was afterwards created at Córdoba which has rendered valuable service. Dr Burmeister was afterwards placed in charge of the provincial museum of Buenos Aires, and devoted himself to the acquisition of a collection of fossil remains, now in the La Plata museum, which ranks among the best of the world. Not only has scientific study advanced at the university of Buenos Aires, but scientific research is promoting the development of the country; examples are the geographical explorations of the Andean frontier, and especially of the Patagonian Andes, by Francisco P. Moreno. In literature Argentina is still under the spell of Bohemianism and dilettanteism. Exceptions are the admirable biographies of Manuel Belgrano (d. 1820) and San Martin, important contributions to the history of the country and of the war of independence, by ex-President Bartolomé Mitre (1821–1906). Buenos Aires has some excellent daily journals, but the tone of the press in general is sensational. The number of newspapers published is large, especially in Buenos Aires, where in 1902 the total, including sundry periodicals, was 183.

Political Divisions and Towns.—The chief political divisions of the republic consist of one federal district, 14 provinces and 10 territories, the last in great part dating from the settlement of the territorial controversies with Chile. For purposes of local administration the provinces are divided into departments. The names, area and population of the provinces and territories are as follows:—

Administrative Divisions.	Area, sq. m.	Pop. 1895.	Pop. est. for 1904.
Provinces—			
Federal Capital	72	663,854	979,235
Buenos Aires	117,778	921,168	1,312,953
Santa Fé	50,916	397,188	640,755
Entre Rios	28,784	292,019	367,006
Corrientes	32,580	239,618	299,479
Córdoba	62,160	351,223	465,464
San Luis	28,535	81,450	97,458
Santiago del Estero	39,764	161,502	186,206
Mendoza	56,502	116,136	159,780
San Juan	33,715	84,251	99,955
Rioja	34,546	69,502	82,099
Catamarca	47,531	90,161	103,082
Tucumán	8,926	215,742	263,079
Salta	62,184	118,015	136,059
Jujuy	18,977	49,713	55,450
Territories—			
Misiones	11,282	33,163	38,755
Formosa	41,402	4,829	6,094
Chaco	52,741	10,422	13,937
Pampa	56,320	25,914	52,150
Neuquen	42,345	14,517	18,022
Rio Negro	75,924	9,241	18,648
Chubut	93,427	3,748	9,060
Santa Cruz	109,142	1,058	1,793
Tierra del Fuego	8,299	477	1,411
Los Andes	21,989	..	2,095
Total	1,135,840	3,954,911	5,410,028
Gotha computations of 1902 with corrections for boundary changes	1,083,596		

The principal towns, with estimated population for 1905, are as follows: Buenos Aires (1,025,653), Rosario (129,121), La Plata (85,000), Tucumán (55,000), Córdoba (43,000), Sante Fé (33,200), Mendoza (32,000), Paraná (27,000), Salta (18,000), Corrientes (18,000), Chivilcoy (15,000), Gualeguaychú (13,300), San Nicolás (13,000), Concordia (11,700), San Juan (11,500), Río Cuarto (10,800), San Luis (10,500), Barracas al Sud (10,200).

Communications.—The development of railways in Argentina, which dates from 1857 when the construction of the Buenos Aires Western was begun, was at first slow and hesitating, but after 1880 it went forward rapidly. Official corruption and speculation have led to some unsound ventures, but in the great majority of cases the

[1] There are two distinct statistical offices compiling immigration returns and their totals do not agree, owing in part to the traffic between Buenos Aires and Montevideo. Another report gives the arrivals in 1904 as 125,567 and the departures 38,923. Of the arrivals 67,598 were Italians and 39,851 Spaniards. The total for the years 1859–1904 was 3,166,073 and the departures 1,239,064, showing a net gain of 1,927,009.

lines constructed have been beneficial and productive. The principal centres of the system are Buenos Aires, Rosario and Bahia Blanca, with La Plata as a secondary centre to the former, and from these the lines radiate westward and northward. The creation of a commercial port at Bahia Blanca and the development of the territories of La Pampa, Rio Negro and Neuquen, have given an impetus to railway construction in that region, and new lines are being extended toward the promising districts among the Andean foothills. Beginning with 6 m. in 1857, the railway mileage of the republic increased to 1563 m. in 1880, 5865 m. in 1890, 7752 m. in 1891, 10,304 m. in 1901, and 12,274 m. in 1906, with 1794 m. under construction. The greater development of railway construction between 1885 and 1891 was due, principally, to the dubious concessions of interest guarantees by the Celman administration, and also to the fever of speculation. Some of these lines resulted disastrously. The Transandine line, designed to open railway communication between Buenos Aires and Valparaiso, was so far completed early in 1909 that on the Argentine side only the summit tunnel, 2 m. 127 yds. long, remained to be finished. The piercing was completed in Nov. 1909, but in the meantime passengers were conveyed by road over the pass. The gauge is broken at Mendoza, the Buenos Aires and Pacific having a gauge of 5 ft. 6 in. and the Transandine of one metre.

Tramway lines, which date from 1870, are to be found in all important towns. Those of Buenos Aires, Rosario and La Plata are owned by public companies. According to the census returns of 1895, the total mileage was 496 m., representing a capital expenditure of $84,044,581 paper. Electric traction was first used in Buenos Aires in 1897, since when nearly all the lines of that city have been reconstructed to meet its requirements, and subways are contemplated to relieve the congested street traffic of the central districts; the companies contribute 6 % of their gross receipts to the municipality, besides paying $50 per annum per square on each single track in paved streets, 5 per thousand on the value of their property, and 33 % of the cost of street repaving and renewals.

The telegraph lines of Argentina are subject to the national telegraph law of 1875, the international telegraph conventions, and special conventions with Brazil and Uruguay. In 1902 the total length of wires strung was 28,125 m.; in 1906 it had been increased to 34,080 m. The national lines extend from Buenos Aires north to La Quiaca on the Bolivian frontier (1180 m.), and south to Cape Virgenes (1926 m.), at the entrance to the Straits of Magellan. Telegraphic communication with Europe is effected by cables laid along the Uruguayan and Brazilian coasts, and by the Brazilian land lines to connect with transatlantic cables from Pernambuco. Communication with the United States is effected by land lines to Valparaiso, and thence by a cable along the west coast. The service is governed by the international telegraph regulations, but is subject to local inspection and interruption in times of political disorder.

The postal and telegraph services are administered by the national government, and are under the immediate supervision of the minister of the interior. Argentina has been a member of the Postal Union since 1878. Owing to the great distances which must be covered, and also to the defective means of communication in sparsely settled districts, the costs of the postal service in Argentina are unavoidably high in relation to the receipts.

Shipping.—Although Argentina has an extensive coast-line, and one of the great fluvial systems of the world, the tonnage of steamers and sailing vessels flying her flag is comparatively small. In 1898 the list comprised only 1416 sailing vessels of all classes, from 10 tons up, with a total tonnage of 118,894 tons, and 222 steamships, of 36,323 tons. There has been but slight improvement since that date. There are excellent fishing grounds on the coast, but they have had no appreciable influence in developing a commerical marine. The steamships under the national flag are almost wholly engaged in the traffic between Buenos Aires and Montevideo, the river traffic, and port services.

Agriculture.—In 1878 the production of wheat was insufficient for home consumption, the amount of Indian corn grown barely covered local necessities, and the only market for live stock was in the slaughtering establishments, where the meat was cut into strips and cured, making the so-called "jerked beef" for the Brazilian and Cuban markets. But three years later a new economic development began. In 1881 President Roca offered for public purchase by auction the lands in the south-west of the province of Buenos Aires, the Pampa Central, and the Neuquen district, these lands having been rendered habitable after the campaign of 1878 against the Indians. The upset (reserve) price was £80 sterling per square league of 6669 acres, and, as the lands were quickly sold, an expansion of the pastoral industry immediately ensued. The demand for animals for stock-breeding purposes sent up prices, and this acted as a stimulus to other branches of trade, so that, as peace under the Roca régime seemed assured, a steady flow of immigration from Italy set in. The development of the pastoral industry of Argentina from that time to the end of the century was remarkable. In 1878 the number of cattle was 12,000,000; of sheep, 65,000,000; and of horses, 4,000,000; in 1899 the numbers were—cattle, 25,000,000; sheep, 89,000,000; and horses, about 4,500,000. Originally the cattle were nearly all of the long-horned Spanish breed and of little value for their meat, except to the saladero establishments. Gradually Durham, Shorthorn, Hereford and other stock were introduced to improve the native breeds, with results so satisfactory that now herds of three-quarters-bred cattle are to be found in all parts of the country. Holstein, Jersey and other well-known dairy breeds were imported for the new industries of butter- and cheese-making. Not only has the breed of cattle been improved, but the system of grazing has completely altered. Vast areas of land have been ploughed and sown with lucerne (alfalfa); magnificent permanent pasturage has been created where there were coarse and hard grasses in former days, and Argentina has been able to add baled hay to her list of exports. In 1889 the first shipment of Argentine cattle, consisting altogether of 1930 steers, was sent to England. The results of these first experiments were not encouraging, owing mainly to the poor class of animals, but the exporters persevered, and the business steadily grew in value and importance, until in 1898 the number of live cattle shipped was 359,296, which then decreased to 119,189 in 1901, because of the foot-and-mouth disease. In 1906 the export of live stock was prohibited for that reason. Large quantities of frozen and preserved meat are exported, profitable prices being realized. Dairy-farming is making rapid strides, and the development of sheep-farming has been remarkable. In 1878, 65,000,000 sheep yielded 230,000,000 lb weight of wool, or an average per sheep of about 3½ lb. In the season of 1899–1900 the wool exports weighed 420,000,000 lb, and averaged more than 5 lb per sheep. The extra weight of fleece was owing to the large importation of better breeds. The export, moreover, of live sheep and of frozen mutton to Europe has become an important factor in the trade of Argentina. In 1892 the number of live sheep shipped for foreign ports was 40,000; in 1898 the export reached a total of 577,813, which in 1901 fell off to 25,746. In 1892 the frozen mutton exported was 25,500 tons, and this had increased in 1901 to 63,013 tons.

Live stock, &c.

The advance made in agricultural industry also is of very great importance. In 1872 the cultivated area was about 1,430,000 acres; in 1895, 12,083,000 acres; in 1901, 17,465,973 acres. In 1899 the wheat exports exceeded 50,000,000 bushels, and the Indian corn 40,000,000 bushels. The area under wheat in 1901 was 8,351,843 acres; Indian corn, 3,102,140 acres; linseed, 1,512,340 acres; alfalfa, 3,088,929 acres. The farming industry is not, however, on a satisfactory basis. No national lands in accessible districts are available for the application of a homestead law, and the farmer too often has no interest in the land beyond the growing crops, a percentage of the harvest being the rent charged by the owner of the property. This system is mischievous, since, if a few consecutive bad seasons occur, the farmer moves to some more favoured spot; while, on the other hand, a succession of good years tends to increase rents. The principal wheat and Indian corn producing districts lie in the provinces of Santa Fé, Buenos Aires, Córdoba and Entre Rios, and the average yield of wheat throughout the country is about 12 bushels to the acre. Little attention is paid to methods of cultivation, and the farmer has no resources to help him if the cereal crops fail. In the Andean provinces of Mendoza, San Juan, Catamarca and Rioja viticulture attracts much attention, and the area in vineyards in 1901 was 109,546 acres, only 18 % of which was outside the four provinces named. Wine is manufactured in large quantities, but the output is not sufficient to meet the home demand. In the provinces of Tucumán, Salta and Jujuy the main industry is sugar growing and manufacture. In 1901 the production of sugar was 151,639 tons, of which 58,000 tons were exported. The sugar manufacture, however, is a protected and bounty-fed industry, and the 51 sugar mills in operation in 1901 are a heavy tax upon consumers and taxpayers. Other products are tobacco, olives, castor-oil, peanuts, canary-seed, barley, rye, fruit and vegetables.

Crops.

The pastoral and agricultural industries have been hampered by fluctuations in the value of the currency, farm products being sold at a gold value for the equivalent in paper, while labourers are paid in currency. The existing system of taxation also presses heavily upon the provinces, as may be seen from the fact that the national, provincial and municipal exactions together amount to £7 per head of population, while the total value of the exports in 1898 was only £6 in round numbers. The *guia* tax on the transport of stock from one province to another, which has been declared unconstitutional in the courts, is still enforced, and is a vexatious tax upon the stock-raiser, while the consumption, or octroi, tax in Buenos Aires and other cities is a heavy burden upon small producers.

Manufactures.—Manufacturing enterprise in Argentina, favoured by the protection of a high tariff, made noticeable progress in the national capital during the closing years of the last century, especially in those small industries which commanded a secure market. The principal classes of products affected are foods, wearing apparel, building materials, furniture, &c., chemical products, printing and allied trades, and sundry others, such as cigars, matches, tanning, paints, &c. In some manufactures the raw material is imported partly manufactured, such as thread for weaving. The lack of coal in Argentina greatly increases the difficulty and cost of maintaining these industries, and high prices of the products result. Electric power generated by steam is now commonly used in Buenos Aires and other large cities for driving light machinery.

Commerce.—The rapid development of the foreign trade of the republic since 1881 is due to settled internal conditions and to the

prime necessity to the commercial world of many Argentine products, such as beef, mutton, hides, wool, wheat and Indian corn. Efforts to hasten this development have created some serious financial and industrial crises, and have burdened the country with heavy debts and taxes. During the decade 1881–1890 great sums of European capital were invested in railways and other undertakings, encouraged by the grant of interest guarantees and by state mortgage bank loans in the form of *cedulas*, nominally secured on landed property. In 1890 the crisis came, the mortgage banks failed, credits were contracted, the value of property declined, defaults were common, imports decreased, and the losses to the country were enormous. The constant fluctuations in the value of the currency, then much depreciated, intensified the distress and complicated the situation. Recovery required years, although made easier by the sound and steady development of the pastoral and agricultural industries, which were slightly affected by the crisis; and the steadily increasing volume of exports, mainly foodstuffs and other staples, saved the situation. There have been some changes in commercial methods since 1890, the retailer, and sometimes the consumer, importing direct to save intermediate commission charges. Such transactions are made easy by the foreign banks established in all the large cities of the republic. The conversion law of 1899, which gave a fixed gold value to the currency (44 centavos gold for each 100 centavos paper), has had beneficial influence on commercial transactions, through the elimination of daily fluctuations in the value of the currency, and the commercial and financial situation has been steadily improved, notwithstanding heavy taxation and tariff restrictions. The import trade shows the largest totals in foodstuffs, wines and liquors, textiles and raw materials for their manufacture, wood and its manufactures, iron and its manufactures, paper and cardboard, glass and ceramic wares. The official valuation of imports, which is arbitrary and incorrect, was $164,569,884 gold in 1889, fell off to $67,207,780 in 1891, but gradually increased to $205,154,420 in 1905. The exports, which are almost wholly of agricultural and pastoral products, increased from $103,219,000 in 1891 to $322,843,841 in 1905.

Government.—The present constitution of Argentina dates from the 25th of September 1860. The legislative power is vested in a congress of two chambers—the senate, composed of 30 members (two from each province and two from the capital), elected by the provincial legislatures and by a special body of electors in the capital for a term of nine years; and the chamber of deputies, of 120 members (1906), elected for four years by direct vote of the people, one deputy for every 33,000 inhabitants. To the chamber of deputies exclusively belongs the initiation of all laws relating to the raising of money and the conscription of troops. It has also the exclusive right to impeach the president, vice-president, cabinet ministers, and federal judges before the senate. The executive power is exercised by the president, elected by presidential electors from each province chosen by direct vote of the people. The president and vice-president are voted for by separate tickets. The system closely resembles that followed in the United States. The president must be a native citizen of Argentina, a Roman Catholic, not under thirty years of age, and must have an annual income of at least $2000. His term of office is six years, and neither he nor the vice-president is eligible for the next presidential term. All laws are sanctioned and promulgated by the president, who is invested with the veto power, which can be overruled only by a two-thirds vote. The president, with the advice and consent of the senate, appoints judges, diplomatic agents, governors of territories, and officers of the army and navy above the rank of colonel. All other officers and officials he appoints and promotes without the consent of the senate. The cabinet is composed of eight ministers—the heads of the government departments of the interior, foreign affairs, finance, war, marine, justice, agriculture, and public works. They are appointed by and may be removed by the president.

Justice is administered by a supreme federal court of five judges and an attorney-general, which is also a court of appeal, four courts of appeal, with three judges each, located in Buenos Aires, La Plata, Paraná and Córdoba, and by a number of inferior and local courts. Each province has also its own judicial system. Trial by jury is established by the constitution, but never practised. Civil and criminal courts are both corrupt and dilatory. In May 1899 the minister of justice stated in the chamber of deputies that the machinery of the courts in the country was antiquated, unwieldy and incapable of performing its duties; that 50,000 cases were then waiting decision in the minor courts, and 10,000 in the federal division; and that a reconstruction of the judiciary and the judicial system had become necessary. In June 1899 he sent his project for the reorganization of the legal procedure to congress, but no action was then taken beyond referring the bill to a committee for examination and report. The proceedings are, with but few exceptions, written, and the procedure is a survival of the antiquated Spanish system.

Under the constitution, the provinces retain all the powers not delegated to the federal government. Each province has its own constitution, which must be republican in form and in harmony with that of the nation. Each elects its governor, legislators and provincial functionaries of all classes, without the intervention of the federal government. Each has its own judicial system, and enacts laws relating to the administration of justice, the distribution and imposition of taxes, and all matters affecting the province. All the public acts and judicial decisions of one province have full legal effect and authority in all the others. In cases of armed resistance to a provincial government, the national government exercises the right to intervene by the appointment of an interventor, who becomes the executive head of the province until order is restored. The territories are under the direct control of the national government.

Army.—The military service of the republic was reorganized in 1901, and is compulsory for all citizens between the ages of 20 and 45. The army consists of: (1) The Line, comprising the Active and Reserve, in which all citizens 20 to 28 years of age are obliged to serve; (2) the National Guard, comprising citizens of 28 to 40 years; (3) the Territorial Guard, comprising those 40 to 45 years. Conscripts of 20 years of age have to serve two years, three months each year. The active or standing army comprises 18 battalions of infantry, 12 regiments of cavalry, 8 regiments of artillery, and 4 battalions of engineers. A military school, with 125 cadets, is maintained at San Martin, near the national capital, and a training school for non-commissioned officers in the capital itself. Compulsory attendance of young men at national guard drills is enforced for at least two months of the year, under penalty of enforced service in the Line. In 1906 the president announced that permission had been given by the German emperor for 30 Argentine officers to enter the German army each year and to serve eighteen months, and also for five officers to attend the Berlin Military Academy. The equipment of the standing army is thoroughly modern, the infantry being provided with Mauser rifles and the artillery with Krupp batteries.

Navy.—The disputes with Chile during the closing years of the 19th century led to a large increase in the navy, but in 1902 a treaty between the two countries provided for the restriction of further armaments for the next four years. The naval vessels then under construction were accordingly sold, but in 1906 both countries, influenced apparently by the action of Brazil, gave large orders in Europe for new vessels. At the time when further armaments were suspended, the effective strength of the Argentine navy consisted of 3 ironclads, 6 first-class armoured cruisers, 2 monitors (old), 4 second-class cruisers, 2 torpedo cruisers, 3 destroyers, 3 high-sea torpedo boats, 14 river torpedo boats, 1 training ship, 5 transports, and various auxiliary vessels. Two of these first-class cruisers were sold to Japan. The armament included 394 guns of all calibres, 6 of which were of 250 millimetres, 4 of 240, and 12 of 200. There are about 320 officers in active service, and the total personnel ranges from 5000 to 6000 men. The service is not popular, and it is recruited by means of conscription from the national guard, the term of service being two years. These conscripts number about 2000 a year. In addition, there is a corps of coast artillery numbering 450 men, from which garrisons are drawn for the military port, Zárate arsenal and naval prison. The government maintains a naval school at Flores, a school of mechanics in Buenos Aires, an artillery school on the cruiser "Patagonia," and a school for torpedo practice at La Plata. The naval arsenal is situated on the "north basin" of the Buenos Aires port, and the military port at Bahia Blanca is provided

with a dry dock of the largest size, and extensive repair shops. There is also a dockyard and torpedo arsenal at La Plata, an artillery depot at Zárate, above Buenos Aires, and naval depots on the island of Martin Garcia and at Tigre, on the Luján river.

Education.—Primary education is free and secular, and is compulsory for children of 6 to 14 years. In the national capital and territories it is supervised by a national council of education with the assistance of local school boards; in the 14 provinces it is under provincial control. Secondary instruction is also free, but is not compulsory. It is under the control of the national government, which in 1902 maintained 19 colleges. Of these colleges four are in Buenos Aires, one in each province, and one in Concepción del Uruguay. For the instruction of teachers the republic has 28 normal schools, as follows: three in the national capital; one in Paraná, three (regional) in Corrientes, San Luis and Catamarca; 14 for female teachers in the provincial capitals; and seven for either sex in the larger towns of the provinces of Buenos Aires, Santa Fé, Córdoba and San Luis. The normal schools, maintained by the state on a secular basis, were founded by President Sarmiento, who engaged experienced teachers in the United States to direct them; their work is excellent; notably, their model primary schools. For higher and professional education there are two national universities at Buenos Aires and Córdoba, and three provincial universities, at La Plata, Santa Fé and Paraná, which comprise faculties of law, medicine and engineering, in addition to the usual courses in arts and science. To meet the needs of technical and industrial education there are a school of mines at San Juan, a school of viticulture at Mendoza, an agronomic and veterinary school at La Plata, several agricultural and pastoral schools, and commercial schools in Buenos Aires, Rosario, Bahia Blanca and Concordia. Schools of art and conservatories of music are also maintained in the large cities, where there are, besides, many private schools. Secular education has been vigorously opposed by strict churchmen, and efforts have been made to maintain separate schools under church control. The national government has founded several scholarships (some in art) for study abroad. The total school population of Argentina in 1900 (6 to 14 years) was 994,089, of which 45 % attended school, and 13 % of those not attending were able to read and write. The illiterate school population was about 41 %, and of those of 15 years and over 54 % were illiterate. Of the whole population over 6 years, 50·5 % were illiterate.

Religion.—The Argentine constitution recognizes the Roman Catholic religion as that of the state, but tolerates all others. The state controls all ecclesiastical appointments, decides on the passing or rejection of all decrees of the Holy See, and provides an annual subsidy for maintenance of the churches and clergy. Churches and chapels are founded and maintained by religious orders and private gift as well. At the head of the Argentine hierarchy are one archbishop and five suffragan bishops, who have five seminaries for the education of the priesthood. From statistics of 1895 it appears that in each 1000 of population 991 are Roman Catholics, 7 Protestants, and 2 Jews, the Jews being entirely of Russian origin, sent into the republic since 1891 by the Jewish Colonization Association under the provisions of the Hirsch legacy; from 1895 to 1908 the number of Jews in Argentina increased from 6085 to about 30,000.

Finance.—The revenue of the republic is derived mainly from customs and excise, and the largest item of expenditure is the service of the public debt. Since 1891 the national budgets have been calculated in both gold and currency, and both receipts and expenditures have been carried out in this dual system. The collection of a part of the import duties in gold has served to give the government the gold it requires for certain expenditures, but it has complicated returns and accounts and increased the burden of taxation. According to a compilation of statistical returns published by Dr Francisco Latzina in 1901, the national revenues and expenditures for the 37 years from 1864 to 1900, inclusive, reduced to a common standard, show a total deficit for that period of $408,260,795 gold, which has been met by external and internal loans, and by a continued increase in the scope and rate of taxation. The growth of the annual budget is shown by a comparison of the following years:—

	Total Revenue.	Total Expenditure.
1864	$7,005,328 gold.	$7,119,931 gold.
1880	19,594,306 „	26,919,295 „
1890	73,150,856 „	95,363,854 „
1900	62,045,458 paper.	104,501,614 paper.
	37,998,704 gold.	23,644,543 gold.
1905	63,439,000 paper.	105,581,680 paper.
	43,461,324 gold.	24,865,016 gold.

The bane of Argentine finance has been the extravagant and unscrupulous use of national credit for the promotion of schemes calculated to benefit individuals rather than the public. The large increase in military expenditures during the disputes with Chile also proved a heavy burden, and in the continued strife with Brazil for naval superiority this burden could not fail to be increased greatly. A very considerable percentage of Argentina's population of five to six millions is hopelessly poor and unprogressive, and cannot be expected to bear its share of the burden. To meet these expenditures there are a high tariff on imported merchandise, and excise and stamp taxes of a far-reaching and often vexatious character. Nothing is permitted to escape taxation, and duplicated taxes on the same thing are frequent. In Argentina these burdens bear heavily upon the labouring classes, and in years of depression they send away by thousands immigrants unable to meet the high costs of living. For the year 1900 the total expenditures of the national government, 14 provincial governments, and 16 principal cities, were estimated to have been $208,811,925 paper, which is equivalent to $91,877,247 gold, or (at $5.04 per pound stg.) to £18,229,612, 10s. The population that year was estimated to be 4,794,149, from which it is seen that the annual costs of government were no less than £3,16s. for each man, woman, and child in the republic. About 71 % of this charge was on account of national expenditures, and 29 % provincial and municipal expenditures. Had the expenses of all the small towns and rural communities been included, the total would be in excess of $20 gold, or £4, *per capita*.

In 1889 the public debt of the republic amounted to about £24,000,000, but the financial difficulties which immediately followed that year, and the continuance of excessive expenditures, forced the debt up to approximately £128,000,000 during the next ten years. In the year 1905 the outstanding and authorized debt of the republic was as follows:—

External debt (July 31, 1905):		
National loans		£42,297,050
Provincial loans and others, assumed		30,395,916
National cedulas		11,763,923
Total		£84,456,889
Consolidated Internal debt (Dec. 31, 1904):		
Gold	$16,544,000	
Paper	79,174,400	
		£10,178,718
Total service on funded debt, 1905, $24,375,067 gold, and $15,914,335 paper		£6,225,669
Floating debt	£259,170	
Treasury bills (Apr. 30, 1905)	275,220	
Unpaid bills, $3,332,594, paper	288,560	
		£822,950

The paper currency forms an important part of the internal debt, and has been a fruitful source of trouble to the country. Few countries have suffered more from a depreciated currency than Argentina. During the era of so-called "prosperity" between 1881 and 1890 an enormous amount of bank notes were issued under various authorizations, especially that of the "free banking law" of 1887. During this period the bank-note circulation was increased to $161,700,000, and two mortgage banks—the National Hypothecary Bank and the Provincial Mortgage Bank (of Buenos Aires)—flooded the country with $509,000,000 of *cedulas* (hypothecary bonds). When the crash came and the national treasury was found to be without resources to meet current expenses, further issues of $110,000,000 in currency were made. The free-banking law which permitted the issue of notes by provincial banks was primarily responsible for this situation. Under the provisions of this law the provinces were authorized to borrow specie abroad and deposit the same with the national government as security for their issues. These loans aggregated £27,000,000. The Celman administration, in violation of the trust, then sold the specie and squandered the proceeds, leaving the provincial bank notes without guarantee and value. The national government has since assumed responsibility for all these provincial loans abroad. As on previous occasions, the great depreciation in the value of the currency has led to a repudiation of part of its nominal value. This depreciation reached its maximum in October 1891 ($460.82 paper for $100 gold), and remained between that figure and $264 during the next six years. To check these prejudicial fluctuations and to prevent too great a fall in the price of gold (to repeat a popular misconception), a

conversion law was adopted on the 31st of October 1899, which provided that the outstanding circulation should be redeemed at the rate of 44 centavos gold for each 100 centavos paper, the official rate for gold being 227·27. Provisions were also made for the creation of a special conversion fund in specie to guarantee the circulation, which fund reached a total of $100,000,000 in March 1906. These measures have served to give greater stability to the value of the circulating medium, and to prevent the ruinous losses caused by a constant fluctuation in value, but the rate established prevents the further appreciation of the currency. On the 18th of January 1906 the currency in circulation amounted to $502,420,485, which is more than $95 *per capita*. (A. J. L.)

History

The first Europeans who visited the river Plate were a party of Spanish explorers in search of a south-west passage to the East Indies. Their leader, Juan Diaz de Solis, landing incautiously in 1516 on the north coast with a few attendants to parley with a body of Charrua Indians, was suddenly attacked by them and was killed, together with a number of his followers. This untoward disaster led to the abandonment of the expedition, which forthwith returned to Spain, bringing with them the news of the discovery of a fresh-water sea. Four years later (1520) the Portuguese seaman, Ferdinand Magellan, entered the estuary in his celebrated voyage round the world, undertaken in the service of the king of Spain (Charles I., better known as the emperor Charles V.). Magellan, as soon as he had satisfied himself that there was no passage to the west, left the river without landing.

The first attempt to penetrate by way of the river Plate and its affluents inland, with a view to effecting settlements in the interior, was made in 1526 by Sebastian Cabot. This great navigator had already won renown in the service of Henry VII. of England by his voyage to the coast of North America in company with his father, Giovanni Caboto or Cabot (see Cabot, John). Sebastian Cabot had in 1519 deserted England for Spain, and had received from King Charles the post of pilot-major formerly held by Juan de Solis. In 1526 he was sent out in command of an expedition fitted out for the purpose of determining by astronomical observations the exact line of demarcation, under the treaty of Tordesillas, between the colonizing spheres of Spain and Portugal, and of conveying settlers to the Moluccas. Arrived in the river Plate in 1527, rumours reached Cabot of mineral wealth and a rich and civilized empire in the far interior, and he resolved to abandon surveying for exploration. He built a fort a short distance up the river Uruguay, and despatched one of his lieutenants, Juan Alvarez Ramón, with a separate party upon an expedition up stream. This expedition was assailed by the Charruas and forced to return on foot, their leader himself being killed. Cabot, with a large following, entered the Paraná and established a settlement just above the mouth of the river Carcarañal, to which he gave the name of San Espiritù, among the Timbú Indians, with whom he formed friendly relations. He continued the ascent of the Paraná as far as the rapids of Apipé, and finding his course barred in this direction, he afterwards explored the river Paraguay, which he mounted as far as the mouth of the affluent called by the Indians Lepeti, now the river Bermejo. His party was here fiercely attacked by the Agaces or Payaguá Indians, and suffered severely. Cabot in his voyage had seen many silver ornaments in the possession of the Timbú and Guarani Indians. Some specimens of these trinkets he sent back to Spain with a report of his discoveries. The arrival of these first-fruits of the mineral wealth of the southern continent gained for the estuary of the Paraná the name which it has since borne, that of Rio de la Plata, the silver river. As Cabot was descending the stream to his settlement of San Espiritù, he encountered an expedition which had been despatched from Spain for the express purpose of exploring the river discovered by Solis, under the command of Diego Garcia. Finding that he had been forestalled, Garcia resolved to return home. Cabot himself, after an absence of more than three years, came back in 1530, and applied to Charles V. for means to open up communications with Peru by way of the river Bermejo. The emperor's resources were, however, absorbed by his struggle for European supremacy with Francis I. of France, and he was obliged to leave the enterprise of South American discoveries to his wealthy nobles. Cabot's colony at San Espiritù did not long survive his departure; an attempt of the chief of the Timbús to gain possession of one of the Spanish ladies of the settlement led to a treacherous massacre of the garrison.

Cabot.

Two years after the return of Cabot, the news of Francisco Pizarro's marvellous conquest of Peru reached Europe (1532), and stirred many an adventurous spirit to strive to emulate his good fortune. Among these was Pedro de Mendoza, a Basque nobleman. He obtained from Charles V. a grant (*asiento*) of two hundred leagues of the coast from the boundary of the Portuguese possessions southward towards the Straits of Magellan, and the inland country which lay behind it. Mendoza undertook to conquer and settle the territory at his own charges, certain profits being reserved to the crown. In August 1534 the *adelantado*, or governor, sailed from San Lucar, at the head of the largest and wealthiest expedition that had ever left Europe for the New World. In January 1535 he entered the river Plate, where he followed the northern shore to the island of San Gabriel, and then crossing over he landed by a little stream, still called Riachuelo. The name of Buenos Aires was given to the country by Sancho del Campo, brother-in-law of the *adelantado*, who first stepped ashore. Here, on the 2nd of February, Mendoza laid the foundations of a settlement which in honour of the day he named Santa Maria de Buenos Aires. Mendoza, after some fierce encounters with the Indians, now proceeded up the Paraná, and built a fort, which he called Corpus Christi, near the site of Cabot's former settlement of San Espiritù. The expedition, which originally numbered 2500 men, was reduced by deaths at the hands of the Indians, by disease and privation, within a year to less than 500 men. From Corpus Christi, Mendoza sent out various bodies to explore the interior in the direction of Peru, but without much success, and at length, thoroughly discouraged and broken in health, he abandoned his enterprise, and returned to Spain in 1537.

Mendoza.

Buenos Aires.

A portion of one of the expeditions he despatched, under Juan de Ayolas, pushing up the Paraguay, is said to have reached the south-east districts of Peru, but while returning laden with booty, was attacked by the Payaguá Indians, and every man perished. The other portion, which had stayed behind as a reserve under Domingos Iralá, had better fortunes. Finding their comrades did not return, Iralá and his companions determined to descend the river, and on their downward journey opposite the mouth of the river Pilcomayo, finding a suitable site for colonizing, they founded (1536) what proved to be the first permanent Spanish settlement in the interior of South America, the future city of Asunción (15th August 1536).

Asunción.

In the meantime the colony at Buenos Aires had been dragging on a miserable existence, and after terrible sufferings from famine and from the ceaseless attacks of the Indians, the remaining settlers abandoned the place and made their way up the river first to Corpus Christi, then to Asunción. Here, by the emperor's orders, the assembled Spaniards proceeded to the election of a captain-general, and their choice fell almost unanimously on Domingos Martinez de Iralá, who was proclaimed captain-general of the Rio de la Plata (August 1538). In 1542 the settlement of Buenos Aires was re-established by an expedition sent for the purpose from Spain, under a tried *adelantado*, Cabeza de Vaca. This able leader, eager to reach Asunción as quickly as possible, sent on his ships to the river Plate, but himself with a small following marched overland from Santa Catherina on the coast of Brazil to join Iralá. His doings at Asunción belong, however, not to the history of Argentina, but of Paraguay. Suffice it to say that differences with Iralá eventually led to his arrest, and to his being sent back to Spain to answer to the charges brought against him for maladministration. The second settlement made by his expedition at Buenos Aires was even less successful and

Iralá.

long-lived than the first. Exposed to the incessant attacks of the savages, the place was a second time abandoned, February 1543.

Forty years were now to elapse before any further efforts were made by the Spaniards to colonize any part of the territory of the river Plate and lower Paraná. In 1573 Juan de Garay, at the head of an expedition despatched from Asunción, founded the city of Santa Fé near the abandoned settlements of San Espiritù and Corpus Christi. Seven years later (1580), when the new colony had been firmly established, Juan de Garay proceeded southwards, and made the third attempt to build a city on the site of Buenos Aires; and despite the determined hostility of the Querendi Indians he succeeded in finally gaining a complete mastery over them. In a desperate battle, the natives were defeated with great slaughter, and the territory surrounding the town was divided into ranches, in which the conquered natives had to labour. The new town received from Garay the name of *Ciudad de la Santissima Trinidad*, while its port retained the old appellation of Santa Maria de Buenos Aires. It was endowed by its founder with a *cabildo* (corporation) and full Spanish municipal privileges. Garay, when on his way to Santa Fé, was unfortunately murdered by a party of Indians, Minuas (Mimas), three years later, while incautiously sleeping on the river bank near the ruins of San Espiritù. The new settlement, however, continued to prosper, and the cattle and horses brought from Europe multiplied and spread over the plains of the Pampas.

Juan de Garay.

In the meantime the Spaniards had penetrated into the interior of what is now the Argentine Republic, and established themselves on the eastern slopes of the Andes. In 1553 an expedition from Peru made their way through the mountain region and founded the city of Santiago del Estero, that of Tucumán in 1565, and that of Córdoba in 1573. Another expedition from Chile, under Garcia Hurtado de Mendoza, crossed the Cordillera in 1559, and having defeated the Araucanian Indians, made a settlement which from the name of the leader was called Mendoza. In 1620 Buenos Aires was separated from the authority of the government established at Asunción, and was made the seat of a government extending over Mendoza, Santa Fé, Entre Rios and Corrientes, but at the same time remained like the government of Paraguay at Asunción, and that of the province of Tucumán, which had Córdoba as its capital, subject to the authority of the viceroyalty of Peru.

Thus at the opening of the 17th century, after many adventurous efforts, and the expenditure of many lives and much treasure, the Spaniards found themselves securely established on the river Plate, and had planted a number of centres of trade and colonization in the interior. Unfortunately, in no part of the Spanish oversea possessions did the restrictive legislation of the home government operate more harshly or disadvantageously to the interests of the colony; it was a more effective hindrance to the development of its resources and the spread of civilization over the country, than the hostility of the Indians. Cabot had urged the feasibility of opening an easier channel for trade with the interior of Peru through the river Plate and its tributaries, than that by way of the West Indies and Panama; and now that his views were able to be realized, the interests of the merchants of Seville and of Lima, who had secured a monopoly of the trade by the route of the isthmus, were allowed to destroy the threatened rivalry of that by the river Plate. Never in the history of colonization has a mother country pursued so relentlessly a policy more selfish and short-sighted. Spanish legislation was not satisfied with endeavouring to exclude all European nations except Spain from trading with the West Indies, but it sought to limit all commerce to one particular route, and it forbade any trade being transacted by way of the river Plate, thus enacting the most flagrant injustice towards the people it had encouraged to settle in the latter country. The strongest protests were raised, but the utmost they could effect was that, in 1618, permission was granted to export from Buenos Aires two shiploads of produce a year. But the Spanish government was not content with the prohibition of sea-borne commerce. To prevent internal trade with Peru a custom-house was set up at Córdoba to levy a duty of 50 % on everything in transit to and from the river Plate. In 1665 the relaxation of this system was brought about by the continual remonstrances of the people, but for more than a century afterwards (until 1776) the policy of exclusion was enforced. This naturally led to a contraband trade of considerable dimensions. The English, after the treaty of Utrecht (1715) held the contract (*asiento*) for supplying the Spanish-American colonies with negro slaves. Among other places the slave ships regularly visited Buenos Aires, and despite the efforts of the Spanish authorities, contrived both to smuggle in and carry away a quantity of goods. This illicit commerce went on steadily till 1739, when it led to an outbreak of war between England and Spain, which put an end to the *asiento*. The Portuguese were even worse offenders, for in 1680 they made a settlement on the north of the river Plate, right opposite to Buenos Aires, named Colonia, which with one or two short intervals, remained in their hands till 1777. From this port foreign merchandise found its way duty free into the Spanish provinces of Buenos Aires, Tucumán and Paraguay, and even into the interior of Peru. The continual encroachments of the Portuguese at length led the Spanish government to take the important step of making Buenos Aires the seat of a viceroyalty with jurisdiction over the territories of the present republics of Bolivia, Paraguay, Uruguay and the Argentine Confederation (1776). At the same time all this country was opened to Spanish trade even with Peru, and the development of its resources, so long thwarted, was allowed comparatively free play. Pedro de Zeballos, the first viceroy, took with him from Spain a large military force with which he finally expelled the Portuguese from the banks of the river Plate.

Evils of Spanish colonial system.

Asiento question.

The wars of the French Revolution, in which Spain was allied with France against Great Britain, interrupted the growing prosperity of Buenos Aires. On the 17th of June 1806 General William Beresford landed with a body of troops from a British fleet under the command of Sir Home Popham, and obtained possession of Buenos Aires. But a French officer, Jacques de Liniers, gathered together a large force with which he enclosed the British within the walls, and finally, on the 12th of August, by a successful assault, forced Beresford and his troops to surrender. In July 1807 another British force of eight thousand men under General Whitelock endeavoured to regain possession of Buenos Aires, but strenuous preparations had been made for resistance, and after fierce street fighting the invading army, after suffering severe losses, was compelled to capitulate. The colonists, who had achieved their two great successes without any aid from the home government, were naturally elated, and began to feel a new sense of self-reliance and confidence in their own resources. The successful defence of Buenos Aires accentuated the growing feeling of dissatisfaction with the Spanish connexion, which was soon to lead to open insurrection. The establishment of the Napoleonic dynasty at Madrid was the actual cause which brought about the disturbances which were to end in separation. Liniers was viceroy on the arrival of the news of the crowning of Joseph Bonaparte as king of Spain, but as a Frenchman he was distrusted and was deposed by the adherents of Ferdinand VII. The central junta at Seville, acting in the name of Ferdinand, appointed Balthasar de Cisneros to be viceroy in his place. He entered upon the duties of his office on the 19th of July 1809, and at first he gained popularity by acceding to the urgent appeals of the people and throwing open the trade of the country to all nations. But his measures speedily gave dissatisfaction to the Argentine or Creole party, who had long chafed under the disabilities of Spanish rule, and who now felt themselves no longer bound by ties of loyalty to a country which was in the possession of the French armies.

Effects of French war.

On the 25th of May 1810 a great armed assembly met at Buenos Aires and a provisional junta was formed to supersede the authority of the viceroy and carry on the government. The acts of the new government ran in the name of Ferdinand VII.,

but the step taken was a revolutionary one, and the 25th of May has ever since been regarded as the birthday of Argentine independence. The most prominent leader of the junta was its secretary Mariano Moreno (1778–1811), who with a number of other active supporters of the patriot cause succeeded in raising a considerable force of Buenos Aireans to maintain, arms in hand, their nationalist and anti-Spanish doctrines. An attempt of the Spanish party to make Balthasar de Cisneros president of the junta failed, and the ex-viceroy retired to Montevideo. A sanguinary struggle between the party of independence and the adherents of Spain spread over the whole country, and was carried on with varying fortune. Foremost among the leaders of the revolutionary armies were Manuel Belgrano, and after March 1812 General José de San Martin, an officer who had gained experience against the French in the Peninsular War. A state of disorder, almost of anarchy, reigned in the provinces, but on the 25th of March 1816 a congress of deputies was assembled at Tucumán, who named Don Martin Pueyrredón supreme director, and on the 9th of July the separation of the united provinces of the Rio de la Plata was formally proclaimed, and comparative order was re-established in the country; Buenos Aires was declared the seat of the government. The jealousy of the provinces, however, against the capital led to a series of disturbances, and for many years continual civil war devastated every part of the country. Bolivia, Paraguay and Uruguay rose in armed revolt, and finally established themselves as separate republics, whilst the city of Buenos Aires itself was torn with faction and the scene of many a sanguinary fight.

Struggle for independence.

From 1816, however, the independence of the Argentine Republic was assured, and success attended the South Americans in their contest with the royal armies. The combined forces of Buenos Aires and Chile defeated the Spaniards at Chacabuco in 1817, and at Maipú in 1818; and from Chile the victorious general José de San Martin led his troops into Peru, where on the 9th of July 1821, he made a triumphal entry into Lima, which had been the chief stronghold of the Spanish power, having from the time of its foundation by Pizarro been the seat of government of a viceroyalty which at one time extended to the river Plate. A general congress was assembled at Buenos Aires on the 1st of March 1822, of representatives from all the liberated provinces, and a general amnesty was decreed, though the war was not over until the 9th of December 1824, when the republican forces gained the final victory of Ayacucho, in the Peruvian border-land. The Spanish government did not, however, formally acknowledge the independence of the country until the year 1842. On the 23rd of January 1825 a national constitution for the federal states, which formed the Argentine Republic, was decreed; and on the 2nd of February of the same year Sir Woodbine Parish, acting under the instructions of George Canning, signed a commercial treaty in Buenos Aires, by which the British government acknowledged the independence of the country. It had already been recognized by the United States of America two years previously.

Republic established.

In 1826 Bernardo Rivadavia was elected president of the confederation. His policy was to establish a strong central government, and he became the head of a party known as Unitarians in contradistinction to their opponents, who were styled Federalists, their aim being to maintain to the utmost the local autonomy of the various provinces. Under the government of Rivadavia the people of Buenos Aires became involved, practically single-handed, in a war with Brazil in defence of the Banda Oriental, which had been seized by the imperial forces (see URUGUAY). The Brazilians were defeated, notably at Ituzaingo, and in 1827 the war issued in the independence of Uruguay. Rivadavia's term of office was likewise memorable for the constitution of the 24th of December 1826, passed by the constituent congress of all the provinces, by which the bonds which united the confederated states of the Argentine Republic were strengthened. This project of closer union met, however, with much opposition both at Buenos Aires and the provinces. Rivadavia resigned, and Vicente Lopez, a Federalist, was elected to succeed him, but was speedily displaced by Manuel Dorrego (1827), another representative of the same party. The carrying out of Federalist principles led, however, to the formation in the republic of a number of quasi-independent military states, and Dorrego only ruled in Buenos Aires. After the conclusion of the peace with Brazil, the Unitarians placed themselves under the leadership of General Juan de Lavalle, the victor of Ituzaingo. Lavalle, at the head of a division of troops, drove Dorrego from Buenos Aires, pursued him into the interior, and captured him. He was shot (December 9, 1828), by the order of Lavalle, and during the year 1828 the country was given up to the horrors of civil war.

Unitarians and Federalists.

On the death of Dorrego, a remarkable man, Juan Manuel de Rosas, became the Federalist chief. In 1829 he defeated Lavalle, made himself master of Buenos Aires, and in the course of the next three years made his authority recognized after much fighting throughout the provinces. The Unitarians were relentlessly hunted down and a veritable reign of terror ensued. Rosas gradually concentrated all power in his own hands, and was hailed by the populace as a saviour of the state. In 1835, with the title of governor and captain-general, he acquired dictatorial powers, and all public authority passed into his hands. This dictatorship of Rosas continued until 1852. In every department of administration and of government he was supreme. He was exceedingly jealous of foreign interference, and quarrelled with France on questions connected with the rights of foreign residents. Buenos Aires was in 1838 blockaded by a French fleet; but Rosas stood firm. A formidable revolt took place in 1839 under General Lavalle, who had returned to the country accompanied by a number of banished Unitarians. In 1840 he invaded Buenos Aires at the head of troops raised chiefly in the province of Entre Rios; but he was defeated at Santa Fé, then at Luján, and finally was captured in Jujuy and shot, 1841. The rule of Rosas was now one of tyranny and almost incessant bloodshed in Buenos Aires, while his partisans, foremost amongst whom was General Ignacio Oribe, endeavoured to exterminate the Unitarians throughout the provinces. The scene of slaughter was extended to the Banda Oriental by the attempt of Oribe, with the support of Rosas, and of Justo José de Urquiza, governor of Entre Rios, to establish himself as president of that republic (see URUGUAY), where the existing government was hostile to Rosas and sheltered all political refugees from the country under his despotic rule. The siege of Montevideo led to a joint intervention of England and France. Buenos Aires was blockaded by the combined English and French fleets, September 1845, which landed a force to open the passage up the Paraná to Paraguay, which had been declared closed to foreigners by Rosas. A convention was signed in 1849, which secured the free navigation of the Paraná and the independence of the Banda Oriental. The downfall of Rosas was at last brought about by the instrumentality of Justo José de Urquiza, who as governor of Entre Rios, had for many years been one of his strongest supporters. The breach between the two men which led to open collision took place in 1846. The first efforts of Urquiza to rouse the country against the oppressor were unsuccessful, but in 1851 he concluded an alliance with Brazil, to which Uruguay afterwards adhered. A large army of twenty-four thousand men was collected at Montevideo, and on the 8th of January 1852 the allied forces crossed the Paraná and the road to Buenos Aires lay open before them. Rosas met the allies at the head of a body of troops fully equal in numbers to their own, but was crushingly routed, February 3rd, at Monte Caseros, about 10 m. from the capital. The dictator fled for refuge to the British legation, from whence he was conveyed on board H.B.M.S. "Locust," which carried him into exile.

Rosas dictator.

A provisional government was formed under Urquiza, and the Brazilian and Uruguayan troops withdrew. He summoned all the provincial governors at San Nicolás in the province of Buenos Aires, and on the 31st of May they proclaimed a new constitution, with Urquiza as provisional director of the Argentine nation. A constituent congress, in which each province had equal representation, was duly

Urquiza president.

elected, and in order to provide against the predominance of Buenos Aires, it was determined that Sante Fé should be the place of session. But this did not suit the *porteños*, as the people of Buenos Aires were called, and the province refused to take any part in the congressional proceedings. But Urquiza was a man of different temperament from Rosas, and when he found that Buenos Aires refused to submit to his authority, he declined to use force. The congress had (May 1, 1853) appointed Urquiza president of the confederation, and he established the seat of government at Paraná. The province of Buenos Aires was recognized as an independent state, and under the enlightened administration of Doctor Obligado made rapid strides in commercial prosperity. The two sections of the Argentine nation contrived to exist as separate governments without an open breach of the peace until 1859, when the long-continued tension led to the outbreak of hostilities. The army of the *porteños*, commanded by Colonel Bartolomé Mitre, was defeated at Cepeda by the confederate forces under Urquiza, and Buenos Aires agreed to re-enter the confederation (November 11, 1859). Urquiza at this juncture resigned the presidency, and Doctor Santiago Derqui was elected president of the fourteen provinces with the seat of government at Paraná; while Urquiza became once more governor of Entre Rios, and Mitre was appointed governor of Buenos Aires.

Buenos Aires and the provinces.

The struggle for supremacy between Buenos Aires and the provinces had, however, to be fought out, and hostilities once more broke out in 1861. The armies of the opposing parties, under Generals Mitre and Urquiza respectively, met at Pavón in the province of Santa Fé (September 17). The battle ended in the disastrous defeat of the provincial forces; General Mitre used his victory in a spirit of moderation and sincere patriotism. He was elected president of the Argentine confederation and did his utmost to settle the questions which had led to so many civil wars, on a permanent and sound basis. The constitution of 1853 was maintained, but Buenos Aires became the seat of federal government without ceasing to be a provincial capital. Causes of friction still remained, but they did not develop into open quarrels, for Mitre was content to leave Urquiza in his province of Entre Rios, and the other administrators (*caudillos*) in their several governments, a large measure of autonomy, trusting that the position and growing commercial importance of Buenos Aires would inevitably tend to make the federal capital the real centre of power of the republic. In 1865 the Argentines were forced into war with Paraguay through the overbearing attitude of the president Francisco Solano Lopez. The dictator of Paraguay had quarrelled with Brazil for its intervention in the internal affairs of Uruguay, and he demanded free passage for his troops across the Argentine province of Corrientes. This Mitre refused, and alliance was formed between Argentina, Brazil and Uruguay, for joint action against Lopez. General Mitre became commander-in-chief of the combined armies for the invasion of Paraguay and was absent for several years in the field. The struggle was severe and attended by heavy losses, and it was not until 1870 that the Paraguayans were conquered, Lopez killed, and peace concluded (see PARAGUAY). Meanwhile, disturbances had broken out in the interior of Argentina (1867), which compelled Mitre to relinquish his command in Paraguay, and to call back a large part of the Argentine forces to suppress the insurrection. The rebels had hoped for assistance from Urquiza, but the powerful governor of Entre Rios maintained the peace in his province, which under his firm and beneficent rule had greatly prospered, and the revolutionary movement was quickly subdued.

Mitre president.

Paraguay war.

In 1868 the term of General Mitre came to an end, and Doctor Domingo Faustino Sarmiento, a native of San Juan, was quietly elected to succeed him. His conduct of affairs was broad-minded and upright, and was characterized by earnest efforts to promote education and to develop the resources of the country. His period of office was marked by the rapid advance of Buenos Aires in population and prosperity, and by an expansion of trade that was unfortunately accompanied by financial extravagance. The war with Paraguay left a legacy of disputes concerning boundaries which almost led to war between the two victorious allies, Argentina and Brazil, but by the exertions of Mitre, who was sent at the close of 1872 as special envoy to Rio, a settlement was arrived at and friendly relations restored. The month of April 1870 saw an insurrection in Entre Rios headed by the *caudillo*, Lopez Jordan. Urquiza was assassinated, and the provincial legislature, through fear, at once proclaimed Lopez Jordan governor. The federal government refused to acknowledge the new governor, and troops were despatched by Sarmiento against Entre Rios. The contest lasted with varying success for more than a year, but finally Lopez Jordan was completely defeated and driven into exile.

Sarmiento president.

The presidential election of 1874 resolved itself, as so often before, into a struggle between the provincials and the *porteños* (Buenos Aires). The candidate of the former, Dr Nicolas Avellaneda, triumphed over General Mitre, not without suspicions of tampering with the returns; and the unsuccessful party appealed to arms. The new president, however, who was installed in office on the 12th of October, took active steps to suppress the revolution, which never assumed a really serious character. The government troops gained two decisive victories over the insurgents under Generals Mitre and Arredondo, and they were compelled to surrender at discretion. But though peace was for a time restored, the old causes of soreness and dissension remained unappeased, and as the time for the next presidential election began to draw near, it became more and more evident that a critical struggle was at hand, and that the people of Buenos Aires, supported by the province of Corrientes, were determined to bring to an issue the question as to what position Buenos Aires was to hold for the future with regard to the remaining provinces of the confederation. It was evident that the president intended to use all the influence which the party in power could exercise, to secure the return of General Julio Roca, who had distinguished himself in 1878 by a successful campaign against the warlike Indian tribes bordering on the Andes. The *porteños* on their part were determined to resist this policy to the utmost. Mass meetings were held, and a committee was appointed for the purpose of considering what action should be taken to defeat the ambitious designs of the provincials. Under the direction of this committee, the association known as the "Tiro Nacional" was formed, with the avowed object of training the able-bodied citizens of Buenos Aires in military exercises and creating a volunteer army, ready for service if called upon, to withstand by force the pretensions of their opponents. The establishment of the Tiro Nacional was enthusiastically received by all classes in Buenos Aires, the men turning out regularly to drill, and the women aiding the movement by collecting subscriptions for the purpose of armament and other necessaries. On the 13th of February 1880, the minister of war, Dr Carlos Pellegrini, summoned the principal officers connected with the Tiro Nacional, General Bartolomé Mitre, his brother Emilio, Colonel Julio Campos, Colonel Hilario Lagos and others, and warned them that as officers of the national army they owed obedience to the national government, and would be severely punished if concerned in any revolutionary outbreak against the constituted authorities. The reply to this threat was the immediate resignation of their commissions by all the officers connected with the Tiro Nacional. Two days later, the national government occupied, with a strong force of infantry and artillery, the parade ground at Palermo used by the Buenos Aires volunteers for drill purposes. A great meeting of citizens was then called and marched through the streets. President Avellaneda was frightened at the results of his action, and to avoid a collision ordered the troops to be withdrawn. Negotiations were now opened by the government with the provincial authorities for the disarmament of the city and province of Buenos Aires, but they led to nothing. Matters became still further strained on account of the outrages committed by the national troops, and such was the bitterness of

Avellaneda president.

The Tiro Nacional.

feeling developed between the two factions, that an appeal to arms became inevitable.

In the month of June 1880, President Avellaneda and his ministers left Buenos Aires, and this act was considered by the *porteño* leaders equivalent to a declaration of war. The national government and the twelve provinces forming the Córdoba League, were ranged on one side; the city and province of Buenos Aires and the province of Corrientes on the other. The national troops were well armed with Remington rifles, provided with abundant ammunition, equipped with artillery and supported by the fleet. In the city and province of Buenos Aires, plenty of volunteers offered their services, and an army of some twenty-five thousand men was quickly raised, but they were armed with old-fashioned weapons and there was only a limited supply of ammunition. Feverish attempts were made to remedy the lack of warlike stores, but difficulty was experienced on account of the fleet blockading the entrance to the river. After several skirmishes, the national army commanded by General Roca, containing many troops seasoned in Indian campaigns, assaulted the *porteños* posted before Buenos Aires, and after two days' hard fighting (20th and 21st July) forced its way into the town. On 23rd July the surrender of the city was demanded and obtained. The terms of the surrender were that all the leaders of the revolution should be removed from positions of authority, all government employees implicated in the movement dismissed, and the force in the province and city of Buenos Aires at once disarmed and disbanded. The power of Buenos Aires was thus completely broken and at the mercy of the Córdoba League. The *porteños* were no longer in a position to nominate a candidate in opposition to General Julio Roca, who was duly elected. He assumed office in October 1880.

Appeal to arms.

Fall of Buenos Aires.

Hitherto General Roca had been regarded only in his capacity as a soldier, and not from the point of view of an administrator. In the campaigns against the Indians in the south-west of the province of Buenos Aires and the valley of the Rio Negro he had gained much prestige; the victory over Buenos Aires added to his fame, and secured his authority in the outlying provincial centres. One of the first notable acts of the Roca administration was to declare the city of Buenos Aires the property of the national government. This separation of the city from the province, and its federalization had been one of the chief aims of the Córdoba League, and was the natural consequence of the crushing defeat inflicted on the *porteños*. As a sequel to this step, in 1884 the town of La Plata was declared to be the capital of the province of Buenos Aires, and the provincial administration was moved to that place. This federalization of the capital has proved to be a most important factor in binding together the different parts of the confederation, and in promoting the evolution of an Argentine nation out of a loosely cemented union of a number of semi-independent states.

Roca president.

Considering the circumstances in which General Roca assumed office, it must be admitted that he showed great moderation and used the practically absolute power that he possessed to establish a strong central government, and to initiate a national policy, which aimed at furthering the prosperity and development of the whole country. He was able by the influence he exerted to keep down the internal dissensions and insurrectionary outbreaks which had so greatly impeded for many years the development of the vast natural resources of the republic. With this object he had promoted the extension of railways so as to link the provinces with the great port of Buenos Aires, and to provide at the same time facilities for the rapid despatch of military forces to disturbed districts. Unfortunately the last two years of Roca's term of office were marked by two grave errors, which subsequently caused widespread suffering and distress throughout the country. The first of these mistakes was a measure making (January 1885) the currency inconvertible for a period of two years. This act, which was only decided upon after much hesitation, had a most deleterious effect upon the national credit. The second was the nomination of Dr Miguel Juarez Celman for the presidential term commencing in October 1886. The nomination was brought about by the Córdoba clique, and Roca lacked the moral courage to oppose the decision of this group, though he was well aware that Celman, who was his brother-in-law, was neither intellectually nor morally fitted for the post.

No sooner had President Juarez Celman come into power towards the close of 1886, than the respectable portion of the community began to feel alarmed at the methods practised by the new president in his conduct of public affairs. At first it was hoped that the influence of General Roca would serve to check any serious extravagance on the part of Celman. This hope, however, was doomed to disappointment, and before many months had elapsed it was clear that the president would listen to no prudent counsels from Roca or from any one else. The men of the old Córdoba League became dominant in all branches of the government, and carpet-bagging politicians occupied every official post. In their hurry to obtain wealth, this crowd of office-mongers from the provinces lent themselves to all kinds of bribery and corruption. The public credit was pledged at home and abroad to fill the pockets of the adventurers, and the wildest excesses were committed under the guise of administrative acts. What followed in the second and third years of the Celman administration can only adequately be described as a debauchery of the national honour, of the national resources, of the rights of Argentines as citizens of the republic. Buenos Aires was still prostrate under the crushing blow of the misfortunes of 1880, and lacked strength and power of organization necessary to raise any effective protest against the proceedings of Celman and his friends when the true character of these proceedings was first understood. The conduct of public affairs, however, at length became so scandalous, that action on the part of the more sober-minded and conservative sections was seen to be absolutely imperative if the country was to be saved from speedy and certain ruin. In 1889 the association of the "Union Civica" was founded, and the organization undertaken by Dr Leandro Alem, Dr Aristobulo del Valle, Dr Bernardo Irigoyen, Dr Vicente Lopez, Dr Lucio Lopez, Dr Oscar Lilliedale and other leading citizens. The untiring energy and zeal of Leandro Alem fitted him for being the chief organizer of a movement into which he threw himself heart and soul. Mass meetings were held in Buenos Aires, and it fell specially to the lot of Dr del Valle, who was an able orator as well as a sincere patriot, to expose the irresponsible and corrupt character of the administration, and the terrible dangers that threatened the republic through its reckless extravagance and financial improvidence. Subsidiary clubs affiliated to the central administration were formed throughout the length and breadth of the country, and millions of leaflets and pamphlets were distributed broadcast to explain the importance of the movement. President Celman underrated the strength of the new opposition, and relied upon his armed forces promptly to suppress any signs of open hostility. No change was made in official methods, and the condition of affairs drifted from bad to worse, until the temper of the people, so long and so sorely tried, showed plainly that the situation had become insufferable. The Union Civica then decided to make a bold bid for freedom by attempting forcibly to eject Celman and his clique from office.

Celman president.

The Union Civica.

On the night of the 26th of July 1890 the Union Civica called its members to arms. It was joined by some regiments of the regular army and received the support of the fleet. Barricades were thrown up in the principal streets, and the surrounding houses were occupied by the insurgents. Two days of desultory street fighting ensued, during which the fleet began to bombard the city, but was compelled to desist by the interference of foreign men-of-war, on the ground that the bombardment was causing unnecessary damage to the life and property of non-combatants. A suspension of hostilities then took place, and negotiations were opened between the contending parties. Celman, acting upon the advice of General Roca, who recognized the strength of public opinion in the outbreak, placed his resignation in the hands of congress on the 31st of July. A scene of

intense enthusiasm followed, and Buenos Aires was *en fête* for the following three days. The vice-president of the confederation, Carlos Pellegrini, who had been minister of war under presidents Avellaneda and Roca and had had much administrative experience, succeeded without opposition to the vacant post.

Much satisfaction was shown in Europe at the fall of President Celman, for investors had suffered heavily by the way in which the resources of Argentina had been dissipated by a corrupt government, and hopes were entertained that the uprising of public opinion against his financial methods signified a more honest conduct of the national affairs in the future. Great expectations were entertained of the ability of President Pellegrini to establish a sound administration, and he succeeded in forming a ministry which gave general satisfaction throughout the country. General Roca was induced to undertake the duties of minister of the interior, and his influence in the provinces was sufficient to check any attempts to stir up disturbances at Córdoba or elsewhere. The most onerous post of all, that of minister of finance, was confided to Dr Vicente Lopez, who, though he was not of marked financial ability, was at least a man of untiring industry and of a personal integrity that was above suspicion. But the economic and financial situation was one of almost hopeless embarrassment and confusion, and Pellegrini proved himself incapable of grappling with it. Instead of facing the difficulties, the president preferred to put off the day of reckoning by flooding the country with inconvertible notes, with the result that the financial crisis became more and more aggravated. Through the rapid depreciation of Argentine credit, the great firm of Baring Brothers, the financial agents of the government in London, became so heavily involved that they were forced into liquidation, November 1890. The consequences of this catastrophe were felt far and wide, and in the spring of 1891 both the Banco Nacional and the Banco de la provincia de Buenos Aires were unable to meet their obligations. Amidst this sea of financial troubles the government drifted helplessly on, without showing any inclination or capacity to initiate a strong policy of reform in the methods of administration which had done so much to ruin the country.

Pellegrini president.

It is little wonder that, in these circumstances, the choice of a successor to Pellegrini, whose term of office expired in 1892, should have been felt to possess peculiar importance. General Bartolomé Mitre was proposed by the *porteños* as their candidate. He had been absent from Argentina on a journey to Europe, and on his return in April 1891, a popular reception was given to him at which 50,000 persons attended. A petition was presented to him begging him to be a candidate for the presidency, and with some reluctance the veteran leader gave his consent. His partisans, however, found themselves confronted by a compact provincial party, who proposed to put forward the other strong man of the republic, General Roca, to oppose him. But the two generals were equally averse to a contest *à outrance*, which could only end in civil war. They met accordingly at a conference known as *El Acuerdo*, and it was arranged that both should withdraw, and that a non-party candidate should be selected who should receive the support of them both. The choice fell upon Dr Saenz Peña, a judge of the supreme court, and a man universally respected, who had never taken any part in political life. This compact aroused the bitter enmity of Dr Leandro Alem, who did his utmost to stir up the Union Civica to a campaign against the neutral candidate. Finding that the more conservative section of the union would not follow him, Alem formed a new association to which he gave the name of Union Civica Radical. Such was his energy, that soon a network of branches of the Union Civica Radical was organized throughout the republic, and Dr Bernardo Irigoyen was put forward as a rival candidate to Dr Saenz Peña. But Alem was not content with constitutional opposition to the Acuerdo, and his movement soon assumed the character of a revolutionary propaganda against the national government. His violence gave Pellegrini the opportunity of taking active steps to preserve the peace. In April 1892 Alem and his chief colleagues were arrested and sent into exile.

In the following month (May), the presidential elections were held; Dr Saenz Peña was declared duly elected, and Dr José Uriburu, the minister in Chile, was chosen as vice-president.

The idea of Dr Saenz Peña was to conduct the government on common sense and non-partisan lines, in fact to translate into practical politics the principles which underlay the compromise of the Acuerdo. He was a straightforward and honourable man, who tried his best to do his duty in a position that had been forced upon him, and was in no sense of the word his own seeking. No sooner, however, was he installed in office than difficulties began to crop up on all sides, and he quickly discovered that to attempt to govern without the aid of a majority in congress was practically impossible. He had had no experience of political life, and he refused to create the support he needed by using his presidential prerogative to build up a political majority. Obstruction met his well-meant efforts to promote the general good, and before twelve months of the presidential term had run public affairs were at a deadlock. Dr Alem, who had been permitted to return from exile, was not slow to profit by the occasion. Embittered by his treatment in 1892, he openly preached the advisability of an armed rising to overthrow the existing administration. Public opinion had been outraged by the immunity with which the governors of certain provinces, and more particularly Dr Julio Costa, the governor of the province of Buenos Aires, had been allowed to maintain local forces, by the aid of which they exacted the payment of illegal taxes and exercised other acts of injustice and oppression. A number of officers of the army and navy agreed to lend assistance to a revolutionary outbreak, and towards the end of July 1893 matters came to a head. The population of Buenos Aires assembled in armed bodies with the avowed intention of ejecting the governor from office, and electing in his stead a man who would give them a just administration. The president was for some time in doubt whether he had any right to intervene in provincial affairs, but eventually troops were despatched to La Plata. There was no serious fighting. Negotiations were soon opened which quickly led to the resignation of Costa, and the return of the insurgents to their homes. While these disturbances were taking place in the province of Buenos Aires, another revolutionary rising was in progress in Santa Fé. Here the efforts of Dr Alem succeeded in supplying a large body of rebels with arms and ammunition, and he was able, by a bold attack, to seize the town of Rosario and there establish the revolutionary headquarters. This capture so alarmed the national government that a force was sent under the command of Roca to put down the insurrection. The revolt speedily collapsed before this redoubtable commander, and Alem and the other leaders surrendered. They were sentenced to banishment in Staten Island at the pleasure of the federal government.

Saenz Peña president.

But the suppression of disorder did not relieve the tension between the congress and the executive. During the whole of the 1894 session, the attitude of senators and deputies alike was one of pronounced hostility to the president. All his acts were opposed, legislation was at a standstill and every effort was made to force Dr Saenz Peña to resign. But although he experienced the utmost difficulty in forming a cabinet, the president was obstinate in his determination to retain office without identifying himself with any party. A definite issue was therefore sought by the congress on which to join battle, and it arose out of the death sentences which had been pronounced on certain naval and military officers who had been implicated in the Santa Fé outbreak. The president had made up his mind that the sentence must be carried out; the congress by a great majority were resolved not to permit the death penalty to be inflicted. It was a one-sided struggle, for without the consent of the congress the president could not raise any money for supplies, and congress refused to vote the budget. But heavy expenses had been incurred in putting down revolutionary movements in various parts of the provinces, and war with Chile

was threatened upon the question of a dispute concerning the boundaries between the two republics. In January 1895 a special session of congress was summoned to take into consideration the financial proposals of the government, which included an increase in the naval and military estimates. Congress, however, had now got their opportunity, and they used the time of national stress to bring increased pressure to bear upon the president. On the 21st of January Dr Saenz Peña at last perceived that his position was untenable, and he handed in his resignation. It was accepted at once by the chambers, and the vice-president, Dr José Uriburu, became president of the republic for the three years and nine months of Peña's term which remained unexpired.

Uriburu president.

Uriburu was neither a politician nor a statesman, but had spent the greater portion of his life abroad in the diplomatic service. His knowledge of foreign affairs was, however, peculiarly useful at a juncture when boundary questions were the subjects that chiefly attracted public attention. After disputes with Brazil, extending over fifteen years, about the territory of "Misiones," the matter had been submitted to the arbitration of the president of the United States. In March 1895 President Cleveland gave his decision, which was wholly favourable to the contention of Brazil. The Argentine government, though disappointed at the result, accepted the award loyally. The boundary dispute with Chile, to which reference has already been made, was of a more serious character. The dispute was of old standing. Already in 1884 a protocol had been signed between the contending parties, by which it was agreed that the frontier should follow the line where "the highest peaks of the Andine ranges divide the watershed." This definition unfortunately ignored the fact that the Andes do not run from north to south in one continuous line, but are separated into cordilleras with valleys between them, and covering in their total breadth a considerable extent of country. Difference of opinion, therefore, arose as to the interpretation of the protocol, the Argentines insisting that the boundary should run from highest peak to highest peak, the Chileans that it should follow the highest points of the watershed. The quarrel at length became acute, and on both sides the populace clamoured from time to time for an appeal to arms, and the resources of both countries were squandered in military and naval preparations for a struggle. Nevertheless despite these obstacles, President Uriburu did something during his term of office to relieve the nation's financial difficulties. In 1896 a bill was passed by congress, which authorized the state by the issue of national bonds to assume the provincial external indebtedness. This proof of the desire of the Argentine government to meet honestly all its obligations did much to restore its credit abroad. Uriburu found in 1897 the financial position so far improved that he was able to resume cash payments on the entire foreign debt.

Roca president.

In 1898 there was another presidential election. Public opinion, excited by the prospect of a war with Chile, naturally supported the candidature of General Roca, and he was elected without opposition (12th October 1898). The first question which he had to handle was the Chilean boundary dispute. During the last months of President Uriburu's administration, matters had reached a climax, especially in connexion with the delimitation in a district known as the Puña de Atacama. In August an ultimatum was received from Chile demanding arbitration. After some hesitation, on the advice of Roca the Argentines agreed to the demand, and peace was maintained. The principle of arbitration being accepted, the conditions were quickly arranged. The question of the Puña de Atacama was referred to a tribunal composed of the United States minister to Argentina and of one Argentine and one Chilean delegate; that of the southern frontier in Patagonia to the British crown. One of the first steps of President Roca, after his accession to office, was to arrange a meeting with the president of Chile at the Straits of Magellan. At their conference all difficulties were discussed and settled, and an undertaking was given on both sides to put a stop to warlike preparations. The decision of the representative of the United States was given in April 1899. Although the Chileans professed dissatisfaction, no active opposition was raised, and the terms were duly ratified. In his message to congress, on the 1st of May 1899, General Roca spoke strongly of the immediate necessity of a reform in the methods of administering justice, the expediency of a revision of the electoral law, and the imperative need of a reconstruction of the department of public instruction. The administration of justice, he declared, had fallen to so low an ebb as to be practically non-existent. By the powerful influence of the president, government measures were sanctioned by the legislature dealing with the abuses which had been condemned. On the 31st of August of the same year a series of proposals upon the currency question was submitted to congress by the president, whose real object was to counteract the too rapid appreciation of the inconvertible paper money. The official value of the dollar was fixed at 44 cents gold for all government purposes. The violent fluctuations in the value of the paper dollar, which caused so much damage to trade and industry, were thus checked. In October 1900 Dr Manuel Campos Salles, president of Brazil, paid a visit to Buenos Aires, and was received with great demonstrations of friendliness. The aggressive attitude of Chile towards Bolivia was causing considerable anxiety, and Argentina and Brazil wished to show that they were united in opposing a policy which aimed at acquiring an extension of territory by force of arms. The feeling of enmity between Chile and Argentina was indeed anything but extinct. The delay of the arbitration tribunal in London in giving its decision in the matter of the disputed boundary in Patagonia led to a crop of wild rumours being disseminated, and to a revival of animosity between the two peoples. In December 1901 warlike preparations were being carried on in both states, and the outbreak of active hostilities appeared to be imminent. At the critical moment the British government, urged to move in the matter by the British residents in both countries, who feared that war would mean the financial ruin of both Chile and Argentina, used its utmost influence both at Santiago and Buenos Aires to allay the misunderstandings; and negotiations were set on foot which ended in a treaty for the cessation of further armaments being signed, June 1902. The award of King Edward VII. upon the delimitation of the boundary was given a few months later, and was received without controversy and ratified by both governments.

Quintana and Alcorta presidents.

To the calm resourcefulness and level-headedness of President Roca at a very difficult and critical juncture must be largely ascribed the preservation of peace, and the permanent removal of a dispute that had aroused so much irritation. His term of office came to an end in 1904, when Dr Manuel Quintana was elected president and Dr José Figueroa Alcorta vice-president, both having Roca's support. Dr Quintana at the time of his election was sixty-four years of age. He proved a hard-working progressive president, who did much for the development of communications and the opening up of the interior of the country. He died amidst general regret in March 1906, and was succeeded by Dr Alcorta for the remaining years of his term. (G. E.)

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ARGENTINE, a former city of Wyandotte county, Kansas, U. S. A., since 1910 a part of Kansas City, on the S. bank of the Kansas river, just above its mouth. Pop. (1890) 4732; (1900) 5878, of whom 623 were foreign-born and 603 of negro descent; (1905, state census) 6053. It is served by the Atchison, Topeka & Santa Fé railway, which maintains here yards and machine shops. The streets of the city run irregularly up the steep face of the river bluffs. Its chief industrial establishment is that of the United Zinc and Chemical Company, which has here one of the largest plants of its kind in the country. There are large grain interests. The site was platted in 1880, and the city was first incorporated in 1882 and again, as a city of the second class, in 1889.

ARGENTITE, a mineral which belongs to the galena group, and is cubic silver sulphide (Ag_2S). It is occasionally found as uneven cubes and octahedra, but more often as dendritic or earthy masses, with a blackish lead-grey colour and metallic lustre. The cubic cleavage, which is so prominent a feature in galena, is here present only in traces. The mineral is perfectly sectile and has a shining streak; hardness 2·5, specific gravity 7·3. It occurs in mineral veins, and when found in large masses, as in Mexico and in the Comstock lode in Nevada, it forms an important ore of silver. The mineral was mentioned so long ago as 1529 by G. Agricola, but the name argentite (from the Lat. *argentum*, "silver") was not used till 1845 and is due to W. von Haidinger. Old names for the species are Glaserz, silver-glance and vitreous silver. A cupriferous variety, from Jalpa in Tabasco, Mexico, is known as jalpaite. Acanthite is a supposed dimorphous form, crystallizing in the orthorhombic system, but it is probable that the crystals are really distorted crystals of argentite. (L. J. S.)

ARGENTON, a town of western France, in the department of Indre, on the Creuse, 19 m. S.S.W. of Châteauroux on the Orléans railway. Pop. (1906) 5638. The river is crossed by two bridges, and its banks are bordered by picturesque old houses. There are numerous tanneries, and the manufacture of boots and shoes and linen goods is carried on. The site of the ancient *Argentomagus* lies a little to the north.

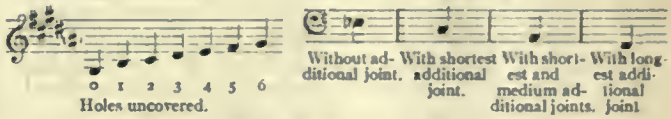
ARGHANDAB, a river of Afghanistan, about 250 m. in length. It rises in the Hazara country north-west of Ghazni, and flowing south-west falls into the Helmund 20 m. below Girishk. Very little is known about its upper course. It is said to be shallow, and to run nearly dry in height of summer; but when its depth exceeds 3 ft. its great rapidity makes it a serious obstacle to travellers. In its lower course it is much used for irrigation, and the valley is cultivated and populous; yet the water is said to be somewhat brackish. It is doubtful whether the ancient Arachotus is to be identified with the Arghandab or with its chief confluent the Tarnak, which joins it on the left about 30 m. S. W. of Kandahar. The two rivers run nearly parallel, inclosing the backbone of the Ghilzai plateau. The Tarnak is much the shorter (length about 200 m.) and less copious. The ruins at Ulân Robât, supposed to represent the city Arachosia, are in its basin; and the lake known as Ab-i-Istâda, the most probable representative of Lake Arachotus, is near the head of the Tarnak, though not communicating with it. The Tarnak is dammed for irrigation at intervals, and in the hot season almost exhausted. There is a good deal of cultivation along the river, but few villages. The high road from Kabul to Kandahar passes this way (another reason for supposing the Tarnak to be Arachotus), and the people live off the road to avoid the onerous duties of hospitality.

ARGHOUL, ARGHOOL, or ARGHUL (in the Egyptian hieroglyphs, As or As-ir),[1] an ancient and modern Egyptian and Arab wood-wind instrument, with cylindrical bore and single reed mouthpiece of the clarinet type. The arghoul consists of two reed pipes of unequal lengths bound together by means of waxed thread, so that the two mouthpieces lie side by side, and can be taken by the performer into his mouth at the same time. The mouthpiece consists of a reed having a small tongue detached by means of a longitudinal slit which forms the beating reed, as in the clarinet mouthpiece. The shorter pipe has six holes on which the melody is played; the three upper holes being covered by the fingers of the right hand, and the lower by those of the left hand. The longer pipe has no lateral holes; it is a

(From Edward William Lane's *An Account of the Manners and Customs of the Modern Egyptians.*)

Modern Arghoul, 3 ft. 2½ in. long.

drone pipe with one note only, which, however, can be varied by the addition of extra lengths of reed. In the illustration all three lengths are shown in use. An arghoul belonging to the collection of the Conservatoire Royal at Brussels, described by Victor Mahillon in his catalogue[2] (No. 113), gives the following scale:—



The total length of the shorter pipe, including the mouthpiece, is 0·435 m.; of the longer pipe, without additional joints, 0·555 m. An Egyptian arghoul,[3] presented by the khedive to the Victoria and Albert Museum, measures 4 ft. 8½ in.

For further information see Victor Loret, *L'Egypte au temps des Pharaons* (Paris, 1889), 8vo, pp. 139, 143, 144; G. A. Villoteau, *Description historique technique et littéraire des instruments de musique des orientaux* (*Description de l'Egypte*, Paris, 1823, tome xiii. pp. 456–473). (K. S.)

ARGOL, the commercial name of crude tartar (*q.v.*). It is a semi-crystalline deposit which forms on wine vats, and is generally grey or red in colour.

ARGON (from the Gr. ἀ-, privative, and ἔργον, work; hence meaning "inert"), a gaseous constituent of atmospheric air. For more than a hundred years before 1894 it had been supposed that the composition of the atmosphere was thoroughly known. Beyond variable quantities of moisture and traces of carbonic acid, hydrogen, ammonia, &c., the only constituents recognized were nitrogen and oxygen. The analysis of air was conducted by determining the amount of oxygen present and assuming the remainder to be nitrogen. Since the time of Henry Cavendish no one seemed even to have asked the question whether the residue was, in truth, all capable of conversion into nitric acid.

The manner in which this condition of complacent ignorance came to be disturbed is instructive. Observations undertaken mainly in the interest of Prout's law, and extending over many years, had been conducted to determine afresh the densities of the principal gases—hydrogen, oxygen and nitrogen. In the latter case, the first preparations were according to the

[1] See Victor Loret, "Les flûtes égyptiennes antiques," *Journal Asiatique*, 8ème série, tome xiv., Paris, 1889, pp. 129, 130 and 132.

[2] *Catalogue descriptif et analytique du musée du Conservatoire Royal de Bruxelles* (Ghent, 1880), p. 141.

[3] *A Descriptive Catalogue of the Musical Instruments in the South Kensington Museum*, by Carl Engel (London, 1874), p. 143.

convenient method devised by Vernon Harcourt, in which air charged with ammonia is passed over red-hot copper. Under the influence of the heat the atmospheric oxygen unites with the hydrogen of the ammonia, and when the excess of the latter is removed with sulphuric acid, the gas properly desiccated should be pure nitrogen, derived in part from the ammonia, but principally from the air. A few concordant determinations of density having been effected, the question was at first regarded as disposed of, until the thought occurred that it might be desirable to try also the more usual method of preparation in which the oxygen is removed by actual oxidation of copper without the aid of ammonia. Determinations made thus were equally concordant among themselves, but the resulting density was about $\frac{1}{100}$ part greater than that found by Harcourt's method (Rayleigh, *Nature*, vol. xlvi. p. 512, 1892). Subsequently when *oxygen* was substituted for air in the first method, so that all (instead of about one-seventh part) of the nitrogen was derived from ammonia, the difference rose to ½ %. Further experiment only brought out more clearly the diversity of the gases hitherto assumed to be identical. Whatever were the means employed to rid air of accompanying oxygen, a uniform value of the density was arrived at, and this value was ½ % greater than that appertaining to nitrogen extracted from compounds such as nitrous oxide, ammonia and ammonium nitrite. No impurity, consisting of any known substance, could be discovered capable of explaining an excessive weight in the one case, or a deficiency in the other. Storage for eight months did not disturb the density of the chemically extracted gas, nor had the silent electric discharge any influence upon either quality. ("On an Anomaly encountered in determining the Density of Nitrogen Gas," *Proc. Roy. Soc.*, April 1894.)

At this stage it became clear that the complication depended upon some hitherto unknown body, and probability inclined to the existence of a gas in the atmosphere heavier than nitrogen, and remaining unacted upon during the removal of the oxygen —a conclusion afterwards fully established by Lord Rayleigh and Sir William Ramsay. The question which now pressed was as to the character of the evidence for the universally accepted view that the so-called nitrogen of the atmosphere was all of one kind, that the nitrogen of the air was the same as the nitrogen of nitre. Reference to Cavendish showed that he had already raised this question in the most distinct manner, and indeed, to a certain extent, resolved it. In his memoir of 1785 he writes:—

"As far as the experiments hitherto published extend, we scarcely know more of the phlogisticated part of our atmosphere than that it is not diminished by lime-water, caustic alkalies, or nitrous air; that it is unfit to support fire or maintain life in animals; and that its specific gravity is not much less than that of common air; so that, though the nitrous acid, by being united to phlogiston, is converted into air possessed of these properties, and consequently, though it was reasonable to suppose, that part at least of the phlogisticated air of the atmosphere consists of this acid united to phlogiston, yet it may fairly be doubted whether the whole is of this kind, or whether there are not in reality many different substances confounded together by us under the name of phlogisticated air. I therefore made an experiment to determine whether the whole of a given portion of the phlogisticated air of the atmosphere could be reduced to nitrous acid, or whether there was not a part of a different nature to the rest which would refuse to undergo that change. The foregoing experiments indeed, in some measure, decided this point, as much the greatest part of air let up into the tube lost its elasticity; yet, as some remained unabsorbed, it did not appear for certain whether that was of the same nature as the rest or not. For this purpose I diminished a similar mixture of dephlogisticated [oxygen] and common air, in the same manner as before [by sparks over alkali], till it was reduced to a small part of its original bulk. I then, in order to decompound as much as I could of the phlogisticated air [nitrogen] which remained in the tube, added some dephlogisticated air to it and continued the spark until no further diminution took place. Having by these means condensed as much as I could of the phlogisticated air, I let up some solution of liver of sulphur to absorb the dephlogisticated air; after which only a small bubble of air remained unabsorbed, which certainly was not more than $\frac{1}{120}$ of the bulk of the dephlogisticated air let up into the tube; so that, if there be any part of the dephlogisticated air of our atmosphere which differs from the rest, and cannot be reduced to nitrous acid, we may safely conclude that it is not more than $\frac{1}{120}$ part of the whole."

Although, as was natural, Cavendish was satisfied with his result, and does not decide whether the small residue was genuine, it is probable that his residue was really of a different kind from the main bulk of the "phlogisticated air," and contained the gas afterwards named argon.

The announcement to the British Association in 1894 by Rayleigh and Ramsay of a new gas in the atmosphere was received with a good deal of scepticism. Some doubted the discovery of a new gas altogether, while others denied that it was present in the atmosphere. Yet there was nothing inconsistent with any previously ascertained fact in the asserted presence of 1 % of a non-oxidizable gas about half as heavy again as nitrogen. The nearest approach to a difficulty lay in the behaviour of liquid air, from which it was supposed, as the event proved erroneously, that such a constituent would separate itself in the solid form. The evidence of the existence of a new gas (named Argon on account of its chemical inertness), and a statement of many of its properties, were communicated to the Royal Society (see *Phil. Trans.* clxxxvi. p. 187) by the discoverers in January 1895. The isolation of the new substance by removal of nitrogen from air was effected by two distinct methods. Of these the first is merely a development of that of Cavendish. The gases were contained in a test-tube A (fig. 1) standing over a large quantity of weak alkali B, and the current was conveyed in wires insulated by U-shaped glass tubes CC passing through the liquid and round the mouth of the test-tube. The inner platinum ends DD of the wire may be sealed into the glass insulating tubes, but reliance should not be placed upon these sealings. In order to secure tightness in spite of cracks, mercury was placed in the bends. With a battery of five Grove cells and a Ruhmkorff coil of medium size, a somewhat short spark, or arc, of about 5 mm. was found to be more favourable than a longer one. When the mixed gases were in the right proportion, the rate of absorption was about 30 c.c. per hour, about thirty times as fast as Cavendish could work with the electrical machine of his day. Where it is available, an alternating electric current is much superior to a battery and break. This combination, introduced by W. Spottiswoode, allows the absorption in the apparatus of fig. 1 to be raised to about 80 c.c. per hour, and the method is very convenient for the purification of small quantities of argon and for determinations of the amount present in various samples of gas, *e.g.* in the gases expelled from solution in water. A convenient adjunct to this apparatus is a small voltameter, with the aid of which oxygen or hydrogen can be introduced at pleasure. The gradual elimination of the nitrogen is tested at a moment's notice with a miniature spectroscope. For this purpose a small Leyden jar is connected as usual to the secondary terminals, and if necessary the force of the discharge is moderated by the insertion of resistance in the primary circuit. When with a fairly wide slit the yellow line is no longer visible, the residual nitrogen may be considered to have fallen below 2 or 3 %. During this stage the oxygen should be in considerable excess. When the yellow line of nitrogen has disappeared, and no further contraction seems to be in progress, the oxygen may be removed by cautious introduction of hydrogen. The spectrum may now be further examined with a more powerful instrument. The most conspicuous group in the argon spectrum at atmospheric pressure is that first recorded by A. Schuster (fig. 2). Water vapour and excess of oxygen in moderation do not interfere seriously with its visibility. It is of interest to note that the argon spectrum may be fully developed by operating upon a miniature scale, starting with only 5 c.c. of air (*Phil. Mag.* vol. i. p. 103, 1901).

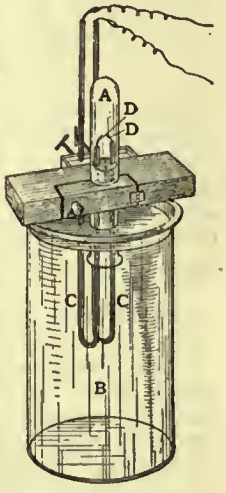


FIG. 1.

The development of Cavendish's method upon a large scale

involves arrangements different from what would at first be expected. The transformer working from a public supply should give about 6000 volts on open circuit, although when the electric flame is established the voltage on the platinums is only from 1600 to 2000. No sufficient advantage is attained by raising the pressure of the gases above atmosphere, but a capacious vessel is necessary. This may consist of a glass sphere of 50 litres' capacity, into the neck of which, presented downwards, the necessary tubes are fitted. The whole of the interior surface is washed with a fountain of alkali, kept in circulation by means of a small centrifugal pump. In this apparatus, and with about one horse-power utilized at the transformer, the absorption of gas is 21 litres per hour ("The Oxidation of Nitrogen Gas," *Trans. Chem. Soc.*, 1897).

In one experiment, specially undertaken for the sake of measurement, the total air employed was 9250 c.c., and the oxygen consumed, manipulated with the aid of partially deaërated water, amounted to 10,820 c.c. The oxygen contained in the air would be 1942 c.c.; so that the quantities of atmospheric nitrogen and of total oxygen which enter into combination would be 7308 c.c. and 12,762 c.c. respectively. This corresponds to $N+1{\cdot}75\ O$, the oxygen being decidedly in excess of the proportion required to form nitrous acid. The argon ultimately found was 75·0 c.c., or a little more than 1 % of the atmospheric nitrogen used. A subsequent determination over mercury by A. M. Kellas (*Proc. Roy. Soc.* lix. p. 66, 1895) gave 1·186 c.c. as the amount of argon present in 100 c.c. of mixed atmospheric nitrogen and argon. In the earlier stages of the inquiry, when it was important to meet the doubts which had been expressed as to the presence of the new gas in the atmosphere, blank experiments were executed in which air was replaced by nitrogen from ammonium nitrite. The residual argon, derived doubtless from the water used to manipulate the gases, was but a small

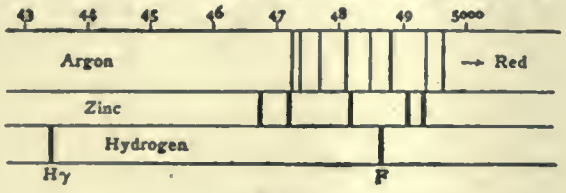


FIG. 2.

fraction of what would have been obtained from a corresponding quantity of air.¶

The other method by which nitrogen may be absorbed on a considerable scale is by the aid of magnesium. The metal in the form of thin turnings is charged into hard glass or iron tubes heated to a full red in a combustion furnace. Into this air, previously deprived of oxygen by red-hot copper and thoroughly dried, is led in a continuous stream. At this temperature the nitrogen combines with the magnesium, and thus the argon is concentrated. A still more potent absorption is afforded by calcium prepared *in situ* by heating a mixture of magnesium dust with thoroughly dehydrated quick-lime. The density of argon, prepared and purified by magnesium, was found by Sir William Ramsay to be 19·941 on the O=16 scale. The volume actually weighed was 163 c.c. Subsequently large-scale operations with the same apparatus as had been used for the principal gases gave an almost identical result (19·940) for argon prepared with oxygen.

Argon is soluble in water at 12° C. to about 4·0%, that is, it is about 2½ times more soluble than nitrogen. We should thus expect to find it in increased proportion in the dissolved gases of rain-water. Experiment has confirmed this anticipation. The weight of a mixture of argon and nitrogen prepared from the dissolved gases showed an excess of 24 mg. over the weight of true nitrogen, the corresponding excess for the atmospheric mixture being only 11 mg. Argon is contained in the gases liberated by many thermal springs, but not in special quantity. The gas collected from the King's Spring at Bath gave only ½ %, *i.e.* half the atmospheric proportion.

The most remarkable physical property of argon relates to the constant known as the ratio of specific heats. When a gas is warmed one degree, the heat which must be supplied depends upon whether the operation is conducted at a constant volume or at a constant pressure, being greater in the latter case. The ratio of specific heats of the principal gases is 1·4, which, according to the kinetic theory, is an indication that an important fraction of the energy absorbed is devoted to rotation or vibration. If, as for Boscovitch points, the whole energy is translatory, the ratio of specific heats must be 1·67. This is precisely the number found from the velocity of sound in argon as determined by Kundt's method, and it leaves no room for any sensible energy of rotatory or vibrational motion. The same value had previously been found for mercury vapour by Kundt and Warburg, and had been regarded as confirmatory of the monatomic character attributed on chemical grounds to the mercury molecule. It may be added that helium has the same character as argon in respect of specific heats (Ramsay, *Proc. Roy. Soc.* l. p. 86, 1895).

The refractivity of argon is ·961 of that of air. This low refractivity is noteworthy as strongly antagonistic to the view at one time favoured by eminent chemists that argon was a condensed form of nitrogen represented by N_3. The viscosity of argon is 1·21, referred to air, somewhat higher than for oxygen, which stands at the head of the list of the principal gases ("On some Physical Properties of Argon and Helium," *Proc. Roy. Soc.* vol. lix. p. 198, 1896).

The spectrum shows remarkable peculiarities. According to circumstances, the colour of the light obtained from a Plücker vacuum tube changes "from red to a rich steel blue," to use the words of Crookes, who first described the phenomenon. A third spectrum is distinguished by J. M. Eder and Edward Valenta. The red spectrum is obtained at moderately low pressures (5 mm.) by the use of a Ruhmkorff coil without a jar or air-gap. The red lines at 7056 and 6965 (Crookes) are characteristic. The blue spectrum is best seen at a somewhat lower pressure (1 mm. to 2·5 mm.), and usually requires a Leyden jar to be connected to the secondary terminals. In some conditions very small causes effect a transition from the one spectrum to the other. The course of electrical events attending the operation of a Ruhmkorff coil being extremely complicated, special interest attaches to some experiments conducted by John Trowbridge and T. W. Richards, in which the source of power was a secondary battery of 5000 cells. At a pressure of 1 mm. the red glow of argon was readily obtained with a voltage of 2000, but not with much less. After the discharge was once started, the difference of potentials at the terminals of the tube varied from 630 volts upwards.

The introduction of a capacity between the terminals of the Geissler tube, for example two plates of metal 1600 sq. cm. in area separated by a glass plate 1 cm. thick, made no difference in the red glow so long as the connexions were good and the condenser was quiet. As soon as a spark-gap was introduced, or the condenser began to emit the humming sound peculiar to it, the beautiful blue glow so characteristic of argon immediately appeared. (*Phil. Mag.* xliii. p. 77, 1897.)

The behaviour of argon at low temperatures was investigated by K. S. Olszewski (*Phil. Trans.*, 1895, p. 253). The following results are extracted from the table given by him:—

Name.	Critical Temperature, Cent.	Critical Pressure, Atmos.	Boiling Point, Cent.	Freezing Point, Cent.
Nitrogen. .	−146·0	35·0	−194·4	−214·0
Argon . .	−121·0	50·6	−187·0	−189·6
Oxygen . .	−118·8	50·8	−182·7	?

The smallness of the interval between the boiling and freezing points is noteworthy.

From the manner of its preparation it was clear at an early stage that argon would not combine with magnesium or calcium at a red heat, nor under the influence of the electric discharge with oxygen, hydrogen or nitrogen. Numerous other attempts to induce combination also failed. Nor does it appear that any well-defined compound of argon has yet been prepared. It was

found, however, by M. P. E. Berthelot that under the influence of the silent electric discharge, a mixture of benzene vapour and argon underwent contraction, with formation of a gummy product from which the argon could be recovered.

The facts detailed in the original memoir led to the conclusion that argon was an element or a mixture of elements, but the question between these alternatives was left open. The behaviour on liquefaction, however, seemed to prove that in the latter case either the proportion of the subordinate constituents was small, or else that the various constituents were but little contrasted. An attempt, somewhat later, by Ramsay and J. Norman Collie to separate argon by diffusion into two parts, which should have different densities or refractivities, led to no distinct effect. More recently Ramsay and M. W. Travers have obtained evidence of the existence in the atmosphere of three new gases, besides helium, to which have been assigned the names of neon, krypton and xenon. These gases agree with argon in respect of the ratio of the specific heats and in being non-oxidizable under the electric spark. As originally defined, argon included small proportions of these gases, but it is now preferable to limit the name to the principal constituent and to regard the newer gases as "companions of argon." The physical constants associated with the name will scarcely be changed, since the proportion of the "companions" is so small. Sir William Ramsay considers that probably the volume of all of them taken together does not exceed $\frac{1}{100}$th part of that of the argon. The physical properties of these gases are given in the following table (*Proc. Roy. Soc.* lxvii. p. 331, 1900):—

	Helium.	Neon.	Argon.	Krypton.	Xenon.
Refractivities (air = 1)	·1238	·2345	·968	1·449	2·364
Densities (O = 16)	1·98	9·97	19·96	40·88	64
Boiling points at 760 mm.	c. 6° [1] abs.	?	86·9° abs.	121·33° abs.	163·9° abs.
Critical temperatures	?	below 68° abs.	155·6° abs.	210·5° abs.	287·7° abs.
Critical pressures	?	?	40·2 metres.	41·24 metres.	43·5 metres.
Weight of 1c.c. of liquid	?	?	1·212 gm.	2·155 gm.	3·52 gm.

The glow obtained in vacuum tubes is highly characteristic, whether as seen directly or as analysed by the spectroscope.

Now that liquid air is available in many laboratories, it forms an advantageous starting-point in the preparation of argon. Being less volatile than nitrogen, argon accumulates relatively as liquid air evaporates. That the proportion of oxygen increases at the same time is little or no drawback. The following analyses (Rayleigh, *Phil. Mag.*, June 1903) of the *vapour* arising from liquid air at various stages of the evaporation will give an idea of the course of events:—

Percentage of Oxygen.	Percentage of Argon.	Argon as a Percentage of the Nitrogen and Argon.
30	1·3	1·9
43	2·0	3·5
64	2·0	5·6
75	2·1	8·4
90	2·0	20·0

(R.)

ARGONAUTS (Ἀργοναῦται, the sailors of the "Argo"), in Greek legend a band of heroes who took part in the Argonautic expedition under the command of Jason, to fetch the golden fleece. This task had been imposed on Jason by his uncle Pelias (*q.v.*), who had usurped the throne of Iolcus in Thessaly, which rightfully belonged to Jason's father Aeson. The story of the fleece was as follows. Jason's uncle Athamas had two children, Phrixus and Helle, by his wife Nephele, the cloud goddess. But after a time he became enamoured of Ino, the daughter of Cadmus, and neglected Nephele, who disappeared in anger. Ino, who hated the children of Nephele, persuaded Athamas, by means of a false oracle, to offer Phrixus as a sacrifice, as the only means of alleviating a famine which she herself had caused by ordering the grain to be secretly roasted before it was sown. But before the sacrifice the shade of Nephele appeared to Phrixus, bringing a ram with a golden fleece on which he and his sister Helle endeavoured to escape over the sea. Helle fell off and was drowned in the strait, which after her was called the Hellespont. Phrixus, however, reached the other side in safety, and proceeding by land to Aea in Colchis on the farther shore of the Euxine Sea, sacrificed the ram, and hung up its fleece in the grove of Ares, where it was guarded by a sleepless dragon.

Jason, having undertaken the quest of the fleece, called upon the noblest heroes of Greece to take part in the expedition. According to the original story, the crew consisted of the chief members of Jason's own race, the Minyae. But when the legend became common property, other and better-known heroes were added to their number—Orpheus, Castor and Polydeuces (Pollux), Zetes and Calaïs, the winged sons of Boreas, Meleager, Theseus, Heracles. The crew was supposed to consist of fifty, agreeing in number with the fifty oars of the "Argo," so called from its builder Argos, the son of Phrixus, or from ἀργός (swift). It was a larger vessel than had ever been seen before, built of pine-wood that never rotted from Mount Pelion. The goddess Athena herself superintended its construction, and inserted in the prow a piece of oak from Dodona, which was endowed with the power of speaking and delivering oracles. The outward course of the "Argo" was the same as that of the Greek traders, whose settlements as early as the 6th century B.C. dotted the southern shores of the Euxine. The first landing-place was the island of Lemnos, which was occupied only by women, who had put to death their fathers, husbands and brothers. Here the Argonauts remained some months, until they were persuaded by Heracles to leave. It is known from Herodotus (iv. 145) that the Minyae had formed settlements at Lemnos at a very early date. Proceeding up the Hellespont, they sailed to the country of the Doliones, by whose king, Cyzicus, they were hospitably received. After their departure, being driven back to the same place by a storm, they were attacked by the Doliones, who did not recognize them, and in a battle which took place Cyzicus was killed by Jason. After Cyzicus had been duly mourned and buried, the Argonauts proceeded along the coast of Mysia, where occurred the incident of Heracles and Hylas (*q.v.*). On reaching the country of the Bebryces, they again landed to get water, and were challenged by the king, Amycus, to match him with a boxer. Polydeuces came forward, and in the end overpowered his adversary, and bound him to a tree, or according to others, slew him. At the entrance to the Euxine, at Salmydessus on the coast of Thrace, they met Phineus, the blind and aged king whose food was being constantly polluted by the Harpies. He knew the course to Colchis, and offered to tell it, if the Argonauts would free him from the Harpies. This was done by the winged sons of Boreas, and Phineus now told them their course, and that the way to pass through the Symplegades or Cyanean rocks—two cliffs which moved on their bases and crushed whatever sought to pass—was first to fly a pigeon through, and when the cliffs, having closed on the pigeon, began to retire to each side, to row the "Argo" swiftly through. His advice was successfully followed, and the "Argo" made the passage unscathed, except for trifling damage to the stern. From that time the rocks became fixed and never closed again. The next halting-places were the country of the Maryandini, where the helmsman Tiphys died, and the land of the Amazons on the banks of the Thermodon. At the island of Aretias they drove away the Stymphalian birds, who used their feathers of brass as arrows. Here they found and took on board the four sons of Phrixus who, after their father's death, had been sent by Aeetes, king of Colchis, to fetch the treasures of Orchomenus, but had been driven by a storm upon the island. Passing near Mount Caucasus, they heard the groans of Prometheus and the flapping of the wings of the eagle which gnawed his liver. They now reached their goal, the river Phasis, and the following morning Jason repaired to the palace of Aeetes, and demanded

[1] Sir James Dewar, *Compt. Rend.* (1904), 139, 261 and 241.

the golden fleece. Aeetes required of Jason that he should first yoke to a plough his bulls, given him by Hephaestus, which snorted fire and had hoofs of brass, and with them plough the field of Ares. That done, the field was to be sown with the dragons' teeth brought by Phrixus, from which armed men were to spring. Successful so far by means of the mixture which Medea, daughter of Aeetes, had given him as proof against fire and sword, Jason was next allowed to approach the dragon which watched the fleece; Medea soothed the monster with another mixture, and Jason became master of the fleece. Then the voyage homeward began, Medea accompanying Jason, and Aeetes pursuing them. To delay him and obtain escape, Medea dismembered her young brother Absyrtus, whom she had taken with her, and cast his limbs about in the sea for his father to pick up. Her plan succeeded, and while Aeetes was burying the remains of his son at Tomi, Jason and Medea escaped. In another account Absyrtus had grown to manhood then, and met his death in an encounter with Jason, in pursuit of whom he had been sent. Of the homeward course various accounts are given. In the oldest (Pindar) the "Argo" sailed along the river Phasis into the eastern Oceanus, round Asia to the south coast of Libya, thence to the mythical lake Tritonis, after being carried twelve days over land through Libya, and thence again to Iolcus. Hecataeus of Miletus (Schol. Apollon. Rhod. iv. 259) suggested that from the Oceanus it may have sailed into the Nile, and so to the Mediterranean. Others, like Sophocles, described the return voyage as differing from the outward course only in taking the northern instead of the southern shore of the Euxine. Some (pseudo-Orpheus) supposed that the Argonauts had sailed up the river Tanaïs, passed into another river, and by it reached the North Sea, returning to the Mediterranean by the Pillars of Hercules. Again, others (Apollonius Rhodius) laid down the course as up the Danube (Ister), from it into the Adriatic by a supposed mouth of that river, and on to Corcyra, where a storm overtook them. Next they sailed up the Eridanus into the Rhodanus, passing through the country of the Celts and Ligurians to the Stoechades, then to the island of Aethalia (Elba), finally reaching the Tyrrhenian Sea and the island of Circe, who absolved them from the murder of Absyrtus. Then they passed safely through Scylla and Charybdis, past the Sirens, through the Planctae, over the island of the Sun, Trinacria and on to Corcyra again, the land of the Phaeacians, where Jason and Medea held their nuptials. They had sighted the coast of Peloponnesus when a storm overtook them and drove them to the coast of Libya, where they were saved from a quicksand by the local nymphs. The "Argo" was now carried twelve days and twelve nights to the Hesperides, and thence to lake Tritonis (where the seer Mopsus died), whence Triton conducted them to the Mediterranean. At Crete the brazen Talos, who would not permit them to land, was killed by the Dioscuri. At Anaphe, one of the Sporades, they were saved from a storm by Apollo. Finally, they reached Iolcus, and the "Argo" was placed in a groove sacred to Poseidon on the isthmus of Corinth. Jason's death, it is said, was afterwards caused by part of the stern giving way and falling upon him.

The story of the expedition of the Argonauts is very old. Homer was acquainted with it and speaks of the "Argo" as well known to all men; the wanderings of Odysseus may have been partly founded on its voyage. Pindar, in the fourth Pythian ode, gives the oldest detailed account of it. In Greek, there are also extant the *Argonautica* of Apollonius Rhodius and the pseudo-Orpheus (4th century A.D.), and the account in Apollodorus (i. 9), based on the best extant authorities; in Latin, the imitation of Apollonius (a free translation or adaptation of whose *Argonautica* was made by Terentius Varro Atacinus in the time of Cicero) by Valerius Flaccus. In ancient times the expedition was regarded as a historical fact, an incident in the opening up of the Euxine to Greek commerce and colonization. Its object was the acquisition of gold, which was caught by the inhabitants of Colchis in fleeces as it was washed down the rivers. Suidas says that the fleece was a book written on parchment, which taught how to make gold by chemical processes. The rationalists explained the ram on which Phrixus crossed the sea as the name or ornament of the ship on which he escaped. Several interpretations of the legend have been put forward by modern scholars. According to C. O. Müller, it had its origin in the worship of Zeus Laphystius; the fleece is the pledge of reconciliation; Jason is a propitiating god of health, Medea a goddess akin to Hera; Aeetes is connected with the Colchian sun-worship. Forchhammer saw in it an old nature symbolism; Jason, the god of healing and fruitfulness, brought the fleece—the fertilizing rain-cloud—to the western land that was parched by the heat of the sun. Others treat it as a solar myth; the ram is the light of the sun, the flight of Phrixus and the death of Helle signify its setting, the recovery of the fleece its rising again.

There are numerous treatises on the subject: F. Vater, *Der Argonautenzug* (1845); J. Stender, *De Argonautarum Expeditione* (1874); D. Kennerknecht, *De Argonautarum Fabula* (1886); M. Groeger, *De Argonautarum Fabularum Historia* (1889); see also Grote, *History of Greece*, part i. ch. 13; Preller, *Griechische Mythologie*; articles in Pauly-Wissowa's *Realencyclopädie*, Roscher's *Lexikon der Mythologie*, and Daremberg and Saglio's *Dictionnaire des Antiquités*.

ARGONNE, a rocky forest-clad plateau in the north-east of France, extending along the borders of Lorraine and Champagne, and forming part of the departments of Ardennes, Meuse and Marne. The Argonne stretches from S.S.E. to N.N.W., a distance of 63 m. with an average breadth of 19 m., and an average height of 1150 ft. It forms the connecting-link between the plateaus of Haute Marne and the Ardennes, and is bounded E. by the Meuse and W. by the Ante and the Aisne, which rises in its southern plateau. The valleys of the Aire and other rivers traverse it longitudinally, a fact to which its importance as a bulwark of north-eastern France is largely due. Of the numerous forests which clothe both slopes of the plateau, the chief is that of Argonne, which extends for 25 m. between the Aire and the Aisne.

For Dumouriez's Argonne campaign in 1792, see FRENCH REVOLUTIONARY WARS.

ARGOS, the name of several ancient Greek cities or districts, but specially appropriated in historic times to the chief town in eastern Peloponnese, whence the peninsula of Argolis derives its name. The Argeia, or territory of Argos proper, consisted of a shelving plain at the head of the Gulf of Argolis, enclosed between the eastern wall of the Arcadian plateau and the central highlands of Argolis. The waters of this valley (Inachus, Charadrus, Erasinus), when properly regulated, favoured the growth of excellent crops, and the capital standing only 3 m. from the sea was well placed for Levantine trade. Hence Argos was perhaps the earliest town of importance in Greece; the legends indicate its high antiquity and its early intercourse with foreign countries (Egypt, Lycia, &c.). Though eclipsed in the Homeric age, when it appears as the seat of Diomedes, by the later foundation of Mycenae, it regained its predominance after the invasion of the Dorians (*q.v.*), who seem to have occupied this site in considerable force. In accordance with the tradition which assigned the portion to the eldest-born of the Heracleid conquerors, Argos was for some centuries the leading power in Peloponnesus. There is good evidence that its sway extended originally over the entire Argolis peninsula, the land east of Parnon, Cythera, Aegina and Sicyon. Under King Pheidon the Argive empire embraced all eastern Peloponnesus, and its influence spread even to the western districts.

This supremacy was first challenged about the 8th century by Sparta. Though organized on similar lines, with a citizen population divided into three Dorian tribes (and one containing other elements), with a class of Perioeci (neighbouring dependents) and of serfs, the Argives had no more constant foe than their Lacedaemonian kinsmen. In a protracted struggle for the possession of the eastern seaboard of Laconia in spite of the victory at Hysiae (apparently in 669), they were gradually driven back, until by 550 they had lost the whole coast strip of Cynuria. A later attempt to retrieve this loss resulted in a crushing defeat near Tiryns at the hands of King Cleomenes I. (probably in 495), which so weakened the Argives that they had to open the franchise to their Perioeci. By this time they

had also lost control over the other cities of Argolis, which they never succeeded in recovering. Partly in consequence of its defeat, partly out of jealousy against Sparta, Argos took no part in the war against Xerxes. Indeed on this, as on later occasions, its relations with Persia seem to have been friendly. About 470 the conflict with Sparta was renewed in concert with the Arcadians, but all that the Argives could achieve was to destroy their revolted dependencies of Mycenae and Tiryns (468 or 464). In 461 they contracted an alliance with Athens, thus renewing a connexion established by Peisistratus (*q.v.*). In spite of this league Argos made no headway against Sparta, and in 451 consented to a truce. A more important result of Athenian intervention was the substitution of the democratic government for the oligarchy which had succeeded the early monarchy; at any rate forty years later we find that Argos possessed complete democratic institutions.

During the early Peloponnesian War Argos remained neutral; after the break-up of the Spartan confederacy consequent upon the peace of Nicias the alliance of this state, with its unimpaired resources and flourishing commerce, was courted on all sides. By throwing in her lot with the Peloponnesian democracies and Athens, Argos seriously endangered Sparta's supremacy, but the defeat of Mantineia (418) and a successful rising of the Argive oligarchs spoilt this chance. The speedily restored democracy put little heart into the conflict, and beyond sending mercenary detachments, lent Athens no further help in the war (see PELOPONNESIAN WAR).

At the outset of the 4th century, Argos, with a population and resources equalling those of Athens, took a prominent part in the Corinthian League against Sparta. In 394 the Argives helped to garrison Corinth, and the latter state seems for a while to have been annexed by them. But the peace of Antalcidas (*q.v.*) dissolved this connexion, and barred Argive pretensions to control all Argolis. After the battle of Leuctra Argos experienced a political crisis; the oligarchs attempted a revolution, but were put down by their opponents with such vindictiveness that 1200 of them are said to have been executed (370). The democracy consistently supported the victorious Thebans against Sparta, figuring with a large contingent on the decisive field of Mantineia (362). When pressed in turn by their old foes the Argives were among the first to call in Philip of Macedon, who reinstated them in Cynuria after becoming master of Greece. In the Lamian War Argos was induced to side with the patriots against Macedonia; after its capture by Cassander from Polyperchon (317) it fell in 303 into the hands of Demetrius Poliorcetes. In 272 the Argives joined Sparta in resisting the ambition of King Pyrrhus of Epirus, whose death ensued in an unsuccessful night attack upon the city. They passed instead into the power of Antigonus Gonatas of Macedonia, who maintained his control by means of tyrants. After several unavailing attempts Aratus (*q.v.*) contrived to win Argos for the Achaean League (229), in which it remained save during a brief occupation by the Spartans Cleomenes III. (*q.v.*) and Nabis (224 and 196).

The Roman conquest of Achaea enhanced the prosperity of Argos by removing the trade competition of Corinth. Under the Empire, Argos was the headquarters of the Achaean synod, and continued to be a resort of Roman merchants. Though plundered by the Goths in A.D. 267 and 395 it retained some of its commerce and culture in Byzantine days. The town was captured by the Franks in 1210; after 1246 it was held in fief by the rulers of Athens. In later centuries it became the scene of frequent conflicts between the Venetians and the Turks, and on two occasions (1397 and 1500) its population was massacred by the latter. Repeopled with Albanian settlers, Argos was chosen as seat of the Greek national assembly in the wars of independence. Its citadel was courageously defended by the patriots (1822); in 1825 the city was burnt to the ground by Ibrahim Pasha. The present town of 10,000 inhabitants is a purely agricultural settlement. The Argive plain, though not yet sufficiently reclaimed, yields good crops of corn, rice and tobacco.

In the early days of Greece the Argives enjoyed high repute for their musical talent. Their school of bronze sculpture, whose first famous exponent was Ageladas (Hagelaidas), the reputed master of Pheidias, reached its climax towards the end of the 5th century in the atelier of Polyclitus (*q.v.*) and his pupils. To this period also belongs the new Heraeum (see below), one of the most splendid temples of Greece.

Remains of the early city are still visible on the Larissa acropolis, which towers 900 ft. high to the north-west of the town. A few courses of the ancient ramparts appear under the double enceinte of the surviving medieval fortress. An aqueduct of Greek times is represented by some fragments on the south-western edge. In the slope above the town was hewn a theatre equalling that of Athens in size. The Aspis or smaller citadel to the north-east has revealed traces of an early Mycenaean settlement; the Deiras or ridge connecting the two heights contains a prehistoric cemetery.

AUTHORITIES.—Herodotus, Thucydides, Xenophon; Plutarch, *Pyrrhus*, 30-34; Strabo pp. 373-374; Pausanias ii. 15-24; W. M. Leake, *Travels in the Morea* (London, 1835), ii. chs. 19-22; E. Curtius, *Peloponnesos* (Gotha, 1851), ii. 350-364; H. F. Tozer, *Geography of Greece* (London, 1873), pp. 292-294; J. K. Kophiniotis, Ἱστορία τοῦ Ἄργους (Athens, 1892–1893); W. Vollgraff in *Bulletin de Correspondance Hellénique* (1904, pp. 364-399; 1906, pp. 1-45; 1907, pp. 139-184). (M. O. B. C.)

The Argive Heraeum.—Since 1892 investigation has added considerably to our knowledge concerning the Argive Heraeum or Heraion, the temple of Hera, which stood, according to Pausanias, "on one of the lower slopes of Euboea." The term Euboea did not designate the eminence upon which the Heraeum is placed, or the mountain-top behind the Heraeum only, but, as Pausanias distinctly indicates, the group of foothills of the hilly district adjoining the mountain. When once we admit that this designated not only the mountain, which is 1730 ft. high, but also the hilly district adjoining it, the general scale of distance for this site grows larger. The territory of the Heraeum was divided into three parts, namely Euboea, Acraea and Prosymna. Pausanias tells us that the Heraeum is 15 stadia from Mycenae. Strabo, on the other hand, says that the Heraeum was 40 stadia from Argos and 10 from Mycenae. Both authors underestimate the distance from Mycenae, which is about 25 stadia, or a little more than 3 m., while the distance from Argos is 45 stadia, or a little more than 5 m. The distance from the Heraeum to the ancient Midea is slightly greater than to Mycenae, while that from the Heraeum to Tiryns is about 6 m. The Argive Heraeum was the most important centre of Hera and Juno worship in the ancient world; it always remained the chief sanctuary of the Argive district, and was in all probability the earliest site of civilized life in the country inhabited by the Argive people. In fact, whereas the site of Hissarlik, the ancient Troy, is not in Greece proper, but in Asia Minor, and can thus not furnish the most direct evidence for the earliest Hellenic civilization as such; and whereas Tiryns, Mycenae, and the city of Argos, each represent only one definite period in the successive stages of civilization, the Argive Heraeum, holding the central site of early civilization in Greece proper, not only retained its importance during the three periods marked by the supremacy of Tiryns, Mycenae and the city of Argos, but in all probability antedated them as a centre of civilized Argive life. These conditions alone account for the extreme archaeological importance of this ancient sanctuary.

According to tradition the Heraeum was founded by Phoroneus at least thirteen generations before Agamemnon and the Achaeans ruled. It is highly probable that before it became important merely as a temple, it was the fortified centre uniting the Argive people dwelling in the plain, the citadel which was superseded in this function by Tiryns. There is ample evidence to show that it was the chief sanctuary during the Tirynthian period. When Mycenae was built under the Perseïds it was still the chief sanctuary for that centre, which superseded Tiryns in its dominance over the district, and which this temple clearly antedated in construction. According to the *Dictys Cretensis*, it was at this Heraeum that Agamemnon assembled the leaders

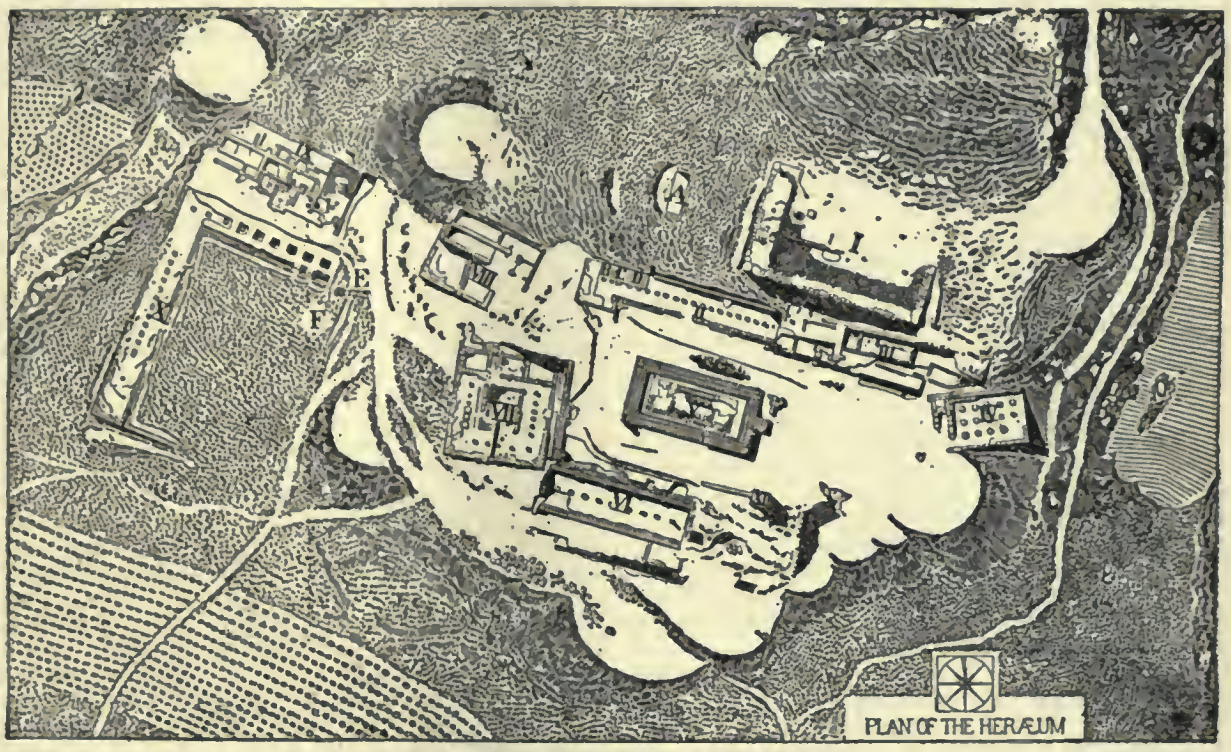
before setting out for Troy. In the period of Dorian supremacy, in spite of the new cults which were introduced by these people, the Heraeum maintained its supreme importance: it was here that the tablets recording the succession of priestesses were kept which served as a chronological standard for the Argive people, and even far beyond their borders; and it was here that Pheidon deposited the ὀβελίσκοι when he introduced coinage into Greece.

We learn from Strabo that the Heraeum was the joint sanctuary for Mycenae and Argos. But in the 5th century the city of Argos vanquished the Mycenaeans, and from that time onwards the city of Argos becomes the political centre of the district, while the Heraeum remains the religious centre. And when in the year 423 B.C., through the negligence of the priestess Chryseis, the old temple was burnt down, the Argives erected a splendid new temple, built by Eupolemos, in which was placed the great gold and ivory statue of Hera, by the sculptor Polyclitus, the contemporary and rival of Pheidias, which was one of the most perfect works of sculpture in antiquity. Pausanias describes the temple and its contents (ii. 17), and in his time he still saw the ruins of the older burnt temple above the temple of Eupolemos.

All these facts have been verified and illustrated by the excavations of the American Archaeological Institute and School of Athens, which were carried on from 1892 to 1895. In 1854 A. R. Rhangabé made tentative excavations on this site, digging a trench along the north and east sides of the second temple. Of these excavations no trace was to be seen when those of 1892 were begun. The excavations have shown that the sanctuary, instead of consisting of but one temple with the ruins of the older one above it, contained at least eleven separate buildings, occupying an area of about 975 ft. by 325.

On the uppermost terrace, defined by the great Cyclopean supporting wall, exactly as described by Pausanias, the excavations revealed a layer of ashes and charred wood, below which were found numerous objects of earliest date, together with some remains of the walls resting on a polygonal platform—all forming part of the earliest temple. Immediately adjoining the Cyclopean wall and below it were found traces of small houses of the rudest, earliest masonry which are pre-Mycenaean, if not pre-Cyclopean.

We then descend to the second terrace, in the centre of which the substructure of the great second temple was revealed, together with so much of the walls, as well as the several architectural members forming the superstructure, that it has been possible for E. L. Tilton to design a complete restoration of the temple. On the northern side of this terrace, between the second temple and the Cyclopean supporting wall, a long stoa or colonnade runs from east to west abutting at the west end in structures which evidently contained a well-house and waterworks; while at the eastern end of this stoa a number of chambers were erected against the hill, in front of which were placed statues and inscriptions, the bases for which are still extant. At the eastern-most end of this second terrace a large hall with three rows of columns in the interior, with a porch and entrance at the west end facing the temple, is built upon elaborate supporting walls of good masonry.



PLAN OF THE HERAEUM (*surveyed and drawn by Edward L. Tilton*).

I. Old Temple.	IV. East Building.	VII. West Building.	X. Lower Stoa.
II. Stoa.	V. 5th-Century Temple.	VIII. North-West Building.	XI. Phylakeion.
III. Stoa.	VI. South Stoa.	IX. Roman Building.	A, B, C, D, E, F, Cisterns.

Below the second terrace at the south-west end a large and complicated building, with an open courtyard surrounded on three sides by a colonnade and with chambers opening out towards the north, may have served as a gymnasium or a sanatorium. It is of good early Greek architecture, earlier than the second temple. A curious, ruder building to the north of this and to the west of the second terrace is probably of much earlier date, perhaps of the Mycenaean period, and may have served as propylaea.

Immediately below the second temple at the foot of the elevation on which this temple stands, towards the south, and thus facing the city of Argos, a splendid stoa or colonnade, to which large flights of steps lead, was erected about the time of the building of the second temple. It is a part of the great plan to give worthy access to the temple from the city of Argos. To the east of this large flights of steps lead up to the temple proper.

At the western extremity of the whole site, immediately beside the river-bed, we again have a huge stoa running round two sides of a square, which was no doubt connected with the functions of this sanctuary as a health resort, especially for women, the goddess

Hera presiding over and protecting married life and childbirth. Finally, immediately to the north of this western stoa there is an extensive house of Roman times also connected with baths.

While the buildings give archaeological evidence for every period of Greek life and history from the pre-Mycenaean period down to Roman times, the topography itself shows that the Heraeum must have been constructed before Mycenae and without any regard to it. The foothills which it occupies form the western boundary to the Argive plain as it stretches down towards the sea in the Gulf of Nauplia. While it was thus probably chosen as the earliest site for a citadel facing the sea, its second period points towards Tiryns and Midea. It could not have been built as the sanctuary of Mycenae, which was placed farther up towards the north-west in the hills, and could not be seen from the Heraeum, its inhabitants again not being able to see their sanctuary. The west building, the traces of bridges and roads, show that at one time it did hold some relation to Mycenae; but this was long after its foundation or the building of the huge Cyclopean supporting wall which is coeval with the walls of Tiryns, these again being earlier than those of Mycenae. There are, moreover, traces of still more primitive walls, built of rude small stones placed one upon the other without mortar, which are in character earlier than those of Tiryns, and have their parallel in the lowest layers of Hissarlik.

Bearing out the evidence of tradition as well as architecture, the numerous finds of individual objects in terra-cotta figurines, vases, bronzes, engraved stones, &c., point to organized civilized life on this site many generations before Mycenae was built, *a fortiori* before the life as depicted by Homer flourished—nay, before, as tradition has it, under Proetus the walls of Tiryns were erected. We are aided in forming some estimate of the chronological sequence preceding the Mycenaean age, as suggested by the finds of the Heraeum, in the new distribution which Dörpfeld has been led to make of the chronological stratification of Hissarlik. For the layer, which he now assigns to the Mycenaean period, is the sixth stratum from below. Now, as some of the remains at the Heraeum correspond to the two lowest layers of Hissarlik, the evidence of the Argive temple leads us far beyond the date assigned to the Mycenaean age, and at least into the second millennium B.C. (see also AEGEAN CIVILIZATION). As to its chronological relation to the Cretan sites—Cnossus, Phaestus, &c., and the "Minoan" civilization as determined by Dr A. Evans, see the discussion under CRETE.

This sanctuary still holds a position of central importance as illustrating the art of the highest period in Greek history, namely, the art of the 5th century B.C. under the great sculptor Polyclitus. Though the excavations in the second temple have clearly revealed the outlines of the base upon which the great gold and ivory statue of Hera stood, it is needless to say that no trace of the statue itself has been found. From Pausanias we learn that "the image of Hera is seated and is of colossal size: it is made of gold and ivory, and is the work of Polyclitus." Based on the computations made by the architect of the American excavations, E. L. Tilton, on the ground of the height of the nave, the total height of the image, including the base and the top of the throne, would be about 26 ft., the seated figure of the goddess herself about 18 ft. It is probable that the face, neck, arms and feet were of ivory, while the rest of the figure was draped in gold. Like the Olympian Zeus of Pheidias, Hera was seated on an elaborately decorated throne, holding in her left hand the sceptre, surmounted in her case by the cuckoo (as that of Zeus had an eagle), and in her right, instead of an elaborate figure of Victory (such as the Athena Parthenos and the Olympian Zeus held), simply a pomegranate. The crown was adorned with figures of Graces and the Seasons. A Roman imperial coin of Antoninus Pius shows us on a reduced scale the general composition of the figure; while contemporary Argive coins of the 5th century give a fairly adequate rendering of the head. A further attempt has been made to identify the head in a beautiful marble bust in the British Museum hitherto known as Bacchus (Waldstein, *Journal of Hellenic Studies*, vol. xxi., 1901, pp. 30 seq.)

We also learn from Pausanias that the temple was decorated with "sculptures over the columns, representing some the birth of Zeus and the battle of the gods and giants, others the Trojan War and the taking of Ilium." It was formerly supposed that the phrase "over the columns" pointed to the existence of sculptured metopes, but no pedimental groups. Finds made in the excavations, however, have shown that the temple also had pedimental groups. Besides numerous fragments of nude and draped figures belonging to pedimental statues, a well-preserved and very beautiful head of a female divinity, probably Hera, as well as a draped female torso of excellent workmanship, both belonging to the pediments, have been discovered. Of the metopes also a great number of fragments have been found, together with two almost complete metopes, the one containing the torso of a nude warrior in perfect preservation, as well as ten well-preserved heads. These statues bear the same relation to the sculptor Polyclitus which the Parthenon marbles hold to Pheidias; and the excavations have thus yielded most important material for the illustration of the Argive art of Polyclitus in the 5th century B.C.

See Waldstein, *The Argive Heraeum* (vol. i., Boston and New York, 1902; vol. ii., the Vases by J. C. Hoppin, the Bronzes by H. F. de Cosa, 1905); *Excavations of the American School of Athens at the Heraion of Argos* (1892); and numerous reports and articles in the *American Archaeological Journal* since 1892. (C. W.*)

ARGOSTOLI (anc. *Cephallenia*), the capital of Cephalonia (one of the Ionian islands), and the seat of a bishop of the Greek church. Pop. about 10,000. It possesses an excellent harbour, a quay a mile in length, and a fine bridge. Shipbuilding and silk-spinning are carried on. Near at hand are the ruins of Cranii, which afford fine examples of Greek military architecture; and at the west side of the harbour there is a curious stream, flowing *from* the sea, and employed to drive mills before losing itself in caverns inland.

See Sir C. Fellows's *Journal of an Excursion in Asia Minor* in 1838, and Wiebel's *Die Insel Kephalonia und die Meermühlen von Argostoli* (Hamburg, 1873).

ARGOSY (a corruption, by transposition of letters, of the name of the seaport Ragusa), the term originally for a carrack or merchant ship from Ragusa and other Adriatic ports, now used poetically of any vessel carrying rich merchandise. In English writings of the 16th century the seaport named is variously spelt Ragusa, Aragouse or Aragosa, and ships coming thence were named Ragusyes, Arguzes and Argosies; the last form surviving and passing into literature. The incorrect derivation from Jason's ship, the "Argo," is of modern origin.

ARGUIN, an island (identified by some writers with Hanno's Cerne), off the west coast of Africa, a little south of Cape Blanco, in 20° 25′ N., 16° 37′ W. It is some 4 m. long by 2½ broad, produces gum-arabic, and is the seat of a lucrative turtle-fishery. Off the island, which was discovered by the Portuguese in the 15th century, are extensive and very dangerous reefs. Arguin was occupied in turn by Portuguese, Dutch, English and French; and to France it now belongs. The aridity of the soil and the bad anchorage prevent a permanent settlement. The fishery is mostly carried on by inhabitants of the Canary Isles. In July 1816 the French frigate "Medusa," which carried officers on their way to Senegal to take possession of that country for France, was wrecked off Arguin, 350 lives being lost.

ARGUMENT, a word meaning "proof," "evidence," corresponding in English to the Latin word *argumentum*, from which it is derived; the originating Latin verb *arguere*, to make clear, from which comes the English "argue," is from a root meaning bright, appearing in Greek ἀργής, white. From its primary sense are derived such applications of the word as a chain of reasoning, a fact or reason given to support a proposition, a discussion of the evidence or reasons for or against some theory or proposition and the like. More particularly "argument" means a synopsis of the contents of a book, the outline of a novel, play, &c. In logic it is used for the middle term in a syllogism, and for many species of fallacies, such as the *argumentum ad hominem*, *ad baculum*, &c. (see FALLACY). In mathematics the term has received special meanings; in mathematical tables

the "argument" is the quantity upon which the other quantities in the table are made to depend; in the theory of complex variables, *e.g.* such as $a+ib$ where $i=\sqrt{-1}$, the "argument" (or "amplitude") is the angle θ given by $\tan\theta=b/a$. In astronomy, the term is used in connexion with the Ptolemaic theory to denote the angular distance on the epicycle of a planet from the true apogee of the epicycle; and the "equation to the argument" is the angle subtended at the earth by the distance of a planet from the centre of the epicycle.

ARGUS, in ancient Greek mythology, the son of Inachus, Agenor or Arestor, or, according to others, an earth-born hero (autochthon). He was called Panoptes (all-seeing), from having eyes all over his body. After performing several feats of valour, he was appointed by Hera to watch the cow into which Io had been transformed. While doing this he was slain by Hermes, who stoned him to death, or put him to sleep by playing on the flute and then cut off his head. His eyes were transferred by Hera to the tail of the peacock. Argus with his countless eyes originally denoted the starry heavens (Apollodorus ii. 1; Aeschylus, *P. V.* 569; Ovid, *Metam.* i. 264).

Another ARGUS, the old dog of Odysseus, who recognized his master on his return to Ithaca, figures in one of the best-known incidents in Homer's *Odyssey* (xvii. 291-326).

ARGYLL, EARLS AND DUKES OF. The rise of this family of Scottish peers, originally the Campbells of Lochow, and first ennobled as Barons Campbell, is referred to in the article ARGYLLSHIRE.

ARCHIBALD CAMPBELL, 5th earl of Argyll (1530–1573), was the elder son of Archibald, 4th earl of Argyll (d. 1558), and a grandson of Colin, the 3rd earl (d. 1530). His great-grandfather was the 2nd earl, Archibald, who was killed at Flodden in 1513, and this nobleman's father was Colin, Lord Campbell (d. 1493), the founder of the greatness of the Campbell family, who was created earl of Argyll in 1457. With Lord James Stuart, afterwards the regent Murray, the 5th earl of Argyll became an adherent of John Knox about 1556, and like his father was one of the most influential members of the party of religious reform, signing what was probably the first "godly band" in December 1557. As one of the "lords of the congregation" he was one of James Stuart's principal lieutenants during the warfare between the reformers and the regent, Mary of Lorraine; and later with Murray he advised and supported Mary queen of Scots, who regarded him with great favour. It was about this time that William Cecil, afterwards Lord Burghley, referred to Argyll as "a goodly gentleman universally honoured of all Scotland." Owing to his friendship with Mary, Argyll was separated from the party of Knox, but he forsook the queen when she determined to marry Lord Darnley; he was, however, again on Mary's side after Queen Elizabeth's refusal to aid Murray in 1565. Argyll was probably an accomplice in the murder of Rizzio; he was certainly a consenting party to that of Darnley, and then separating himself from Murray he commanded Mary's soldiers after her escape from Lochleven, and by his want of courage and resolution was partly responsible for her defeat at Langside in May 1568. Soon afterwards he made his peace with Murray, but it is possible that he was accessory to the regent's murder in 1570. After this event Argyll became lord high chancellor of Scotland, and he died on the 12th of September 1573. His first wife was an illegitimate daughter of James V., and he was thus half-brother-in-law to Mary and to Murray. His relations with her were not harmonious; he was accused of adultery, and in 1568 he performed a public penance at Stirling.

He left no children, and on his death his half-brother Colin (d. 1584) became 6th earl of Argyll. This nobleman, whose life was partly spent in feuds with the regent Morton, died in October 1584. He was succeeded as 7th earl by his young son Archibald (1576–1638), who became a Roman Catholic, fought for Philip III. of Spain in Flanders, whither he had gone to avoid his creditors, and, having entrusted the care of his estates to his son, died in London.

ARCHIBALD CAMPBELL, 1st marquess and 8th earl of Argyll (1607–1661), eldest son of Archibald, 7th earl, by his first wife, Lady Anne Douglas, daughter of William, 1st earl of Morton, was born in 1607[1] and educated at St Andrews University, where he matriculated on the 15th of January 1622. He had early in life, as Lord Lorne, been entrusted with the possession of the Argyll estates when his father renounced Protestantism and took service with Philip of Spain; and he exercised over his clan an authority almost absolute, disposing of a force of 20,000 retainers, and being, according to Baillie, "by far the most powerful subject in the kingdom." On the outbreak of the religious dispute between the king and Scotland in 1637 his support was eagerly desired by Charles I. He had been made a privy councillor in 1628, and in 1638 the king summoned him, together with Traquair and Roxburgh, to London; but he refused to be won over, openly and courageously warned Charles against his despotic ecclesiastical policy, and showed great hostility towards Laud. In consequence a secret commission was given to the earl of Antrim to invade Argyllshire and stir up the Macdonalds against the Campbells, a wild and foolish project which completely miscarried. Argyll, who inherited the title by the death of his father in 1638, had originally no preference for Presbyterianism, but now definitely took the side of the Covenanters in defence of the national religion and liberties. He continued to attend the meetings of the Assembly after its dissolution by the marquess of Hamilton, when Episcopacy was abolished. In 1639 he sent a statement to Laud, and subsequently to the king, defending the Assembly's action; and raising a body of troops he seized Hamilton's castle of Brodick in Arran. After the pacification of Berwick he carried a motion, in opposition to Montrose, by which the estates secured to themselves the election of the lords of the articles, who had formerly been nominated by the king, a fundamental change in the Scottish constitution, whereby the management of public affairs was entrusted to a representative body and withdrawn from the control of the crown. An attempt by the king to deprive him of his office as justiciary of Argyll and Tarbet failed, and on the prorogation of the parliament by Charles, in May 1640, Argyll moved that it should continue its sittings and that the government and safety of the kingdom should be secured by a committee of the estates, of which, though not a member, he was himself the guiding spirit. In June he was entrusted with a "commission of fire and sword" against the royalists in Atholl and Angus, which, after succeeding in entrapping the earl of Atholl, he carried out with completeness and some cruelty. It was on this occasion that took place the burning of "the bonnie house of Airlie." By this time the personal rivalry and difference in opinion between Montrose and Argyll had led to an open breach. The former arranged that on the occasion of Charles's approaching visit to Scotland, Argyll should be accused of high treason in the parliament. The plot, however, was disclosed, and Montrose with others was imprisoned. Accordingly when the king arrived he found himself deprived of every remnant of influence and authority. It only remained for Charles to make a series of concessions. He transferred the control over judicial and political appointments to the parliament, created Argyll a marquess (1641) with a pension of £1000 a year, and returned home, having in Clarendon's words "made a perfect deed of gift of that kingdom." Meanwhile the king's policy of peace and concession had, as usual, been rudely and treacherously interrupted by a resort to force, an unsuccessful attempt, known as the "incident," being made to kidnap Argyll, Hamilton and Lanark. Argyll was mainly instrumental at this crisis in keeping the national party faithful to what was to him evidently the common cause, and in accomplishing the alliance with the Long Parliament in 1643. In January 1644 he accompanied the Scottish army into England as a member of the committee of both kingdoms and in command of a troop of horse, but was soon in March compelled to return to suppress royalist movements in the north and to defend his own territories. He compelled Huntly to retreat in April, and in July advanced to meet the Irish troops now landed in Argyllshire, which were acting in conjunction with Montrose, who had put himself at the

[1] The date of 1598, previously accepted, is shown by Willcock to be incorrect.

head of the royalist forces in Scotland. A campaign followed in the north in which neither general succeeded in obtaining any advantage over the other, or even in engaging battle. Argyll then returned to Edinburgh, threw up his commission, and retired to Inveraray Castle. Thither Montrose unexpectedly followed him in December, compelled him to flee to Roseneath, and devastated his territories. On the 2nd of February 1645, when following Montrose northwards, Argyll was surprised by him at Inverlochy and witnessed from his barge on the lake, to which he had retired owing to a dislocated arm, a fearful slaughter of his troops, which included 1500 of the Campbells. He arrived at Edinburgh on the 12th of February and was again present at Montrose's further great victory on the 15th of August at Kilsyth, whence he escaped to Newcastle. Argyll was at last delivered from his formidable antagonist by Montrose's final defeat at Philiphaugh on the 12th of September. In 1646 he was sent to negotiate with the king at Newcastle after his surrender to the Scottish army, when he endeavoured to moderate the demands of the parliament and at the same time to persuade the king to accept them. On the 7th of July 1646 he was appointed a member of the Assembly of Divines.

Up to this point the statesmanship of Argyll had been highly successful. The national liberties and religion of Scotland had been defended and guaranteed, and the power of the king in Scotland reduced to a mere shadow. In addition, these privileges had been still further secured by the alliance with the English opposition, and by the subsequent triumph of the parliament and Presbyterianism in the neighbouring kingdom. The sovereign himself, after vainly contending in arms, was a prisoner in their midst. But Argyll's influence could not survive the rupture of the alliance between the two nations on which his whole policy was constructed. He opposed in vain the secret treaty now concluded between the king and the Scots against the parliament, and while Hamilton marched into England and was defeated by Cromwell at Preston, Argyll, after a narrow escape from a surprise at Stirling, joined the Whiggamores, a body of Covenanters at Edinburgh; and, supported by Loudon, Leven and Leslie, he established a new government, which welcomed Cromwell on his arrival there on the 4th of October. This alliance, however, was at once destroyed by the execution of Charles I., which excited universal horror in Scotland. In the series of tangled incidents which followed, Argyll lost control of the national policy. He describes himself at this period as "a distracted man . . . in a distracted time" whose "remedies . . . had the quite contrary operation." He supported the invitation from the Covenanters to Charles II. to land in Scotland, gazed upon the captured Montrose, bound on a cart on his way to execution at Edinburgh, and subsequently, when Charles II. came to Scotland, having signed the Covenant and repudiated Montrose, Argyll remained at the head of the administration. After the defeat of Dunbar, Charles retained his support by the promise of a dukedom and the Garter, and an attempt was made by Argyll to marry the king to his daughter. On the 1st of January 1651 he placed the crown on Charles's head at Scone. But his power had now passed to the Hamilton party. He strongly opposed, but was unable to prevent, the expedition into England, and in the subsequent reduction of Scotland, after having held out in Inveraray Castle for nearly a year, was at last surprised in August 1652 and submitted to the Commonwealth. His ruin was then complete. His policy had failed, his power had vanished. In his estate he was hopelessly in debt, and on terms of such violent hostility with his eldest son as to be obliged to demand a garrison in his house for his protection. During his visit to Monk at Dalkeith in 1654 to complain of this, he was subjected to much personal insult from his creditors, and on visiting London in September 1655 to obtain money due to him from the Scottish parliament, he was arrested for debt, though soon liberated. In Richard Cromwell's parliament of 1659 Argyll sat as member for Aberdeenshire. At the Restoration he presented himself at Whitehall, but was at once arrested by order of Charles and placed in the Tower (1660), being sent to Edinburgh to stand his trial for high treason. He was acquitted of complicity in the death of Charles I., and his escape from the whole charge seemed imminent, but the arrival of a packet of letters written by Argyll to Monk showed conclusively his collaboration with Cromwell's government, particularly in the suppression of Glencairn's royalist rising in 1652. He was immediately sentenced to death, his execution by beheading taking place on the 27th of May 1661, before even the death warrant had been signed by the king. His head was placed on the same spike upon the west end of the Tolbooth on which that of Montrose had previously been exposed, and his body was buried at the Holy Loch, where the head was also deposited in 1664. A monument was erected to his memory in St Giles's church in Edinburgh in 1895.

While imprisoned in the Tower he wrote *Instructions to a Son* (1661; reprinted in 1689 and 1743). Some of his speeches, including the one delivered on the scaffold, were published and are printed in the *Harleian Miscellany*. He married Lady Margaret Douglas, daughter of William, 2nd earl of Morton, and had two sons and four daughters.

See also the *Life and Times of Archibald Marquis of Argyll* (1903), by John Willcock, who prints for the first time the six incriminating letters to Monk; *Eng. Hist. Review*, xviii. 369 and 624; *Scottish History Society*, vol. xvii. (1894); *Charles II. and Scotland in 1650*, ed. by S. R. Gardiner, and vol. xviii. (1895); *History of Scotland*, by A. Lang, vol. iii. (1904).

ARCHIBALD CAMPBELL, 9th earl of Argyll (1629–1685), eldest son of the 8th earl, studied abroad, and at the age of thirteen was appointed captain in the Scottish regiment serving in France under his uncle the earl of Irvine. He returned home at the close of 1649, and was made captain of Charles II.'s life guards on the king's arrival in Scotland in 1650. He declared himself a royalist in opposition to his father, with the view, as some said, of securing the family estates in any event. He fought at Dunbar on the 3rd of September 1650, and after the battle of Worcester joined Glencairn in the Highlands. Bitter disputes arose, and on the 2nd of January 1654 Lorne, quitting his troops, fled to avoid arrest. In 1655 he submitted to Monk. He appears, however, to have maintained communications with Charles, and on his refusal to take the oath renouncing allegiance to the Stuarts in 1657 he was imprisoned, remaining in confinement probably till a short time before the Restoration. He was then well received at court by Charles II. After the execution of his father, he endeavoured to obtain the restitution of his forfeited estates and title, but having incautiously attacked certain members of the government in letters which were made public, he was indicted at Edinburgh on the capital charge of "leasing-making" and was sentenced to death on the 26th of August. He remained a prisoner in Edinburgh Castle till the 4th of June 1663, when the sentence was cancelled and he was re-created earl and restored to his estates. He disapproved of the severities practised upon the Covenanters in the west, and in 1671 pleaded for milder methods. His staunch Protestantism rendered him exceedingly obnoxious to James, duke of York, who in 1680 arrived as high commissioner in Scotland and at once expressed his jealousy of Argyll's immense territorial influence. Argyll moved the re-enactment of "all the acts against popery" omitted on James's account, and opposed the exemption of the royal family from the test, though allowing it in the case of James. In signing the test himself, in its final form both ambiguous and self-contradictory, he made the reservation "so far as consistent with itself and the Protestant faith," and declined to engage himself not to promote any alteration of advantage in church or state. On his refusal to record his oath in writing and to sign it, he was dismissed from the Scottish privy council, and on the 9th of November 1681 was accused of treason, a charge which Halifax declared openly in England "they would not hang a dog upon." A trial followed, a scandalous exhibition of illegality and injustice, at the close of which Argyll was sentenced to death and to the forfeiture of his estates. Shortly afterwards, through the instrumentality of his step-daughter, Sophia Lindsay, he succeeded in making his escape, and after some adventures retired to Holland. His subsequent movements are uncertain, but he appears to have

again visited London, and was in correspondence with the Rye House plotters and proposing to head a rebellion in Scotland in 1683. In 1685 he joined the conspiracy in Holland to set Monmouth on the throne instead of James II., arriving in Orkney on the 6th of May and making his way to his own country. But his clansmen refused to join him, and whatever small chances of success remained were destroyed by constant and paralysing disputes. His ships and ammunition were captured, and after some aimless wanderings he found himself deserted, with but one companion, Major Fullerton. On the 18th of June he was taken prisoner at Inchinnan and arrived at Edinburgh on the 20th, where he was paraded through the streets and put in irons in the castle. James ordered his summary execution on the 29th, and it was carried out by beheading on the following day, on the old charge of 1681. His head was exposed on the west side of the Tolbooth, where his father's and Montrose's had also been exhibited, his body finding its final place of burial at Inveraray.

By his first wife, Lady Mary Stewart, daughter of the 4th earl of Moray (Murray), he had four sons and three daughters.

See *Argyll Papers* (1834); *Letters from Archibald, 9th Earl of Argyle, to the Duke of Lauderdale* (1829); *Hist. MSS. Comm.* vi. Rep. 606; *Life of Mr Donald Cargile*, by P. Walker, pp. 45 et seq.; *The 3rd Part of the Protestant Plot . . . and a Brief Account of the Case of the Earl of Argyle* (1682); Sir George Mackenzie's *Hist. of Scotland*, p. 70; and J. Willcock, *A Scots Earl in Covenanting Times* (1908).

ARCHIBALD CAMPBELL, 1st duke of Argyll (?1651–1703), was the eldest son of the 9th earl. He tried to get his father's attainder reversed by seeking the king's favour, but being unsuccessful he went over to the Hague and joined William of Orange as an active promoter of the revolution of 1688. In spite of the attainder, he was admitted in 1689 to the convention of the Scottish estates as earl of Argyll, and he was deputed, with Sir James Montgomery and Sir John Dalrymple, to present the crown to William III. in its name, and to tender him the coronation oath. In 1690 an act was passed restoring his title and estates, and it was in connexion with the refusal of the Macdonalds of Glencoe to join in the submission to him that he organized the terrible massacre which has made his name notorious. In 1696 he was made a lord of the treasury, and his political services were rewarded in 1701 by his being created duke of Argyll. He had two sons by his wife Elizabeth, daughter of Sir Lionel Talmash, John (the 2nd duke) and Archibald (the 3rd duke).

JOHN CAMPBELL, 2nd duke of Argyll and duke of Greenwich (1678–1743), was born on the 10th of October 1678. He entered the army in 1694, and in 1701 was promoted to the command of a regiment. On the death of his father in 1703, he was appointed a member of the privy council, and at the same time colonel of the Scotch horse guards, and one of the extraordinary lords of session. In return for his services in promoting the Union, he was created (1705) a peer of England, by the titles of baron of Chatham and earl of Greenwich, and in 1710 was made a knight of the Garter. He first distinguished himself in a military capacity at the battle of Oudenarde (1708), where he served as a brigadier-general; and was afterwards present under the duke of Marlborough at the sieges of Lille, Ghent, Bruges and Tournay, and did remarkable service at the battle of Malplaquet in 1709. He was very popular with the troops, and his rivalry with Marlborough on this account is thought to have been the cause of the enmity shown by Argyll afterwards to his old commander. In 1711 he was sent to take command in Spain; but being seized with a violent fever at Barcelona, and disappointed of supplies from home, he returned to England. Having a seat in the House of Lords, and being gifted with an extraordinary power of oratory, he censured the measures of the ministry with such freedom that all his places were disposed of to other noblemen; but at the accession of George I. he recovered his influence. On the breaking out of the rebellion in 1715 he was appointed commander-in-chief of the forces in North Britain, and was principally instrumental in effecting the total extinction of the rebellion in Scotland without much bloodshed. He arrived in London early in March 1716, and at first stood high in the favour of the king, but in a few months was stripped of his offices. This disgrace, however, did not deter him from the discharge of his parliamentary duties; he supported the bill for the impeachment of Bishop Atterbury, and lent his aid to his countrymen by opposing the bill for punishing the city of Edinburgh for the Porteous riot. In the beginning of the year 1719 he was again admitted into favour, appointed lord steward of the household, and, in April following, created duke of Greenwich; he held various offices in succession, and in 1735 was made a field marshal. He continued in the administration till after the accession of George II., when, in April 1740, a violent speech against the government led again to his dismissal from office. He was soon restored on a change of the ministry, but disapproving the measures of the new administration, and apparently disappointed at not being given the command of the army, he shortly resigned all his posts, and spent the rest of his life in privacy and retirement. He died on the 4th of October 1743. A monument by Roubillac was erected to his memory in Westminster Abbey. He was twice married, and by his second wife, Jane Warburton, had five daughters; his Scottish titles passed to his brother, but his English titles became extinct, and though his eldest daughter was created baroness of Greenwich in 1767 this title also became extinct on her death in 1794.

ARCHIBALD CAMPBELL, 3rd duke of Argyll (1682–1761), was born at Ham House in Surrey, in June 1682. On his father being created a duke, he joined the army, and served for a short time under the duke of Marlborough. In 1705 he was appointed treasurer of Scotland, and in the following year was one of the commissioners for treating of the Union; on the consummation of which, having been raised to the peerage of Scotland as earl of Islay, he was chosen one of the sixteen peers for Scotland in the first parliament of Great Britain. In 1711 he was called to the privy council, and commanded the royal army at the battle of Sheriffmuir in 1715. He was appointed keeper of the privy seal in 1721, and was afterwards entrusted with the principal management of Scottish affairs to an extent which caused him to be called "king of Scotland." In 1733 he was made keeper of the great seal, an office which he held till his death. He succeeded to the dukedom in 1743. Both as earl of Islay and as duke of Argyll he was prominently connected (with Duncan Forbes of Culloden) with the movement for consolidating Scottish loyalty by the formation of locally recruited highland regiments. The duke was eminent not only for his political abilities, but also for his literary accomplishments, and he collected one of the most valuable private libraries in Great Britain. He died suddenly on the 15th of April 1761. He was married but had no legitimate issue, and his English property was left to a Mrs Williams, by whom he had a son, William Campbell.

The succession now passed to the descendants of the younger son of the 9th earl, the Campbells of Mamore; the 4th duke died in 1770, and was succeeded by his son JOHN, the 5th duke (1723–1806). He was a soldier who had fought at Dettingen and Culloden, and became colonel of the 42nd regiment (Black Watch), and eventually a field marshal. He sat in the House of Commons for Glasgow from 1744 to 1761, when on his father's succession to the dukedom he became legally disqualified, as courtesy marquess of Lorne, for a Scottish constituency; he could sit, however, for an English one, and was returned for Dover, which he represented till 1766, when he was created an English peer as Baron Sundridge, the title by which till 1892 the dukes of Argyll sat in the House of Lords. The 5th duke was an active landlord, and was the first president of the Highland and Agricultural Society. In 1759 he had married the widowed duchess of Hamilton (the beautiful Elizabeth Gunning), by whom he had two sons and two daughters. The eldest of his sons, GEORGE (d. 1841), became 6th duke, and on his death was succeeded as 7th duke by his brother JOHN (1777–1847), who from 1799–1822 sat in parliament as member for Argyllshire. He was thrice married, and by his second wife, Joan Glassell (d. 1828), had two sons, the eldest of whom (b. 1821) died

in 1837, and two daughters, the second of whom died in infancy.

GEORGE JOHN DOUGLAS CAMPBELL, 8th duke (1823–1900), the second son of the 7th duke, was born on the 30th of April 1823, and succeeded his father in April 1847. He had already obtained notice as a writer of pamphlets on the disruption of the Church of Scotland, which he strove to avert, and he rapidly became prominent on the Liberal side in parliamentary politics. He was a frequent and eloquent speaker in the House of Lords, and sat as lord privy seal (1852) and postmaster-general (1855) in the cabinets of Lord Aberdeen and Lord Palmerston. In Mr Gladstone's cabinet of 1868 he was secretary of state for India, and somewhat infelicitously signalized his term of office by his refusal, against the advice of the Indian government, to promise the amir of Afghanistan support against Russian aggression, a course which threw that ruler into the arms of Russia and was followed by the second Afghan War. His eminence alike as a great Scottish noble, and as a British statesman, was accentuated in 1871 when his son, the marquess of Lorne, married Princess Louise, the fourth daughter of Queen Victoria; but in the political world few memorable acts on his part call for record except his resignation of the office of lord privy seal, which he held in Mr Gladstone's administration of 1880, from his inability to assent to the Irish land legislation of 1881. He opposed the Home Rule Bill with equal vigour, though Mr Gladstone subsequently stated that, among all the old colleagues who dissented from his course, the duke was the only one whose personal relations with him remained entirely unchanged. Detached from party, the duke took an independent position, and for many years spoke his mind with great freedom in letters to *The Times* on public questions, especially such as concerned the rights or interests of landowners. He was no less active on scientific questions in their relation to religion, which he earnestly strove to reconcile with the progress of discovery. With this aim he published *The Reign of Law* (1866), *Primeval Man* (1869), *The Unity of Nature* (1884), *The Unseen Foundations of Society* (1893), and other essays. He also wrote on the Eastern question, with especial reference to India, the history and antiquities of Iona, patronage in the Church of Scotland, and many other subjects. The duke (to whose Scottish title was added a dukedom of the United Kingdom in 1892) died on the 24th of April 1900. He was thrice married: first (1844) to a daughter of the second duke of Sutherland (d. 1878); secondly (1881) to a daughter of Bishop Claughton of St Albans (d. 1894); and thirdly (1895) to Ina Erskine M'Neill. Few men of the duke's era displayed more versatility of intellect, and he was remarkable among the men of his time for his lofty eloquence.

He was succeeded as 9th duke by his eldest son JOHN DOUGLAS SUTHERLAND CAMPBELL (1845–), whose marriage in 1871 to H.R.H. Princess Louise gave him a special prominence in English public life. He was governor-general of Canada from 1878 to 1883; member of parliament for South Manchester, in the Unionist interest, 1895 to 1900; and he also became known as a writer both in prose and verse. In 1907 he published his reminiscences, *Pages from the Past*.

See the *Autobiography and Memoirs* of the 8th duke, edited by his widow (1906), which is full of interesting historical and personal detail. (P. C. Y.; H. CH.)

ARGYLLSHIRE, a county on the west coast of Scotland, the second largest in the country, embracing a large tract of country on the mainland and a number of the Hebrides or Western Isles. The mainland portion is bounded N. by Inverness-shire; E. by Perth and Dumbarton, Loch Long and the Firth of Clyde; S. by the North Channel (Irish Sea); and W. by the Atlantic. Its area is 1,990,471 acres or 3110 sq. m. The principal districts are Ardnamurchan on the Atlantic, Ardnamurchan Point being the most westerly headland of Scotland; Morven or Morvern, bounded by Loch Sunart, the Sound of Mull and Loch Linnhe; Appin, on Loch Linnhe, with piers at Ballachulish and Port Appin; Benderloch, lying between Loch Creran and Loch Etive; Lorne, surrounding Loch Etive and giving the title of marquess to the Campbells; Argyll, in the middle of the shire, containing Inveraray Castle and furnishing the titles of earl and duke to the Campbells; Cowall, between Loch Fyne and the Firth of Clyde, in which lie Dunoon and other favourite holiday resorts; Knapdale between the Sound of Jura and Loch Fyne; and Kintyre or Cantyre, a long narrow peninsula (which, at the isthmus of Tarbert, is little more than 1 m. wide), the southernmost point of which is known as the Mull, the nearest part of Scotland to the coast of Ireland, only 13 m. distant.

There are no navigable rivers. The two principal mountain streams are the Orchy and Awe. The Orchy flows from Loch Tulla through Glen Orchy, and falls into the north-eastern end of Loch Awe; and the Awe drains the loch at its north-western extremity, discharging into Loch Etive. Among other streams are the Add, Aray, Coe or Cona, Creran, Douglas, Eachaig, Etive, Euchar, Feochan, Finart, Fyne, Kinglass, Nell, Ruel, Shiel, Shira, Strae and Uisge-Dhu. The county is remarkable for the numerous sea-lochs which deeply indent the coast, the principal being Loch Long (with its branches Loch Goil and the Holy Loch), Loch Striven (Rothesay's "weather glass"), Loch Riddon, Loch Fyne (with Loch Gilp and Loch Gair), Lochs Tarbert, Killisport, Swin, Crinan, Craignish, Melfort, Feochan, Etive, Linnhe (with its branches Loch Creran, Loch Leven and Loch Eil) and Sunart. There are also a large number of inland lakes, the total area of which is about 25,000 acres. Of these the principal are Lochs Awe, Avich, Eck, Lydoch and Shiel. The principal islands are Mull, Islay, Jura, Colonsay, Lismore, Tyree, Coll, Gigha, Luing and Kerrera. Besides these there are the two small but interesting islands of Staffa and Iona. The mountains are so many as to give the shire a markedly rugged character. Some of them are among the loftiest in the kingdom, as Ben Cruachan with its summit of twin pyramids (3689 ft.), Ben More, in Mull (3172), Ben Ima (3318), Buachaille Etive (3345), Ben Bui (3106), Ben Lui (or Loy), on the confines of the shires of Perth and Argyll (3708), Ben Starav near the head of Loch Etive (3541), and Ben Arthur, called from its shape "The Cobbler" (2891), on the borders of Dumbartonshire. There are many picturesque glens, of which the best-known are Glen Aray, Glen Croe, Glen Etive, Glendaruel, Glen Lochy ("the wearisome glen" —some 10 m. of bare hills and boulders—between Tyndrum and Dalmally), Glen Strae, Hell's Glen (off Loch Goil) and Glencoe, the scene of the massacre in 1692. The waterfalls of Cruachan are beautiful; and those of Connel, which are more in the nature of rapids, caused by the rush of the ebbing tide over the rocky bar at the narrowing mouth of Loch Etive, have been made celebrated by Ossian, who called them "the Falls of Lora." In several of the glens, as Glen Aray, small falls may be seen, enhanced in beauty when the rivers are in flood. Pre-eminently Argyll is the shire of the sportsman. The lovely Western Isles provide endless enjoyment for the yachtsman; the lochs and rivers abound with salmon and trout; the deer forests and grouse moors are second to none in Scotland.

Geology.—The mainland portion of the county consists chiefly of the metamorphic rocks of the Eastern Highlands, nearly all the subdivisions of that series (see SCOTLAND: *Geology*) being represented. They form parallel belts of varying width trending north-east and south-west. The slates and phyllites referred to the lowest group occur along the shore at Dunoon, and are followed by the Beinn Bheula grits and albite schists, forming nearly all the highest ground in Cowall between Loch Fyne and the Firth of Clyde and the greater part of Kintyre. The green beds, Glensluan mica-schists and Loch Tay limestones are developed in Glendaruel, and have been traced north-east to Glen Fyne and at intervals south-west to Campbeltown. The next prominent zone is that of the Ardrishaig phyllites, with quartzites in the lower portion and soft phyllites in the upper part, which cover a belt from 3 to 6 m. across, stretching from Glen Shira by Inveraray and Ardrishaig to south Knapdale.

Next in order come the Easdale slates, phyllites with thin dark limestone, the main limestone of Loch Awe and the pebbly quartzite (Schiehallion), which are repeated by innumerable folds and spread northwards to Loch Linnhe and westwards to Jura and Islay. The slates of this horizon have been largely quarried at Easdale and Ballachulish, and this main limestone is typically developed near Loch Awe, near Kilmartin, on the islands of Lismore and Shuna, and in Islay between Bridgend and Portaskaig. The quartzites of this series form the highest hills in the south of Islay, occupy nearly the whole of Jura, and are continued in the mainland, where, by

means of the rapid isoclinal folding, they form lenticular masses. In Islay and at various localities on the mainland a conglomerate occurs at or near the base of the quartzites, which contains fragments of the underlying rocks and boulders of granite not now found in place in that region.

On the mainland, on the north side of the compound synclinal folding of Loch Awe, the Ardrishaig phyllites reappear at Craignish near Kilmartin, and the quartzites of this group are supposed to come to the surface again in Glencoe, not far from the outcrop of the Schiehallion quartzite.

The metamorphic rocks are associated with bands of epidiorite which have shared in the folding and metamorphism of the region. These are largely developed near Loch Awe, in Knapdale, and on the south-east coast of Islay. They have been usually regarded as intrusive, but south of Tayvallich on the mainland, lavas and tuffs, which have escaped deformation, occur in the Easdale slates and the pebbly limestone.

The Lower Old Red Sandstone, chiefly composed of volcanic rocks—lavas and tuffs—rests unconformably on the metamorphic series. These rocks cover a wide area in Lorne between Loch Melfort, Oban and the Pass of Brander, and they reappear in the lofty mountains on both sides of Glencoe. Representatives of this formation are found in Kintyre, south of Campbeltown, where the sediments prevail. The intrusive igneous rocks belonging to this period are widely distributed and form conspicuous features. The plutonic masses are represented by the granite of Ben Cruachan, by the diorite of Gleann Domhainn, and by the kentallenite (a basic rock related to the monzonites), near Ballachulish. Throughout the Lorne volcanic plateau there are numerous dykes of porphyrite which likewise traverse the schists and part of the Ben Cruachan granite. Sheets of quartz-porphyry, lamprophyre and diorite are also represented, the first of these types being quarried at Crarae on the north shore of Loch Fyne.

The Upper Old Red Sandstone forms isolated patches resting unconformably on all older rocks, on the west coast of Kintyre, and between Campbeltown and Southend. In the district of Campbeltown these red sandstones and cornstones are followed by the volcanic rocks of the Calciferous Sandstone series, which lie to the south of the depression at Machrihanish, and are succeeded by the lower limestones and coals of the Carboniferous Limestone series.

On the north and south shores of the promontory of Ardnamurchan there are small patches of Jurassic strata ranging from the Lower Lias to the Oxford Clay, and in Morvern on the shores of Loch Aline representatives of the Upper Greensand are covered by the basaltic lavas of Tertiary age. The acid and basic plutonic rocks (gabbros and granophyres) of Tertiary time occur in Ardnamurchan. A striking geological feature of the county is the number of dolerite and basalt dykes trending in a north-west direction, which are referred to the same period of intrusion. There is, however, another group of dolerite dykes running east and west near Dunoon and elsewhere, which are cut by the former and are probably of older date.

Lead veins occur at Strontian which have yielded a number of minerals, including sphalerite, fluorite, strontianite, harmotone, brewsterite and pilolite. Near Inveraray, nickeliferous ore has been obtained at two localities.

Climate.—The rainfall is very abundant. At Oban, the average annual amount is 64·18 in.; in Glen Fyne, 104·11 in.; at the bridge of Orchy, 113·62 in., and at Upper Glencoe 127·65. The prevailing winds, as observed near Crinan, are south-west and south-east, and next in frequency are the north-west and north-east. The average yearly temperature is 48° F.

Agriculture.—Argyllshire was formerly partly covered with natural forests, remains of which, consisting chiefly of oak, ash, pine and birch, are still visible in the mosses; but, owing to the clearance of the ground for the introduction of sheep, and to past neglect of planting, the county is now remarkable for its lack of wood, except in the neighbourhood of Inveraray, where there are extensive and flourishing plantations, and a few other places. Replanting, however, has been carried on. Most of the county is unfitted for agriculture; but many districts afford fine pasturage for mountain sheep; and some of the valleys, such as Glendaruel, are very fertile. The chief crop is oats; there is a little barley, but no wheat. The shire is one of those where the crofting system exists, but it is by no means universal. It is predominant in Tyree and the western district of the mainland, but elsewhere farms of moderate size are the rule. The cattle, though small, are equal to any other breed in the kingdom, and are marketed in large numbers in the south. Dairy farming is carried on to some extent in the southern parts of Kintyre, where there is a large proportion of arable land. In the higher tracts sheep have taken the place of cattle with excellent results. The black-faced is the species most generally reared.

Industries.—Whisky is manufactured at Campbeltown, in Islay, at Oban, Ardrishaig and elsewhere. Gunpowder is made at Kames (Kyles of Bute), Melfort and Furnace. Coarse woollens are made for home use; but fishing is the most important industry, Loch Fyne being famous for its herrings. The season lasts from June to January, but white fishing is carried on at one or other of the ports all the year round. Slate and granite quarrying and some coal-mining are the only other industries of any consequence.

Communications.—Owing partly to the paucity of trading industries and partly to the fact that, owing to its greatly indented coast-line, no place in the shire is more than 12 m. from the sea, the railway mileage in the county is very small. The Tyndrum to Oban section of the Caledonian railway company's system is within the county limits; a small portion of the track of the North British railway company's line to Mallaig skirts the extreme west of the shire, and the Caledonian line from Oban to Ballachulish serves the northern coast districts of the Argyllshire mainland. In connexion with this last route mention should be made of the cantilever bridge crossing the Falls of Lora with a span of 500 ft. at a height of 125 ft. above the water-way. The chief means of communication is by steamers, which maintain regular intercourse between Glasgow and various parts of the coast. In order to avoid the circuitous passage round the Mull of Kintyre the Crinan Canal, across the isthmus from Ardrishaig to Loch Crinan, a distance of 9 m., was constructed in 1793–1801, at a cost of £142,000. It has 15 locks, an average depth of 10 ft., a surface width of 66 ft., and bottom width of 30 ft., is navigable by vessels of 200 tons, and runs through a district of remarkable beauty. Another canal unites Campbeltown with Dalavaddy. In summer the mails for the islands and the great bulk of the tourist traffic by the MacBrayne fleet is conveyed through the Crinan Canal, transhipment being effected at Ardrishaig and Crinan. Throughout the year goods traffic between the Clyde and elsewhere and the West Highland ports is conveyed by deep-sea steamers round the Mull. Before the advent of railways the shire contained many famous coaching routes, but now coaches only run during the tourist season, either in connexion with train and steamer, or in districts still not served by either.

Population and Government.—Owing to emigration, chiefly to Canada, the population has declined, almost without a break, since 1831, when it was 100,973, to 74,085 in 1891 and 73,642 in 1901, in which year there were 24 persons to the sq. m. In 1901 the number of Gaelic-speaking persons was 34,224, of whom 3313 spoke Gaelic only. The chief towns are Campbeltown (population in 1901, 8286), Dunoon (6779) and Oban (5427), with Ardrishaig (1285), Ballachulish (1143), Lochgilphead (1313) and Tarbert (1697). The county returns a member to parliament. Inveraray, Campbeltown and Oban belong to the Ayr district group of parliamentary burghs. Argyllshire is a sheriffdom, and there are resident sheriffs-substitute at Inveraray, Campbeltown and Oban; courts are held also at Tobermory, Lochgilphead, Bowmore in Islay, and Dunoon. Both Presbyterian bodies are strongly represented; there are Roman Catholic and (Anglican) Episcopal bishops of Argyll and the Isles, and there is a Roman Catholic pro-cathedral at Oban. Campbeltown, Dunoon and Oban have secondary schools, Tarbert public school has a secondary department, and several other schools earn grants for giving higher education. Part of the "residue" grant is spent by the county council on classes of navigation and other subjects in various schools, short courses in agriculture for farmers, and in providing bursaries.

History.—The early history of Argyll (Airergaidheal) is very obscure. At the close of the 5th century Fergus, son of Erc, a descendant of Conor II., *airdrigh* or high king of Ireland, came over with a band of Irish Scots and established himself in Argyll and Kintyre. Nothing more is known till, in the days of Conall I., the descendant of Fergus in the fourth generation, St Columba

appears. Conall died in 574, and Columba was mainly instrumental in establishing his first cousin, Aidan, founder of the Dalriad kingdom and ancestor of the royal house of Scotland, in power. In the 8th century Argyll, with the Western Islands and Man, fell under the power of the Norsemen until, in the 12th century, Somerled (or Somhairle), a descendant of Colla-Uais, *airdrigh* of Ireland (327–331), succeeded in ousting them and established his authority, not only as thane of Argyll, but also in Kintyre and the Western Islands. Somerled died in 1164 and his descendants maintained themselves in Argyll and the islands, between the conflicting claims of the kings of Scotland, Norway and Man, until the end of the 15th century.

Up to 1222 Argyll had formed an independent Celtic princedom; but in that year it was reduced by Alexander II., the Scottish king, to a sheriffdom, and was henceforth regarded as an integral part of Scotland. Among the various clans in Argyll, the Campbells of Loch Awe, a branch of the clan McArthur, now began to come to the fore, though the mainland was still chiefly in the possession of the MacDougals. The position of the lords of the house of Somerled was now curious, since they were feudatories of the king of Norway for the isles and of the king of Scotland for Argyll. Their policy in the wars between the two powers was a masterly neutrality. Thus, during the expedition of Alexander II. to the Western Isles in 1249, Ewan (Eoghan), lord of Argyll, refused to fight against the Norwegians; in 1263 the same Ewan refused to join Haakon of Norway in attacking Alexander III. Forty years later the clansmen of Argyll, mainly MacDougals, were warring on the side of Edward of England against Robert Bruce, by whom they were badly beaten on Loch Awe in 1309. The clansmen of the house of Somerled in the isles, on the other hand, the MacDonalds, remained loyal to Scotland in spite of the persuasions of John of Argyll, appointed admiral of Edward II.'s western fleet; and, under their chief Angus Og, they contributed much to the victory of Bannockburn. The alliance of John, earl of Ross and lord of the Isles, with Edward IV. of England in 1461 led to the breaking of the power of the house of Somerled, and in 1478 John was forced to resign Ross to the crown and, two years later, his lordships of Knapdale and Kintyre as well. In Argyll itself the Campbells had already made the first step to supremacy through the marriage of Colin, grandson of Sir Duncan Campbell of Lochow, first Lord Campbell, with Isabel Stewart, eldest of the three co-heiresses of John, third lord of Lorne. He acquired the greater part of the lands of the other sisters by purchase, and the lordship of Lorne from Walter their uncle, the heir in tail male, by an exchange for lands in Perthshire. In 1457 he was created, by James II., earl of Argyll. He died on the 10th of May 1493. From him dates the greatness of the house of the earls and dukes of Argyll (*q.v.*), whose history belongs to that of Scotland. The house of Somerled survives in two main branches—that of Macdonald of the Isles, Alexander Macdonald (d. 1795) having been raised to the peerage in 1776, and that of the Macdonnells, earls of Antrim in Ireland. The principal clans in Argyll, besides those already mentioned, were the Macleans, the Stewarts of Appin, the Macquarries and the Macdonalds of Glencoe, and the Macfarlanes of Glencroe. The Campbells are still very numerous in the county.

Argyllshire men have made few contributions to English literature. For long the natives spoke Gaelic only and their bards sang in Gaelic (see CELT: *Literature*: Scottish). Near Inistrynich on the north-eastern shore of Loch Awe stands the monumental cairn erected in honour of Duncan Ban McIntyre (1724–1812), the most popular of modern Gaelic bards. But the romantic beauty of the country has made it a favourite setting for the themes of many poets and story-tellers, from "Ossian" and Sir Walter Scott to Robert Louis Stevenson, while not a few men distinguished in affairs or in learning have been natives of the county.

The antiquities comprise monoliths, circles of standing stones, crannogs and cairns. In almost all the burying-grounds—as at Campbeltown, Keil, Soroby, Kilchousland, Kilmun—there are specimens of sculptured crosses and slabs. Besides the famous ecclesiastical remains at Iona (*q.v.*), there are ruins of a Cistercian priory in Oronsay, and of a church founded in the 12th century by Somerled, thane of Argyll, at Saddell. Among castles may be mentioned Dunstaffnage, Ardtornish, Skipness, Kilchurn (beloved of painters), Ardchonnel, Dunolly, Stalker, Dunderaw and Carrick.

AUTHORITIES.—The (Eighth) Duke of Argyll, *Commercial Principles Applied to the Hire of Land* (London, 1877); *Crofts and Farms in the Hebrides* (Edinburgh, 1883); *Iona* (Edinburgh, 1889); *Scotland as it Was and Is* (Edinburgh, 1887); *House of Argyll* (Glasgow, 1871); A. Brown, *Memorials of Argyllshire* (Greenock, 1889); Harvie-Brown and Buckley, *Vertebrate Fauna of Argyll and the Inner Hebrides* (Edinburgh, 1892); D. Clerk, "On the Agriculture of the County of Argyll" (*Trans. of H. and A. Soc.*, 1878); T. Gray, *Week at Oban* (Edinburgh, 1881); Stewart, *Collection of Views of Campbeltown*. For antiquities see *The Sculptured Stones of Scotland*, vol. ii., published by the Spalding Club, and Capt. T. P. White's *Archaeological Sketches in Kintyre* and *Proc. Antiq. Soc. of Scotland*, vols. iv., v., viii.

ARGYRODITE, a mineral which is of interest as being that in which the element germanium was discovered by C. Winkler in 1886. It is a silver sulpho-germanate, Ag_8GeS_6, and crystallizes in the cubic system. The crystals have the form of the octahedron or rhombic dodecahedron, and are frequently twinned. The botryoidal crusts of small indistinct crystals first found in a silver mine at Freiberg in Saxony were originally thought to be monoclinic, but were afterwards proved to be identical with the more distinctly developed crystals recently found in Bolivia. The colour is iron-black with a purplish tinge, and the lustre metallic. There is no cleavage; hardness $2\frac{1}{2}$, specific gravity 6·2. It is of interest to note that the Freiberg mineral was long ago imperfectly described by A. Breithaupt under the name *Plusinglanz*, and that the Bolivian crystals were incorrectly described in 1849 as crystallized brongniardite. The name argyrodite is from the Greek ἀργυρώδης, rich in silver.

Isomorphous with argyrodite is the corresponding tin compound Ag_8SnS_6, also found in Bolivia as cubic crystals, and known by the name canfieldite. Other Bolivian crystals are intermediate in composition between argyrodite and canfieldite. (L. J. S.)

ARGYROKASTRO, or ARGYROCASTRON (Turkish, *Ergeri*; Albanian, *Ergir Castri*), a town of southern Albania, Turkey, in the vilayet of Iannina. Pop. (1900) about 11,000. Argyrokastro is finely situated 1060 ft. above sea-level, on the eastern slopes of the Acroceraunian mountains, and near the left bank of the river Dhrynos, a left-hand tributary of the Viossa. It is the capital of a sanjak bearing the same name, and was formerly important as the headquarters of the local Moslem aristocracy, partly owing to the mountainous and easily defensible nature of the district. It contains the ruins of an imposing castellated fort. A fine kind of snuff, known as *fuli*, is manufactured here. Argyrokastro has been variously identified with the ancient Hadrianopolis and Antigonea. In the 18th century it is said to have contained 20,000 inhabitants, but it was almost depopulated by plague in 1814. Albanian Moslems constitute the greater part of the population.

ARGYROPULUS, or ARGYROPULO, **JOHN** (*c.* 1416–1486), Greek humanist, one of the earliest promoters of the revival of learning in the West, was born in Constantinople, and became a teacher there, Constantine Lascaris being his pupil. He then appears to have crossed over to Italy, and taught in Padua in 1434, being subsequently made rector of the university. About 1441 he returned to Constantinople, but after its capture by the Turks, again took refuge in Italy. About 1456 he was invited to Florence by Cosimo de'Medici, and was there appointed professor of Greek in the university. In 1471, on the outbreak of the plague, he removed to Rome, where he continued to act as a teacher of Greek till his death. Among his scholars were Angelus Politianus and Johann Reuchlin. His principal works were translations of the following portions of Aristotle,—*Categoriae*, *De Interpretatione*, *Analytica Posteriora*, *Physica*, *De Caelo*, *De Anima*, *Metaphysica*, *Ethica Nicomachea*, *Politica*;

and an *Expositio Ethicorum Aristotelis*. Several of his writings exist still in manuscript.

See Humphrey Hody, *De Graecis Illustribus*, 1742, and Smith's *Dictionary of Greek and Roman Biography*, s.v. Joannes.

ARIA (Ital. for "air"), a musical term, equivalent to the English "air," signifying a melody apart from the harmony, but especially a musical composition for a single voice or instrument, with an accompaniment of other voices or instruments.

The aria originally developed from the expansion of a single vocal melody, generally on the lines of what is known as binary form (see SONATA and SONATA FORMS). Accordingly, while the germs of aria form may be traceable in the highest developments of folk-song, the aria as a definite art-form could not exist before the middle of the 17th century; because up to that time the whole organization of music was based upon polyphonic principles which left no room for the development of melody for melody's sake. When at the beginning of the 17th century the Monodists (see HARMONY and MONTEVERDE) inaugurated a new era and showed in their first experiments the enormous possibilities latent in their new art of accompanying single voices by instruments, it was natural that for many years the mere suggestiveness and variety of their experiments should suffice to retain the attention of contemporary listeners, without any real artistic coherence in the works as wholes. But, even at the outset, mere novelty of harmony, however poignant its emotional expression, was felt by the profounder spirits of the new art to be an untrustworthy guide to progress. And Monteverde's famous lament of the deserted Ariadne is one of many early examples that appeal to an elementary sense of form by making the last phrase identical with the first. As instrumental music grew, and the modern sense of key became strong and consistent, composers felt themselves more and more able to appeal to that sense of harmonically consistent melody which has asserted itself in folk-music before the history of harmonic music may be said to have begun. The technique of solo singers grew as rapidly as that of solo players, and composers soon found their chief musical interest in doing justice to both. In Sir Hubert Parry's work, *The Music of the 17th Century* (*Oxford History of Music*, vol. iii.), will be found numerous illustrations of the early development of aria forms, from their first indications in Monteverde's instinctive struggles after coherence, to their complete maturity in the works of Alessandro Scarlatti.

By Scarlatti's time it was thoroughly established that the binary form of melody was that which could best be expanded into a form which should do justice both to singers and to the players who accompanied them. Thus the aria became on a small scale the prototype of the Concerto; and under that heading will accordingly be found all that need be said as to the relation between the instrumental *ritornello* and the material of the voice part in an aria.

So far we have spoken only of the main body of the aria; but the addition of a middle section with a *da Capo*, which constitutes the universal 18th-century *da Capo* form of aria, adds a very simple new principle to the essential scheme without really modifying it. A typical aria of the Scarlatti or Handelian type is a very large melody in binary form, delivered by the voice, which expands it with florid perorations before each cadence (and sometimes also with florid preludes); while relief is given to the voice, further spaciousness to the form, and justice done to the accompaniment, by the addition of an instrumental ritornello containing the gist of the melody not only at the beginning and end, but also in suitable shorter forms at the principal intermediate cadences in foreign keys. A smaller scheme of the same kind in a new group of related keys, but generally without much new material, is then appended as a middle section after which follows the main section *da Capo*. The result is generally a piece of music of considerable length, in a form which cannot fail to be effective and coherent; and there is little cause for wonder in the extent to which it dominated 18th-century music. It was not, however, invariable. In the *Cavatina* we find a form too small for the *da Capo*; and in the oratorios of Handel and the choral works of Bach we find a majority of arias in a larger form which evades the possibility of exact repetition.

The aria forms are profoundly influenced by the difference between the Sonata style and the style of Bach and Handel. But the scale of the form is inevitably small, and in any opera an aria is hardly possible except in a situation which is a tableau rather than an action. Consequently there is no such difference between the form of the classical operatic aria of Mozart and that of the Handelian type as there is between sonata music and suite music. The scale, however, has become too large for the *da Capo*, which was in any case too rigid to survive in music designed to intensify a dramatic situation instead of to distract attention from it. The necessary change of style was so successfully achieved that, until Wagner succeeded in devising music that moved absolutely *pari passu* with his drama, the aria remained as the central formal principle in dramatic music; and few things in artistic evolution are more interesting than the extent to which Mozart's predecessor, the great dramatic reformer Gluck, profited by the essential resources of his pet aversion, the aria style, when he had not only purged it of what had become the stereotyped ideas of ritornellos and vocal flourishes, but animated it by the new sense of dramatic climax to which the sonata style appealed.

In modern opera the aria is almost always out of place, and the forms in which definite melodies nowadays appear are rather those of the song in its limited sense as that of a poem in formal stanzas all set to the same music. In other words, a song in a modern opera tends to be something which would be sung even if the drama had to be performed as a play without music; whereas a classical aria would in non-musical drama be a soliloquy. This can be shown by works at such opposite poles of musical and dramatic technique as Bizet's *Carmen* and the later works of Wagner. In *Carmen* the librettist has so managed that, if his work were performed as a play, almost the whole of it would have to be sung; and the one exception of musical importance is the developed soliloquy of Micaëla in the third act, which, although treated in no old-fashioned or commonplace spirit by the composer, is the one thing in the opera which sounds "operatic."

In the later works of Wagner those passages in which we can successfully detach complete melodies from their context have, one and all, dramatically the aspect of songs and not of soliloquies. Siegmund sings the song of Spring to his sister-bride; Mime teaches Siegfried lessons of gratitude in nursery rhymes; and the whole story of the *Meistersinger* is a series of opportunities for song-singing.

The distinctions and gradations between aria and song are of great aesthetic importance, but their history would carry us too far. The distinction is obviously of the same importance as that between dramatic and lyric poetry. Beethoven's *Adelaïde* is a famous example of what is called a song when it is really entirely in aria style; while the operas of Mozart and Weber naturally contain in appropriate situations many numbers which really are songs. The composers themselves generally give appropriate names. Thus Mozart, in *Figaro*, calls "Non so piu cosa son" an aria, because of its free style, though Cherubino actually sings it as a song he has just invented; while "Voi che sapete," being more purely lyric, is called *Canzona*.

The term *aria form* is applied, generally most inaccurately, to all kinds of slow cantabile instrumental music of which the general design can be traced to the operatic aria. Mozart, for example, is very fond of slow movements in large binary form without development, and this is constantly called aria-form, though the term ought certainly to be restricted to such examples as have some traits of the aria style, such as the first slow movement in the great serenade in B flat. At all events, until writers on music have agreed to give the term some more accurate use, it is as well to avoid it and its cognate version, *Lied-form*, altogether in speaking of instrumental music.

The *air* or *aria* in a suite is a short binary movement in a flowing rhythm in common or duple time and by no means of the broadly tunelike quality which its name would seem to imply.

(D. F. T.)

ARIADNE (in Greek mythology), was the daughter of Minos, king of Crete, and Pasiphae, the daughter of Helios the Sun-god. When Theseus landed on the island to slay the Minotaur (*q.v.*), Ariadne fell in love with him, and gave him a clue of thread to guide him through the mazes of the labyrinth. After he had slain the monster, Theseus carried her off, but, according to Homer (*Odyssey*, xi. 322) she was slain by Artemis at the request of Dionysus in the island of Dia near Cnossus, before she could reach Athens with Theseus. In the later legend, she was abandoned, while asleep on the island of Naxos, by Theseus, who had fallen a victim to the charms of Aegle (Plutarch, *Theseus*, 20; Diodorus, iv. 60, 61). Her abandonment and awakening are celebrated in the beautiful *Epithalamium* of Catullus. On Naxos she is discovered by Dionysus on his return from India, who is enchanted with her beauty, and marries her when she awakes. She receives a crown as a bridal gift, which is placed amongst the stars, while she herself is honoured as a goddess (Ovid, *Metam.* viii. 152, *Fasti*, iii. 459).

The name probably means "very holy" = ἀρι-αγνη; another (Cretan) form Ἀριδήλα (= φανερά) indicates the return to a "bright" season of nature. Ariadne is the personification of spring. In keeping with this, her festivals at Naxos present a double character; the one, full of mourning and sadness, represents her death or abandonment by Theseus, the other, full of joy and revelry, celebrates her awakening from sleep and marriage with Dionysus. Thus nature sleeps and dies during winter, to awake in springtime to a life of renewed luxuriance. With this may be compared the festivals of Adonis and Osiris and the myth of Persephone. Theseus himself was said to have founded a festival at Athens in honour of Ariadne and Dionysus after his return from Crete. The story of Dionysus and Ariadne was a favourite subject for reliefs and wall-paintings. Most commonly Ariadne is represented asleep on the shore at Naxos, while Dionysus, attended by satyrs and bacchanals, gazes admiringly upon her; sometimes they are seated side by side under a spreading vine. The scene where she is holding the clue to Theseus occurs on a very early vase in the British Museum. There is a statue of the sleeping Ariadne in the Vatican Museum.

Kanter, *De Ariadne* (1879); Pallat, *De Fabula Ariadnea* (1891).

ARIANO DI PUGLIA, a town and episcopal see, which, despite its name, now belongs to Campania, Italy, in the province of Avellino, 1509 ft. above sea-level, on the railway between Benevento and Foggia, 24 m. E. of the former by rail. Pop. (1901) town, 8384; commune, 17,653. It lies in the centre of a fertile district, but has no buildings of importance, as it has often been devastated by earthquakes. A considerable part of the population still dwells in caves. It has been supposed to occupy the site of Aequum Tuticum, an ancient Samnite town, which became a post-station on the Via Traiana[1] in Roman times; but this should probably be sought at S. Eleuterio 5½ m. north. It was a military position of some importance in the middle ages. Thirteen miles south-south-east is the Sorgente Mefita, identical with the pools of Ampsanctus (*q.v.*). (T. As.)

ARIAS MONTANO, BENITO (1527–1598), Spanish Orientalist and editor of the Antwerp Polyglot, was born at Fregenal de la Sierra, in Estremadura, in 1527. After studying at the universities of Seville and Alcala, he took orders about the year 1559 and in 1562 he was appointed consulting theologian to the council of Trent. He retired to Peña de Aracena in 1564, wrote his commentary on the minor prophets (1571), and was sent to Antwerp by Philip II. to edit the polyglot Bible projected by Christopher Plantin. The work appeared in 8 volumes folio, between 1568 and 1573. León de Castro, a professor at Salamanca, thereon brought charges of heresy against Arias Montano, who was finally acquitted after a visit to Rome in 1575–1576. He was appointed royal chaplain, but withdrew to Peña de Aracena from 1579 to 1583; he resigned the chaplaincy in 1584, and went into complete seclusion at Santiago de la Espada in Seville, where he died in 1598.

He is the subject of an *Elogio histórico* by Tomás Gonzalez Carvajal in the *Memorias de la Real Academia de la Historia* (Madrid, 1832), vol. vii.

ARICA (San Marcos de Arica), a town and port of the Chilean-governed province of Tacna, situated in 18° 28′ 08″ S. lat. and 70° 20′ 46″ W. long. It is the port for Tacna, the capital of the province, 38 m. distant, with which it is connected by rail, and is the outlet for a large and productive mining district. Arica at one time had a population of 30,000 and enjoyed much prosperity, but through civil war, earthquakes and conquest, its population had dwindled to 2853 in 1895 and 2824 in 1902. The great earthquake of 1868, followed by a tidal wave, nearly destroyed the town and shipping. Arica was captured, looted and burned by the Chileans in 1880, and in accordance with the terms of the treaty of Ancon (1883) should have been returned to Peru in 1894, but this was not done. Late in 1906 the town again suffered severely from an earthquake.

ARICIA (mod. *Ariccia*), an ancient city of Latium, on the Via Appia, 16 m. S.E. of Rome. The old town, or at any rate its acropolis, now occupied by the modern town, lay high (1350 ft. above sea-level) above the circular Valle Aricciana, which is probably an extinct volcanic crater; some remains of its fortifications, consisting of a mound of earth supported on each side by a wall of rectangular blocks of peperino stone, have been discovered (D. Marchetti, in *Notizie degli scavi*, 1892, 52). The lower town was situated on the north edge of the valley, close to the Via Appia, which descended into the valley from the modern Albano, and re-ascended partly upon very fine substructions of *opus quadratum*, some 200 yds. in length, to the modern Genzano. Remains of the walls of the lower town, of the *cella* of a temple built of blocks of peperino, and also of later buildings in brickwork and *opus reticulatum*, connected with the post-station (Aricia being the first important station out of Rome, cf. Horace, *Sat.* i. 5. 1, *Egressum magna me excepit Aricia Roma hospitio modico*) on the highroad, may still be seen (cf. T. Ashby in *Mélanges de l'école française de Rome*, 1903, 399). Aricia was one of the oldest cities of Latium, and appears as a serious opponent of Rome at the end of the period of the kings and beginning of the republic. In 338 B.C. it was conquered by C. Maenius and became a *civitas sine suffragio*, but was soon given full rights. Even in the imperial period its chief magistrate was styled *dictator*, and its council *senatus*, and it preserved its own calendar of festivals. Its vegetables and wine were famous, and the district is still fertile. (T. As.)

ARICINI, the ancient inhabitants of Aricia (*q.v.*), the form of the name ranking them with the Sidicini, Marrucini (*q.v.*), &c., as one of the communities belonging probably to the earlier or Volscian stratum of population on the west side of Italy, who were absorbed by the Sabine or Latin immigrants. Special interest attaches to this trace of their earlier origin, because of the famous cult of Diana Nemorensis, whose temple in the forest close by Aricia, beside the *lacus Nemorensis*, was served by "the priest who slew the slayer, and shall himself be slain"; that is to say, the priest, who was called *rex Nemorensis*, held office only so long as he could defend himself from any stronger rival. This cult, which is unique in Italy, is picturesquely described in the opening chapter of J. G. Frazer's *Golden Bough* (2nd ed., 1900) where full references will be found. Of these references the most important are, perhaps, Strabo v. 3. 12; Ovid, *Fasti*, iii. 263-272; and Suetonius, *Calig.* 35, whose wording indicates that the old-world custom was dying out in the 1st century A.D. It is a reasonable conjecture that this extraordinary relic of barbarism was characteristic of the earlier stratum of the population who presumably called themselves *Arici*.

On the anthropological aspect of the cult, see also A. B. Cook, *Class. Rev.* xvi., 1902, p. 365, where the whole evidence is very fully collected; and Frazer's *Studies in the Early History of Kingship* (1907), where he accepts Cook's criticism of his own earlier theory. (R. S. C.)

ARIÈGE, an inland department of southern France, bounded S. by Spain, W. and N. by the department of Haute-Garonne, N.E. and E. by Aude, and S.E. by Pyrénées-Orientales. It

[1] This has generally been supposed to be the place referred to by Horace (*Sat.* i. 5. 87), as one which the metre would not allow him to mention by name; but H. Nissen (*Halische Landeskunde*, Berlin, 1902, ii. 845) proposes Ausculum instead.

embraces the old countship of Foix, and a portion of Languedoc and Gascony. Area, 1893 sq. m. Pop. (1906) 205,684. Ariège is for the most part mountainous. Its southern border is occupied by the snow-clad peaks of the eastern Pyrenees, the highest of which within the department is the Pic de Montcalm (10,512 ft.). Communication with Spain is afforded by a large number of *ports* or *cols*, which are, however, for the most part difficult paths, and only practicable for a few months in the year. Farther to the north two lesser ranges running parallel to the main chain traverse the centre of the department from south-east to north-west. The more southerly, the Montagne de Tabe, contains, at its south-eastern end, several heights between 7200 and 9200 ft., while the Montagnes de Plantaurel to the north of Foix are of lesser altitude. These latter divide the fertile alluvial plains of the north from the mountains of the centre and south. The department is intersected by torrents belonging to the Garonne basin—the Salat, the Arize, which, near Mas d'Azil, flows through a subterranean gallery, the Ariège and the Hers. The climate is mild in the south, but naturally very severe among the mountains. Generally speaking, the arable land, which is chiefly occupied by small holdings, is confined to the lowlands. Wheat, maize and potatoes are the chief crops. Good vineyards and market gardens are found in the neighbourhood of Pamiers in the north. Flax and hemp are also cultivated. The mountains afford excellent pasture, and a considerable number of cattle, sheep and swine are reared. Poultry- and bee-farming flourish. Forests cover more than one-third of the department and harbour wild boars and even bears. Game, birds of prey and fish are plentiful. There is abundance of minerals, including lead, copper, manganese and especially iron. Grindstones, building-stone, talc, gypsum, marble and phosphates are also produced. Warm mineral springs of note are found at Ax, Aulus and Ussat. Pamiers and St Girons are the most important industrial towns. Iron founding and forging, which have their chief centre at Pamiers, are principal industries. Flour-milling, paper-making and cloth-weaving may also be mentioned. Ariège is served by the Southern railway. It forms the diocese of Pamiers and belongs to the ecclesiastical province of Toulouse. It is within the circumscriptions of the académie (educational division) and of the court of appeal of Toulouse and of the XVII. army corps. Its capital is Foix; it comprises the arrondissements of Foix, St Girons and Pamiers, with 20 cantons and 338 communes. Foix, Pamiers, St Girons and St Lizier-de-Cousérans are the more noteworthy towns. Mention may also be made of Mirepoix, once the seat of a bishopric, and possessing a cathedral (15th and 16th centuries) with a remarkable Gothic spire.

ARIES ("The Ram"), in astronomy, the first sign of the zodiac (*q.v.*), denoted by the sign ♈, in imitation of a ram's head. The name is probably to be associated with the fact that when the sun is in this part of the heavens (in spring) sheep bring forth their young; this finds a parallel in *Aquarius*, when there is much rain. It is also a constellation, mentioned by Eudoxus (4th century B.C.) and Aratus (3rd century B.C.); Ptolemy catalogued eighteen stars, Tycho Brahe twenty-one, and Hevelius twenty-seven. According to a Greek myth, Nephele, mother of Phrixus and Helle, gave her son a ram with a golden fleece. To avoid the evil designs of Hera, their stepmother, Phrixus and Helle fled on the back of the ram, and reaching the sea, attempted to cross. Helle fell from the ram and was drowned (hence the *Hellespont*); Phrixus, having arrived in Colchis and been kindly received by the king, Aeetes, sacrificed the ram to Zeus, to whom he also dedicated the fleece, which was afterwards carried away by Jason. Zeus placed the ram in the heavens as the constellation.

ARIKARA, or ARICARA (from *ariki*, horn), a tribe of North American Indians of Caddoan stock. They are now settled with the Hidatsas and the Mandans on the Fort Berthold Reservation, North Dakota. They originally lived in the Platte Valley, Nebraska, with the Pawnees, to whom they are related. They number about 400.

See *Handbook of American Indians*, ed. F. W. Hodge (Washington, 1907.)

ARIMASPI, an ancient people in the extreme N.E. of Scythia (*q.v.*), probably the eastern Altai. All accounts of them go back to a poem by Aristeas of Proconnesus, from whom Herodotus (iii. 116, iv. 27) drew his information. They were supposed to be one-eyed (hence their Scythian name), and to steal gold from the griffins that guarded it. In art they are usually represented as richly dressed Asiatics, picturesquely grouped with their griffin foes; the subject is often described by poets from Aeschylus to Milton. They are so nearly mythical that it is impossible to insist on the usual identification with the ancestors of the Huns. Their gold was probably real, as gold still comes from the Altai.

ARIMINUM (mod. *Rimini*), a city of Aemilia, on the N.E. coast of Italy, 69 m. S.E. of Bononia. It was founded by the Umbrians, but in 268 B.C. became a Roman colony with Latin rights. It was reached from Rome by the Via Flaminia, constructed in 220 B.C., and from that time onwards was the bulwark of the Roman power in Cisalpine Gaul, to which province it even gave its name. Its harbour was of some importance, but is now silted up, the sea having receded. The remains of its moles were destroyed in 1807–1809. Ariminum became a place of considerable traffic owing to the construction of the Via Aemilia (187 B.C.) and the Via Popilia (132 B.C.), and is frequently mentioned by ancient authors. In 90 B.C. it acquired Roman citizenship, but in 82 B.C. having been held by the partisans of Marius, it was plundered by those of Sulla (who probably made the Rubicon the frontier of Italy instead of the Aesis), and a military colony settled there. Caesar occupied it in 49 B.C. after his crossing of the Rubicon. It was one of the eighteen richest cities of Italy which the triumviri selected as a reward for their troops. In 27 B.C. Augustus planted new colonists there, and divided the city into seven *vici* after the model of Rome, from which the names of the *vici* were borrowed. He also restored the Via Flaminia (*Mon. Ancyr.* c. 20) from Rome to Ariminum. At the entrance to the latter the senate erected, in his honour, a triumphal arch which is still extant—a fine simple monument with a single opening. At the other end of the *decumanus maximus* or main street (3000 Roman ft. in length) is a fine bridge over the Ariminus (mod. Marecchia) begun by Augustus and completed by Tiberius in A.D. 20. It has five wide arches, the central one having a span of 35 ft., and is well preserved. Both it and the arch are built of Istrian stone. The present Piazza Giulio Cesare marks the site of the ancient forum. The remains of the amphitheatre are scanty; many of its stones have gone to build the city wall, which must, therefore, at the earliest belong to the end of the classical period. In A.D. 1 Augustus's grandson Gaius Caesar had all the streets of Ariminum paved. In A.D. 69 the town was attacked by the partisans of Vespasian, and was frequently besieged in the Gothic wars. It was one of the five seaports which remained Byzantine until the time of Pippin. (See RIMINI.)

See A. Tonini, *Storia della Città di Rimini* (Rimini, 1848–1862). (T. As.)

ARIOBARZANES, the name of three ancient kings or satraps of Pontus, and of three kings of Cappadocia and a Persian satrap.

Of the Pontic rulers two are most famous. (1) The son of Mithradates I., who revolted against Artaxerxes in 362 B.C. and may be regarded as the founder of the kingdom of Pontus (*q.v.*). According to Demosthenes he and his three sons received from the Athenians the honour of citizenship. (2) The son of Mithradates III., who reigned *c.* 266–240 B.C., and was one of those who enlisted the help of the invading Gauls (see GALATIA).

Of the Cappadocian rulers the best-known one ("Philo-Romaeus" on the coins) reigned nominally from 93 to 63 B.C., but was three times expelled by Mithradates the Great and as often reinstated by Roman generals. Soon after the third occasion he formally abdicated in favour of his son Ariobarzanes "Philopator," of whom we gather only that he was murdered some time before 51. His son Ariobarzanes, called "Eusebes" and "Philo-Romaeus," earned the gratitude of Cicero during his proconsulate in Cilicia, and fought for Pompey in the civil

wars, but was afterwards received with honour by Julius Caesar, who subsequently reinstated him when expelled by Pharnaces of Pontus. In 42 B.C. Brutus and Cassius declared him a traitor, invaded his territory and put him to death.

The Persian satrap of this name unsuccessfully opposed Alexander the Great on his way to Persepolis (331 B.C.).

ARION, of Methymna, in Lesbos, a semi-legendary poet and musician, friend of Periander, tyrant of Corinth. He flourished about 625 B.C. Several of the ancients ascribe to him the invention of the dithyramb and of dithyrambic poetry; it is probable, however, that his real service was confined to the organization of that verse, and the conversion of it from a mere drunken song, used in the Dionysiac revels, to a measured antistrophic hymn, sung by a trained body of performers. The name Cycleus given to his father indicates the connexion of the son with the "cyclic" or circular chorus which was the origin of tragedy. According to Suidas he composed a number of songs and proems; none of these is extant; the fragment of a hymn to Poseidon attributed to him (Aelian, *Hist. An.* xii. 45) is spurious and was probably written in Attica in the time of Euripides. Nothing is known of the life of Arion, with the exception of the beautiful story first told by Herodotus (i. 23) and elaborated and embellished by subsequent writers. According to Herodotus, Arion being desirous of exhibiting his skill in foreign countries left Corinth, and travelled through Sicily and parts of Italy, where he gained great fame and amassed a large sum of money. At Taras (Tarentum) he embarked for his homeward voyage in a Corinthian vessel. The sight of his treasure roused the cupidity of the sailors, who resolved to possess themselves of it by putting him to death. In answer to his entreaties that they would spare his life, they insisted that he should either die by his own hand on shipboard or cast himself into the sea. Arion chose the latter, and as a last favour begged permission to sing a parting song. The sailors, desirous of hearing so famous a musician, consented, and the poet, standing on the deck of the ship, in full minstrel's attire, sang a dirge accompanied by his lyre. He then threw himself overboard; but instead of perishing, he was miraculously borne up in safety by a dolphin, supposed to have been charmed by the music. Thus he was conveyed to Taenarum, whence he proceeded to Corinth, arriving before the ship from Tarentum. Immediately on his arrival Arion related his story to Periander, who was at first incredulous, but eventually learned the truth by a stratagem. Summoning the sailors, he demanded what had become of the poet. They affirmed that he had remained behind at Tarentum; upon which they were suddenly confronted by Arion himself, arrayed in the same garments in which he had leapt overboard. The sailors confessed their guilt and were punished. Arion's lyre and the dolphin were translated to the stars. Herodotus and Pausanias (iii. 25. 7) both refer to a brass figure at Taenarum which was supposed to represent Arion seated on the dolphin's back. But this story is only one of several in which the dolphin appears as saving the lives of favoured heroes. For instance, it is curious that Taras, the mythical founder of Tarentum, is said to have been conveyed in this manner from Taenarum to Tarentum. On Tarentine coins a man and dolphin appear, and hence it may be thought that the monument at Taenarum represented Taras and not Arion. At the same time the connexion of Apollo with the dolphin must not be forgotten. Under this form the god appeared when he founded the celebrated oracle at Delphi, the name of which commemorates the circumstance. He was also the god of music, the special preserver of poets, and to him the lyre was sacred.

Among the numerous modern versions of the story, particular mention may be made of the pretty ballad by A. W. Schlegel; see also Lehrs, *Populäre Aufsätze aus dem Alterthum* (1844–1846); Clement, *Arion* (1898).

ARIOSTO, LODOVICO (1474–1533) Italian poet, was born at Reggio, in Lombardy, on the 8th of September 1474. His father was Niccolo Ariosto, commander of the citadel of Reggio. He showed a strong inclination to poetry from his earliest years, but was obliged by his father to study the law—a pursuit in which he lost five of the best years of his life. Allowed at last to follow his inclination, he applied himself to the study of the classics under Gregorio da Spoleto. But after a short time, during which he read the best Latin authors, he was deprived of his teacher by Gregorio's removal to France as tutor of Francesco Sforza. Ariosto thus lost the opportunity of learning Greek, as he intended. His father dying soon after, he was compelled to forego his literary occupations to undertake the management of the family, whose affairs were embarrassed, and to provide for his nine brothers and sisters, one of whom was a cripple. He wrote, however, about this time some comedies in prose and a few lyrical pieces. Some of these attracted the notice of the cardinal Ippolito d'Este, who took the young poet under his patronage and appointed him one of the gentlemen of his household. This prince usurped the character of a patron of literature, whilst the only reward which the poet received for having dedicated to him the *Orlando Furioso*, was the question, "Where did you find so many stories, Master Ludovic?" The poet himself tells us that the cardinal was ungrateful; deplores the time which he spent under his yoke; and adds, that if he received some niggardly pension, it was not to reward him for his poetry, which the prelate despised, but to make some just compensation for the poet's running like a messenger, with the risk of his life, at his eminence's pleasure. Nor was even this miserable pittance regularly paid during the period that the poet enjoyed it. The cardinal went to Hungary in 1518, and wished Ariosto to accompany him. The poet excused himself, pleading ill health, his love of study, the care of his private affairs and the age of his mother, whom it would have been disgraceful to leave. His excuses were not received, and even an interview was denied him. Ariosto then boldly said, that if his eminence thought to have bought a slave by assigning him the scanty pension of 75 crowns a year, he was mistaken and might withdraw his boon—which it seems the cardinal did.

The cardinal's brother, Alphonso, duke of Ferrara, now took the poet under his patronage. This was but an act of simple justice, Ariosto having already distinguished himself as a diplomatist, chiefly on the occasion of two visits to Rome as ambassador to Pope Julius II. The fatigue of one of these hurried journeys brought on a complaint from which he never recovered; and on his second mission he was nearly killed by order of the violent pope, who happened at the time to be much incensed against the duke of Ferrara. On account of the war, his salary of only 84 crowns a year was suspended, and it was withdrawn altogether after the peace; in consequence of which Ariosto asked the duke either to provide for him, or to allow him to seek employment elsewhere. A province, situated on the wildest heights of the Apennines, being then without a governor, Ariosto received the appointment, which he held for three years. The office was no sinecure. The province was distracted by factions and banditti, the governor had not the requisite means to enforce his authority and the duke did little to support his minister. Yet it is said that Ariosto's government satisfied both the sovereign and the people confided to his care; and a story is added of his having, when walking out alone, fallen in with a party of banditti, whose chief, on discovering that his captive was the author of *Orlando Furioso*, humbly apologized for not having immediately shown him the respect which was due to his rank. Although he had little reason to be satisfied with his office, he refused an embassy to Pope Clement VII. offered to him by the secretary of the duke, and spent the remainder of his life at Ferrara, writing comedies, superintending their performance as well as the construction of a theatre, and correcting his *Orlando Furioso*, of which the complete edition was published only a year before his death. He died of consumption on the 6th of June 1533.

That Ariosto was honoured and respected by the first men of his age is a fact; that most of the princes of Italy showed him great partiality is equally true; but it is not less so that their patronage was limited to kind words. It is not known that he ever received any substantial mark of their love for literature; he lived and died poor. He proudly wrote on the entrance of a house built by himself,

" Parva, sed apta mihi, sed nulli obnoxia, sed non
Sordida, parta meo sed tamen aere domus;"

which serves to show the incorrectness of the assertion of flatterers, followed by Tiraboschi, that the duke of Ferrara built that house for him. The only one who seems to have given anything to Ariosto as a reward for his poetical talent was the marquess del Vasto, who assigned him an annuity of 100 crowns on the revenues of Casteleone in Lombardy; but it was only paid, if ever, from the end of 1531. That he was crowned as poet by Charles V. seems untrue, although a diploma may have been issued to that effect by the emperor.

The character of Ariosto seems to have been fully and justly delineated by Gabriele, his brother:—

" Ornabat pietas et grata modestia Vatem,
Sancta fides, dictique memor, munitaque recto
Justitia, et nullo patientia victa labore,
Et constans virtus animi, et clementia mitis,
Ambitione procul pulsa, fastusque tumore."

His satires, in which we see him before us such as he was, show that there was no flattery in this portrait. In these compositions we are struck with the noble independence of the poet. He loved liberty with a most jealous fondness. His disposition was changeable withal, as he himself very frankly confesses in his Latin verses, as well as in the satires.

" Hoc olim ingenio vitales hausimus auras,
Multa cito ut placeant, displicitura brevi.
Non in amore modo mens haec, sed in omnibus impar
Ipsa sibi longa non retinenda mora."

Hence he never would bind himself, either by going into orders, or by marrying, till towards the end of his life, when he espoused Alessandra, widow of Tito Strozzi. He had no issue by his wife, but he left two natural sons by different mothers.

His Latin poems do not perhaps deserve to be noticed: in the age of Flaminio, Vida, Fracastoro and Sannazaro, better things were due from a poet like Ariosto. His lyrical compositions show the poet, although they do not seem worthy of his powers. His comedies, of which he wrote four, besides one which he left unfinished, are avowedly imitated from Plautus and Terence; and although native critics may admire in them the elegance of the diction, the liveliness of the dialogue and the novelty of some scenes, few will feel interest either in the subject or in the characters, and it is hard to approve the immoral passages by which they are disfigured, however grateful these might be to the audiences and patrons of theatrical representations in Ariosto's own day.

Of all the works of Ariosto, the most solid monument of his fame is the *Orlando Furioso*, the extraordinary merits of which have cast into oblivion the numberless romance poems which inundated Italy during the 15th, 16th and 17th centuries.

The popularity which an earlier poem on the same theme, *Orlando Innamorato*, by Boiardo, enjoyed in Ariosto's time, cannot be well conceived, now that the enthusiasm of the crusades, and the interest which was attached to a war against the Moslems, have passed away. Boiardo wrote and read his poem at the court of Ferrara, but died before he was able to finish it. Many poets undertook the difficult task of its completion; but it was reserved for Ariosto both to finish and to surpass, his original. Boiardo did not, perhaps, yield to Ariosto either in vigour or in richness of imagination, but he lived in a less refined age, and died before he was able to recast or even finish the poetical romance which he had written under the impulse of his exuberant fancy. Ariosto, on the other hand, united to a powerful imagination an elegant and cultivated taste. He began to write his great poem about 1503, and after having consulted the first men of the age of Leo X., he published it in 1516, in only 40 cantos (extended afterwards to 46); and up to the moment of his death never ceased to correct and improve both the subject and the style. It is in this latter quality that he excels, and for which he had assigned him the name of *Divino Lodovico*. Even when he jests, he never compromises his dignity; and in pathetic description or narrative he excites the reader's deepest feelings. In his machinery he displays a vivacity of fancy with which no other poet can vie; but he never lets his fancy carry him so far as to omit to employ, with an art peculiar to himself, those simple and natural pencil-strokes which, by imparting to the most extraordinary feats a colour of reality, satisfy the reason without disenchanting the imagination. The death of Zerbino, the complaints of Isabella, the effects of discord among the Saracens, the flight of Astolfo to the moon, the passion which causes Orlando's madness, teem with beauties of every variety. The supposition that the poem is not connected throughout is wholly unfounded; there is a connexion which, with a little attention, will become evident. The love of Ruggero and Bradamante forms the main subject of the *Furioso*; every part of it, except some episodes, depend upon this subject; and the poem ends with their marriage.

The first complete edition of the *Orlando Furioso* was published at Ferrara in 1532, as noted above. The edition of Morali (Milan, 1818) follows the text of the 1532 edition with great correctness. Of editions published in England, those of Baskerville (Birmingham, 1773) and Panizzi (London, 1834) are the most important. The indifferent translations into English of Sir John Harrington (1591) and John Hoole (1783) have been superseded by the spirited rendering of W. Stewart Rose (1823). See also E. Gardner, *Ariosto: the Prince of Court Poets* (1906).

ARISTAENETUS, Greek epistolographer, flourished in the 5th or 6th century A.D. He was formerly identified with Aristaenetus of Nicaea (the friend of Symmachus), who perished in an earthquake at Nicomedia, A.D. 358, but internal evidence points to a much later date. Under his name two books of love stories, in the form of letters, are extant; the subjects are borrowed from the erotic elegies of such Alexandrian writers as Callimachus, and the language is a patchwork of phrases from Plato, Lucian, Alciphron and others. The stories are feeble and insipid, and full of strange and improbable incidents.

Text: Boissonade (1822); Hercher, *Epistolographi Graeci* (1873). English translations: Boyer (1701); Thomas Brown (1715); R. B. Sheridan and Halked (1771 and later).

ARISTAEUS, a divinity whose worship was widely spread throughout ancient Greece, but concerning whom the myths are somewhat obscure. The account most generally received connects him specially with Thessaly. Apollo carried off from Mount Pelion the nymph Cyrene, daughter or granddaughter of the river-god Peneus, and conveyed her to Libya, where she gave birth to Aristaeus. From this circumstance the town of Cyrene took its name. The child was at first handed over to the care of the Hours, or the nymph Melissa and the centaur Cheiron. He afterwards left Libya and went to Thebes, where he received instruction from the Muses in the arts of healing and prophecy, and married Autonoe, daughter of Cadmus, by whom he had several children, among others, the unfortunate Actaeon. He is said to have visited Ceos, where, by erecting a temple to Zeus Icmaeus (the giver of moisture), he freed the inhabitants from a terrible drought. The islanders worshipped him, and occasionally identified him with Zeus, calling him Zeus Aristaeus. After travelling through many of the Aegean islands, through Sicily, Sardinia and Magna Graecia, everywhere conferring benefits and receiving divine honours, Aristaeus reached Thrace, where he was initiated into the mysteries of Dionysus, and finally disappeared near Mount Haemus. While in Thrace he is said to have caused the death of Eurydice, who was bitten by a snake while fleeing from him. Aristaeus was essentially a benevolent deity; he was worshipped as the first who introduced the cultivation of bees (Virgil, *Georg.* iv. 315-558), and of the vine and olive; he was the protector of herdsmen and hunters; he warded off the evil effects of the dog-star; he possessed the arts of healing and prophecy. He was often identified with Zeus, Apollo and Dionysus. In ancient sculptures and coins he is represented as a young man, habited like a shepherd, and sometimes carrying a sheep on his shoulders. Coins of Ceos exhibit the head of Aristaeus and Sirius in the form of a dog crowned with rays.

Pindar, *Pythia*, ix. 5-65; Apollonius Rhodius, schol. on ii. 498, 500; Diodorus, iv. 81.

ARISTAGORAS (d. 497 B.C.), brother-in-law and cousin of Histiaeus, tyrant of Miletus. While Histiaeus was practically a prisoner at the court of Darius, he acted as regent in Miletus.

In 500 B.C. he persuaded the Persians to join him in an attack upon Naxos, but he quarrelled with Megabates, the Persian commander, who warned the inhabitants of the island, and the expedition failed. Finding himself the object of Persian suspicion, Aristagoras, instigated by a message from Histiaeus, raised the standard of revolt in Miletus, though it seems likely that this step had been under consideration for some time (see IONIA). After the complete failure of the Ionian revolt he emigrated to Myrcinus in Thrace. Here he fell in battle (497), while attacking Ennea Hodoi (afterwards Amphipolis) on the Strymon, which belonged to the Edonians, a Thracian tribe. The aid given to him by Athens and Eretria, and the burning of Sardis, were the immediate cause of the invasion of Greece by Darius.

See Herodotus v. 30-51, 97-126; Thucydides iv. 102; Diodorus xii. 68; for a more favourable view see G. B. Grundy, *Great Persian War* (London, 1901).

ARISTANDER, of Telmessus in Lycia, was the favourite soothsayer of Alexander the Great, who consulted him on all occasions. After the death of the monarch, when his body had lain unburied for thirty days, Aristander procured its burial by foretelling that the country in which it was interred would be the most prosperous in the world. He is frequently mentioned by the historians who wrote about Alexander, and was probably the author of a work on prodigies, which is referred to by Pliny (*Nat. Hist.* xvii. 38) and Lucian.

Philopatris, 21; Arrian, *Anabasis*, ii. 26, iii. 2, iv. 4; Plutarch, *Alexander*; Curtius iv. 2, 6, 15, vii. 7.

ARISTARCHUS, of Samos, Greek astronomer, flourished about 250 B.C. He is famous as having been the first to maintain that the earth moves round the sun. On this account he was accused of impiety by the Stoic Cleanthes, just as Galileo, in later years, was attacked by the theologians. His only extant work is a short treatise (with a commentary by Pappus) *On the Magnitudes and Distances of the Sun and Moon.* His method of estimating the relative lunar and solar distances is geometrically correct, though the instrumental means at his command rendered his data erroneous. Although the heliocentric system is not mentioned in the treatise, a quotation in the *Arenarius* of Archimedes from a work of Aristarchus proves that he anticipated the great discovery of Copernicus. Further, Copernicus could not have known of Aristarchus's doctrine, since Archimedes's work was not published till after Copernicus's death. Aristarchus is also said to have invented two sun-dials, one hemispherical, the so-called *scaphion*, the other plane.

Editio princeps by Wallis (1688); Fortia d'Urban (1810); Nizze (1856). See Bergk-Hinrichs, *Aristarchus von Samos* (1883); Tannery, *Aristarque de Samos*; also ASTRONOMY.

ARISTARCHUS, of Samothrace (*c.* 220–143 B.C.), Greek grammarian and critic, flourished about 155. He settled early in Alexandria, where he studied under Aristophanes of Byzantium, whom he succeeded as librarian of the museum. On the accession of the tyrant Ptolemy Physcon (his former pupil), he found his life in danger and withdrew to Cyprus, where he died from dropsy, hastened, it is said, by voluntary starvation, at the age of 72. Aristarchus founded a school of philologists, called after him "Aristarcheans," which long flourished in Alexandria and afterwards at Rome. He is said to have written 800 commentaries alone, without reckoning special treatises. He edited Hesiod, Pindar, Aeschylus, Sophocles and other authors; but his chief fame rests on his critical and exegetical edition of Homer, practically the foundation of our present recension. In the time of Augustus, two Aristarcheans, Didymus and Aristonicus, undertook the revision of his work, and the extracts from these two writers in the Venetian scholia to the *Iliad* give an idea of Aristarchus's Homeric labours. To obtain a thoroughly correct text, he marked with an obelus the lines he considered spurious; other signs were used by him to indicate notes, varieties of reading, repetitions and interpolations. He arranged the *Iliad* and the *Odyssey* in twenty-four books as we now have them. As a commentator his principle was that the author should explain himself, without recourse to allegorical interpretation; in grammar, he laid chief stress on analogy and uniformity of usage and construction. His views were opposed by Crates of Mallus, who wrote a treatise Περὶ Ἀνωμαλίας, especially directed against them.

See Lehrs, *De Aristarchi Stud. Homericis* (3rd ed., 1882); Ludwich, *Aristarchs homerische Textcritik* (1884); especially Sandys, *Hist. of Class. Schol.* (ed. 1906), vol. i. with authorities; also HOMER.

ARISTEAS, a somewhat mythical personage in ancient Greece, said to have lived in the time of Cyrus and Croesus, or, according to some, *ca.* 690 B.C. We are chiefly indebted to Herodotus (iv. 13-15) for our knowledge of him and his poem *Arimaspeia.* He belonged to a noble family of Proconnesus, an island colony from Miletus in the Propontis, and was supposed to be inspired by Apollo. He travelled through the countries north and east of the Euxine, and visited the Hyperboreans, Issedonians and Arimaspians, who fought against the gold-guarding griffins. An important historical fact which seems to be indicated in his poem is the rush of barbarian hordes towards Europe under pressure from their neighbours. Twelve lines of the poem are preserved in Tzetzes and Longinus. Wonderful stories are told of Aristeas. At Proconnesus, he fell dead in a shop; simultaneously a traveller declared he had spoken with him near Cyzicus; his body vanished; six years afterwards, he returned. Again disappearing, 240 years later he was at Metapontum, and commanded the inhabitants to raise a statue to himself and an altar to Apollo, whom he had accompanied in the form of a raven, at the founding of the city. According to Suidas, Aristeas also wrote a prose theogony. The genuineness of his works is disputed by Dionysius of Halicarnassus.

See Tournier, *De Aristea Proconneso* (1863); Macan, *Hdt.* iv. 14 note.

ARISTEAS, the pseudonymous author of a famous *Letter* in which is described, in legendary form, the origin of the Greek translation of the Old Testament known as the Septuagint (*q.v.*). Aristeas represents himself as a Gentile Greek, but was really an Alexandrian Jew who lived under one of the later Ptolemies. Though the *Letter* is unauthentic, it is now recognized as a useful source of information concerning both Egyptian and Palestinian affairs in the 2nd and possibly in the 3rd century B.C.

An English translation, based on a critical Greek text, was published by H. St J. Thackeray in the *Jewish Quarterly Review*, vol. xv. There are two modern editions of the Greek, one by the last named (in Swete's *Introduction to the Old Testament in Greek*, Cambridge, 1900), the other by P. Wendland (Leipzig, 1900).

ARISTIDES [Ἀριστείδης] (*c.* 530–468 B.C.), Athenian statesman, called "the Just," was the son of Lysimachus, and a member of a family of moderate fortune. Of his early life we are told merely that he became a follower of the statesman Cleisthenes and sided with the aristocratic party in Athenian politics. He first comes into notice as strategus in command of his native tribe Antiochis at Marathon, and it was no doubt in consequence of the distinction which he then achieved that he was elected chief archon for the ensuing year (489–488). In pursuance of his conservative policy which aimed at maintaining Athens as a land power, he was one of the chief opponents of the naval policy of Themistocles (*q.v.*). The conflict between the two leaders ended in the ostracism of Aristides, at a date variously given between 485 and 482. It is said that, on this occasion, a voter, who did not know him, came up to him, and giving him his sherd, desired him to write upon it the name of Aristides. The latter asked if Aristides had wronged him. "No," was the reply, "and I do not even know him, but it irritates me to hear him everywhere called *the just.*"

Early in 480 Aristides profited by the decree recalling the post-Marathonian exiles to help in the defence of Athens against the Persian invaders, and was elected strategus for the year 480–479. In the campaign of Salamis he rendered loyal support to Themistocles, and crowned the victory by landing Athenian infantry on the island of Psyttaleia and annihilating the Persian garrison stationed there (see SALAMIS). In 479 he was re-elected strategus, and invested with special powers as commander of the Athenian contingent at Plataea; he is also said to have judiciously suppressed a conspiracy among some oligarchic malcontents in the army, and to have played a prominent part

in arranging for the celebration of the victory. In 478 or 477 Aristides was in command of the Athenian squadron off Byzantium, and so far won the confidence of the Ionian allies that, after revolting from the Spartan admiral Pausanias, they offered him the chief command and left him with absolute discretion in fixing the contributions of the newly formed confederacy (see DELIAN LEAGUE). His assessment was universally accepted as equitable, and continued as the basis of taxation for the greater part of the league's duration; it was probably from this that he won the title of "the Just." Aristides soon left the command of the fleet to his friend Cimon (*q.v.*), but continued to hold a predominant position in Athens. At first he seems to have remained on good terms with Themistocles, whom he is said to have helped in outwitting the Spartans over the rebuilding of the walls of Athens. But in spite of statements in which ancient authors have represented Aristides as a democratic reformer, it is certain that the period following the Persian wars during which he shaped Athenian policy was one of conservative reaction. (For the theory based on Plutarch, *Aristid.* 22, that Aristides after Plataea threw open the archonship to all the citizens, see ARCHON.)

He is said by some authorities to have died at Athens, by others on a journey to the Euxine sea. The date of his death is given by Nepos as 468; at any rate he lived to witness the ostracism of Themistocles, towards whom he always displayed a generous conduct, but had died before the rise of Pericles. His estate seems to have suffered severely from the Persian invasions, for apparently he did not leave enough money to defray the expenses of his burial, and it is known that his descendants even in the 4th century received state pensions. (See ATHENS; THEMISTOCLES.)

AUTHORITIES.—Herodotus viii. 79-81, 95; ix. 28; "Constitution of Athens" (*Ath. Pol.*), 22-24, 41; Plutarch, *Aristides*; Cornelius Nepos, *Vita Aristidis*. See also E. Meyer, *Geschichte des Altertums* (Stuttgart, 1901), iii. pp. 481, 492. In the absence of positive information the 4th-century writers (on whom Plutarch and Nepos mainly rely) seized upon his surname of "Just," and wove round it a number of anecdotes more picturesque than historical. Herodotus is practically our only trustworthy authority. (M. O. B. C.)

ARISTIDES, of Miletus, generally regarded as the father of Greek prose romance, flourished 150–100 B.C. He wrote six books of erotic *Milesian Tales* (Μιλησιακά), which enjoyed great popularity, and were subsequently translated into Latin by Cornelius Sisenna (119–67 B.C.). They are lost, with the exception of a few fragments, but the story of the Ephesian matron in Petronius gives an idea of their nature. They have been compared with the old French *fabliaux* and the tales of Boccaccio.

Plutarch, *Crassus*, 32; Ovid, *Tristia*, ii. 413, 443; Müller, *Fragmenta Historicorum Graecorum*, iv.

ARISTIDES, of Thebes, a Greek painter of the 4th century B.C. He is said to have excelled in expression. For example, a picture of his representing a dying mother's fear lest her infant should suck death from her breast was much celebrated. He also painted one of Alexander's battles. One of his pictures is said to have been bought by King Attalus for 100 talents (more than £20,000).

ARISTIDES, AELIUS, surnamed THEODORUS, Greek rhetorician and sophist, son of Eudaemon, a priest of Zeus, was born at Hadriani in Mysia, A.D. 117 (or 129). He studied under Herodes Atticus of Athens, Polemon of Smyrna, and Alexander of Cotyaeum, in whose honour he composed a funeral oration still extant. In the practice of his calling he travelled through Greece, Italy, Egypt and Asia, and in many places the inhabitants erected statues to him in recognition of his talents. In 156 he was attacked by an illness which lasted thirteen years, the nature of which has caused considerable speculation. However, it in no way interfered with his studies; in fact, they were prescribed as part of his cure. Aristides' favourite place of residence was Smyrna. In 178, when it was destroyed by an earthquake, he wrote an account of the disaster to Aurelius, which deeply affected the emperor and induced him to rebuild the city. The grateful inhabitants set up a statue in honour of Aristides, and styled him the "builder" of Smyrna. He refused all honours from them except that of priest of Asclepius, which office he held till his death, about 189. The extant works of Aristides consist of two small rhetorical treatises and fifty-five declamations, some not really speeches at all. The treatises are on *political* and *simple speech*, in which he takes Demosthenes and Xenophon as models for illustration; some critics attribute these to a later compiler (Spengel, *Rhetores Graeci*). The six *Sacred Discourses* have attracted some attention. They give a full account of his protracted illness, including a mass of superstitious details of visions, dreams and wonderful cures, which the god Asclepius ordered him to record. These cures, from his account, offer similarities to the effects produced by hypnotism. The speeches proper are epideictic or show speeches—on certain gods, panegyrics of the emperor and individual cities (Smyrna, Rome); justificatory—the attack on Plato's *Gorgias* in defence of rhetoric and the four statesmen, Thucydides, Miltiades, Pericles, Cimon; symbouleutic or political, the subjects being taken from the past history of free Greece—the Sicilian expedition, peace negotiations with Sparta, the political situation after the battle of Leuctra. The *Panathenaicus* and *Encomium of Rome* were actually delivered, the former imitated from Isocrates. The *Leptinea*—the genuineness of which is disputed—contrast unfavourably with the speech of Demosthenes. Aristides' works were highly esteemed by his contemporaries; they were much used for school instruction, and distinguished rhetoricians wrote commentaries upon them. His style, formed on the best models, is generally clear and correct, though sometimes obscured by rhetorical ornamentation; his subjects being mainly fictitious, the cause possessed no living interest, and his attention was concentrated on form and diction.

Editio princeps (52 declamations only) (1517); Dindorf (1829); Keil (1899); Sandys, *Hist. of Class. Schol.* i. 312 (ed. 1906).

ARISTIDES, QUINTILIANUS, the author of an ancient treatise on music, who lived probably in the third century A.D. According to Meibomius, in whose collection (*Antiq. Musicae Auc. Septem*, 1652) this work is printed, it contains everything on music that is to be found in antiquity. (See Pauly-Wissowa, *Realencyc.* ii. 894.)

ARISTIDES, APOLOGY OF. Until 1878 our knowledge of the early Christian writer Aristides was confined to the statement of Eusebius that he was an Athenian philosopher, who presented an apology "concerning the faith" to the emperor Hadrian. In that year, however, the Mechitharists of S. Lazzaro at Venice published a fragment in Armenian[1] from the beginning of the apology; and in 1889 Dr Rendel Harris found the whole of it in a Syriac version on Mount Sinai. While his edition was passing through the press, it was observed by the present writer that all the while the work had been in our hands in Greek, though in a slightly abbreviated form, as it had been imbedded as a speech in a religious novel written about the 6th century, and entitled "The Life of Barlaam and Josaphat." The discovery of the Syriac version reopened the question of the date of the work. For although its *title* there corresponds to that given by the Armenian fragment and by Eusebius, it begins with a formal inscription to "the emperor Titus Hadrianus Antoninus Augustus Pius"; and Dr R. Harris is followed by Harnack and others in supposing that it was only through a careless reading of this inscription that the work was supposed to have been addressed to Hadrian. If this be the case, it must be placed somewhere in the long reign of Antoninus Pius (138–161). There are, however, no internal grounds for rejecting the thrice-attested dedication to Hadrian his predecessor, and the picture of primitive Christian life which is here found points to the earlier rather than to the later date. It is possible that the Apology was read to Hadrian in person when he visited Athens, and that the Syriac inscription was prefixed by a scribe on the analogy of Justin's Apology, a mistake being made in the amplification of Hadrian's name.

The Apology opens thus: "I, O king, by the providence of God came into the world; and having beheld the heaven, and the earth, and the sea, the sun and moon, and all besides, I

[1] *Codex Venet. ann.*, 981, and *Codex Etchmiaz.* of the 11th century.

marvelled at their orderly disposition; and seeing the world and all things in it, that it is moved by compulsion, I understood that He that moveth and governeth it is God. For whatsoever moveth is stronger than that which is moved, and whatsoever governeth is stronger than that which is governed." Having briefly spoken of the divine nature in the terms of Greek philosophy, Aristides proceeds to ask which of all the races of men have at all partaken of the truth about God. Here we have the first attempt at a systematic comparison of ancient religions. For the purpose of his inquiry he adopts an obvious threefold division into idolaters, Jews and Christians. Idolaters, or, as he more gently terms them in addressing the emperor, "those who worship what among you are said to be gods," he subdivides into the three great world-civilizations—Chaldeans, Greeks and Egyptians. He chooses this order so as to work up to a climax of error and absurdity in heathen worship. The direct nature-worship of the Chaldeans is shown to be false because its objects are works of the Creator, fashioned for the use of men. They obey fixed laws and have no power over themselves. "The Greeks have erred worse than the Chaldeans . . . calling those gods who are no gods, according to their evil lusts, in order that having these as advocates of their wickedness they may commit adultery, and plunder and kill, and do the worst of deeds." The gods of Olympus are challenged one by one, and shown to be either vile or helpless, or both at once. A heaven of quarrelling divinities cannot inspire a reasonable worship. These gods are not even respectable; how can they be adorable? "The Egyptians have erred worse than all the nations; for they were not content with the worships of the Chaldeans and Greeks, but introduced, moreover, as gods even brute beasts of the dry land and of the waters, and plants and herbs. . . . Though they see their gods eaten by others and by men, and burned, and slain, and rotting, they do not understand concerning them that they are no gods."

Throughout the whole of the argument there is strong common-sense and a stern severity unrelieved by conscious humour. Aristides is engaged in a real contest; he strikes hard blows, and gives no quarter. He cannot see, as Justin and Clement see, a striving after truth, a feeling after God, in the older religions, or even in the philosophies of Greece. He has no patience with attempts to find a deeper meaning in the stories of the gods. "Do they say that one nature underlies these diverse forms? Then why does god hate god, or god kill god? Do they say that the histories are mythical? Then the gods themselves are myths, and nothing more."

The Jews are briefly treated. After a reference to their descent from Abraham and their sojourn in Egypt, Aristides praises them for their worship of the one God, the Almighty Creator; but blames them as worshipping angels, and observing "sabbaths and new moons, and the unleavened bread, and the great fast, and circumcision, and cleanness of meats." He then proceeds to the description of the Christians. He begins with a statement which, when purged of glosses by a comparison of the three forms in which it survives, reads thus: "Now the Christians reckon their race from the Lord Jesus Christ; and He is confessed to be the Son of God Most High. Having by the Holy Spirit come down from heaven, and having been born of a Hebrew virgin, He took flesh and appeared unto men, to call them back from their error of many gods; and having completed His wonderful dispensation, He was pierced by the Jews, and after three days He revived and went up to heaven. And the glory of His coming thou canst learn, O king, from that which is called among them the evangelic scripture, if thou wilt read it. He had twelve disciples, who after His ascent into heaven went forth into the provinces of the world and taught His greatness; whence they who at this day believe their preaching are called Christians." This passage contains striking correspondences with the second section of the Apostles' Creed. The attribution of the Crucifixion to the Jews appears in several 2nd-century documents; Justin actually uses the words "He was pierced by you" in his dialogue with Trypho the Jew.

"These are they," he proceeds, "who beyond all the nations of the earth have found the truth: for they know God as Creator and Maker of all things, and they worship no other god beside Him; for they have His commandments graven on their hearts, and these they keep in expectation of the world to come. . . . . Whatsoever they would not should be done unto them, they do not to another. . . . He that hath supplieth him that hath not without grudging: if they see a stranger they bring him under their roof, and rejoice over him, as over a brother indeed, for they call not one another brethren after the flesh, but after the spirit. They are ready for Christ's sake to give up their own lives; for His commandments they securely keep, living holily and righteously, according as the Lord their God hath commanded them, giving thanks to Him at all hours, over all their food and drink, and the rest of their good things." This simple description is fuller in the Syriac, but the additional details must be accepted with caution: for while it is likely that the monk who appropriated the Greek may have cut it down to meet the exigencies of his romance, it is the habit of certain Syriac translators to elaborate their originals. After asserting that "this is the way of truth," and again referring for further information to "the writings of the Christians," he says: "And truly this is a new race, and there is something divine mingled with it." At the close we have a passage which is found only in the Syriac, but which is shown by internal evidence to contain original elements: "The Greeks, because they practise foul things . . . turn the ridicule of their foulness upon the Christians." This is an allusion to the charges of Thyestean banquets and other immoralities, which the early apologists constantly rebut. "But the Christians offer up prayers for them, that they may turn from their error; and when one of them turns, he is ashamed before the Christians of the deeds that were done by him, and he confesses to God saying: 'In ignorance I did these things'; and he cleanses his heart, and his sins are forgiven him, because he did them in ignorance in former time, when he was blaspheming the true knowledge of the Christians."

These last words point to the use in the composition of this Apology of a lost apocryphal work of very early date, *The Preaching of Peter*. This book is known to us chiefly by quotations in Clement of Alexandria: it was widely circulated, and at one time claimed a place within the Canon. It was used by the Gnostic Heracleon and probably by the unknown writer of the epistle to Diognetus. From the fragments which survive we see that it contained: (1) a description of the nature of God, which closely corresponds with Arist. i., followed by (2) a warning not to worship according to the Greeks, with an exposure of various forms of idolatry; (3) a warning not to worship according to the Jews—although they alone think they know the true God—for they worship angels and are superstitious about moons and sabbaths, and feasts, comp. Arist. xiv.; (4) a description of the Christians as being "a third race," and worshipping God in "a new way" through Christ; (5) a proof of Christianity from Jewish prophecy; (6) a promise of forgiveness to Jews and Gentiles who should turn to Christ, because they had sinned "in ignorance" in the former time. Now all these points, except the proof from Jewish prophecy, are taken up and worked out by Aristides with a frequent use of the actual language of *The Preaching of Peter*. A criterion is thus given us for the reconstruction of the Apology, where the Greek which we have has been abbreviated, and we are enabled to claim with certainty some passages of the Syriac which might otherwise be suspected as interpolations.

The style of the Apology is exceedingly simple. It is curiously misdescribed by Jerome, who never can have seen it, as "Apologeticum pro Christianis contextum philosophorum sententiis." Its merits are its recognition of the helplessness of the old heathenism to satisfy human aspiration after the divine, and the impressive simplicity with which it presents the unfailing argument of the lives of Christians.

The student may consult *The Apology of Aristides*, Syriac text and translation (J. R. Harris), with an appendix containing the Greek text, *Texts and Studies*, i. 1 (1891), and a critical discussion by R. Seeberg in Zahn's *Forschungen*, v. 2 (1893); also, brief

discussions by A. Harnack, *Altchristl. Litteratur*, I. 96 ff., *Chronologie*, i. 271 ff., where references to other writers may be found. The *Epistola ad omnes philosophos* and the *Homily on the Penitent Thief*, ascribed by Armenian tradition to Aristides, are really of 5th-century origin. Trans. of *Apology* by W. S. Walford (1909). (J. A. R.)

ARISTIPPUS (*c.* 435–356 B.C.), Greek philosopher, the founder of the Cyrenaic school, was the son of Aritadas, a merchant of Cyrene. At an early age he came to Athens, and was induced to remain by the fame of Socrates, whose pupil he became. Subsequently he travelled through a number of Grecian cities, and finally settled in Cyrene, where he founded his school. His philosophy was eminently practical (see CYRENAICS). Starting from the two Socratic principles of virtue and happiness, he emphasized the second, and made pleasure the criterion of life. That he held to be good which gives the maximum of pleasure. In pursuance of this he indulged in all forms of external luxury. At the same time he remained thoroughly master of himself and had the self-control to refrain or to enjoy. Diogenes Laertius (ii. 65), quoting Phanias the peripatetic, says that he received money for his teaching, and Aristotle (*Met.* ii. 2) expressly calls him a sophist. Diogenes further states that he wrote several treatises, but none have survived. The five letters attributed to him are undoubtedly spurious. His daughter Arete, and her son Aristippus (*μητροδίδακτος*, "pupil of his mother"), carried on the school after his death. A cosmopolitan on principle, and a convinced disbeliever in the ethics of his day, he comes very near to modern empiricism and especially to the modern Hedonist school.

ARISTO or ARISTON, of Chios (*c.* 250 B.C.), a Stoic philosopher and pupil of Zeno. He differed from Zeno on many points, and approximated more closely to the Cynic school. He was eloquent (hence his nickname "the Siren") but controversial in tone. He despised logic, and rejected the philosophy of nature as beyond the powers of man. Ethics alone he considered worthy of study, and in that only general and theoretical questions. He rejected Zeno's doctrine of desirable things, intermediate between virtue and vice. There is only one virtue—a clear, intelligent, healthy state of mind (*hygeia*). Aristo is frequently confounded with another philosopher of the same name, Ariston of Iulis, in Ceos, who, about 230 B.C., succeeded Lyco as scholarch of the Peripatetics. (See STOICS.)

ARISTO, of Pella, a Jewish Christian writer of the middle of the 2nd century, who like Hegesippus (*q.v.*) represents a school of thought more liberal than that of the Pharisaic and Essene Ebionites to which the decline of Jewish Christianity mainly led. Aristo is cited by Eusebius (*Hist. Eccl.* iv. 6. 3) for a decree of Hadrian respecting the Jews, but he is best known as the writer of a *Dialogue* (between Papiscus, an Alexandrian Jew, and Jason, who represents the author) on the witness of prophecy to Jesus Christ, which was approvingly defended by Origen against the reproaches of Celsus. The little book was perhaps used by Justin Martyr in his own *Dialogue with Trypho*, and probably also by Tertullian and Cyprian, but it has not been preserved.

The literature is cited in G. Krüger's *Early Christian Literature*, pp. 104 f.

ARISTOBULUS, of Cassandreia, Greek historian, accompanied Alexander the Great on his campaigns, of which he wrote an account, mainly geographical and ethnological. His work was largely used by Arrian.

Müller, *Historicorum Graecorum Fragmenta*; Schöne, *De Rerum Alexandri Magni Scriptoribus* (1870).

ARISTOBULUS, of Paneas (*c.* 160 B.C.), a Jewish philosopher of the Peripatetic school. Gercke places him in the time of Ptolemy X. Philometor (end of 2nd century), Anatolius in that of Ptolemy II. Philadelphus, but the middle of the 2nd century is more probable. He was among the earliest of the Jewish-Alexandrian philosophers whose aim was to reconcile and identify Greek philosophical conceptions with the Jewish religion. Only a few fragments of his work, apparently entitled *Commentaries on the Writings of Moses*, are quoted by Clement, Eusebius and other theological writers, but they suffice to show its object. He endeavoured to prove that early Greek philosophers had borrowed largely from certain parts of Scripture, and quoted from Linus, Orpheus, Musaeus and others, passages which strongly resemble the Mosaic writings. These passages, however, were obvious forgeries. It is suggested that the name Aristobulus was taken from 2 Macc. I. 10. The hypothesis (Schlatter, *Das neugefundene hebräische Stück des Sirach*) that it was from Aristobulus that the philosophy of *Ecclesiasticus* was derived is not generally accepted.

See E. Schürer, *History of the Jewish People* (Eng. trans., 1890–1891), ii. 237 seq.; article ALEXANDRIAN SCHOOL: *Philosophy*; and *s.v.* "Aristobulus" in *Jewish Encyclopedia* (Paul Wendland).

ARISTOCRACY (Gr. *ἄριστος*, best; *κρατία*, government), etymologically, the "rule of the best," a form of government variously defined and appreciated at different times and by different authorities. In Greek political philosophy, aristocracy is the government of those who most nearly attain to the ideal of human perfection. Thus Plato in the *Republic* advocates the rule of the "philosopher-king" who, in the social scheme, is analogous to Reason in the intellectual, and alone is qualified to control the active principles, *i.e.* the fighting population and the artisans or workers. Aristocracy is thus the government by those who are superior both morally and intellectually, and, therefore, govern directly in the interests of the governed, as a good doctor works for the good of his patient. Aristotle classified good governments under three heads—monarchy, aristocracy and commonwealth (*πολιτεία*), to which he opposed the three perverted forms—tyranny or absolutism, oligarchy and democracy or mob-rule. The distinction between aristocracy and oligarchy, which are both necessarily the rule of the few, is that whereas the few *ἄριστοι* will govern unselfishly, the oligarchs, being the few wealthy ("plutocracy" in modern terminology), will allow their personal interests to predominate. While Plato's aristocracy might be the rule of the wise and benevolent despot, Aristotle's is necessarily the rule of the few.

Historically aristocracy develops from primitive monarchy by the gradual progressive limitation of the regal authority. This process is effected primarily by the nobles who have hitherto formed the council of the king (an excellent example will be found in Athenian politics, see ARCHON), whose triple prerogative—religious, military and judicial—is vested, *e.g.*, in a magistracy of three. These are either members of the royal house or the heads of noble families, and are elected for life or periodically by their peers, *i.e.* by the old royal council (cf. the Areopagus at Athens, the Senate at Rome), now the sovereign power. In practice this council depends primarily on a birth qualification, and thus has always been more or less inferior to the Aristotelian ideal; it is, by definition, an "oligarchy" of birth, and is recruited from the noble families, generally by the addition of emeritus magistrates. From the earliest times, therefore, the word "aristocracy" became practically synonymous with "oligarchy," and as such it is now generally used in opposition to democracy (which similarly took the place of Aristotle's *πολιτεία*), in which the ultimate sovereignty resides in the whole citizen body.

The aristocracy of which we know most in ancient Greece was that of Athens prior to the reforms of Cleisthenes, but all the Greek city-states passed through a period of aristocratic or oligarchic government. Rome, between the regal and the imperial periods, was always more or less under the aristocratic government of the senate, in spite of the gradual growth of democratic institutions (the Lat. *optimates* is the equivalent of *ἄριστοι*). There is, however, one feature which distinguishes these aristocracies from those of modern states, namely, that they were all slave-owning. The original relation of the slave-population, which in many cases outnumbered the free citizens, cannot always be discovered. But in some cases we know that the slaves were the original inhabitants who had been overcome by an influx of racially different invaders (cf. Sparta with its Helots); in others they were captives taken in war. Hence even the most democratic states of antiquity were so far aristocratic that the larger proportion of the inhabitants had no voice in the government. In the second place this relation gave rise to a philosophic doctrine, held even by Aristotle, that there were

peoples who were inferior by nature and adapted to submission (φύσει δοῦλοι); such people had no "virtue" in the technical civic sense, and were properly occupied in performing the menial functions of society, under the control of the ἄριστοι. Thus, combined with the criteria of descent, civic status and the ownership of the land, there was the further idea of intellectual and social superiority. These qualifications were naturally, in course of time, shared by an increasingly large number of the lower class who broke down the barriers of wealth and education. From this stage the transition is easy to the aristocracy of wealth, such as we find at Carthage and later at Venice, in periods when the importance of commerce was paramount and mercantile pursuits had cast off the stigma of inferiority (in Gr. βαναυσία).

It is important at this stage to distinguish between aristocracy and the feudal governments of medieval Europe. In these it is true that certain power was exercised by a small number of families, at the expense of the majority. But under this system each noble governed in a particular area and within strict limitations imposed by his sovereign; no sovereign authority was vested in the nobles collectively.

Under the conditions of the present day the distinction of aristocracy, democracy and monarchy cannot be rigidly maintained from a purely governmental point of view. In no case does the sovereign power in a state reside any longer in an aristocracy, and the word has acquired a social rather than a political sense as practically equivalent to "nobility," though the distinction is sometimes drawn between the "aristocracy of birth" and the "aristocracy of wealth." Modern history, however, furnishes many examples of government in the hands of an aristocracy. Such were the aristocratic republics of Venice, Genoa and the Dutch Netherlands, and those of the free imperial cities in Germany, Such, too, in practice though not in theory, was the government of Great Britain from the Revolution of 1689 to the Reform Bill of 1832. The French nobles of the *Ancien Régime*, denounced as "aristocrats" by the Revolutionists, had no share as such in government, but enjoyed exceptional privileges (*e.g.* exemption from taxation). This privileged position is still enjoyed by the heads of the German mediatized families of the "High Nobility." In Great Britain, on the other hand, though the aristocratic principle is still represented in the constitution by the House of Lords, the "aristocracy" generally, apart from the peers, has no special privileges.

ARISTODEMUS (8th century B.C.), semi-legendary ruler of Messenia in the time of the first Messenian War. Tradition relates that, after some six years' fighting, the Messenians were forced to retire to the fortified summit of Ithome. The Delphic oracle bade them sacrifice a virgin of the house of Aepytus. Aristodemus offered his own daughter, and when her lover, hoping to save her life, declared that she was no longer a maiden, he slew her with his own hand to prove the assertion false. In the thirteenth year of the war, Euphaes, the Messenian king, died. As he left no children, popular election was resorted to, and Aristodemus was chosen as his successor, though the national soothsayers objected to him as the murderer of his daughter. As a ruler he was mild and conciliatory. He was victorious in the pitched battle fought at the foot of Ithome in the fifth year of his reign, a battle in which the Messenians, reinforced by the entire Arcadian levy and picked contingents from Argos and Sicyon, defeated the combined Spartan and Corinthian forces. Shortly afterwards, however, led by unfavourable omens to despair of final success, he killed himself on his daughter's tomb. Though little is known of his life and the chronology is uncertain, yet Aristodemus may fairly be regarded as a historical character. His reign is dated 731–724 B.C. by Pausanias, and this may be taken as approximately correct, though Duncker (*History of Greece*, Eng. trans., ii. p. 69) inclines to place it eight years later.

Pausanias iv. 9-13 is practically our only authority. He followed as his chief source the prose history of Myron of Priene, an untrustworthy writer, probably of the 2nd century B.C.; hence a good deal of his story must be regarded as fanciful, though we cannot distinguish accurately between the true and the fictitious. (M. N. T.)

ARISTOLOCHIA (Gr. ἄριστος, best, λοχεία, child-birth, in allusion to its repute in promoting child-birth), a genus of shrubs or herbs of the natural order Aristolochiaceae, often with climbing stems, found chiefly in the tropics. The flower forms a tube inflated at the base. *A. Clematitis*, birthwort, is a central and southern European species, found sometimes in England apparently wild on ruins and similar places, but not a native. *A. Sipho*, Dutchman's pipe, or pipe vine, is a climber, native in the woods of the Atlantic United States, and grown in Europe as a garden plant. The flower is bent like a pipe.

A member of the same order is the *asarabacca* (*Asarum europaeum*), a small creeping herb with kidney-shaped leaves and small purplish bell-shaped flowers. It is a native of the woods of Europe and north temperate Asia, and occurs wild in some English counties. It was formerly grown for medicinal purposes, the underground stem having cathartic and emetic properties. An allied species, *A. canadense*, is the Canadian snake-root, a native of Canada and the Atlantic United States.

ARISTOMENES, of Andania, the semi-legendary hero of the second Messenian war. He was a member of the Aepytid family, the son of Nicomedes (or, according to another version, of Pyrrhus) and Nicoteleia, and took a prominent part in stirring up the revolt against Sparta and securing the co-operation of Argos and Arcadia. He showed such heroism in the first encounter, at Derae, that the crown was offered him, but he would accept only the title of commander-in-chief. His daring is illustrated by the story that he came by night to the temple of Athene "of the Brazen House" at Sparta, and there set up his shield with the inscription, "Dedicated to the goddess by Aristomenes from the Spartans." His prowess contributed largely to the Messenian victory over the Spartan and Corinthian forces at "The Boar's Barrow" in the plain of Stenyclarus, but in the following year the treachery of the Arcadian king Aristocrates caused the Messenians to suffer a crushing defeat at "The Great Trench." Aristomenes and the survivors retired to the mountain stronghold of Eira, where they defied the Spartans for eleven years. On one of his raids he and fifty of his companions were captured and thrown into the Cacadas, the chasm on Mt. Taygetus into which criminals were cast. Aristomenes alone was saved, and soon reappeared at Eira: legend told how he was upheld in his fall by an eagle and escaped by grasping the tail of a fox, which led him to the hole by which it had entered. On another occasion he was captured during a truce by some Cretan auxiliaries of the Spartans, and was released only by the devotion of a Messenian girl who afterwards became his daughter-in-law. At length Eira was betrayed to the Spartans (668 B.C. according to Pausanias), and after a heroic resistance Aristomenes and his followers had to evacuate Messenia and seek a temporary refuge with their Arcadian allies. A desperate plan to seize Sparta itself was foiled by Aristocrates, who paid with his life for his treachery. Aristomenes retired to Ialysus in Rhodes, where Damagetus, his son-in-law, was king, and died there while planning a journey to Sardis and Ecbatana to seek aid from the Lydian and Median sovereigns (Pausanias iv. 14-24). Another tradition represents him as captured and slain by the Spartans during the war (Pliny, *Nat. Hist.* xi. 187; Val. Maximus i. 8, 15; Steph. Byzant. *s.v.* Ἀνδανία). Though there seems to be no conclusive reason for doubting the existence of Aristomenes, his history, as related by Pausanias, following mainly the *Messeniaca* of the Cretan epic poet Rhianus (about 230 B.C.), is evidently largely interwoven with fictions. These probably arose after the foundation of Messene in 369 B.C. Aristomenes' statue was set up in the stadium there: his bones were fetched from Rhodes and placed in a tomb surmounted by a column (Paus. iv. 32. 3, 6); and more than five centuries later we still find heroic honours paid to him, and his exploits a popular subject of song (*ib.* iv. 14. 7; 16. 6).

For further details see Pausanias iv.; Polyaenus ii. 31; G. Grote, *History of Greece*, pt. ii. chap. vii.; M. Duncker, *History of Greece*, Eng. trans., book iv. chap. viii.; A. Holm, *History of Greece*, Eng. trans., vol. i. chap. xvi. (M. N. T.)

ARISTONICUS, of Alexandria, Greek grammarian, lived during the reigns of Augustus and Tiberius. He taught at Rome and wrote commentaries and grammatical treatises. His chief work was Περὶ Σημείων Ὁμήρου, in which he gave an account of the "critical marks" inserted by Aristarchus in the margin of his recension of the text of the *Iliad* and *Odyssey*. Important fragments are preserved in the scholia of the Venetian Codex A of the *Iliad*.

Friedländer, *Aristonici* Περὶ Σημείων Ἰλιάδος *reliquiae* (1853); Carnuth, *Aristonici* Περὶ Σημείων Ὀδυσσείας *reliquiae* (1869).

ARISTOPHANES (*c.* 448–385 B.C.[1]), the great comic dramatist and poet of Athens. His birth-year is uncertain. He is known to have been about the same age as Eupolis, and is said to have been "almost a boy" when his first comedy (*The Banqueters*) was brought out in 427 B.C. His father Philippus was a landowner in Aegina. Aristophanes was an Athenian citizen of the tribe Pandionis, and the deme Cydathenc. The stories which made him a native of Camirus in Rhodes, or of the Egyptian Naucratis, had probably no other foundation than an indictment for usurpation of civic rights (ξενίας γραφή) which appears to have been more than once laid against him by Cleon. His three sons—Philippus, Araros and Nicostratus—were all comic poets. Philippus, the eldest, was a rival of Eubulus, who began to exhibit in 376 B.C. Araros brought out two of his father's latest comedies—the *Cocalus* and the *Aeolosicon*, and in 375 began to exhibit works of his own. Nicostratus, the youngest, is assigned by Athenaeus to the Middle Comedy, but belongs, as is shown by some of the names and characters of his pieces, to the New Comedy also.

Although tragedy and comedy had their common origin in the festivals of Dionysus, the regular establishment of tragedy at Athens preceded by half a century that of comedy. The Old Comedy may be said to have lasted about eighty years (470–390 B.C.), and to have flourished about fifty-six (460–404 B.C.). Of the forty poets who are named as having illustrated it the chief were Cratinus, Eupolis and Aristophanes. The Middle Comedy covers a period of about seventy years (390–320 B.C.), its chief poets being Antiphanes, Alexis, Theopompus and Strattis. The New Comedy was in vigour for about seventy years (320–250 B.C.), having for its foremost representatives Menander, Philemon and Diphilus. The Old Comedy was possible only for a thorough democracy. Its essence was a satirical censorship, unsparing in personalities, of public and of private life—of morality, of statesmanship, of education, of literature, of social usage—in a word, of everything which had an interest for the city or which could amuse the citizens. Preserving all the freedom of banter and of riotous fun to which its origin gave it an historical right, it aimed at associating with this a strong practical purpose—the expression of a democratic public opinion in such a form that no misconduct or folly could altogether disregard it. That licentiousness, that grossness of allusion which too often disfigures it, was, it should be remembered, exacted by the sentiment of the Dionysiac festivals, as much as a decorous cheerfulness is expected at the holiday times of other worships. This was the popular element. Without this the entertainment would have been found flat and unseasonable. But for a comic poet of the higher calibre the consciousness of a recognized power which he could exert, and the desire to use this power for the good of the city, must always have been the uppermost feelings. At Athens the poet of the Old Comedy had an influence analogous, perhaps, rather to that of the journalist than to that of the modern dramatist. But the established type of Dionysiac comedy gave him an instrument such as no public satirist has ever wielded. When Molière wished to brand hypocrisy he could only make his Tartuffe the central figure of a regular drama, developed by a regular process to a just catastrophe. He had no choice between touching too lightly and using sustained force to make a profound impression. The Athenian dramatist of the Old Comedy worked under no such limitations of form. The wildest flights of extravagance were permitted to him. Nothing bound him to a dangerous emphasis or a wearisome insistence. He could deal the keenest thrust, or make the most earnest appeal, and at the next moment—if his instinct told him that it was time to change the subject—vary the serious strain by burlesque. He had, in short, an incomparable scope for trenchant satire directed by sure tact.

Aristophanes is for us the representative of the Old Comedy. But his genius, while it includes, also transcends the genius of the Old Comedy. He can denounce the frauds of a Cleon, he can vindicate the duty of Athens to herself and to her allies, with a stinging scorn and a force of patriotic indignation which makes the poet almost forgotten in the citizen. He can banter Euripides with an ingenuity of light mockery which makes it seem for the time as if the leading Aristophanic trait was the art of seeing all things from their prosaic side. Yet it is neither in the denunciation nor in the mockery that he is most individual. His truest and highest faculty is revealed by those wonderful bits of lyric writing in which he soars above everything that can move laughter or tears, and makes the clear air thrill with the notes of a song as free, as musical and as wild as that of the nightingale invoked by his own chorus in the *Birds*. The speech of Dikaios Logos in the *Clouds*, the praises of country life in the *Peace*, the serenade in the *Ecclesiazusae*, the songs of the Spartan and Athenian maidens in the *Lysistrata*, above all, perhaps, the chorus in the *Frogs*, the beautiful chant of the Initiated,—these passages, and such as these, are the true glories of Aristophanes. They are the strains, not of an artist, but of one who warbles for pure gladness of heart in some place made bright by the presence of a god. Nothing else in Greek poetry has quite this wild sweetness of the woods. Of modern poets Shakespeare alone, perhaps, has it in combination with a like richness and fertility of fancy.

Fifty-four[2] comedies were ascribed to Aristophanes. Forty-three of these are allowed as genuine by Bergk. Eleven only are extant. These eleven form a running commentary on the outer and the inner life of Athens during thirty-six years. They may be ranged under three periods. The first, extending to 420 B.C., includes those plays in which Aristophanes uses an absolutely unrestrained freedom of political satire. The second ends with the year 405. Its productions are distinguished from those of the earlier time by a certain degree of reticence and caution. The third period, down to 388 B.C., comprises two plays in which the transition to the character of the Middle Comedy is well marked, not merely by disuse of the parabasis, but by general self-restraint.

I. *First Period.* (1) 425 B.C. *The Acharnians.*—Since the defeat in Boeotia the peace party at Athens had gained ground, and in this play Aristophanes seeks to strengthen their hands. Dicaeopolis, an honest countryman, is determined to make peace with Sparta on his own account, not deterred by the angry men of Acharnae, who crave vengeance for the devastation of their vineyards. He sends to Sparta for samples of peace; and he is so much pleased with the flavour of the Thirty Years' sample that he at once concludes a treaty for himself and his family. All the blessings of life descend on him; while Lamachus, the leader of the war party, is smarting from cold, snow and wounds.

(2) 424 B.C. *The Knights.*—Three years before, in his *Babylonians*, Aristophanes had assailed Cleon as the typical demagogue. In this play he continues the attack. The Demos, or State, is represented by an old man who has put himself and his household into the hands of a rascally Paphlagonian steward. Nicias and Demosthenes, slaves of Demos, contrive that the Paphlagonian shall be supplanted in their master's favour by a sausage-seller. No sooner has Demos been thus rescued than his youthfulness and his good sense return together.

(3) 423 B.C. *The Clouds* (the first edition; a second edition was brought out in 422 B.C.).—This play would be correctly described as an attack on the new spirit of intellectual inquiry and culture rather than on a school or class. Two classes of

[1] [The dates in the text, as given by Jebb, are retained. According to R. G. Kent, *Classical Review* (April 1905, April 1906), Aristophanes was born in 455, and died in 375 B.C.]

[2] [Or "forty-four" (reading μδ' for νδ' in Suidas).]

thinkers or teachers are, however, specially satirized under the general name of "Sophist" (v. 331)—1. The Physical Philosophers—indicated by allusions to the doctrines of Anaxagoras, Heraclitus and Diogenes of Apollonia. 2. The professed teachers of rhetoric, belles lettres, &c., such as Protagoras and Prodicus. Socrates is taken as the type of the entire tendency. A youth named Pheidippides—obviously meant for Alcibiades—is sent by his father to Socrates to be cured of his dissolute propensities. Under the discipline of Socrates the youth becomes accomplished in dishonesty and impiety. The conclusion of the play shows the indignant father preparing to burn up the philosopher and his hall of contemplation.

(4) 422 B.C. *The Wasps.*—This comedy, which suggested *Les Plaideurs* to Racine, is a satire on the Athenian love of litigation. The strength of demagogy, while it lay chiefly in the ecclesia, lay partly also in the paid dicasteries. From this point of view the *Wasps* may be regarded as supplementing the *Knights*. Philocleon (admirer of Cleon), an old man, has a passion for law-suits—a passion which his son, Bdelycleon (detester of Cleon) fails to check, until he hits upon the device of turning the house into a law-court, and paying his father for absence from the public suits. The house-dog steals a Sicilian cheese; the old man is enabled to gratify his taste by trying the case, and, by an oversight, acquits the defendant. In the second half of the play a change comes over the dream of Philocleon; from litigation he turns to literature and music, and is congratulated by the chorus on his happy conversion.

(5) 421 B.C.[1] *The Peace.*—In its advocacy of peace with Sparta, this play, acted at the Great Dionysia shortly before the conclusion of the treaty, continues the purpose of the *Acharnians*. Trygaeus, a distressed Athenian, soars to the sky on a beetle's back. There he finds the gods engaged in pounding the Greek states in a mortar. In order to stop this, he frees the goddess Peace from a well in which she is imprisoned. The pestle and mortar are laid aside by the gods, and Trygaeus marries one of the handmaids of Peace.

II. *Second Period.* (6) 414 B.C. *The Birds.*—Peisthetaerus, an enterprising Athenian, and his friend Euelpides persuade the birds to build a city—"Cloud-Cuckoo-borough"—in mid-air, so as to cut off the gods from men. The plan succeeds; the gods send envoys to treat with the birds; and Peisthetaerus marries Basileia, daughter of Zeus. Some have found in the *Birds* a complete historical allegory of the Sicilian expedition; others, a general satire on the prevalence at Athens of headstrong caprice over law and order; others, merely an aspiration towards a new and purified Athens—a dream to which the poet had turned from his hope for a revival of the Athens of the past. In another view, the piece is mainly a protest against the religious fanaticism which the incident of the Hermae had called forth.

(7) 411 B.C. *The Lysistrata.*—This play was brought out during the earlier stages of those intrigues which led to the revolution of the Four Hundred. It appeared shortly before Peisander had arrived in Athens from the camp at Samos for the purpose of organizing the oligarchic policy. The *Lysistrata* expresses the popular desire for peace at any cost. As the men can do nothing, the women take the question into their own hands, occupy the citadel, and bring the citizens to surrender.

(8) 411 B.C. *The Thesmophoriazusae* (Priestesses of Demeter).—This came out three months later than the *Lysistrata*, during the reign of terror established by the oligarchic conspirators, but before their blow had been struck. The political meaning of the play lies in the absence of political allusion. Fear silences even comedy. Only women and Euripides are satirized. Euripides is accused and condemned at the female festival of the Thesmophoria.

(9) 405 B.C. *The Frogs.*—This piece was brought out just when Athens had made her last effort in the Peloponnesian War, eight months before the battle of Aegospotami, and about fifteen months before the taking of Athens by Lysander. It may be considered as an attempt to distract men's minds from public affairs. It is a literary criticism. Aeschylus and Euripides were both lately dead. Athens is beggared of poets; and Dionysus goes down to Hades to bring back a poet. Aeschylus and Euripides contend in the under-world for the throne of tragedy; and the victory is at last awarded to Aeschylus.

III. *Third Period.*[2] (10) 393 B.C.[2] *The Ecclesiazusae* (women in parliament).—The women, disguised as men, steal into the ecclesia, and succeed in decreeing a new constitution. At this time the demagogue Agyrrhius led the assembly; and the play is, in fact, a satire on the general demoralization of public life.

(11) 388 B.C. *The Plutus* (Wealth).—The first edition of the play had appeared in 408 B.C., being a symbolical representation of the fact that the victories won by Alcibiades in the Hellespont had brought back the god of wealth to the treasure-chamber of the Parthenon. In its extant form the *Plutus* is simply a moral allegory. Chremylus, a worthy but poor man, falls in with a blind and aged wanderer, who proves to be the god of wealth. Asclepius restores eyesight to Plutus; whereupon all the just are made rich and all the unjust are reduced to poverty.

Among the lost plays, the following are the chief of which anything is known:—

1. *The Banqueters* (Δαιταλεῖς), 427 B.C.—A satire on young Athens. A father has two sons; one is brought up in the good old school, another in the tricky subtleties of the new; and the contrast of results is the chief theme.

2. *The Babylonians*, 426 B.C.—Under this name the subject-allies of Athens are represented as "Babylonians"—barbarian slaves, employed to grind in the mill. The oppression of the allies by the demagogues—a topic often touched elsewhere—was, then, the main subject of the piece, in which Aristophanes is said to have attacked especially the system of appointing to offices by lot. The comedy is memorable as opening that Aristophanic war upon Cleon which was continued in the *Knights* and the *Wasps*.

The Merchantmen, *The Farmers*, *The Preliminary Contest* (*Proagon*), and possibly the *Old Age* (*Geras*), belonged to the First Period. The *Geras* is assigned by Süvern to 422 B.C., and is supposed to have been a picture of dotage similar to that in the *Knights*. A comedy called *The Islands* is conjectured to have dealt with the sufferings imposed by the war on the insular tributaries. The *Triphales* was probably a satire on Alcibiades; the *Storks*, on the tragic poet Patrocles.

In the *Aeolosicon*—produced by his son Araros in 387 B.C.—Aristophanes probably parodied the *Aeolus* of Euripides. The *Cocalus* is thought to have been a parody of the legend, according to which a Sicilian king of that name slew Minos.

A sympathetic reader of Aristophanes can hardly fail to perceive that, while his political and intellectual tendencies are well marked, his opinions, in so far as they colour his comedies, are too indefinite to reward, or indeed to tolerate, analysis. Aristophanes was a natural conservative. His ideal was the Athens of the Persian wars. He disapproved the policy which had made Athenian empire irksome to the allies and formidable to Greece; he detested the vulgarity and the violence of mob-rule; he clave to the old worship of the gods; he regarded the new ideas of education as a tissue of imposture and impiety. How far he was from clearness or precision of view in regard to the intellectual revolution which was going forward, appears from the *Clouds*, in which thinkers and literary workers who had absolutely nothing in common are treated with sweeping ridicule as prophets of a common heresy. Aristophanes is one of the men for whom opinion is mainly a matter of feeling, not of reason. His imaginative susceptibility gave him a warm and loyal love for the traditional glories of Athens, however dim the past to which they belonged; a horror of what was ugly or ignoble in the present; a keen perception of what was offensive or absurd in pretension. The broad preferences and dislikes thus generated were enough not only to point the moral of comedy, but to make him, in many cases, a really useful censor for the city. The service which he could render in this way was, however, only negative. He could hardly be, in any positive sense, a political or a moral teacher for Athens. His rooted antipathy to intellectual progress, while it affords easy and wide scope for his wit, must after all, lower his intellectual rank. The great minds are not the enemies of ideas. But as a mocker—to use the word which seems most closely to describe him on this side—he is incomparable for the union of subtlety with riot of the comic

[1] See E. Curtius, *Hist. of Greece*, iii. (Eng. trans. p. 275).

[2] [The date is uncertain; others give 392 and 389.]

imagination. As a poet, he is immortal. And, among Athenian poets, he has it for his distinctive characteristic that he is inspired less by that Greek genius which never allows fancy to escape from the control of defining, though spiritualizing, reason, than by such ethereal rapture of the unfettered fancy as lifts Shakespeare or Shelley above it,—

" Pouring his full heart
In profuse strains of unpremeditated art.'

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ARISTOPHANES, of Byzantium, Greek critic and grammarian, was born about 257 B.C. He removed early to Alexandria, where he studied under Zenodotus and Callimachus. At the age of sixty he was appointed chief librarian of the museum. He died about 185–180 B.C. Aristophanes chiefly devoted himself to the poets, especially Homer, who had already been edited by his master Zenodotus. He also edited Hesiod, the chief lyric, tragic and comic poets, arranged Plato's dialogues in trilogies, and abridged Aristotle's *Nature of Animals*. His arguments to the plays of Aristophanes and the tragedians are in great part preserved. His works on Athenian courtesans, masks and proverbs were the results of his study of Attic comedy. He further commented on the Πίνακες of Callimachus, a sort of history of Greek literature. As a lexicographer, Aristophanes compiled collections of foreign and unusual words and expressions, and special lists (words denoting relationship, modes of address). As a grammarian, he founded a scientific school, and in his *Analogy* systematically explained the various forms. He introduced critical signs—except the obelus; punctuation prosodiacal, and accentual marks were probably already in use. The foundation of the so-called Alexandrian " canon " was also due to his impulse (Sandys, *Hist. Class. Schol.*, ed. 1906, i. 129 f.).

Nauck, *Aristophanis Byzantii Grammatici Fragmenta* (1848).

ARISTOTLE (384–322 B.C.), the great Greek philosopher, was born at Stagira, on the Strymonic Gulf, and hence called " the Stagirite." Dionysius of Halicarnassus, in his *Epistle on Demosthenes and Aristotle* (chap. 5), gives the following sketch of his life:—Aristotle ('Αριστοτέλης) was the son of Nicomachus, who traced back his descent and his art to Machaon, son of Aesculapius; his mother being Phaestis, a descendant of one of those who carried the colony from Chalcis to Stagira. He was born in the 99th Olympiad in the archonship at Athens of Diotrephes (384–383), three years before Demosthenes. In the archonship of Polyzelus (367–366), after the death of his father, in his eighteenth year, he came to Athens, and having joined Plato spent twenty years with him. On the death of Plato (May 347) in the archonship of Theophilus (348–347) he departed to Hermias, tyrant of Atarneus, and, after three years' stay, during the archonship of Eubulus (345–344) he moved to Mitylene, whence he went to Philip of Macedon in the archonship of Pythodotus (343–342), and spent eight years with him as tutor of Alexander. After the death of Philip (336), in the archonship of Euaenetus (335–334), he returned to Athens and kept a school in the Lyceum for twelve years. In the thirteenth, after the death of Alexander (June 323) in the archonship of Cephisodorus (323–322), having departed to Chalcis, he died of disease (322), after a life of three-and-sixty years.

I. ARISTOTLE'S LIFE

This account is practically repeated by Diogenes Laertius in his *Life of Aristotle*, on the authority of the *Chronicles* of Apollodorus, who lived in the 2nd century B.C. Starting then from this tradition, near enough to the time, we can confidently divide Aristotle's career into four periods: his youth under his parents till his eighteenth year; his philosophical education under Plato at Athens till his thirty-eighth year; his travels in the Greek world till his fiftieth year; and his philosophical teaching in the Lyceum till his departure to Chalcis and his death in his sixty-third year. But when we descend from generals to particulars, we become less certain, and must here content ourselves with few details.

Aristotle from the first profited by having a father who, being physician to Amyntas II., king of Macedon, and one of the Asclepiads who, according to Galen, practised their sons in dissection, both prepared the way for his son's influence at the Macedonian court, and gave him a bias to medicine and biology, which certainly led to his belief in nature and natural science, and perhaps induced him to practise medicine, as he did, according to his enemies, Timaeus and Epicurus, when he first went to Athens. At Athens in his second period for some twenty years he acquired the further advantage of balancing natural science by metaphysics and morals in the course of reading Plato's writings and of hearing Plato's unwritten dogmas (cf. ἐν τοῖς λεγομένοις ἀγράφοις δόγμασιν, Ar. *Physics*, iv. 2, 209 b 15, Berlin ed.). He was an earnest, appreciative, independent student. The master is said to have called his pupil the intellect of the school and his house a reader's. He is also said to have complained that his pupil spurned him as colts do their mothers. Aristotle, however, always revered Plato's memory (*Nic. Ethics*, i. 6), and even in criticizing his master counted himself enough of a Platonist to cite Plato's doctrines as what "we say" (cf. φαμέν, *Metaphysics*, i. 9, 990 b 16). At the same time, he must have learnt much from other contemporaries at Athens, especially from astronomers such as Eudoxus and Callippus, and from orators such as Isocrates and Demosthenes. He also attacked Isocrates, according to Cicero, and perhaps even set up a rival school of rhetoric. At any rate he had pupils of his own, such as Eudemus of Cyprus, Theodectes and Hermias, books of his own, especially dialogues, and even to some extent his own philosophy, while he was still a pupil of Plato.

Well grounded in his boyhood, and thoroughly educated in his manhood, Aristotle, after Plato's death, had the further advantage of travel in his third period, when he was in his prime. The appointment of Plato's nephew, Speusippus, to succeed his uncle in the Academy induced Aristotle and Xenocrates to leave Athens together and repair to the court of Hermias. Aristotle admired Hermias, and married his friend's sister or niece, Pythias, by whom he had his daughter Pythias. After the tragic death of Hermias, he retired for a time to Mitylene, and in 343–342 was summoned to Macedon by Philip to teach Alexander, who was then a boy of thirteen. According to Cicero (*De Oratore*, iii. 41), Philip wished his son, then a boy of thirteen, to receive from Aristotle "agendi praecepta et eloquendi." Aristotle is said to have written on monarchy and on colonies for Alexander; and the pupil is said to have slept with his master's edition of Homer under his pillow, and to have respected him, until from hatred of Aristotle's tactless relative, Callisthenes, who was done to death in 328, he turned at last against Aristotle himself. Aristotle had power to teach, and Alexander to learn. Still we must not exaggerate the result. Dionysius must have spoken too strongly.

when he says that Aristotle was tutor of Alexander for eight years; for in 340, when Philip went to war with Byzantium, Alexander became regent at home, at the age of sixteen. From this date Aristotle probably spent much time at his paternal house in his native city at Stagira as a patriotic citizen. Philip had sacked it in 348: Aristotle induced him or his son to restore it, made for it a new constitution, and in return was celebrated in a festival after his death. All these vicissitudes made him a man of the world, drew him out of the philosophical circle at Athens, and gave him leisure to develop his philosophy. Besides Alexander he had other pupils: Callisthenes, Cassander, Marsyas, Phanias, and Theophrastus of Eresus, who is said to have had land at Stagira. He also continued the writings begun in his second period; and the Macedonian kings have the glory of having assisted the Stagirite philosopher with the means of conducting his researches in the *History of Animals*.

At last, in his fourth period, after the accession of Alexander, Aristotle at fifty returned to Athens and became the head of his own school in the Lyceum, a gymnasium near the temple of Apollo Lyceius in the suburbs. The master and his scholars were called Peripatetics (*οἱ ἐκ τοῦ περιπάτου*), certainly from meeting, like other philosophical schools, in a walk (*περίπατος*), and perhaps also, on the authority of Hermippus of Smyrna, from walking and talking there, like Protagoras and his followers as described in Plato's *Protagoras* (314 E, 315 C). Indeed, according to Ammonius, Plato too had talked as he walked in the Academy; and all his followers were called Peripatetics, until, while the pupils of Xenocrates took the name "Academics," those of Aristotle retained the general name. Aristotle also formed his Peripatetic school into a kind of college with common meals under a president (*ἄρχων*) changing every ten days; while the philosopher himself delivered lectures, in which his practice, as his pupil Aristoxenus tells us (*Harmonics*, ii. *init.*), was, avoiding the generalities of Plato, to prepare his audience by explaining the subject of investigation and its nature. But Aristotle was an author as well as a lecturer; for the hypothesis that the Aristotelian writings are notes of his lectures taken down by his pupils is contradicted by the tradition of their learning while walking, and disproved by the impossibility of taking down such complicated discourses from dictation. Moreover, it is clear that Aristotle addressed himself to readers as well as hearers, as in concluding his whole theory of syllogisms he says, "There would remain for all of you or for our hearers (*πάντων ὑμῶν ἢ τῶν ἠκροαμένων*) a duty of according to the defects of the investigation consideration, to its discoveries much gratitude" (*Sophistical Elenchi*, 34, 184 b 6). In short, Aristotle was at once a student, a reader, a lecturer, a writer and a book collector. He was, says Strabo (608), the first we knew who collected books and taught the kings in Egypt the arrangement of a library. In his library no doubt were books of others, but also his own. There we must figure to ourselves the philosopher, constantly referring to his autograph rolls; entering references and cross-references; correcting, rewriting, collecting and arranging them according to their subjects; showing as well as reading them to his pupils; with little thought of publication, but with his whole soul concentrated on being and truth.

On his first visit to Athens, during which occurred the fatal battle of Mantineia (362 B.C.), Aristotle had seen the confusion of Greece becoming the opportunity of Macedon under Philip; and on his second visit he was supported at Athens by the complete domination of Macedon under Alexander. Having witnessed the unjust exactions of a democracy at Athens, the dwindling population of an oligarchy at Sparta, and the oppressive selfishness of new tyrannies throughout the Greek world, he condemned the actual constitutions of the Greek states as deviations (*παρεκβάσεις*) directed merely to the good of the government; and he contemplated a right constitution (*ὀρθὴ πολιτεία*), which might be either a commonwealth, an aristocracy or a monarchy, directed to the general good; but he preferred the monarchy of one man, pre-eminent in virtue above the rest, as the best of all governments (*Nicomachean Ethics*, viii. 10; *Politics*, Γ 14-18). Moreover, by adding (*Politics*, H 7, 1327 b 29-33) that the Greek race could govern the world by obtaining one constitution (*μιᾶς τυγχάνον πολιτείας*), he indicated some leaning to a universal monarchy under such a king as Alexander. On the whole, however, he adhered to the Greek city-state (*πόλις*), partly perhaps out of patriotism to his own Stagira. Averse at all events to the Athenian democracy, leaning towards Macedonian monarchy, and resting on Macedonian power, he maintained himself in his school at Athens, so long as he was supported by the friendship of Antipater, the Macedonian regent in Alexander's absence. But on Alexander's sudden death in 323, when Athens in the Lamian war tried to reassert her freedom against Antipater, Aristotle found himself in danger. He was accused of impiety on the absurd charge of deifying the tyrant Hermias; and, remembering the fate of Socrates, he retired to Chalcis in Euboea. There, away from his school, in 322 he died. (A tomb has been found in our time inscribed with the name of Biote, daughter of Aristotle. But is this *our* Aristotle?)

Such is our scanty knowledge of Aristotle's life, which seems to have been prosperous by inheritance and position, and happy by work and philosophy. His will, which was quoted by Hermippus, and, as afterwards quoted by Diogenes Laertius, has come down to us, though perhaps not complete, supplies some further details, as follows:—Antipater is to be executor with others. Nicanor is to marry Pythias, Aristotle's daughter, and to take charge of Nicomachus his son. Theophrastus is to be one of the executors if he will and can, and if Nicanor should die to act instead, if he will, in reference to Pythias. The executors and Nicanor are to take charge of Herpyllis, "because," in the words of the testator, "she has been good to me," and to allow her to reside either in the lodging by the garden at Chalcis or in the paternal house at Stagira. They are to provide for the slaves, who in some cases are to be freed. They are to see after the dedication of four images by Gryllion of Nicanor, Proxenus, Nicanor's mother and Arimnestus. They are to dedicate an image of Aristotle's mother, and to see that the bones of his wife Pythias are, as she ordered, taken up and buried with him. On this will we may remark that Proxenus is said to have been Aristotle's guardian after the death of his father, and to have been the father of Nicanor; that Herpyllis of Stagira was the mother of Nicomachus by Aristotle; and that Arimnestus was the brother of Aristotle, who also had a sister, Arimneste. Every clause breathes the philosopher's humanity.

II. Development from Platonism

Turning now from the man to the philosopher as we know him best in his extant writings (see *Aristoteles*, ed. Bekker, Berlin, 1831, the pages of which we use for our quotations), we find, instead of the general dialogues of Plato, special didactic treatises, and a fundamental difference of philosophy, so great as to have divided philosophers into opposite camps, and made Coleridge say that everybody is born either a Platonist or an Aristotelian. Platonism is the doctrine that the individuals we call things only become, but a thing is always one universal form beyond many individuals, *e.g.* one good beyond seeming goods; and that without supernatural forms, which are models of individuals, there is nothing, no being, no knowing, no good. Aristotelianism is the contrary doctrine: a thing is always a separate individual, a *substance* (*οὐσία*), natural such as earth or supernatural such as God; and without these individual substances, which have attributes and universals belonging to them, there is nothing, to be, to know, to be good. Philosophic differences are best felt by their practical effects: philosophically, Platonism is a philosophy of universal forms, Aristotelianism a philosophy of individual substances: practically, Plato makes us think first of the supernatural and the kingdom of heaven, Aristotle of the natural and the whole world.

So diametrical a difference could not have arisen at once. For, though Aristotle was different from Plato, and brought with him from Stagira a Greek and Ionic but colonial origin, a medical descent and tendency, and a matter-of-fact worldly kind of character, nevertheless on coming to Athens as pupil of Plato he must have begun with his master's philosophy. What then in

more detail was the philosophy which the pupil learnt from the master? When Aristotle at the age of eighteen came to Athens, Plato, at the age of sixty-two, had probably written all his dialogues except the *Laws*; and in the course of the remaining twenty years of his life and teaching, he expounded "the so-called unwritten dogmas" in his lectures on the Good. There was therefore a written Platonism for Aristotle to read, and an unwritten Platonism which he actually heard.

To begin with the written philosophy of the Dialogues. Individual so-called things neither are nor are not, but become: the real thing is always one universal form beyond the many individuals, *e.g.* the one beautiful beyond all beautiful individuals; and each form (*ἰδέα*) is a model which causes individuals by participation to become like, but not the same as, itself. Above all forms stands the form of the good, which is the cause of all other forms being, and through them of all individuals becoming. The creator, or the divine intellect, with a view to the form of the good, and taking all forms as models, creates in a receptacle (*ὑποδοχή*, Plato, *Timaeus*, 49 A) individual impressions which are called things but really change and become without attaining the permanence of being. Knowledge resides not in sense but in reason, which, on the suggestion of sensations of changing individuals, apprehends, or (to be precise) is reminded of, real universal forms, and, by first ascending from less to more general until it arrives at the form of good and then descending from this unconditional principle to the less general, becomes science and philosophy, using as its method the dialectic which gives and receives questions and answers between man and man. Happiness in this world consists proximately in virtue as a harmony between the three parts, rational, spirited and appetitive, of our souls, and ultimately in living according to the form of the good; but there is a far higher happiness, when the immortal soul, divesting itself of body and passions and senses, rises from earth to heaven and contemplates pure forms by pure reason. Such in brief is the Platonism of the written dialogues; where the main doctrine of forms is confessedly advanced never as a dogma but always as a hypothesis, in which there are difficulties, but without which Plato can explain neither being, nor truth nor goodness, because throughout he denies the being of individual things. In the unwritten lectures of his old age, he developed this formal into a mathematical metaphysics. In order to explain the unity and variety of the world, the one universal form and the many individuals, and how the one good is the main cause of everything, he placed as it were at the back of his own doctrine of forms a Pythagorean mathematical philosophy. He supposed that the one and the two, which is indeterminate, and is the great and little, are opposite principles or causes. Identifying the form of the good with the one, he supposed that the one, by combining with the indeterminate two, causes a plurality of forms, which like every combination of one and two are numbers but peculiar in being incommensurate with one another, so that each form is not a mathematical number (*μαθηματικὸς ἀριθμός*), but a formal number (*εἰδητικὸς ἀριθμός*). Further he supposed that in its turn each form, or formal number, is a limited one which, by combining again with the indeterminate two, causes a plurality of individuals. Hence finally he concluded that the good as the one combining with the indeterminate two is directly the cause of all forms as formal numbers, and indirectly through them all of the multitude of individuals in the world.

Aristotle knew Plato, was present at his lectures on the Good, wrote a report of them (*περὶ τἀγαθοῦ*), and described this latter philosophy of Plato in his *Metaphysics*. Modern critics, who were not present and knew neither, often accuse Aristotle of misrepresenting Plato. But Heracleides and Hestiacus, Speusippus and Xenocrates were also present and wrote similar reports. What is more, both Speusippus and Xenocrates founded their own philosophies on this very Pythagoreanism of Plato. Speusippus as president of the Academy from 347 to 339 taught that the one and the many are principles, while abolishing forms and reducing the good from cause to effect. Xenocrates as president from 339 onwards taught that the one and many are principles, only without distinguishing mathematical from formal numbers. Aristotle's critics hardly realize that for the rest of his life he had to live and to struggle with a formal and a mathematical Platonism, which exaggerated first universals and attributes and afterwards the quantitative attributes, one and many, into substantial things and real causes.

Aristotle had no sympathy with the unwritten dogmas of Plato. But with the written dialogues of Plato he always continued to agree almost as much as he disagreed. Like Plato, he believed in real universals, real essences, real causes; he believed in the unity of the universal, and in the immateriality of essences; he believed in the good, and that there is a good of the universe; he believed that God is a living being, eternal and best, who is a supernatural cause of the motions and changes of the natural world, and that essences and matter are also necessary causes; he believed in the divine intelligence and in the immortality of our intelligent souls; he believed in knowledge going from sense to reason, that science requires ascent to principles and is descent from principles, and that dialectic is useful to science; he believed in happiness involving virtue, and in moral virtue being a control of passions by reason, while the highest happiness is speculative wisdom. All these inspiring metaphysical and moral doctrines the pupil accepted from his master's dialogues, and throughout his life adhered to the general spirit of realism without materialism pervading the Platonic philosophy. But what he refused to believe with Plato was that reality is not here, but only above; and what he maintained against Plato was that it is both, and that universals and forms, one and many, the good, are real but not separate realities. This deep metaphysical divergence was the prime cause of the transition from Platonism to Aristotelianism.

Fragmenta Aristotelis.—Aristotle's originality soon asserted itself in early writings, of which fragments have come down to us, and have been collected by Rose (see the Berlin edition of Aristotle's works, or more readily in the Teubner series, which we shall use for our quotations). Many, no doubt, are spurious; but some are genuine, and a few perhaps cited in Aristotle's extant works. Some are dialogues, others didactic works. A special interest attaches to the dialogues written after the manner of Plato but with Aristotle as principal interlocutor; and some of these, *e.g.* the *περὶ ποιητῶν* and the *Eudemus*, seem to have been published. It is not always certain which were dialogues, which didactic like Aristotle's later works; but by comparing those which were certainly dialogues with their companions in the list of Aristotle's books as given by Diogenes Laertius, we may conclude with Bernays that the books occurring first in that list were dialogues. Hence we may perhaps accept as genuine the following:—

1. Dialogues:—
   - *περὶ δικαιοσύνης*: On justice.
   - *περὶ ποιητῶν*: On poets (perhaps cited in *Poetics*, 15, 1454 b 18, *ἐν τοῖς ἐκδεδομένοις λόγοις*).
   - *περὶ φιλοσοφίας*: On philosophy (perhaps cited in *Physics*, ii. 2, 194 a 35–36).
   - *περὶ πολιτικοῦ*: A politician.
   - *περὶ ῥητορικῆς ἢ Γρύλλος*: On rhetoric.
   - *προτρεπτικός*: An exhortation to philosophy (probably in dialogue, because it is the model of Cicero's dialogue *Hortensius*).
   - *Εὔδημος ἢ περὶ Ψυχῆς*: On soul (perhaps cited in *De Anima*, i. 4, 407 b 29, *καὶ τοῖς ἐν κοινῷ γενομένοις λόγοις*).
2. Didactic writings:—
   (1) Metaphysical:—
   - *περὶ τἀγαθοῦ*: On the good (probably not a dialogue but a report of Plato's lectures).
   - *περὶ ἰδεῶν*: On forms.

   (2) Political:—
   - *περὶ βασιλείας*: On monarchy.
   - *Ἀλέξανδρος ἢ ὑπὲρ ἀποίκων*: On colonies.

(3) Rhetorical:—

τέχνης τῆς Θεοδέκτου συναγωγή: The *Theodectea* (cited in the Preface to the *Rhetoric to Alexander* (chap. i.), and as τὰ Θεοδέκτεια in the *Rhetoric* (iii. 9, 1410 b 2),

τεχνῶν συναγωγή: A historical collection of arts of rhetoric.

Difficult as it is to determine when Aristotle wrote all these various works, some of them indicate their dates. Gryllus, celebrated in the dialogue on rhetoric, was Xenophon's son who fell at Mantineia in 362; and Eudemus of Cyprus, lamented in the dialogue on soul, died in Sicily in 352. These then were probably written before Plato died in 347; and so probably were most of the dialogues, precisely because they were imitations of the dialogues of Plato. Among the didactic writings, the περὶ τἀγαθοῦ would probably belong to the same time, because it was Aristotle's report of Plato's lectures. On the other hand, the two political works, if written for Alexander, would be after 343–342 when Philip made Aristotle his tutor. So probably were the rhetorical works, especially the *Theodectea*; since both politics and oratory were the subjects which the father wanted the tutor to teach his son, and, when Alexander came to Phaselis, he is said by Plutarch (*Alexander*, 17) to have decorated the statue of Theodectes in honour of his association with the man through Aristotle and philosophy. On the whole, then, it seems as if Aristotle began with dialogues during his second period under Plato, but gradually came to prefer writing didactic works, especially in the third period after Plato's death, and in connexion with Alexander.

These early writings show clearly how Aristotle came to depart from Plato. In the first place as regards style, though the Stagirite pupil Aristotle could never rival his Attic master in literary form, yet he did a signal service to philosophy in gradually passing from the vague generalities of the dialogue to the scientific precision of the didactic treatise. The philosophy of Plato is dialogue trying to become science; that of Aristotle science retaining traces of dialectic. Secondly as regards subject-matter, even in his early writings Aristotle tends to widen the scope of philosophic inquiry, so as not only to embrace metaphysics and politics, but also to encourage rhetoric and poetics, which Plato tended to discourage or limit. Thirdly as regards doctrines, the surpassing interest of these early writings is that they show the pupil partly agreeing, partly disagreeing, with his master. The *Eudemus* and *Protrepticus* are with Plato; the dialogues *on Philosophy* and the treatise *on Forms* are against Plato.

The *Eudemus*, on the soul (*Fragmenta*, 37 seq.), must have been in style and thought the most Platonic of all the Aristotelian writings. Plato's theory of the soul and its immortality was not the ordinary Greek view derived from Homer, who regarded the body as the self, the soul as a shade having a future state but an obscure existence, and stamped that view on the hearts of his countrymen, and affected Aristotle himself. After Homer there had come to Greece the new view that the soul is more real than the body, that it is imprisoned in the carcase as a prison-house, that it is capable of enjoying a happier life freed from the body, and that it can transmigrate from body to body. This strange, exotic, ascetic view was adopted by some philosophers, and especially by the Pythagoreans, and so transmitted to Plato. Aristotle in the *Eudemus*, written about 352, when he was thirty-two, also believed in it. Accordingly, the soul of Eudemus, when it left his body, is said to be returning home: the soul is made subject to the casting of lots, and in coming from the other world to this it is supposed to forget its former visions: but its disembodied life is regarded as its natural life in a better world. The *Eudemus* also contained a celebrated passage, preserved by Plutarch (*Consolat. ad Apoll.* 27; *Fragm.* 44). Here we can read the young Aristotle, writing in the form of the dialogue like Plato, avoiding hiatus like Isocrates, and justifying the praises accorded to his style by Cicero, Quintilian and Dionysius. It shows how nearly the pupil could imitate his master's dialogues, and still more how exactly he at first embraced his master's doctrines. It makes Silenus, captured by Midas, say that the best of all things is not to have been born, and the next best, having been born, to die as soon as possible. Nothing could be more like Plato's *Phaedo*, or more unlike Aristotle's later work *on the Soul*, which entirely rejects transmigration and allows the next life to sink into the background.

Hardly less Platonic is the *Protrepticus* (*Fragm.* 50 seq.), an exhortation to philosophy which, according to Zeno the Stoic, was studied by his master Crates. It is an exhortation, whose point is that the chief good is philosophy, the contemplation of the universe by divine and immortal intellect. This is indeed a doctrine of Platonic ethics from which Aristotle in his later days never swerved. But in the *Protrepticus* he goes on to say that seeming goods, such as strength, size, beauty, honours, opinions, are mere illusion (σκιαγραφία), worthless and ridiculous, as we should know if we had Lyncean eyes to compare them with the vision of the eternal. This indifference to goods of body and estate is quite Platonic, but is very different from Aristotle's later ethical doctrine that such goods, though not the essence, are nevertheless necessary conditions of happiness. Finally, in the spirit of Plato's *Phaedo* and the dialogue *Eudemus*, the *Protrepticus* holds that the soul is bound to the sentient members of the body as prisoners in Etruria are bound face to face with corpses; whereas the later view of the *De Anima* is that the soul is the vital principle of the body and the body the necessary organ of the soul.

Thus we find that at first, under the influence of his master, Aristotle held somewhat ascetic views on soul and body and on goods of body and estate, entirely opposed both in psychology and in ethics to the moderate doctrines of his later writings. This perhaps is one reason why Cicero, who had Aristotle's early writings, saw no difference between the Academy and the Peripatetics (*Acad. Post*, i. 4, 17-18).

On the other hand, the dialogue *on Philosophy* (περὶ φιλοσοφίας, *Fragm.* 1 seq.) strikingly exhibits the origin of Aristotle's divergence from Platonism, and that too in Plato's lifetime. The young son of a doctor from the colonies proved too fond of this world to stomach his Athenian master's philosophy of the supernatural. Accordingly in this dialogue he attacked Plato's fundamental position, both in its written and in its unwritten presentment, as a hypothesis both of forms and of formal numbers. First, he attacked the hypothesis of forms (τὴν τῶν ἰδεῶν ὑπόθεσιν, *Fragm.* 8), exclaiming in his dialogues, according to Proclus, that he could not sympathize with the dogma even if it should be thought that he was opposing it out of contentiousness; while Plutarch says that his attacks on the forms by means of his exoteric dialogues were thought by some persons more contentious than philosophical, as presuming to disdain Plato's philosophy: so far was he, says Plutarch, from following it. Secondly, in the same dialogue (*Fragm.* 9), according to Syrianus, he disagreed with the hypothesis of formal numbers (τοῖς εἰδητικοῖς ἀριθμοῖς). If, wrote Aristotle, the forms are another sort of number, not mathematical, there would be no understanding of it. Lastly, in the same dialogue (*Fragm.* 18 seq.) he revealed his emphasis on nature by contending that the universe is uncreate and indestructible. According to Plato, God caused the natural world to become: according to Aristotle it is eternal. This eternity of the world became one of his characteristic doctrines, and subsequently enabled him to explain how essences can be eternal without being separate from this world which is also eternal (cf. *Metaph.* Z 8). Thus early did Aristotle begin, even in Plato's lifetime, to oppose Plato's hypothesis of supernatural forms, and advance his own hypothesis of the eternity of the world.

He made another attack on Platonism in the didactic work περὶ ἰδεῶν (*Fragm.* 185 seq.), contending that the Platonic arguments prove not forms (ἰδέαι) but only things common (τὰ κοινά). Here, according to Alexander the commentator, he first brought against Plato the argument of "the third man" (ὁ τρίτος ἄνθρωπος); that, if there is the form, one man beyond many men, there will be a third man predicated of both man and men, and a fourth predicated of all three, and so on to infinity (*Fragm.* 188). Here, too, he examined the hypothesis of Eudoxus that things are caused by mixture of forms, a hypothesis which formed a kind of transition to his own later views, but failed to satisfy him on account of its difficulties. Lastly, in the didactic work περὶ τἀγαθοῦ (*Fragm.* 27 seq.), containing his report of Plato's lectures on the Good, he was dealing with the same mathematical metaphysics which in his dialogue *on Philosophy* he criticized for converting forms into formal numbers. Aristoxenus, at the beginning of the second book of the *Harmonics*, gives a graphic account of the astonishment caused by these lectures of Plato, and of their effect on the lectures of Aristotle. In contending, as Aristotle's pupil, that a teacher should begin by proposing his subject, he tells us how Aristotle used to relate that most of Plato's hearers came expecting to get something about human goods and happiness, but that when the discourses turned out to be all about mathematics, with the conclusion that good is one, it appeared to them a paradox, which some despised and others condemned. The reason, he adds, was that they were not informed by Plato beforehand; and for this very reason, Aristotle, as he told Aristoxenus himself, used to prepare his hearers by informing them of the nature of the subject. From this rare personal reminiscence we see at a glance that the mind of Plato and the mind of Aristotle were so different, that their philosophies must diverge; the one towards the supernatural, the abstract, the discursive, and the other towards the natural, the substantial, the scientific.

Aristotle then even in the second period of his life, while Plato was still alive, began to differ from him in metaphysics. He rejected the Platonic hypothesis of forms, and affirmed that they are not separate but common, without however as yet having advanced to a constructive metaphysics of his own; while at the same time, after having at first adopted his master's dialectical treatment of metaphysical problems, he soon passed from dialogues to didactic works, which had the result of separating metaphysics from dialectic. The

all-important consequence of this first departure from Platonism was that Aristotle became and remained primarily a metaphysician. After Plato's death, coming to his third period he made a further departure from Platonism in his didactic works on politics and rhetoric, written in connexion with Alexander and Theodectes. Those on politics (*Fragm.* 646-648) were designed to instruct Alexander on monarchy and on colonization; and in them Aristotle agreed with Plato in assigning a moral object to the state, but departed from him by saying that a king need not be a philosopher, as Plato had said in the *Republic*, but does need to listen to philosophers. Still more marked was his departure from Plato as regards rhetoric. Plato in the *Gorgias*, (501 A) had contended that rhetoric is not an art but an empirical practice (τριβὴ καὶ ἐμπειρία); Aristotle in the *Gryllus* (*Fragm.* 68-69), written in his second period, took according to Quintilian a similar view. But in his third period, in the *Theodectea* (*Fragm.* 125 seq.), rhetoric is treated as an art, and is laid out somewhat in the manner of his later *Art of Rhetoric*; while he also showed his interest in the subject by writing a history of other arts of rhetoric called τεχνῶν συναγωγή (*Fragm.* 136 seq.). Further, in treating rhetoric as an art in the *Theodectea* he was forced into a conclusion, which carried him far beyond Plato's rigid notions of proof and of passion: he concluded that it is the work of an orator to use persuasion, and to arouse the passions (τὸ τὰ πάθη διαγεῖραι), *e.g.* anger and pity (*ib.* 133-134). Nor could he treat poetry as he is said to have done without the same result.

On the whole then, in his early dialectical and didactic writings, of which mere fragments remain, Aristotle had already diverged from Plato, and first of all in metaphysics. During his master's life, in the second period of his own life, he protested against the Platonic hypothesis of forms, formal numbers and the one as the good, and tended to separate metaphysics from dialectic by beginning to pass from dialogues to didactic works. After his master's death, in the third period of his own life, and during his connexion with Alexander, but before the final construction of his philosophy into a system, he was tending to write more and more in the didactic style; to separate from dialectic, not only metaphysics, but also politics, rhetoric and poetry; to admit by the side of philosophy the arts of persuasive language; to think it part of their legitimate work to rouse the passions; and in all these ways to depart from the ascetic rigidity of the philosophy of Plato, so as to prepare for the tolerant spirit of his own, and especially for his ethical doctrine that virtue consists not in suppressing but in moderating almost all human passions. In both periods, too, as we shall find in the sequel, he was already occupied in composing some of the extant writings which were afterwards to form parts of his final philosophical system. But as yet he had given no sign of system, and—what is surprising—no trace of logic. Aristotle was primarily a metaphysician against Plato; a metaphysician before he was a logician; a metaphysician who made what he called primary philosophy (πρώτη φιλοσοφία) the starting-point of his philosophical development, and ultimately of his philosophical system.

III. Composition of his Extant Works

The system which was taught by Aristotle at Athens in the fourth period of his life, and which is now known as the Aristotelian philosophy, is contained not in fragments but in extant books. It will be best then to give at once a list of these extant works, following the traditional order in which they have long been arranged, and marking with a dagger (†) those which are now usually considered not to be genuine, though not always with sufficient reason.

A. Logical

1. Κατηγορίαι: *Categoriae*: On simple expressions signifying different kinds of things and capable of predication [probably an early work of Aristotle, accepting species and genera as "secondary substances" in deference to Plato's teaching].

2. περὶ Ἑρμηνείας: *De interpretatione*: On language as expression of mind, and especially on the enunciation or assertion (ἀπόφανσις, ἀποφαντικὸς λόγος) [rejected by Andronicus according to Alexander; but probably an early work of Aristotle, based on Plato's analysis of the sentence into noun and verb].

3. Ἀναλυτικὰ πρότερα: *Analytica Priora*: On syllogism, with a view to demonstration.

4. Ἀναλυτικὰ ὕστερα: *Analytica Posteriora*: On demonstration, or demonstrative or scientific syllogism (ἀπόδειξις, ἀποδεικτικὸς ἢ ἐπιστημονικὸς συλλογισμός).

5. Τοπικά: *Topica*: On dialectical syllogism (διαλεκτικὸς συλλογισμός), so called from consisting mainly of commonplaces (τόποι, *loci*), or general sources of argument.

6. Σοφιστικοὶ ἔλεγχοι: *Sophistici Elenchi*: On sophistic (σοφιστικὸς) or eristic syllogism (ἐριστικὸς συλλογισμός), so called from the fallacies used by sophists in refutation (ἔλεγχοι) of their opponents.

[Numbers 1-6 were afterwards grouped together as the *Organon*.]

B. Physical

1. Φυσικὴ ἀκρόασις: *Physica Auscultatio*: On Nature as cause of change, and the general principles of natural science.

2. περὶ οὐρανοῦ: *De coelo*: On astronomy, &c.

3. περὶ γενέσεως καὶ φθορᾶς: *De generatione et corruptione*: On generation and destruction in general.

4. Μετεωρολογικά: *Meteorologica*: On sublunary changes.

5.† περὶ κόσμου: *De mundo*: On the universe. [Supposed by Zeller to belong to the latter half of the 1st century B.C.]

6. περὶ ψυχῆς: *De anima*: On soul, conjoined with organic body.

7. περὶ αἰσθήσεως καὶ αἰσθητῶν: *De sensu et sensili*: On sense and objects of sense.

8. περὶ μνήμης καὶ ἀναμνήσεως: *De memoria et reminiscentia*: On memory and recollection.

9. περὶ ὕπνου καὶ ἐγρηγόρσεως: *De somno et vigilia*: On sleep and waking.

10. περὶ ἐνυπνίων: *De insomniis*: On dreams.

11. περὶ τῆς καθ' ὕπνον μαντικῆς, or περὶ μαντικῆς τῆς ἐν τοῖς ὕπνοις: *De divinatione per somnum*: On prophecy in sleep.

12. περὶ μακροβιότητος καὶ βραχυβιότητος: *De longitudine et brevitate vitae*: On length and shortness of life.

13. περὶ νεότητος καὶ γήρως καὶ περὶ ζωῆς καὶ θανάτου: *De juventute et senectute et de vita et morte*: On youth and age, and on life and death.

14. περὶ ἀναπνοῆς: *De respiratione*: On respiration.

[Numbers 7-14 are grouped together as *Parva naturalia*.]

15.† περὶ πνεύματος: *De spiritu*: On innate spirit (*spiritus vitalis*).

16. περὶ τὰ ζῷα ἱστορίαι: *Historia animalium*: Description of facts about animals, *i.e.* their organs, &c.

17. περὶ ζῴων μορίων: *De partibus animalium*: Philosophy of the causes of the facts about animals, *i.e.* their functions.

18. † περὶ ζῴων κινήσεως: *De animalium motione*: On the motion of animals. [Ascribed to the school of Theophrastus and Strato by Zeller.]

19. περὶ ζῴων πορείας: *De animalium incessu*: On the going of animals.

20. περὶ ζῴων γενέσεως: *De animalium generatione*: On the generation of animals.

21.† περὶ χρωμάτων: *De coloribus*: On colours. [Ascribed to the school of Theophrastus and Strato by Zeller.]

22.† περὶ ἀκουστῶν: *De audibilibus*. [Ascribed to the school of Theophrastus and Strato by Zeller.]

23.† Φυσιογνωμονικά: *Physiognomonica*: On physiognomy, and the sympathy of body and soul.

24.† περὶ φυτῶν: *De plantis*: On plants. [Not Aristotle's work on this subject.]

25.† περὶ θαυμασίων ἀκουσμάτων: *De mirabilibus auscultationibus*: On phenomena chiefly connected with natural history.

26.† Μηχανικά: *Quaestiones mechanicae*: Mechanical questions.

C. Miscellaneous

1.† Προβλήματα: *Problemata*: Problems on various subjects [gradually collected by the Peripatetics from partly Aristotelian materials, according to Zeller].

2.† περὶ ἀτόμων γραμμῶν: *De insecabilibus lineis*: On indivisible lines. [Ascribed to Theophrastus, or his time, by Zeller.]

3.† ἀνέμων θέσεις καὶ προσηγορίαι: *Ventorum situs et appellationes*: A fragment on the winds.

4.† περὶ Ξενοφάνους, περὶ Ζήνωνος, περὶ Γοργίου: *De Xenophane, Zenone et Gorgia*: On Xenophanes, Zeno and Gorgias.

D. Primary Philosophy or Theology or Wisdom

τὰ μετὰ τὰ φυσικά: *Metaphysica*: On being as being and its properties, its causes and principles, and on God as the motive motor of the world.

E. Practical

1. Ἠθικὰ Νικομάχεια: *Ethica Nicomachea*: On the good of the individual.

2.† Ἠθικὰ μεγάλα: *Magna Moralia*: On the same subject. [According to Zeller, an abstract of the *Nicomachean* and the *Eudemian Ethics*, tending to follow the latter, but possibly an early draft of the *Nicomachean Ethics*.]

3.† Ἠθικὰ Εὐδήμια or πρὸς Εὔδημον: *Ethica ad Eudemum*: On the same subject. [Usually supposed to be written by Eudemus, but possibly an early draft of the *Nicomachean Ethics*.]

4.† περὶ ἀρετῶν καὶ κακιῶν: *De virtutibus et vitiis*: On virtues and vices. [An eclectic work of the 1st century B.C., half Academic and half Peripatetic, according to Zeller.]

5. Πολιτικά: *De re publica*: Politics, on the good of the state.

6.† Οἰκονομικά: *De cura rei familiaris*: Economics, on the good of the family. [The first book a work of the school of Theophrastus or Eudemus, the second later Peripatetic, according to Zeller.]

F. Art

1. τέχνη Ῥητορική: *Ars rhetorica*: On the art of oratory.
2. † Ῥητορικὴ πρὸς Ἀλέξανδρον: *Rhetorica ad Alexandrum*: On the same subject. [Ascribed to Anaximenes of Lampsacus (fl. 365, Diodorus xv. 76) by Petrus Victorius, and Spengel, but possibly an earlier rhetoric by Aristotle.]
3. περὶ Ποιητικῆς: *De poetica*: On the art of poetry [fragmentary].

G. Historical

Ἀθηναίων πολιτεία: · *De republica Atheniensium*: On the Constitution of Athens. [One of the Πολιτεῖαι, said to have been 158 at least, the genuineness of which is attested by the defence which Polybius (xii.) makes of Aristotle's history of the Epizephyrian Locrians against Timaeus, Aristotle's contemporary and critic. Hitherto, only fragments have come down to us (cf. *Fragm.* 381-603). The present treatise, without however its beginning and end, written on a papyrus discovered in Egypt and now in the British Museum, was first edited by F. G. Kenyon 1890–1891.] (See the article Constitution of Athens.)

The Difficulty.—The genuineness of the Aristotelian works, as Leibnitz truly said (*De Stilo Phil. Nizolii*, xxx.), is ascertained by the conspicuous harmony of their theories, and by their uniform method of swift subtlety. Nevertheless difficulties lurk beneath their general unity of thought and style. In style they are not quite the same: now they are brief and now diffuse: sometimes they are carelessly written, sometimes so carefully as to avoid hiatus, *e.g.* the *Metaphysics* A, and parts of the *De Coelo* and *Parva Naturalia*, which in this respect resemble the fragment quoted by Plutarch from the early dialogue *Eudemus* (*Fragm.* 44). They also appear to contain displacements, interpolations, prefaces such as that to the *Meteorologica*, and appendices such as that to the *Sophistical Elenchi*, which may have been added. An Aristotelian work often goes on continuously at first, and then becomes disappointing by suddenly introducing discussions which break the connexion or are even inconsistent with the beginning; as in the *Posterior Analytics*, which, after developing a theory of demonstration from necessary principles, suddenly makes the admission, which is also the main theory of science in the *Metaphysics*, that demonstration is about either the necessary or the contingent, from principles either necessary or contingent, only not accidental. At times order is followed by disorder, as in the *Politics*. Again, there are repetitions and double versions, *e.g.* those of the *Physics*, vii., and those of the *De Anima*, ii., discovered by Torstrik; or two discussions of the same subject, *e.g.* of pleasure in the *Nicomachean Ethics*, vii. and x.; or several treatises on the same subject very like one another, viz. the *Nicomachean Ethics*, the *Eudemian Ethics* and the *Magna Moralia*; or, strangest of all, a consecutive treatise and other discourses amalgamated, *e.g.* in the *Metaphysics*, where a systematic theory of being running through several books (B, Γ, E, Z, H, Θ) is preceded, interrupted and followed by other discussions of the subject. Further, there are frequently several titles of the same work or of different parts of it. Sometimes diagrams (διαγραφαί or ὑπογραφαί) are mentioned, and sometimes given (*e.g.* in *De Interp.* 13, 22 a 22; *Nicomachean Ethics*, ii. 7; *Eudemian Ethics*, ii. 3), but sometimes only implied (*e.g.* in *Hist. An.* i. 17, 497 a 32; iii. 1, 510 a 30; iv. 1, 525 a 9). The different works are more or less connected by a system of references, which give rise to difficulties, especially when they are cross-references: for example, the *Analytics* and *Topics* quote one another: so do the *Physics* and the *Metaphysics*; the *De Vita* and *De Respiratione* and the *De Partibus Animalium*; this latter treatise and the *De Animalium Incessu*; the *De Interpretatione* and the *De Anima*. A late work may quote an earlier; but how, it may be asked, can the earlier reciprocally quote the later?

Besides these difficulties in and between the works there are others beyond them. On the one hand, there is the curious story given partly by Strabo (608-609) and partly in Plutarch's *Sulla* (c. 26), that Aristotle's successor Theophrastus left the books of both to their joint pupil, Neleus of Scepsis, where they were hidden in a cellar, till in Sulla's time they were sold to Apellicon, who made new copies, transferred after Apellicon's death by Sulla to Rome, and there edited and published by Tyrannio and Andronicus. On the other hand, there are the curious and puzzling catalogues of Aristotelian books, one given by Diogenes Laertius, another by an anonymous commentator (perhaps Hesychius of Miletus) quoted in the notes of Gilles Ménage on Diogenes Laertius, and known as "Anonymus Menagii," and a third copied by two Arabian writers from Ptolemy, perhaps King Ptolemy Philadelphus, son of the founder of the library at Alexandria. (See Rose, *Fragm.* pp. 1-22.) But the extraordinary thing is that, without exactly agreeing among themselves, the catalogues give titles which do not agree well with the Aristotelian works as we have them. A title in some cases suits a given work or a part of it; but in other cases there are no titles for works which exist, or titles for works which do not exist.

These difficulties are complicated by various hypotheses concerning the composition of the Aristotelian works. Zeller supposes that, though Aristotle may have made preparations for his philosophical system beforehand, still the properly didactic treatises composing it almost all belong to the last period of his life, *i.e.* from 335–334 to 322; and from the references of one work to another Zeller has further suggested a chronological order of composition during this period of twelve years, beginning with the treatises on Logic and Physics, and ending with that on Metaphysics. There is a further hypothesis that the Aristotelian works were not originally treatises, but notes of lectures either for or by his pupils. This easily passes into the further and still more sceptical hypothesis that the works, as we have them, under Aristotle's name, are rather the works of the Peripatetic school, from Aristotle, Theophrastus and Eudemus downwards. "We cannot assert with certainty," says R. Shute in his *History of the Aristotelian Writings* (p. 176), "that we have even got throughout a treatise in the exact words of Aristotle, though we may be pretty clear that we have a fair representation of his thought. The unity of style observable may belong quite as much to the school and the method as to the individual." This sceptical conclusion, the contrary of that drawn by Leibnitz from the harmony of thought and style pervading the works, shows us that the Homeric question has been followed by the Aristotelian question.

The Solution.—Such hypotheses attend to Aristotle's philosophy to the neglect of his life. He was really, as we have seen, a prolific writer from the time when he was a young man under Plato's guidance at Athens; beginning with dialogues in the manner of his master, but afterwards preferring to write didactic works during the prime of his own life between thirty-eight and fifty (347–335-334), and with the further advantage of leisure at Atarneus and Mitylene, in Macedonia and at home in Stagira. When at fifty he returned to Athens, as head of the Peripatetic school, he no doubt wrote much of his extant philosophy during the twelve remaining years of his life (335–322). But he was then a busy teacher, was growing old, and suffered from a disease in the stomach for a considerable time before it proved fatal at the age of sixty-three. It is therefore improbable that he could between fifty and sixty-three have written almost the whole of the many books on many subjects constituting that grand philosophical system which is one of the most wonderful works of man. It is far more probable that he was previously composing them at his leisure and in the vigour of manhood, precisely as his contemporary Demosthenes composed all his great speeches except the *De Corona* before he was fifty.

Turning to Aristotle's own works, we immediately light upon a surprise: Aristotle began his extant scientific works during Plato's lifetime. By a curious coincidence, in two different works he mentions two different events as contemporary with the time of writing, one in 357 and the other in 356. In the *Politics* (E 10, 1312 b 10), he mentions as now (νῦν) Dion's expedition to Sicily which occurred in 357. In the *Meteorologica* (iii. 1, 371 a 30), he mentions as now (νῦν) the burning of the temple at Ephesus, which occurred in 356. To save his hypothesis of late composition, Zeller resorts to the vagueness of the word "now" (νῦν). But Aristotle is graphically describing isolated events, and could hardly speak of events of 357 and 356 as happening "now" in or near 335. Moreover, these two works contain further proofs that they were both begun earlier than this

date. The *Politics* (B 10) mentions as having happened lately (*νεωστί*) the expedition of Phalaecus to Crete, which occurred towards the end of the Sacred War in 346. The *Meteorologica* (Γ 7) mentions the comet of 341. It is true that the *Politics* also mentions much later events, *e.g.* the assassination of Philip which took place in 336 (E 10, 1311 b 1-3). Indeed, the whole truth about this great work is that it remained unfinished at Aristotle's death. But what of that? The logical conclusion is that Aristotle began writing it as early as 357, and continued writing it in 346, in 336, and so on till he died. Similarly, he began the *Meteorologica* as early as 356 and was still writing it in 341. Both books were commenced some years before Plato's death: both were works of many years: both were destined to form parts of the Aristotelian system of philosophy. It follows that Aristotle, from early manhood, not only wrote dialogues and didactic works, surviving only in fragments, but also began some of the philosophical works which are still parts of his extant writings. He continued these and no doubt began others during the prime of his life. Having thus slowly matured his separate writings, he was the better able to combine them more and more into a system, in his last years. No doubt, however, he went on writing and rewriting well into the last period of his life; for example, the recently discovered *Ἀθηναίων πολιτεία* mentions on the one hand (c. 54) the archonship of Cephisophon (329–328), on the other hand (c. 46) triremes and quadriremes but without quinqueremes, which first appeared at Athens in 325–324; and as it mentions nothing later it probably received its final touches between 329 and 324. But it may have been begun long before, and received additions and changes. However early Aristotle began a book, so long as he kept the manuscript, he could always change it. Finally he died without completing some of his works, such as the *Politics*, and notably that work of his whole philosophic career and foundation of his whole philosophy—the *Metaphysics*—which, projected in his early criticism of Plato's philosophy of universal forms, gradually developed into his positive philosophy of individual substances, but remained unfinished after all.

On the whole, then, Aristotle was writing his extant works very gradually for some thirty-five years (357–322), like Herodotus (iv. 30) contemplated additions, continued writing them more or less together, not so much successively as simultaneously, and had not finished writing at his death.

There is a curious characteristic connected with this gradual composition. An Aristotelian treatise frequently has the appearance of being a collection of smaller discourses (λόγοι), as, *e.g.*, K. L. Michelet has remarked.

This is obvious enough in the *Metaphysics*: it has two openings (Books A and α); then comes a nearly consecutive theory of being (B, Γ, E, Z, H, Θ), but interrupted by a philosophical lexicon Δ; afterwards follows a theory of unity (I); then a summary of previous books and of doctrines from the *Physics* (K); next a new beginning about being, and, what is wanted to complete the system, a theory of God in relation to the world (Λ); finally a criticism of mathematical metaphysics (M, N), in which the argument against Plato (A 9) is repeated almost word for word (M 4-5). The *Metaphysics* is clearly a compilation formed from essays or discourses; and it illustrates another characteristic of Aristotle's gradual method of composition. It refers back to passages "in the first discourses" (*ἐν τοῖς πρώτοις λόγοις*) —an expression not uncommon in Aristotelian writings. Sometimes the reference is to the beginning of the whole treatise; *e.g. Met.* B 2,997 b 3-5, referring back to A 6 and 9 about Platonic forms. Sometimes, on the other hand, the reference only goes back to a previous part of a given topic, *e.g. Met.* Θ1, 1045 b 27-32, referring back to Z 1, or at the earliest to Γ 2. On either alternative, however, "the first discourses" mentioned may have originally been a separate discourse; for Book Γ begins quite fresh with the definition of the science of being, long afterwards called "Metaphysics," and Book Z begins Aristotle's fundamental doctrine of substance.

Another indication of a treatise having arisen out of separate discourses is its consisting of different parts imperfectly connected. Thus the *Nicomachean Ethics* begins by identifying the good with happiness (*εὐδαιμονία*), and happiness with virtuous action. But when it comes to the moral virtues (Book iii. 6), a new motive of the "honourable" (*τοῦ καλοῦ ἕνεκα*) is suddenly introduced without preparation, where one would expect the original motive of happiness. Then at the end of the moral virtues justice is treated at inordinate length, and in a different manner from the others, which are regarded as means between two vices, whereas justice appears as a mean only because it is of the middle between too much and too little. Later, the discussion on friendship (Books viii.–ix.) is again inordinate in length, and it stands alone. Lastly, pleasure, after having been first defined (Book vii.) as an activity, is treated over again (Book x.) as an end beyond activity, with a warning against confusing activity and pleasure. The probability is that the *Nicomachean Ethics* is a collection of separate discourses worked up into a tolerably systematic treatise; and the interesting point is that these discourses correspond to separate titles in the list of Diogenes Laertius (*περὶ καλοῦ, περὶ δικαίων, περὶ φιλίας, περὶ ἡδονῆς*, and *περὶ ἡδονῶν*). The same list also refers to tentative notes (*ὑπομνήματα ἐπιχειρηματικά*), and the commentators speak of ethical notes (*ἠθικὰ ὑπομνήματα*). Indeed, they sometimes divide Aristotle's works into notes (*ὑπομνηματικά*) and compilations (*συνταγματικά*). How can it be doubted that in the gradual composition of his works Aristotle began with notes (*ὑπομνήματα*) and discourses (λόγοι), and proceeded to treatises (*πραγματεῖαι*)? He would even be drawn into this process by his writing materials, which were papyrus rolls of some magnitude; he would tend to write discourses on separate rolls, and then fasten them together in a bundle into a treatise.

If then Aristotle was for some thirty-five years gradually and simultaneously composing manuscript discourses into treatises and treatises into a system, he was pursuing a process which solves beforehand the very difficulties which have since been found in his writings. He could very easily write in different styles at different times, now avoiding hiatus and now not, sometimes writing diffusely and sometimes briefly, partly polishing and partly leaving in the rough, according to the subject, his own state of health or humour, his age, and the degree to which he had developed a given topic; and all this even in the same manuscript as well as in different manuscripts, so that a difference of style between different parts of a work or between different works, explicable by one being earlier than another, does not prove either to be not genuine. As he might write, so might he think differently in his long career. To put one extreme case, about the soul he could think at first in the *Eudemus* like Plato that it is imprisoned in the body, and long afterwards in the *De Anima* like himself that it is the immateriate essence of the material bodily organism. Again, he might be inconsistent; now, for example, calling a universal a substance in deference to Plato, and now denying that a universal can be a substance in consequence of his own doctrine that every substance is an individual; and so as to contradict himself in the same treatise, though not in the same breath or at the same moment of thinking. Again, in developing his discourses into larger treatises he might fall into dislocations; although it must be remembered that these are often inventions of critics who do not understand the argument, as when they make out that the treatment of reciprocal justice in the *Ethics* (v. 5-6) needs rearrangement through their not noticing that, according to Aristotle, reciprocal justice, being the fairness of a commercial bargain, is not part of absolute or political justice, but is part of analogical or economical justice. Or he might make repetitions, as in the same book, where he twice applies the principle, that so far as the agent does the patient suffers, first to the corrective justice of the law court (*Eth.* v. 4) in order to prove that in a wrong the injurer gains as much as the injured loses, and immediately afterwards to the reciprocal justice of commerce (*ib.* 5) in order to prove that in a bargain a house must be exchanged for as many shoes as equal it in value. Or he might himself, without double versions, repeat the same argument with a different shade of meaning; as when in the *Nic. Ethics* (vii. 4) he first argues that incontinence

about such natural pleasures as that of gain is only modified incontinence, a sign (as *causa cognoscendi*) of which is that it is not so bad as incontinence about carnal pleasures, and then argues that, because (as *causa essendi*) it is only modified incontinence, therefore it is not so bad. Or he might return again and again to the same point with a difference: there is a good instance in his conclusion that the speculative life is the highest happiness; which he first infers because it is the life of man's highest and divine faculty, intelligence (1176 b-1178 a 8), then after an interval infers a second time because our speculative life is an imitation of that of God (1178 b 7-32), and finally after another interval infers a third time, because it will make man most dear to God (1179 a 22-32). Or, extending himself as it were still more, he might write two drafts, or double versions of his own, on the same subject; *e.g. Physics*, vii. and *De Anima*, ii. Or he might, going still further, in his long literary career write two or more treatises on the same subject, different and even more or less inconsistent with each other, as we shall find in the sequel. Finally, having a great number of discourses and treatises, containing all those small blemishes, around him in his library, and determined to collect, consolidate and connect them into a philosophical system, he would naturally be often taking them down from their places to consult and compare one with another, and as naturally enter in them references one to the other, and cross-references between one another. Thus he would enter in the *Metaphysics* a reference to the *Physics*, and in the *Physics* a reference to the *Metaphysics*, precisely because both were manuscripts in his library. For the same purpose of connexion he would be tempted to add a preface to a book like the *Meteorologica*. In order to refer back to the *Physics*, the *De Coelo*, and the *De Generatione*, this work begins by stating that the first causes of all nature and all natural motion, the stars ordered according to celestial motion and the bodily elements with their transmutations, and generation and corruption have all been discussed; and by adding that there remains to complete this investigation, what previous investigators called meteorology. To suppose this preface, presupposing many sciences, to have been written in 356, when the *Meteorologica* had been already commenced, would be absurd; but equally absurd would it be to reject that date on account of the preface, which even a modern author often writes long after his book. Nor is it at all absurd to suppose that, long after he began the *Meteorologica*, Aristotle himself added the preface in the process of gathering his general treatises on natural science into a system. So he might afterwards add the preface to the *De Interpretatione*, in order to connect it with the *De Anima*, though written afterwards, in order to connect his treatises on mind and on its expression. So also he might add the appendix to the *Sophistical Elenchi*, long after he had written that book, and perhaps, to judge from its being a general claim to have discovered the syllogism, when the founder of logic had more or less realized that he had written a number of connected treatises on reasoning.

The Question of Publication.—There is still another point which would facilitate Aristotle's gradual composition of discourses into treatises and treatises into a system; there was no occasion for him to publish his manuscripts beyond his school. Printing has accustomed us to publication, and misled us into applying to ancient times the modern method of bringing out one book after another at definite dates by the same author. But Greek authors contemplated works rather than books. Some of the greatest authors were not even writers: Homer, Aesop, Thales, Socrates. Some who were writers were driven to publish by the occasion; and after the orders of government, which were occasionally published to be obeyed, occasional poems, such as the poems of Solon, the odes of Pindar and the plays of the dramatists, which all had a political significance, were probably the first writings to be published or, rather, recited and acted, from written copies. With them came philosophical poems, such as those of Xenophanes and Empedocles; the epical history of Herodotus; the dramatic philosophy of Plato. On a larger scale speeches written by orators to be delivered by litigants were published and encouraged publication; and, as the Attic orators were his contemporaries, publication had become pretty common in the time of Aristotle, who speaks of many bundles (*δέσμας*) of judicial speeches by Isocrates being hawked about by the booksellers (*Fragm.* 140).

No doubt then Aristotle's library contained published copies of the works of other authors, as well as the autographs of his own. It does not follow that his own works went beyond his library and his school. Publication to the world is designed for readers, who at all times have demanded popular literature rather than serious philosophy such as that of Aristotle. Accordingly it becomes a difficult question, how far Aristotle's works were published in his lifetime. In answering it we must be careful to exclude any evidence which refers to Aristotle as a man, not as a writer, or refers to him as a writer but does not prove publication while he was alive.

Beginning then with his early writings, which are now lost, the dialogues *On Poetry* and the *Eudemus* were probably the published discourses to which Aristotle himself refers (*Poetics*, 15; *De Anima*, i. 4); and the dialogue *Protrepticus* was known to the Cynic Crates, pupil of Diogenes and master of Zeno (*Fragm.* 50), but not necessarily in Aristotle's lifetime, as Crates was still alive in 307. Again, Aristotle's early rhetorical instructions and perhaps writings, as well as his opinion that a collection of proverbs is not worth while, must have been known outside Aristotle's rhetorical school to the orator Cephisodorus, pupil of Isocrates and master of Demosthenes, for him to be able to write in his *Replies to Aristotle* (*ἐν ταῖς πρὸς Ἀριστοτέλην ἀντιγραφαῖς*) an admired defence of Isocrates (Dionys. H. *De Isoc.* 18). But this early dialectic and rhetoric, being popular, would tend to be published. History comes nearer to philosophy; and Aristotle's *Constitutions* were known to his enemy Timaeus, who attacked him for disparaging the descent of the Locrians of Italy, according to Polybius (xii.), who defended Aristotle. But as Timaeus brought his history down to 264 B.C. (Polyb. i. 5), and therefore might have got his information after Aristotle's death, we cannot be sure that any of the *Constitutions* were published in the author's lifetime. We are equally at a loss to prove that Aristotle published his philosophy. He had, like all the great, many enemies, personal and philosophical; but in his lifetime they attacked the man, not his philosophy. In the Megarian school, first Eubulides quarrelled with him and calumniated him (Diog. Laert. ii. 109) in his lifetime; but the attack was on his life, not on his writings: afterwards Stilpo wrote a dialogue (*Ἀριστοτέλης*), which may have been a criticism of the Aristotelian philosophy from the Megarian point of view; but he outlived Aristotle thirty years. In the absence of any confirmation, "the current philosophemata" (*τὰ ἐγκύκλια φιλοσοφήματα*), mentioned in the *De Coelo* (i. 9, 279 a 30), are sometimes supposed to be Aristotle's published philosophy, to which he is referring his readers. But the example there given, that the divine is unchangeable, is precisely such a religious commonplace as might easily be a current philosopheme of Aristotle's day, not of Aristotle; and this interpretation suits the parallel passage in the *Nic. Ethics* (i. 5, 1096 a 3) where opinions about the happiness of political life are said to have been sufficiently treated "even in current discussions" (*καὶ ἐν τοῖς ἐγκυκλίοις*).

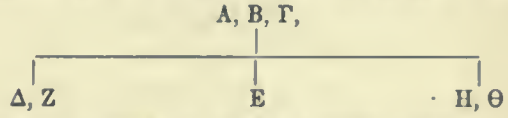
There is therefore no contemporary proof that Aristotle published any part of his mature philosophical system in his lifetime. It is true that a book of Andronicus, as reported by Aulus Gellius (xx. 5), contained a correspondence between Alexander and Aristotle in which the pupil complained that his master had published his "acroatic discourses" (*τοὺς ἀκροατικοὺς τῶν λόγων*). But ancient letters are proverbially forgeries, and in the three hundred years which elapsed between the supposed correspondence and the time of Andronicus there was plenty of time for the forgery of these letters. But even if the correspondence is genuine, "acroatic discourses" must be taken to mean what Alexander would mean by them in the time of Aristotle, and not what they had come to mean by the time of Andronicus. Alexander meant those discourses which Aristotle, when he was his tutor, intended for the ears of himself and his fellow-pupils; such as the early political works on *Monarchy* and on *Colonies*, and the early rhetorical works, the *Theodectea*, the *Collection of*

Arts, and possibly the *Rhetoric to Alexander*, in the preface to which the writer actually says to Alexander: "You wrote to me that nobody else should receive this book." These few early works may have been published, and contrary to the wishes of Alexander, without affecting Aristotle's later system. But even so, Alexander's complaint would not justify writers three centuries later in taking Alexander to have referred to mature scientific writings, which were not addressed, and not much known, to him, the conqueror of Asia; although by the times of Andronicus and Aulus Gellius, Aristotle's scientific writings were all called acroatic, or acroamatic, or sometimes esoteric, in distinction from exoteric—a distinction altogether unknown to Aristotle, and therefore to Alexander. In the absence of any contemporary evidence, we cannot believe that Aristotle in his lifetime published any, much less all, of his scientific books. The conclusion then is that Aristotle on the one hand to some extent published his early dialectical and rhetorical writings, because they were popular, though now they are lost, but on the other hand did not publish any of the extant historical and philosophical works which belong to his mature system, because they were best adapted to his philosophical pupils in the Peripatetic school. The object of the philosopher was not the applause of the public but the truth of things. Now this conclusion has an important bearing on the composition of Aristotle's writings and on the difficulties which have been found in them. If he had like a modern author brought out each of his extant philosophical works on a definite day of publication, he would not have been able to change them without a second edition, which in the case of serious writings so little in demand would not be worth while. But as he did not publish them, but kept the unpublished manuscripts together in his library and used them in his school, he was able to do with them as he pleased down to the very end of his life, and so gradually to consolidate his many works into one system.

While Aristotle did not publish his philosophical works to the world, he freely communicated them to the Peripatetic school. They are not mere lectures; but he used them for lectures: he allowed his pupils to read them in his library, and probably to take copies from them. He also used diagrams, which are sometimes incorporated in his works, but sometimes are only mentioned, and were no doubt used for purposes of teaching. He also availed himself of his pupils' co-operation, as we may judge from his description in the *Ethics* (x. 7) of the speculative philosopher who, though he is self-sufficing, is better having co-operators (*συνεργοὺς ἔχων*). From an early time he had a tendency to address his writings to his friends. For example, he addressed the *Theodectea* to his pupil Theodectes; and even in ancient times a doubt arose whether it was a work of the master or the pupil. It was certainly by Aristotle, because it contained the triple grammatical division of words into noun, verb and conjunction, which the history of grammar recognized as his discovery. But we may explain the share of Theodectes by supposing that he had a hand in the work (cf. Dionys. H. *De Comp. Verb.* 2; Quintilian i. 4. 18). Similarly in astronomy, Aristotle used the assistance of Eudoxus and Callippus. Indeed, throughout his writings he shows a constant wish to avail himself of what is true in the opinions of others, whether they are philosophers, or poets or ordinary people expressing their thoughts in sayings and proverbs. With one of his pupils in particular, Theophrastus, who was born about 370 and therefore was some fifteen years younger than himself, he had a long and intimate connexion; and the work of the pupil bears so close a resemblance to that of his master, that, even when he questions Aristotle's opinions (as he often does), he seems to be writing in an Aristotelian atmosphere; while he shows the same acuteness in raising difficulties, and has caught something of the same encyclopaedic genius. Another pupil, Eudemus of Rhodes, wrote and thought so like his master as to induce Simplicius to call him the most genuine of Aristotle's companions (*ὁ γνησιώτατος τῶν Ἀριστοτέλους ἑταίρων*). It is probable that this extraordinary resemblance is due to the pupils having actually assisted their master; and this supposition enables us to surmount a difficulty we feel in reading Aristotle's works. How otherwise, we wonder, could one man writing alone and with so few predecessors compose the first systematic treatises on the psychology of the mental powers and on the logic of reasoning, the first natural history of animals, and the first civil history of one hundred and fifty-eight constitutions, in addition to authoritative treatises on metaphysics, biology, ethics, politics, rhetoric and poetry; in all penetrating to the very essence of the subject, and, what is most wonderful, describing more facts than any other man has ever done on so many subjects?

The Uncompleted Works.—Such then was the method of composition by which Aristotle began in early manhood to write his philosophical works, continued them gradually and simultaneously, combined shorter discourses into longer treatises, compared and connected them, kept them together in his library without publishing them, communicated them to his school, used the co-operation of his best pupils, and finally succeeded in combining many mature writings into one harmonious system. Nevertheless, being a man, he did not quite succeed. He left some unfinished; such as the *Categories*, in which the main part on categories is not finished, while the last part, afterwards called postpredicaments, is probably not his, the *Politics* and the *Poetics*. He left others imperfectly arranged, and some of the most important, the *Metaphysics*, the *Politics* and the logical writings. Of the imperfect arrangement of the *Metaphysics* we have already spoken; and we shall speak of that of his logical writings when we come to the order of his whole system. At present the *Politics* will supply us with a conspicuous example of the imperfect arrangement of some, as well as of the gradual composition of all, of Aristotle's extant writings.

The *Politics* was begun as early as 357, yet not finished in 322. It betrays its origin from separate discourses. First comes a general theory of constitutions, right and wrong (Books A,B,Γ); and this part is afterwards referred to as "the first discourses" (*ἐν τοῖς πρώτοις λόγοις*). Then follows the treatment of oligarchy, democracy, commonwealth and tyranny, and of the various powers of government (Δ), and independent investigation of revolution, and of the means of preserving states (E), and a further treatment of democracy and oligarchy, and of the different offices of the state (Z), and finally a return to the discussion of the right form of constitution (H, Θ). But Δ and Z are a group interrupted by E, and H and Θ are another group unconnected with the previous group and with E, and are also distinguished in style by avoiding hiatus. Further, the group (Δ, Z) and the group (H, Θ) are both unfinished. Finally the group (Δ, Z), the book (E) and the group (H, Θ), though unconnected with one another, are all connected though imperfectly with "the first discourses" (A,B,Γ). This complicated arrangement may be represented in the following diagram:—



The simplest explanation is that Aristotle began by writing separate discourses, four at least, on political subjects; that he continued to write them and perhaps tried to combine them; but that in the end he failed and left the *Politics* unfinished and in disorder. But modern commentators, possessed by the fallacy that Aristotle like a modern author must from the first have comtemplated a whole treatise in a regular order for definite publication, lose themselves in vain disputes as to whether to go by the traditional order of books indicated by their letters and known to have existed as early as the abstract (given in Stobaeus, *Ecl.* ii. 7) ascribed to Didymus (1st century A.D.), or to put the group H, Θ, as more connected with A, B, Γ, before the group Δ, Z, and this group before the book E. It is agreed, says Zeller, that the traditional order contradicts the original plan. But what right have we to say that Aristotle had an original plan?

The incomplete state in which Aristotle left the *Metaphysics*, the *Politics* and his logical works, brings us to the hard question how much he did, and how much his Peripatetic followers did

to his writings after his death. To answer it we should have to go far beyond Aristotle. But two corollaries follow from our present investigation of his extant writings; the first, that it was the long continuance of the Peripatetic school which gradually caused the publication, and in some cases the forgery, of the separate writings; and the second, that his Peripatetic successors arranged and edited some of Aristotle's writings, and gradually arrived by the time of Andronicus, the eleventh from Aristotle, at an order of the whole body of writings forming the system. Now, it is probable that the arrangement of the works which we are considering was done by the Peripatetic successors of Aristotle. There is nothing indeed in the *Metaphysics* to show whether he left it in isolated treatises or in its present disorder; and nothing in the *Politics*. On the other hand, in the case of logic, it is certain that he did not combine his works on the subject into one whole, but that the Peripatetics afterwards put them together as organic, and made them the parts of logic as an organon, as they are treated by Andronicus. Perhaps something similar occurred to the *Metaphysics*, as Alexander imputed its redaction to Eudemus, and the majority of ancient commentators attributed its second opening (Book α) to Pasicles, nephew of Eudemus. Again, it is not unlikely that the *Politics* was arranged in the traditional order of books by Theophrastus, and that this is the meaning of the curious title occurring in the list of Aristotle's works as given by Diogenes Laertius, πολιτικῆς ἀκροάσεως ὡς ἡ Θεοφράστου α′β′γ′δ′ε′ς′ζ′η′, which agrees with the *Politics* in having eight books. Although, however, we may concede that such great works as the *Metaphysics*, the *Politics* and the logical writings did not receive their present form from Aristotle himself, that concession does not deprive Aristotle of the authorship, but only of the arrangement of those works. On the contrary, Theophrastus and Eudemus, his immediate followers, both wrote works presupposing Aristotle's *Metaphysics* and his logical works, and Dicaearchus, their contemporary, used his *Politics* for his own *Tripoliticus*. It was Aristotle himself then who wrote these works, whether he arranged them or not; and if he wrote the incomplete works, then *a fortiori* he wrote the completed works except those which are proved spurious, and practically consummated the Aristotelian system, which, as Leibnitz said, by its unity of thought and style evinces its own genuineness and individuality. We must not exaggerate the school and underrate the individual, especially such an individual. What he mainly wanted was the time, the leisure and the labour, which we have supposed to have been given to the gradual composition of the extant Aristotelian writings. Aristotle, asked where dwell the Muses, answered, "In the souls of those who love work."

IV. Earlier and Later Writings

Aristotle's quotations of his other books and of historical facts only inform us at best of the dates of isolated passages, and cannot decide the dates and sequences of whole philosophical books which occupied him for many years. Is there then any way of discriminating between early and late works? There is the evidence of the influences under which the books were written. This evidence applies to the whole Aristotelian literature including the fragments. As to the fragments, we are safe in saying that the early dialogues in the manner of Plato were written under the influence of Plato, and that the subsequent didactic writings connected with Alexander were written more under the influence of Philip and Alexander. Turning to the extant writings, we find that some are more under the influence of Plato, while others are more original and Aristotelian. Also some writings are more rudimentary than others on the same subject; and some have the appearance of being first drafts of others. By these differences we can do something to distinguish between earlier and later philosophical works; and also vindicate as genuine some works, which have been considered spurious because they do not agree in style or in matter with his most mature philosophy. In thirty-five years of literary composition, Aristotle had plenty of time to change, because any man can differ from himself at different times.

On these principles, we regard as early genuine philosophical works of Aristotle, (1) the *Categories*; (2) the *De Interpretatione*; (3) the *Eudemian Ethics* and *Magna Moralia*; (4) the *Rhetoric to Alexander*.

1. The *Categories* (κατηγορίαι).—This short discourse turns on Aristotle's fundamental doctrine of individual substances, without which there is nothing. He arrives at it from a classification of categories, by which he here means "things stated in no combination" (τὰ κατὰ μηδεμίαν συμπλοκὴν λεγόμενα) or what we should call "names," capable of becoming predicates (κατηγορούμενα, κατηγορίαι). "Every name," says he (chap. 4), "signifies either substance or something quantitative, or qualitative, or relative, or somewhere, or sometimes, or that it is in a position, or in a condition, or active or passive." He immediately adds that, by the combination of these names with one another, affirmation or negation arises. The categories then are names signifying things capable of becoming predicates in a proposition. Next he proceeds to substances (οὐσίαι), which he divides into primary (πρῶται) and secondary (δεύτεραι). "Substance," says he (chap. 5), "which is properly, primarily and especially so called, is that which is neither a predicate of a subject nor inherent in a subject; for example, a particular man, or a particular horse. Secondary substances so called are the species in which are the primarily called substances, and the genera of these species: for example, a particular man is in a species, man, the genus of which is animal: these then are called secondary substances, man and animal." Having made these subdivisions of substance, he thereupon reduces secondary substances and all the rest of the categories to belongings of individual or primary substances. "All other things," says he, "are either predicates of primary substances as subjects" (καθ' ὑποκειμένων τῶν πρώτων οὐσιῶν) "or inherent in them as subjects" (ἐν ὑποκειμέναις αὐταῖς). He explains that species and genus are predicates of, and that other categories (*e.g.* the quality of colour) are inherent in, some individual substance such as a particular man. Then follows his conclusion: "without primary substances it is impossible for anything to be" (μὴ οὐσῶν οὖν τῶν πρώτων οὐσιῶν ἀδύνατον τῶν ἄλλων τι εἶναι. *Cat.* 5, 2 b 5–6).

Things are individual substances, without which there is nothing—this is the fundamental point of Aristotelianism, as against Platonism, of which the fundamental point is that things are universal forms without which there becomes nothing. The world, according to Aristotle, consists of substances, each of which is a separate individual, this man, this horse, this animal, this plant, this earth, this water, this air, this fire; in the heavens that moon, that sun, those stars; above all, God. On the other hand, a universal species or genus of substances is a predicate which, as well as everything else in all the other categories, always belongs to some individual substance or other as subject, and has no separate being. In full, then, a substance is a separate individual, having universals, and things in all other categories, inseparably belonging to it. The individual substance Socrates, for example, is a man and an animal (οὐσία), tall, (ποσόν), white (ποιόν), a husband (πρός τι), in the market (ποῦ), yesterday (πότε), sitting (κεῖσθαι), armed (ἔχειν), talking (ποιεῖν), listening (πάσχειν). Aristotelianism is this philosophy of substantial things.

The doctrine that all things are substances which are separate individuals, stated in the *Categories*, is expanded in the *Metaphysics*. Both works arrive at it from the classification of categories, which is the same in both; except that in the former the categories are treated rather as a logical classification of names signifying things, in the latter rather as a metaphysical classification of things. In neither, however, are they a grammatical classification of words by their structure; and in neither are they a psychological classification of notions or general conceptions (νοήματα), such as they afterwards became in Kant's *Critique* and the post-Kantian idealism. Moreover, even in the *Categories* as names signifying distinct things they imply distinct things; and hence the *Categories*, as well as the *Metaphysics*, draws the metaphysical conclusion that individual substances are the things without which there is nothing else, and thereby lays the positive foundation of the philosophy running through all the extant Aristotelian writings.

Again, according to both works, an individual substance is a

subject, a universal its predicate; and they have in common the Aristotelian metaphysics, which differs greatly from the modern logic of subject and predicate. Subject (ὑποκείμενον) originally meant a real thing which is the basis of something, and was used by Aristotle both for a thing to which something belongs and for a name of which another is asserted: accordingly "predicate" (κατηγορούμενον) came with him to mean something really belonging (ὑπάρχον) to a substance as real subject, as well as a name capable of being asserted of a name as a nominal subject. In other words, to him subject meant real as well as nominal subject, and predicate meant real as well as nominal predicate; whereas modern logic has gradually reduced both to the nominal terms of a proposition. Accordingly, when he said that a substance is a subject, he meant a real subject; and when he said that a universal species or genus is a predicate, he meant that it is a real predicate belonging to a real subject, which is always some individual substance of the kind. It follows that Aristotelianism in the *Categories* and in the *Metaphysics* is a realism both of individuals and of universals; of individual substances as real subjects, and of universals as real predicates.

Lastly, the two works agree in reducing the *Categories* to substance and its belongings (ὑπάρχοντα). According to both, it is always some substance, such as Socrates, which is quantitative, qualitative, relative, somewhere, some time, placed, conditioned, active, passive; so that all things in all other categories are attributes which are belongings of substances. There are therefore two kinds of belongings, universals and attributes; and in both cases belonging in the sense of having no being but the being of the substance.

In brief then the common ground of the *Categories* and the *Metaphysics* is the fundamental position that all things are substances having belonging to them universals and attributes, which have no separate being as Plato falsely supposed.

This essential agreement suffices to show that the *Categories* and the *Metaphysics* are the result of one mind. Nevertheless, there is a deep difference between them in detail, which may be expressed by saying that the *Categories* is nearer to Platonism. We have seen how anxious Aristotle was to be considered one of the Platonists, how reluctant he was to depart from Plato's hypothesis of forms, and how, in denying the separability, he retained the Platonic belief in the reality and even in the unity of the universal. We have now to see that, in writing the *Categories*, on the one hand he carried his differences from his master further than he had done in his early criticisms by insisting that individual substances are not only real, but are the very things which sustain the universal; but on the other hand, he clung to further relics of the Platonic theory, and it is those which differentiate the *Categories* and the *Metaphysics*.

In the first place, in the *Categories* the belonging of things in other categories to individual substances in the first category is not so well developed. A distinction (chap. 2) is drawn between things which are predicates of a subject (καθ' ὑποκειμένου) and things which inhere in a subject (ἐν ὑποκειμένῳ); and, while universals are called predicates of a subject, things in a subordinate category, *i.e.* attributes such as colour (χρῶμα) in the qualitative, are said to inhere in a subject. It is true that the work gives only a negative definition of the inherent, namely, that it does not inhere as a part and cannot exist apart from that in which it inheres (1 a 24-25), and it admits that what is inherent may sometimes also be a predicate (chap. 5, 2 a 27-34). The commentators explain this to mean that an attribute as individual is inherent, as universal is a predicate. But even so the *Categories* concludes that everything is either a predicate of, or inherent in, a substance; and the view that this colour belongs to this substance only in the sense of being in it, not of it, leaves the impression that, like a Platonic form, it is an entity rather in than of an individual substance, though even in the *Categories* Aristotle is careful to deny its separability. The hypothesis of inherence gives an inadequate account of the dependence of an attribute on a substance, and is a kind of half-way house between separation and predication.

On the other hand, in the *Metaphysics*, the distinction between inherence and predication disappears; and what is more, the relation of an attribute to a substance is regarded as so close that an attribute is merely the substance modified. "The thing itself and the thing affected," says Aristotle, "are in a way the same; *e.g.* Socrates and Socrates musical" (*Met.* Δ 29, 1024 b 30-31). Consequently, all attributes, as well as universals, belong as predicates of individual substances as subjects, according to the *Metaphysics*, and also according to the most authoritative works of Aristotle, such as the *Posterior Analytics*, where (cf. i. 4, 22) an attribute (συμβεβηκός) is said to be only by being the substance possessing it, and any separation of an attribute from a substance is held to be entirely a work of human abstraction (ἀφαίρεσις). At this point, Plato and Aristotle have become very far apart: to the master beauty appears to be an independent thing, and really separate, to the pupil at his best only something beautiful, an attribute which is only mentally separable from an individual substance. The first difference then between the *Categories* and the *Metaphysics* is in the nature of an attribute; and the theory of inherence in the *Categories* is nearer to Plato and more rudimentary than the theory of predication in the *Metaphysics*. The second difference is still nearer to Plato and more rudimentary, and is in the nature of substance. For though both works rest on the reality of individual substances, the *Categories* (chap. 5) admits that universal species and genera can be called substances, whereas the *Metaphysics* (Z 13) denies that a universal can be a substance at all.

It is evident that in the category of substance, as Aristotle perceived, substance is predicate of substance, *e.g.* Socrates (οὐσία) is a man (οὐσία), and an animal (οὐσία). The question then arises, what sort of substance can be predicate; and in the *Categories* Aristotle gave an answer, which would have been impossible, if he had not, under Plato's influence, accepted both the unity and the substantiality of the universal. What he said in consequence was that the substance in the predicate is not an individual substance, *e.g.* this man or this animal, because such a primary substance is not a predicate; but that the species man or the genus animal is the substance which is the predicate of Socrates the subject (*Cat.* 5, 3 a 36 seq.). Finding then that substances are real predicates, and supposing that in that case they must be species or genera, he could not avoid the conclusion that some substances are species or genera, which were therefore called by him "secondary substances," and by his Latin followers *substantiae universales*. It is true that this conclusion gave him some misgivings, because he recognized that it is a characteristic of a substance to signify an individual (τόδε τι), which a species or a genus does not signify (*ib.* 5, 3 b 10-21). Nevertheless, in the *Categories*, he did not venture to deny that in the category of substance a universal species (*e.g.* man), or genus (*e.g.* animal), is itself a substance. On the other hand, in the *Metaphysics* (Z 13), he distinctly denies that any universal can be a substance, on the ground that a substance is a subject, whereas a universal is a predicate and a belonging of a subject, from which it follows as he says that no universal is a substance, and no substance universal. Here again the *Categories* forms a kind of transition from Platonism to the *Metaphysics* which is the reverse: to call universals "secondary substances" is half way between Plato's calling them the only substances and Aristotle's denial in the *Metaphysics* that they are substances at all.

What conclusion are we to draw from these differences between the *Categories* and the *Metaphysics*? The only logical conclusion is that the *Categories*, being nearer to Plato on the nature of attributes, and still nearer on the relation of universals to substances, is earlier than the *Metaphysics*. There are difficulties no doubt in drawing this conclusion; because the *Metaphysics*, though it denies that universals can be substances, and does not allow species and genera to be called "secondary substances," nevertheless falls itself into calling a universal essence (τὸ τί ἦν εἶναι) a substance—and that too in the very book where it is proved that no universal can be a substance. But this lapse only shows how powerful a dominion Plato exercised over Aristotle's soul to the last; for it arises out of the pupil still accepting from his master the unity of the universal though now applying it, not to classes, but to essences. The argument about essences in the *Metaphysics* is as follows:—Since a separate individual, *e.g.* Socrates, is a substance, and he is essentially a rational animal, then his essence, being what he is, is a substance; for we cannot affirm that Socrates is a substance and then deny that this rational animal is a substance (*Met.* Z 3). Now, according to the unity of a universal asserted by Plato and accepted by Aristotle, the universal essence of species, being one and the same for all individuals of the kind, is the same as the essence of each individual: *e.g.* the rational animal in the human species and in Socrates is one and the same; "for the essence is indivisible" (ἄτομον γὰρ τὸ εἶδος, *Met.* Z 8, 1034 *a* 8). It follows that we must call this selfsame essence, at once individual and universal, substance—a conclusion, however, which Aristotle never drew in so many words, though he continued always to call essence substance, and definition a knowledge of substance.

There is therefore a history of Aristotle's metaphysical views, corresponding to his gradual method of composition. It is as follows:—

(1) Negative rejection of Plato's hypothesis of forms and formal numbers, and reduction of forms to the common in the early dialogue περὶ φιλοσοφίας and in the early work περὶ ἰδεῶν.

(2) Positive assertion of the doctrine that things are individual substances in the *Categories*, but with the admission that attributes sometimes inhere in substance without being predicates of it, and that universal species and genera are "secondary substances."

(3) Expansion of the doctrine that things are individual substances in the *Metaphysics*, coupled with the reduction of all attributes to predicates, and the direct denial of universal substances; but nevertheless calling the universal essence of a species of substances substance, because the individual essence of an individual substance really is that substance, and the universal essence of the whole species is supposed to be indivisible and therefore identical with the individual essence of any individual of the species.

2. The *De Interpretatione*.—Another example of Aristotle's gradual desertion of Plato is exhibited by the *De Interpretatione* as compared with the *Prior Analytics*, and it shows another gradual history in Aristotle's philosophy, namely, the development of subject, predicate and copula, in his logic.

The short discourse on the expression of thought by language (περὶ Ἑρμηνείας, *De Interpretatione*) is based on the Platonic

division of the sentence (λόγος) into noun and verb (ὄνομα and ῥῆμα). Its point is to separate the enunciative sentence, or that in which there is truth or falsity, from other sentences; and then, dismissing the rest to rhetoric or poetry (where we should say grammar), to discuss the enunciative sentence (ἀποφαντικὸς λόγος), or enunciation (ἀποφανσίς), or what we should call the proposition (*De Int.* chap. 4). Here Aristotle, starting from the previous grammar of sentences in general, proceeded, for the first time in philosophical literature, to disengage the logic of the proposition, or that sentence which can alone be true or false, whereby it alone enters into reasoning. But in spite of this great logical achievement, he continued throughout the discourse to accept Plato's grammatical analysis of all sentences into noun and verb, which indeed applies to the proposition as a sentence but does not give its particular elements. The first part of the work confines itself strictly to noun and verb, or the form of proposition called *secundi adjacentis*. Afterwards (chap. 10) proceeding to the opposition of propositions, he adds the form called *tertii adjacentis*, in a passage which is the first appearance, or rather adumbration, of the verb of being as a copula. In the form *secundi adjacentis* we only get oppositions, such as the following:—

man is—man is not
not-man is—not-man is not

In the form *tertii adjacentis* the oppositions, becoming more complex, are doubled, as follows:—

man is just—man is not just
man is non-just—man is not non-just
not-man is just—not-man is not just
not-man is non-just—not-man is not non-just.

The words introducing this form (ὅταν δὲ τὸ ἔστι τρίτον προσκατηγορῆται, chap. 10, 19 b 19), which are the origin of the phrase *tertii adjacentis*, disengage the verb of being (ἔστι) partially but not entirely, because they still treat it as an extra part of the predicate, and not as a distinct copula. Nor does the work get further than the analysis of some propositions into noun and verb with "is" added to the predicated verb; an analysis, however, which was a great logical discovery and led Aristotle further to the remark that "is" does not mean "exists"; *e.g.* "Homer is a poet" does not mean "Homer exists" (*De Int.* chap. 11).

How then did Aristotle get further in the logical analysis of the proposition? Not in the *De Interpretatione*, but in the *Prior Analytics*. The first adumbration was forced upon him in the former work by his theory of opposition; the complete appearance in the latter work by his theory of syllogism. In analysing the syllogism, he first says that a premiss is an affirmative or negative sentence, and then that a term is that into which a premiss is dissolved, *i.e.* predicate and subject, combined or divided by being and not being (*Pr. An.* i. 1). Here, for the first time in logical literature, subject and predicate suddenly appear as terms, or extremes, with the verb of being (τὸ εἶναι) or not being (τὸ μὴ εἶναι) completely disengaged from both, but connecting them as a copula. Why here? Because the crossing of terms in a syllogism requires it. In the syllogism "Every man is mortal and Socrates is a man," if in the minor premiss the copula "is" were not disengaged from the predicate "man," there would not be one middle term "man" in the two premisses. It is not necessary in every proposition, but it is necessary in the arrangement of a syllogism, to extricate the terms of its propositions from the copula; *e.g.* mortal—man—Socrates.

This important difference between the *De Interpretatione* and the *Prior Analytics* can only be explained by supposing that the former is the earlier treatise. It is nearer to Plato's analysis of the sentence, and no logician would have gone back to it, after the *Prior Analytics*. It is not spurious, as some have supposed, nor later than the *De Anima*, as Zeller thought, but Aristotle in an earlier frame of mind.

Moreover we can make a history of Aristotle's thought and gradual composition thus:

(1) Earlier acceptance in the *De Interpretatione* of Plato's grammatical analysis of the sentence into noun and verb (*secundi adjacentis*) but gradually disengaging the proposition, and afterwards introducing the verb of being as a third thing added (*tertium adjacens*) to the predicated verb, for the purpose of opposition.

(2) Later logical analysis in the *Prior Analytics* of the proposition as premiss into subject, predicate and copula, for the purpose of syllogism; but without insisting that the original form is illogical.

3. The *Eudemian Ethics* and *Magna Moralia* in relation to the *Nicomachean Ethics*.—Under the name of Aristotle, three treatises on the good of man have come down to us, Ἠθικὰ Νικομάχεια (πρὸς Νικόμαχον, Porphyry), Ἠθικὰ Εὐδήμια (πρὸς Εὔδημον, Porphyry), and Ἠθικὰ μεγάλα; so like one another that there seems no tenable hypothesis except that they are the manuscript writings of one man. Nevertheless, the most usual hypothesis is that, while the *Nicomachean Ethics* (*E.N.*) was written by Aristotle to Nicomachus, the *Eudemian* (*E.E.*) was written, not to, but by, Eudemus, and the *Magna Moralia* (*M.M.*) was written by some early disciple before the introduction of Stoic and Academic elements into the Peripatetic school. The question is further complicated by the fact that three Nicomachean books (*E.N.* v.–vii.) and three Eudemian (*E. E.* Δ–Ζ) are common to the two treatises, and by the consequent question whether, on the hypothesis of different authorship, the common books, as we may style them, were written for the *Nicomachean* by Aristotle, or for the *Eudemian Ethics* by Eudemus, or some by one and some by the other author. Against the "Chorizontes," who have advanced various hypotheses on all these points without convincing one another, it may be objected that they have not considered Aristotle's method of gradual and simultaneous composition of manuscripts within the Peripatetic school. We have to remember the traces of his separate discourses, and his own double versions; and that, as in ancient times Simplicius, who had two versions of the *Physics*, Book vii., suggested that both were early versions of Book viii. on the same subject, so in modern times Torstrik, having discovered that there were two versions of the *De Anima*, Book ii., suggested that both were by Aristotle. Above all, we must consider our present point that Platonic influence is a sign of earliness in an Aristotelian work; and generally, the same man may both think and write differently at different times, especially if, like Aristotle, he has been a prolific author.

These considerations make it probable that the author of all three treatises was Aristotle himself; while the analysis of the treatises favours the hypothesis that he wrote the *Eudemian Ethics* and the *Magna Moralia* more or less together as the rudimentary first drafts of the mature *Nicomachean Ethics*.

As the Platonic philosophy was primarily moral, and its metaphysics a theory of the moral order of the universe, Aristotle from the first must have mastered the Platonic ethics. At first he adopted the somewhat ascetic views of his master about soul and body, and about goods of body and estate; but before Plato's death he had rejected the hypothesis of forms, formal numbers and the form of the good identified with the one, by which Plato tried to explain moral phenomena; while his studies and teaching on rhetoric and poetry soon began to make him take a more tolerant view than Plato did of men's passions. Throughout his whole subsequent life, however, he retained the fundamental doctrine, which he had learnt from Plato, and Plato from Socrates, that virtue is essential to happiness. Twice over this tenet, which makes Socrates, Plato and Aristotle one ethical school, inspired Aristotle to attempt poetry: first, in the Elegy to Eudemus of Cyprus, in which, referring to either Socrates or Plato, he praises the man who first showed clearly that a good and happy man are the same (*Fragm.* 673); and secondly, in the Hymn in memory of Hermias, beginning "Virtue, difficult to the human race, noblest pursuit in life" (*ib.* 675). Moreover, the successors of Plato in the Academy, Speusippus and Xenocrates, showed the same belief in the essentiality of virtue. The question which divided them was what the good is. Speusippus took the ascetic view that the good is a perfect condition of neutrality between two contrary evils, pain and pleasure. Xenocrates took the tolerant view that it is the possession of appropriate

virtue and noble actions, requiring as conditions bodily and external goods. Aristotle was opposed to Speusippus, and nearly agreed with Xenocrates. According to him, the good is activity of soul in accordance with virtue in a mature life, requiring as conditions bodily and external goods of fortune; and virtue is a mean state of the passions. It is probable that when, after Plato's death and the accession of Speusippus in 347, Aristotle with Xenocrates left Athens to visit his former pupil Hermias, the three discussed this moderate system of Ethics in which the two philosophers nearly agreed. At any rate, it was adopted in each of the three moral treatises which pass under the name of Aristotle.

The three treatises are in very close agreement throughout, and in the following details. The good of Ethics is human good; and human good is happiness, not the universal good or form of the good to which Plato subordinated human happiness. Happiness is activity of soul according to virtue in a mature life: it requires other goods only as conditions. The soul is partly irrational, partly rational; and therefore there are two kinds of virtue. Moral virtue, which is that of the irrational desires so far as they are obedient to reason, is a purposive habit in the mean. The motive of the moral virtues is the honourable (*τὸ καλόν, honestum*). As the rational is either deliberative or scientific, either practical or speculative intellect, there are two virtues of the intellect—prudence of the deliberative or practical, and wisdom of the scientific or speculative, intellect. The right reason by which moral virtue is determined is prudence, which is determined in its turn by wisdom. Pleasure is a physical state, and is not a generation in the body supplying a defect and establishing a natural condition, but an activity of a natural condition of the soul. It should be specially noted that this doctrine like the rest is common to the three treatises: in Book vii. of the *Nicomachean*, which is Z of the *Eudemian*, pleasure is defined as *ἐνέργεια τῆς κατὰ φύσιν ἕξεως ἀνεμπόδιστος* (chap. 12, 1153 a 14-15); and in the *Magna Moralia* as *ἡ κίνησις αὐτοῦ καὶ ἡ ἐνέργεια* (ii. 7, 1204 b 28; cf. 1205 b 20-28). It is plain from the context that in the former definition "the natural condition" (*ἡ κατὰ φύσιν ἕξις*) refers to the soul which, while the body is regenerated, remains unimpaired (cf. 1152 b 35 seq., 1154 b 15 seq.); and in the latter definition the thing (*αὐτοῦ*), whose "motion, that is activity" is spoken of, is the part of the soul with which we feel pleased.

Down then to their common definition of pleasure as activity the three treatises present a harmonious system of morals, consistently with one another, and with the general philosophy of Aristotle. In particular, the theory that pleasure is activity (*ἐνέργεια*) is the theory of two of his most authoritative works. In the *De Anima* (iii. 7, 431 a 10-12), being pleased and pained are defined by him as acting *τὸ* (*ἐνεργεῖν*) by a sensitive mean in relation to good or evil as such. In the *Metaphysics* (Λ 7, 1072 b 16), in discussing the occupation of God, he says "his pleasure is activity," or "his activity is pleasure," according to a difference of readings which makes no difference to the identification of pleasure and activity (*ἐνέργεια*). As then we find this identification of pleasure with activity in the *Metaphysics* and in the *De Anima*, as well as in the *Nicomachean Ethics*, the *Eudemian Ethics* and the *Magna Moralia*, the only logical conclusion, from which there is no escape, is that, so far as the treatment of pleasure goes, any Aristotelian treatise which defines it as activity is genuine. There is no reason for doubting that the *Nicomachean Ethics* to the end of Book vii., the *Eudemian Ethics* to the end of Book Z, and the *Magna Moralia* as far as Book ii. chap. 7, were all three written by Aristotle.

Why then doubt at all? It is because the *Nicomachean Ethics* contains a second discourse on pleasure (x. 1-5), in which the author, while agreeing with the previous treatment of the subject that pleasure is not a bodily generation, even when accompanied by it, but something psychical, nevertheless defines it (x. 4, 1174 b 31-33) not as an activity, but as a supervening end (*ἐπιγιγνόμενόν τι τέλος*) perfecting an activity (*τελειοῖ τὴν ἐνέργειαν*). He allows indeed that activity and pleasure are very closely related; that a pleasure of sense or thought perfects an act of sensation or of thinking, depends on it, and is so inseparably conjoined with it as to raise a doubt whether pleasure is end of life or life end of pleasure, and even whether the activity is the same as the pleasure. But he disposes of this doubt in a very emphatic and significant manner. "Pleasure," says he, "does not seem to be thinking or perceiving; for it is absurd: but on account of not being separated from them, it appears to some persons to be the same." Now it is not likely that Aristotle either, after having so often identified pleasure with activity, would say that the identification is absurd though it appears true to some persons, of whom he would in that case be one, or, having once disengaged the pleasure of perceiving and thinking from the acts of perceiving and thinking, would go backwards and confuse them. It is more likely that Aristotle identified pleasure with activity in the *De Anima*, the *Metaphysics* and the three moral treatises, as we have seen; but that afterwards some subsequent Peripatetic, considering that the pleasure of perceiving or thinking is not the same as perceiving or thinking, declared the previous identification of pleasure with activity absurd. At any rate, if we are to choose, it is the identification that, is Aristotle's, and the distinction not Aristotle's. Moreover, the distinction between activity and pleasure in the tenth book is really fatal to the consistency of the whole *Nicomachean Ethics*, which started in the first book with the identification of happiness and virtuous activity. For if the pleasure of virtuous activity is a supervening end beyond the activity, it becomes a supervening end beyond the happiness of virtuous activity, which thus ceases to be the final end. Nevertheless, the distinction between activity and pleasure is true. Some unknown Peripatetic detected a flaw in the *Nicomachean Ethics* when he said that pleasure is a supervening end beyond activity, and, if he had gone on to add that happiness is also a supervening end beyond the virtuous activities which are necessary to produce it, he would have destroyed the foundation of his own founder's Ethics.

It is further remarkable that the *Nicomachean Ethics* proceeds to a different conclusion. After the intrusion of this second discourse on pleasure, it goes on (*E.N.* x. 6-fin.) to the famous theory that the highest happiness is the speculative life of intellect or wisdom as divine, but that happiness as human also includes the practical life of combining prudence and moral virtue; and that, while both lives need external goods as necessaries, the practical life also requires them as instruments of moral action. The treatise concludes with the means of making men virtuous; contending that virtue requires habituation, habituation law, law legislative art, and legislative art politics: Ethics thus passes into Politics. The *Eudemian Ethics* proceeds to its conclusion (*E.E.* H 13-15) differently, with the consideration of (1) good fortune (*εὐτυχία*), and (2) gentlemanliness (*καλοκἀγαθία*). Good fortune it divides into two kinds, both irrational; one divine, according to impulse, and more continuous; the other contrary to impulse and not continuous. Gentlemanliness it regards as perfect virtue, containing all particular virtues, and all goods for the sake of the honourable. Finally, it concludes with the limit (*ὅρος*) of goods. First it finds the limit of goods of fortune in that desire and possession of them which will conduce to the contemplation of God, whereas that which prevents the service and contemplation of God is bad. Then it adds that the best limit of the soul is as little as possible to perceive the other part of the soul (*i.e.* desire). Finally, the treatise concludes with saying that the limit of gentlemanliness has thus been stated, meaning that its limit is the service and contemplation of God and the control of desire by reason. The *Magna Moralia* (*M.M.* ii. 8-10) on these points is unlike the *Nicomachean*, and like the *Eudemian Ethics* in discussing good fortune and gentlemanliness, but it discusses them in a more worldly way. On good fortune (ii. 8), after recognizing the necessity of external goods to happiness, it denies that fortune is due to divine grace, and simply defines it as irrational nature (*ἄλογος φύσις*). Gentlemanliness (ii. 9) it regards as perfect virtue, and defines the gentleman as the man to whom really good things are good and really honourable things honourable. It then adds (ii. 10) that acting according to right reason is when the irrational part of the soul does not hinder the rational part of intellect from doing its work. Thereupon it proceeds to a discourse on friendship, which in the *Nicomachean* and *Eudemian Ethics* is discussed in an earlier position, but breaks off unfinished.

On the whole, the three moral treatises proceed on very similar lines down to the common identification of pleasure with activity, and then diverge. From this point the *Eudemian Ethics* and the *Magna Moralia* become more like one another than like the *Nicomachean Ethics*. They also become less like one another than before: for the treatment of good fortune, gentlemanliness, and their limit is more theological in the *Eudemian Ethics* than in the *Magna Moralia*.

How are the resemblances and differences of the three to be explained? By Aristotle's gradual method of composition. All three are great works, contributing to the origin of the independent science of Ethics. But the *Eudemian Ethics* and the *Magna Moralia* are more rudimentary than the *Nicomachean Ethics*, which as it were seems to absorb them except in the conclusion. They are, in short, neither independent works, nor mere commentaries, but Aristotle's first drafts of his Ethics.

In the *Ethics to Eudemus*, as Porphyry properly called the *Eudemian Ethics*, Aristotle in the first four books successively investigates happiness, virtue, the voluntary and the particular moral virtues, in the same order and in the same letter and spirit as in his *Ethics to Nicomachus*. But the investigations are never so good. They are all such rudiments as Aristotle might well polish into the more developed expositions in the first four books of the *Nicomachean Ethics*. On the other hand, nobody would have gone back afterwards on his masterly treatment of happiness, in the first book, or of virtue in the second, or of the voluntary in the third, or of the particular virtues in the third and fourth, to write the sketchy accounts of the *Eudemian Ethics*.

Again, these sketches are rough preparations for the subsequent books common to the two treatises. It is true, as Dr Henry Jackson has pointed out, though with some exaggeration, that the Eudemian agrees in detail rather better than the Nicomachean treatment of the voluntary with the subsequent discussion of injury (*E.E.* Δ = *E.N.* v. 8); and, as Th. H. Fritzsche remarks, the distinction between politics, and economics, and prudence in the *Eudemian Ethics* (A 8) is a closer anticipation of the subsequent triple distinction of

practical science (*E.E.* Ε = *E.N.* vi 8). On the other hand, there are still more fundamental points in which the first three books of the *Eudemian Ethics* are a very inadequate preparation for the common books. Notably its treatment of prudence (φρόνησις) is a chaos. At first, prudence appears as the operation of the philosophical life and connected with the speculative philosophy of Anaxagoras (*E.E.* A 1-5): then it is brought into connexion with the practical philosophy of Socrates (*ib.* 5) and co-ordinated with politics and economics (*ib.* 8): then it is intruded into the diagram of moral virtues as a mean between villainy (πανουργία) and simplicity (εὐήθεια) (*E.E.* B 33, 1221 a 12): finally, a distinction between virtue by nature and virtue with prudence (μετὰ φρονήσεως) is promised (*E.E.* Τ 7, 1234 a 4). In addition to all this confusion of speculative and practical knowledge, prudence is absent when it ought to be present; *e.g.* from the division of virtues into moral and intellectual (*E.E.* B 1, 1220 a 4-13), and from the definition of moral virtue (*ib.* 5, 10); while, in a passage (B 11) anticipating the subsequent discussion of the relation between prudence and moral virtue (*E.E.* Ε = *E.N.* vi. 12-13), it is stated that in purpose the end is made right by moral virtue, the means by another power, reason, without this right reason being stated to be prudence. After this, it can never be said that the earlier books of the *Eudemian Ethics* are so good a preparation as those of the *Nicomachean Ethics* for the distinction between prudence (φρόνησις) and wisdom (σοφία), which is the main point of the common books, and one of Aristotle's main points against Plato's philosophy.

Curiously enough, although little is made of it, this distinction, absent from the earlier books, is present in the final book Η of the *Eudemian Ethics* (cf. 1246 b 4 seq., 1248 a 35, 1249 b 14); and probably therefore this part was a separate discourse. Meanwhile, however, the truth about the *Eudemian Ethics* in general is that it was an earlier rudimentary sketch written by Aristotle, when he was still struggling, without quite succeeding, to get over Plato's view that there is one philosophical knowledge of universal good, by which not only the dialectician and mathematician must explain the being and becoming of the world, but also the individual and the statesman guide the life of man. Indeed, the final proof that the *Eudemian Ethics* is earlier than the *Nicomachean* is the very fact that it is more under Platonic influence. In the first place, the reason why the account of prudence begins by confusing the speculative with the practical is that the *Eudemian Ethics* starts from Plato's *Philebus*, where, without differentiating speculative and practical knowledge, Plato asks how far good is prudence (φρόνησις), how far pleasure (ἡδονή); and in the *Eudemian Ethics* Aristotle asks the same question, adding virtue (ἀρετή) in order to correct the Socratic confusion of virtue with prudence. Secondly, the *Eudemian Ethics*, while not agreeing with Plato's *Republic* that the just can be happy by justice alone, does not assign to the external goods of good fortune (εὐτυχία) the prominence accorded to them in the *Nicomachean Ethics* as the necessary conditions of all virtue, and the instruments of moral virtue. Thirdly, the emphasis of the *Eudemian Ethics* on the perfect virtue of gentlemanliness (καλοκἀγαθία) is a decidedly old-fashioned trait, which descended to Aristotle from the Greek notion of a gentleman who does his duty to his state (cf. Herodotus i. 30, Thucydides iv. 40) and to his God (Xenophon, *Symp.* iv. 49) through Plato, who in the *Gorgias* (470 Ε) says that the gentleman is happy, and in the *Republic* (489 Ε) imputes to him the love of truth essential to philosophy. Moreover, when Plato goes on (*ib.* 505 Β) to identify the form of good, without which nothing is good, with the gentlemanly thing (καλὸν καὶ ἀγαθὸν), without which any possession is worthless, he inspired into the author of the *Eudemian Ethics* the very limit (ὅρος) of good fortune and gentlemanliness with which it concludes, only without Plato's elevation of the good into the form of the good. In the *Nicomachean Ethics* the old notion, we gladly see, survives (cf. i. 8): virtuous actions are gentlemanly actions, and happiness accordingly is being at our best and noblest and pleasantest (ἄριστον καὶ κάλλιστον καὶ ἥδιστον). But gentlemanliness is no longer called perfect virtue, as in the *Eudemian Ethics*: its place has been taken by justice, which is perfect virtue to one's neighbour, by prudence which unites all the moral virtues, and by wisdom which is the highest virtue. Accordingly, in the end the old ideal of gentlemanliness is displaced by the new ideal of the speculative and practical life.

Lastly. the *Eudemian Ethics* derives from Platonism a strong theological bias, especially in its conclusion (Η 14-15). The opposition of divine good fortune according to impulse to that which is contrary to impulse reminds us of Plato's point in the *Phaedrus* that there is a divine as well as a diseased madness. The determination of the limit of good fortune and of gentlemanliness by looking to the ruler, God, who governs as the end for which prudence gives its orders, and the conclusion that the best limit is the most conducive to the service and contemplation of God, presents the Deity and man's relation to him as a final and objective standard more definitely in the *Eudemian* than in the *Nicomachean Ethics*, which only goes so far as to say that man's highest end is the speculative wisdom which is divine, like God, dearest to God.

Because, then, it is very like, but more rudimentary and more Platonic, we conclude that the *Eudemian* is an earlier draft of the *Nicomachean Ethics*, written by Aristotle when he was still in process of transition from Plato's ethics to his own.

The *Magna Moralia* contains similar evidence of being earlier than the *Nicomachean Ethics*. It treats the same subjects, but always in a more rudimentary manner; and its remarks are always such as would precede rather than follow the masterly expositions of the *Nicomachean Ethics*. This inferiority applies also to its treatment not only of the early part (i. 1-33 corresponding to *E.N.* i.-iv.), but also of the middle part (i. 34–ii. 7 corresponding to *E.N.* v.-vii. = *E.E.* Δ–Ζ). In dealing with justice, it does not make it clear, as the *Nicomachean Ethics* (Book v.) does, that even universal justice is virtue towards another (*M.M.* i. 34, 1193 b 1-15), and it omits altogether the division into distributive and corrective justice. In dealing with what the *Nicomachean Ethics* (Book vi.) calls intellectual virtues, but the *Magna Moralia* (i. 5, 35) virtues of the rational part of the soul, and right reason, it distinguishes (i. 35, 1196 b 34-36) science, prudence, intelligence, wisdom, apprehension (ὑπόληψις), in a rough manner very inferior to the classification of science, art, prudence, intelligence, wisdom, all of which are co-ordinate states of attaining truth, in the *Nicomachean Ethics* (vi. 3). It distinguishes prudence (φρόνησις) and wisdom (σοφία) as the respective virtues of deliberative and scientific reason; and on the whole its account of prudence (cf. *M.M.* i. 5) is more consistent than that of the *Eudemian Ethics*. In these points it is a better preparation for the *Nicomachean Ethics*. But it falls into the confusion of first saying that praise is for moral virtues, and not for virtues of the reason, whether prudence or wisdom (*M.M.* i. 5, 1185 b 8-12), and afterwards arguing that prudence is a virtue, precisely because it is praised (i. 35, 1197 a 16-18). In dealing with continence and incontinence, the same doubts and solutions occur as in the *Nicomachean Ethics* (Book vii. = *E.E.* Ζ), but sometimes confusing doubts and solutions together, instead of first proposing all the doubts and then supplying the solutions as in the *Nicomachean Ethics*. Such rudimentary and imperfect sketches would be quite excusable in a first draft, but inexcusable and incredible after the *Nicomachean Ethics* had been written.

It has another characteristic which points to its being an early work of Aristotle, when he was still under the influence of Plato's style; namely its approximation to dialogue. It asks direct questions (*e.g.* διὰ τί; *M.M.* i. 1 repeatedly, 12; ii. 6, 7), incorporates direct statements of others (*e.g.* φησί, i. 12, 13; ii. 3, 6, 7), alternates direct objections and answers (i. 34), and introduces conversations between the author and others, expressed interrogatively, indicatively and even imperatively (ἀλλ' ἐρεῖ μοι, τὰ ποῖα διασάφησον ὑγιεινὰ ἐστιν. i. 35, 1196 b 10; cf. ii. 10, 1208 a 20-22). The whole treatise inclines to run into dialogue. It is also Platonic, like the *Endemian Ethics*, in making little of external goods in the account of good fortune (ii. 8), and in emphasizing the perfect virtue of gentlemanliness (ii. 9). Indeed, in some respects it is more like the *Eudemian*, though in the main more like the *Nicomachean Ethics*. In the first book, it has the Eudemian distinction between prudence, virtue and pleasure (i. 3, 1184 b 5-6); but does not make so much of it as the distinction between prudence and wisdom blurred in the *Eudemian* but defined in the *Nicomachean Ethics*. In the second book, it runs parallel to the *Eudemian Ethics* in placing good fortune and gentlemanliness (ii. 8-9), where the *Nicomachean Ethics* places the speculative and the practical life; but it omits the theological element by denying that good fortune is divine grace, and by submitting gentlemanliness to no standard but that of right reason, when the irrational part of the soul does not hinder the rational part, or intellect (νοῦς), from doing its work.

Because, then, the *Magna Moralia* is very like the *Nicomachean Ethics*, but more rudimentary, nearer to the Platonic dialogues in style and to a less degree in matter, and also like the *Eudemian Ethics*, we conclude that it is also like that treatise in having been written as an earlier draft of the *Nicomachean Ethics* by Aristotle himself.

The hypothesis that the *Eudemian Ethics*, and by consequence the *Magna Moralia*, are later than Aristotle has arisen from a simple misconception, continued in a Scholium attributed to Aspasius, who lived in the 2nd century A.D. Nicomachean means "addressed to Nicomachus," and Eudemian "addressed to Eudemus"; but, as Cicero thought that the *Nicomachean Ethics* was written by Nicomachus, so the author of the Scholium thought that the *Eudemian Ethics*, at least so far as the first account of pleasure goes, was written by Eudemus. He only thought so, however, because Aristotle could not have written both accounts of pleasure; and, taking for granted that Aristotle had written the second account of pleasure in the *Nicomachean Ethics* (Book x.), he concluded that the first account (Book vii.) was not the work of Aristotle, but of Eudemus (*Comm. in Ar.* (Berlin) xix. p. 151). We have seen reason to reverse this argument: Aristotle did write the first account in Book vii., because it contains his usual theory; and, if we must choose, he did not write the second account in Book x. In this way, too, we get a historical development of the theory of pleasure: Plato and Speusippus said it is generation (cf. Plato's *Philebus*): Aristotle said it is psychical activity sometimes requiring bodily generation, sometimes not (*E.N.* vii. = *E.E.Z*): Aristotle, or some Aristotelian, afterwards said that it is a supervening end completing an activity (*E.N.* x.). Secondly, some modern commentators, starting from the false conclusion that the definition of pleasure as activity (*E.N.* vii. = *E.E.Z*) is by Eudemus, and supposing without proof that he was also author of

the first three books of the *Eudemian Ethics*, have further asserted that these are a better introduction than the first four books of the *Nicomachean Ethics* to the books common to both treatises (*E.N.* Books v.–vii. = *E.E.* Books Δ–Z), and have concluded that Eudemus wrote these common books. But we have seen that Aristotle wrote the first three books of the *Eudemian* as an earlier draft of the *Nicomachean Ethics*; so that, even so far as they form a better introduction, this will not prove the common books to be by Eudemus. Again, those first three books are a better introduction only in details; whereas in regard to the all-important subject of prudence as distinct from wisdom, they are so bad an introduction that the common book which discusses that subject at large (*E.N.* Book vi. = *E.E.* Book E) must be rather founded on the first four books of Aristotle's *Nicomachean Ethics*. Further, as Aristotle wrote both the first three Eudemian and the first four Nicomachean books, there is no reason why sometimes one, sometimes the other, should not be the best introduction to the common books by the same author. Finally, the common books are so integral a part of the Aristotelian system of philosophy that they cannot be disengaged from it: the book on justice (*E.N.* v.) quotes and is quoted in the *Politics* (cf. 1130 b 28, 1280 a 16, 1261 a 30); the book on intellectual virtues (*E.N.* vi.) quotes (vi. 3) the *Posterior Analytics*, i. 2, and is quoted in the *Metaphysics* (A 1); and we have seen that the book (*E.N.* vii.) which defines pleasure as activity is simply stating an Aristotelian commonplace. Thirdly, in order to prove that the *Eudemian Ethics* was by Eudemus, it is said that in its first part it contemplates that there must be a limit (*ὅρος*) for virtue as a mean (*E.E.* B 5, 1222 b 7-8), in its middle part it criticizes the *Nicomachean Ethics* for not being clear about this limit (*E.E.* E 1), and in the end it alone assigns this limit, in the service and contemplation of God (*E.E* H 15, 1249 b 16 seq.). This argument is subtle, but over-subtle. The *Eudemian* and the *Nicomachean* treatments of this subject do not really differ. In the *Nicomachean* as in the *Eudemian Ethics* the limit above moral virtue is right reason, or prudence, which is right reason on such matters; and above prudence wisdom, for which prudence gives its orders; while wisdom is the intelligence and science of the most venerable objects, of the most divine, and of God. After this agreement, there is a shade of difference. While the *Eudemian Ethics* in a more theological vein emphasizes God, the object of wisdom as the end for which prudence gives its orders, the *Nicomachean Ethics* in a more humanizing spirit emphasizes wisdom itself, the speculative activity, as that end, and afterwards as the highest happiness, because activity of the divine power of intellect, because an imitation of the activity of God, because most dear to God. This is too fine a distinction to found a difference of authorship. Beneath it, and behind the curious hesitation which in dealing with mysteries Aristotle shows between the divine and the human, his three moral treatises agree that wisdom is a science of things divine, which the *Nicomachean Ethics* (vi. 7) defines as science and intelligence of the most venerable things, the *Magna Moralia* (i. 35) regards as that which is concerned with the eternal and the divine, and the *Eudemian Ethics* (H 15) elevates into the service and contemplation of God.

Aristotle then wrote three moral treatises, which agree in the fundamental doctrines that happiness requires external fortune, but is activity of soul according to virtue, rising from morality through prudence to wisdom, or that science of the divine which constitutes the theology of his *Metaphysics*. Surely, the harmony of these three moral gospels proves that Aristotle wrote them, and wrote the *Eudemian Ethics* and the *Magna Moralia* as preludes to the *Nicomachean Ethics*. When did he begin? We do not know; but there is a pathetic suggestiveness in a passage in the *Magna Moralia* (i. 35), where he says, "Clever even a bad man is called; as Mentor was thought clever, but prudent he was not." Mentor was the treacherous contriver of the death of Hermias (345–344 B.C.). Was this passage written when Aristotle was mourning for his friend?

4. *The Rhetoric to Alexander.*—This is one of a series of works emanating from Aristotle's early studies in rhetoric, beginning with the *Gryllus*, continuing in the *Theodectea* and the *Collection of Arts*, all of which are lost except some fragments; while among the extant Aristotelian writings as they stand we still possess the *Rhetoric to Alexander* (Ῥητορικὴ πρὸς Ἀλέξανδρον) and the *Rhetoric* (Τέχνη Ῥητορική). But the *Rhetoric to Alexander* was considered spurious by Erasmus, for the inadequate reasons that it has a preface and is not mentioned in the list of Diogenes Laertius, and was assigned by Petrus Victorius, in his preface to the *Rhetoric*, to Anaximenes. It remained for Spengel to entitle the work *Anaximenis Ars Rhetorica* in his edition of 1847, and thus substitute for the name of the philosopher Aristotle that of the sophist Anaximenes on his title-page. We have therefore to ask, first who was the author, and secondly what is the relation of the *Rhetoric to Alexander* to the *Rhetoric*, which nowadays alone passes for genuine.

After a dedicatory epistle to Alexander (chap. 1) the opening of the treatise itself (chap. 2) is as follows:—"There are three genera of political speeches; one deliberative, one declamatory, one forensic: their species are seven; hortative, dissuasive, laudatory, vituperative, accusatory, defensive, critical." This brief sentence is enough to prove the work genuine, because it was Aristotle who first distinguished the three genera (cf. *Rhet.* i. 3; Quintilian iii. 4, 1. 7, 1), by separating the declamatory (*ἐπιδεικτικόν*) from the deliberative (*δημηγορικόν*, *συμβουλευτικόν*) and judicial (*δικανικόν*); whereas his rival Isocrates had considered that laudation and vituperation, which Aristotle elevated into species of declamation, run through every kind (Quintilian iv. 4), and Anaximenes recognized only the deliberative and the judicial (Dionys. H. *de Isaeo*, 19). In order, however, to impute the whole work to Anaximenes, Spengel took one of the most inexcusable steps ever taken in the history of scholarship. Without any manuscript authority he altered the very first words "three genera" (*τρία γένη*) into "two genera" (*δύο γένη*), and omitted the words "one declamatory" (*τὸ δὲ ἐπιδεικτικόν*). Quintilian (iii. 4) imputes to Anaximenes two genera, deliberative and judicial, and seven species, "hortandi, dehortandi, laudandi, vituperandi, accusandi, defendendi, exquirendi, quod *ἐξεταστικὸν* dicit." But the author of this rhetoric most certainly recognized three genera (*τρία γένη*), since, besides the deliberative and judicial, the declamatory genus constantly appears in the work (chaps. 2 *init.*, 4, 7, 18, 36, cf. *οὐκ ἀγῶνος ἀλλ' ἐπιδείξεως ἕνεκα* 1440 *b* 13); and, if the terms for it are not always the same, this is just what one would expect in a new discovery. Moreover, he could recognize seven species in the *Rhetoric to Alexander*, though he recognized only six in the *Rhetoric*, provided the two works were not written at the same time; and as a matter of fact even in the *Rhetoric to Alexander* the seventh or critical species (*ἐξεταστικόν*) is in process of disappearing (cf. chap. 37). As then Anaximenes did not, but Aristotle did, recognize three genera, and as Aristotle could as well as Anaximenes recognize seven species, the evidence is overwhelming that the *Rhetoric to Alexander* is the work not of Anaximenes, but of Aristotle; on the condition that its date is not that of Aristotle's confessedly genuine *Rhetoric*.

There is a second and even stronger evidence that the *Rhetoric to Alexander* is a genuine work of Aristotle. It divides (chap. 8) evidences (*πίστεις*) into two kinds (1) evidence from arguments, actions and men (*αἱ μὲν ἐξ αὐτῶν τῶν λόγων καὶ τῶν πράξεων καὶ τῶν ἀνθρώπων*); (2) adventitious evidences (*αἱ δ' ἐπίθετοι τοῖς λεγομένοις καὶ τοῖς πραττομένοις*). The former are immediately enumerated as probabilities (*εἰκότα*), examples (*παραδείγματα*), proofs (*τεκμήρια*), considerations (*ἐνθυμήματα*), maxims (*γνῶμαι*), signs (*σημεῖα*), refutations (*ἔλεγχοι*); the latter as opinion of the speaker (*δόξα τοῦ λέγοντος*), witnesses (*μαρτυρίαι*), tortures (*βάσανοι*), oaths (*ὅρκοι*). It is confessed by Spengel himself that these two kinds of evidences are the two kinds recognized in Aristotle's *Rhetoric* as (1) artificial (*ἐντέχνοι πίστεις*) and (2) inartificial (*ἀτέχνοι πίστεις*). Now, from the outset of his *Rhetoric* Aristotle himself claims to be the first to distinguish between artificial evidences from arguments and other evidences which he regards as mere additions; and he complains that the composers of arts of speaking had neglected the former for the latter. In particular, rhetoricians appeared to him to have neglected argument in comparison with passion. No doubt, rational evidences had appeared in books of rhetoric, as we see from Plato's *Phaedrus*, 266-267, where we find proofs, probabilities, refutation and maxim, but mixed up with other evidences. The point of Aristotle was to draw a line between rational and other evidences, to insist on the former, and in fact to found a logic of rhetoric. But if in the *Rhetoric to Alexander*, not he, but Anaximenes, had already performed this great achievement, Aristotle would have been the meanest of mankind; for the logic of rhetoric would have been really the work of Anaximenes the sophist, but falsely claimed by Aristotle the philosopher. As we cannot without a tittle of evidence accept such a consequence,

we conclude that Aristotle formulated the distinction between argumentative and adventitious, artificial and inartificial evidences, both in the *Rhetoric to Alexander* and in the *Rhetoric*; and that the former as well as the latter is a genuine work of Aristotle, the founder of the logic of rhetoric.

What is the relation between these two genuine Rhetorics? The last event mentioned in the *Rhetoric to Alexander* occurred in 340, the last in the *Rhetoric* is the common peace (κοινὴ εἰρήνη) made between Alexander and the Greeks in 336 (*Rhet.* ii. 23, 1399 b 12). The former treatise (chap. 9), under the head of examples (παραδείγματα), gives historical examples of the unexpected in war for the years 403, 371, 358, concluding with the year 340, in which the Corinthians, coming with nine triremes to the assistance of the Syracusans, defeated the Carthaginians who were blockading Syracuse with 150 ships. Spengel, indeed, tries to bring the latest date in the book down to 330; but it is by absurdly supposing that the author could not have got the commonplace, "one ought to criticize not bitterly but gently," except from Demosthenes, *De Corona* (§ 265). We may take it then that the last date in the *Rhetoric to Alexander* is 340; and by a curious coincidence 340 was the year when, on Philip's marching against Byzantium, Alexander was left behind as regent and keeper of the seal, and distinguished himself so greatly that Philip was only too glad that the Macedonians called Alexander king (Plutarch, *Alexander*, 9). It is possible then that Aristotle may have written the dedication to Alexander about 340 and treated him as if he were king in the dedicatory epistle. At the same time, as such prefaces are often forgeries, not prejudicing the body of the treatise, it does not really matter whether Aristotle actually dedicated his work to Alexander in that epistle about that year or not. If he did, then the *Rhetoric to Alexander* in 340 was at least four years prior to the *Rhetoric*, which was as late as 336. If he did not, the question still remains, what is the internal relation between these two genuine Rhetorics? It will turn out most important.

The relation between the two Rhetorics turns on their treatment of rational, argumentative, artificial evidences. Each of them, the probability (chap. 8), the example (chap. 9), the proof (chap. 10), the consideration (chap. 11), the maxim (chap. 12), the sign (chap. 13), the refutation (chap. 14), though very like what it is in the *Rhetoric*, receives in the *Rhetoric to Alexander* a definition slightly different from the definition in the *Rhetoric*, which it must be remembered is also the definition in the *Prior Analytics*. Strange as this point is, it is still stranger that not one of these internal evidences is brought into relation with induction and deduction. Example (παράδειγμα) is not called rhetorical induction, and consideration (ἐνθύμημα) is not called rhetorical syllogism, as they are in the *Rhetoric*, and in the *Analytics*. Induction (ἐπαγωγή) and syllogism (συλλογισμός), the general forms of inference, do not occur in the *Rhetoric to Alexander*. In fact, this interesting treatise contains a rudimentary treatment of rational evidences in rhetoric and is therefore earlier than the *Rhetoric*, which exhibits a developed analysis of these rational evidences as special logical forms. Together, the earlier and the later *Rhetoric* show us the logic of rhetoric in the making, going on about 340, the last date of the *Rhetoric to Alexander*, and more developed in or after 336 B.C., the last date of the *Rhetoric*.

Nor is this all: the earlier *Rhetoric to Alexander* and the later *Rhetoric* show us logic itself in the making. We have already said that Aristotle was primarily a metaphysician. He gradually became a logician out of his previous studies: out of metaphysics, for with him being is always the basis of thinking, and common principles, such as that of contradiction, are axioms of things before axioms of thought, while categories are primarily things signified by names; out of the mathematics of the Pythagoreans and the Platonists, which taught him the nature of demonstration; out of the physics, of which he imbibed the first draughts from his father, which taught him induction from sense and the modification of strict demonstration to suit facts; out of the dialectic between man and man which provided him with beautiful examples of inference in the Socratic dialogues of Xenophon and Plato; out of the rhetoric addressed to large audiences, which with dialectic called his attention to probable inferences; out of the grammar taught with rhetoric and poetics which led him to the logic of the proposition. We cannot write a history of the varied origin of logic, beyond putting the rudimentary logic of the proposition in the *De Interpretatione* before the less rudimentary theory of categories as significant names capable of becoming predicates in the *Categories*, and before the maturer analysis of the syllogism in the *Analytics*. But at any rate the process was gradual; and Aristotle was advanced in metaphysics, mathematics, physics, dialectics, rhetoric and poetics, before he became the founder of logic.

V. Order of the Philosophical Writings

Some of Aristotle's philosophical writings then are earlier than others; because they show more Platonic influence, and are more rudimentary; *e.g.* the *Categories* earlier than some parts of the *Metaphysics*, because under the influence of Platonic forms it talks of inherent attributes, and allows secondary substances which are universal; the *De Interpretatione* earlier than the *Analytics*, because in it the Platonic analysis of the sentence into noun and verb is retained for the proposition; the *Eudemian Ethics* and the *Magna Moralia* earlier than the *Nicomachean Ethics*, because they are rudimentary sketches of it, and the one written rather in the theological spirit, the other rather in the dialectical style, of Plato; and the *Rhetoric to Alexander* earlier than the *Rhetoric*, because it contains a rudimentary theory of the rational evidences afterwards developed into a logic of rhetoric in the *Rhetoric* and *Analytics*.

It is tempting to think that we can carry out the chronological order of the philosophical writings in detail. But in the gradual process of composition, by which a work once begun was kept going with the rest, although a work such as the *Politics* (begun in 357) was begun early, and some works more rudimentary came earlier than others, the general body of writings was so kept together in Aristotle's library, and so simultaneously elaborated and consolidated into a system that it soon becomes impossible to put one before another.

Zeller, indeed, has attempted an exact order of succession:—

1. The logical treatises.
2. The *Physics*, *De Coelo*, *De Generatione et Corruptione*, *Meteorologica*.
3. *Historia Animalium*, *De Anima*, *Parva Naturalia*, *De Partibus Animalium*, *De Animalium Incessu*, *De Generatione Animalium*.
4. *Ethics* and *Politics*.
5. *Poetics* and *Rhetoric*.
6. *Metaphysics* (unfinished).

But Zeller does not give enough weight either to the evidence of early composition contained in the *Politics* and *Meteorology*, or to the evidence of subsequent contemporaneous composition contained in the cross-references, *e.g.* between the *Physics* and the *Metaphysics*. On the other hand he gives too much weight to the references from one book to another, which Aristotle could have entered into his manuscripts at any time before his death. Moreover, the arrangement sometimes breaks down: for example, though on the whole the logical books are quoted without quoting the rest, the *De Interpretatione* (chap. 1) quotes the *De Anima*, and therefore is falsely taken by Zeller against its own internal evidence to be subsequent to it and consequently to the other logical books. Again, the *Meteorologica* (iii. 2, 372 b 9) quotes the *De Sensu* (c. 3), and therefore, on Zeller's arguments, ought to follow one of the *Parva Naturalia*. Lastly, though the *Metaphysics* often quotes the *Physics*, and is therefore regarded as being subsequent, it is itself quoted in the *Physics* (i. 8, 191 b 29), and therefore ought to be regarded as antecedent. Zeller tries to get over this difficulty of cross-reference by detaching *Metaphysics*, Book Δ, from the rest and placing it before the *Physics*. But this violent and arbitrary remedy is only partial. The truth is that the *Metaphysics* both precedes and follows the *Physics*, because it had been all along occupying Aristotle ever since he began to differ from Plato's metaphysical views and indeed forms a kind of presupposed basis of his whole system. So generally, the references backwards and forwards, and the cross-references, are really evidences that Aristotle mainly wrote his works not successively but simultaneously, and entered references as and when he pleased, because he had not published them.

There are two kinds of quotations in Aristotle's extant works, the quotation of another book, and the quotation of a historical fact. While the former is useless to determine the sequence of books written simultaneously, the latter is insufficient to determine a complete chronological order. When Aristotle, *e.g.* in the *Politics*, quotes an event as now (νῦν), he was writing about it at that time; and when he quotes another event as lately (νεωστί) he was writing about it shortly after that time; but he might have been writing the rest of the *Politics* both before and after either event. When he quotes the last event mentioned in the book, *e.g.* in the *Rhetoric* (ii. 23, 1399 b 12) the "common peace" of Greece under Alexander in 336, he was writing as late as that date, but he might also have been writing the *Rhetoric* both before it and after it. When he quotes what persons used to say in the past, *e.g.* Plato and Speusippus in the *Ethics*, Eudoxus and Callippus in the *Metaphysics*, he was writing these passages after the deaths of these persons; but he might have been also writing the *Ethics* and the *Metaphysics* both beforehand and afterwards. Lastly, when he is silent about a historical fact, the argument from silence is evidence only when he could not have failed to mention it; as, for example, in the *Constitution of Athens*, when he could not have failed to mention quinqueremes and other facts after 325–324. But this is in a historical work; whereas the argument from silence about historical facts in a philosophical work can seldom apply.

The chronological order therefore is not sufficiently detailed to be the real order of Aristotelian writings. Secondly, the traditional order, which for nearly 2000 years has descended from the edition of Andronicus to the Berlin edition, is satisfactory in details, but

unsatisfactory in system. It gives too much weight to Aristotle's logic, and too little to his metaphysics, on account of two prejudices of the commentators which led them to place both logic and physics before metaphysics. Aristotle rightly used all the sciences of his day, and especially his own physics, as a basis of his metaphysics. For example, at the very outset he refers to the *Physics* (ii. 2) for his use of the four causes, material, efficient, formal and final, in the *Metaphysics* (A 2). This and other applications of the science of nature to the science of all being induced the commentators to adopt this order, and entitle the science of being the *Sequel to the Physics* (τὰ μετὰ τὰ φυσικά). But Aristotle knew nothing of this title, the first known use of which was by Nicolaus Damascenus, a younger contemporary of Andronicus, the editor of the Aristotelian writings, and Andronicus was probably the originator of the title, and of the order. On the other hand, Aristotle entitles the science of all being "Primary Philosophy" (πρώτη φιλοσοφία), and the science of physical being "Secondary Philosophy" (δεύτερα φιλοσοφία), which suggests that his order is from Metaphysics to Physics, the reverse of his editor's order from Physics to Metaphysics. Thus the traditional order puts Physics before Metaphysics without Aristotle's authority. With some more show of authority it puts Logic before Metaphysics. Aristotle, on introducing the principle of contradiction (*Met.* Γ 3), which belongs to Metaphysics as an axiom of being, says that those who attempt to discuss the question of accepting this axiom, do so on account of their ignorance of *Analytics*, which they ought to know beforehand (προεπισταμένους). He means that the logical analysis of demonstration in the *Analytics* would teach them beforehand that there cannot be demonstration, though there must be induction, of an axiom, or any other principle; whereas, if they are not logically prepared for metaphysics, they will expect a demonstration of the axiom, as Heraclitus, the Heraclitean Cratylus and the Sophist Protagoras actually did,—and in vain. Acting on this hint, not Aristotle but the Peripatetics inferred that all logic is an instrument (ὄργανον) of all sciences; and by the time of Andronicus, who was one of them and sometimes called "the eleventh from Aristotle," the order, Logic-Physics-Metaphysics, had become established pretty much as we have it now. It is, however, not the real order for studying the philosophy of Aristotle, because there is more Metaphysics in his Physics than Physics in his Metaphysics, and more Metaphysics in his Logic than Logic in his Metaphysics. The commentators themselves were doubtful about the order: Boethus proposed to begin with Physics, and some of the Platonists with Ethics or Mathematics; while Andronicus preferred to put Logic first as Organon (*Scholia*, 25 b 34 seq.). None of the parties to the dispute had the authority of Aristotle. What do we find in his works? Primary philosophy, Metaphysics, the science of being, is the solid foundation of all parts of his philosophical system; not only in the *Physics*, but also in the *De Coelo* (i. 8, 277 b 10), in the *De Generatione* (i. 3, 318 a 6; ii. 10, 336 b 29), in the *De Anima* (i. 1, 403 a 28, cf. b 16), in the *De Partibus Animalium* (i. 1, 641 a 35), in the *Nicomachean Ethics* (i. 6, 1096 b 30), in the *De Interpretatione* (5, 17 a 14); and in short throughout his extant works. The reason is that Aristotle was primarily a metaphysician half for and half against Plato, occupied himself with metaphysics all his philosophical life, made the science of things the universal basis of all sciences without destroying their independence, and so gradually brought round philosophy from universal forms to individual substances. The traditional order of the Aristotelian writings, still continued in the Berlin edition, beginning with the logical writings on page 1, proceeding to the physical writings on page 184, and postponing the *Metaphysics* to page 980, is not the real order of Aristotle's philosophy.

The real order of Aristotle's philosophy is that of Aristotle's mind, revealed in his writings, and by the general view of thinking, science, philosophy and all learning therein contained. He classified thinking (*Met.* E 1) and science (*Topics*, vi. 6) by the three operations of speculation (θεωρία), practice (πρᾶξις) and production (ποίησις), and made the following subdivisions:—

I. Speculative: about things; subdivided (*Met.* E 1; *De An.* i. 1) into:—
  i. Primary Philosophy, Theology, also called Wisdom, about things as things.
  ii. Mathematical Philosophy, about quantitative things in the abstract.
  iii. Physical Philosophy, about things as changing, and therefore about natural substances or bodies, composed of matter and essence.

II. Practical or Political Philosophy, or philosophy of things human (cf. *E.N.* x. 9-fin.): about human good; subdivided (*E.N.* vi. 8, cf. *E.E.* A 8, 1218 b 13) into:—
  i. Ethics, about the good of the individual.
  ii. Economics, about the good of the family.
  iii. Politics, about the general good of the state.

III. Productive, or Art (τέχνη): about works produced; subdivided (*Met.* A. 1, 981 *b* 17-20) into:—
  i. Necessary (πρὸς τἀναγκαῖα), *e.g.* medicine.
  ii. Fine (πρὸς διαγωγήν), *e.g.* poetry.

Aristotle calls all these investigations sciences (ἐπιστῆμαι); but he also uses the term "sciences" in a narrower sense in consequence of a classification of their objects, which pervades his writings, into things necessary and things contingent, as follows:—

(A) The necessary (τὸ μὴ ἐνδεχόμενον ἄλλως ἔχειν), what must be; subdivided into:—
  (1) Absolutely (ἁπλῶς), *e.g.* the mathematical.
  (2) Hypothetically (ἐξ ὑποθέσεως), *e.g.* matter necessary as means to an end.

(B) The contingent (τὸ ἐνδεχόμενον ἄλλως ἔχειν), what may be; subdivided into:—
  (1) The usual (τὸ ὡς ἐπὶ τὸ πολύ) or natural (τὸ φυσικόν), *e.g.* a man grows grey.
  (2) The accidental (τὸ κατὰ συμβεβηκός), *e.g.* a man sits or not.

Now, according to Aristotle, science in the narrow sense is concerned only with the absolutely necessary (*E.N.* iii. 3), and in the classification would stop at mathematics, which we still call exact science: in the wide sense, on the other hand, it extends to the whole of the necessary and to the usual contingent, but excludes the accidental (*Met.* E 2), and would in the classification include not only metaphysics and mathematics, but also physics, ethics, economics, politics, necessary and fine art; or in short all speculative, practical and productive thinking of a systematic kind. Hence the *Posterior Analytics*, which is Aristotle's authoritative logic of science, is of peculiar interest because, after beginning by defining science as investigating necessary objects from necessary principles (i. 4), it proceeds to say that it is either of the necessary or of the usual though not of the accidental (i. 29), and to admit that its principles are some necessary and some contingent (i. 32, 88 b 7). Philosophy (φιλοσοφία) also is used by him in a similar manner. Though occasionally he means by it primary philosophy (*Met.* Γ 2-3, K 3), more frequently he extends it to all three speculative philosophies (E 1, 1026 a 18, τρεῖς ἂν εἶεν φιλοσοφίαι θεωρητικαί, μαθηματική, φυσική, θεολογική), and to all three practical philosophies, as we see from the constant use of the phrase "political philosopher" in the *Ethics;* and in short applies it to all sciences except productive science or art. With him, as with the Greeks generally, the problems of philosophy are the nature and origin of being and of good: it is not as with too many of us a mere science of mind.

Aristotle's view of thinking in science and philosophy is essentially comprehensive; but it is not so wide as to become indefinite. According to him, science at its widest selects a special subject, *e.g.* number in arithmetic, magnitude in geometry, stars in astronomy, a man's good in ethics; concentrates itself on the causes and appropriate principles of its subject, especially the definition of the subject and its species by their essences or formal causes; and after an inductive intelligence of those principles proceeds by a deductive demonstration from definitions to consequences: philosophy is simply a desire of this definite knowledge of causes and effects. Beyond philosophy, not beyond science, there is art; and beyond philosophy and science there is history, the description of facts preparatory to philosophy, the investigation of causes (cf. *Pr. An.* i. 30); and this may be natural history, preparatory to natural philosophy, as in the *History of Animals* preparatory to the *De Partibus Animalium*, or what we call civil history, preparatory to political philosophy, as in the 158 Constitutions more or less preparatory to the *Politics*.

Wide as is all his knowledge of facts and causes, it does not appear to Aristotle to be the whole of learning and the show of it. Beyond knowledge lies opinion, beyond discovery disputation, beyond philosophy and science dialectic between man and man, which was much practised by the Greeks in the dialogues of Socrates, Plato, the Megarians and Aristotle himself in his early manhood. With Plato, who thought that the interrogation of

man is the best instrument of truth, dialectic was exaggerated into a universal science of everything that is. Aristotle, on the other hand, learnt to distinguish dialectic (διαλεκτική) from science (ἐπιστήμη); in that it has no definite subject, else it would not ask questions (*Post. An.* i. 11, 77 a 31-33); in that for appropriate principles it substitutes the probabilities of authority (τὰ ἔνδοξα) which are the opinions of all, or of the majority, or of the wise (*Top.* i. 1, 100 b 21-23); and in that it is not like science a deduction from true and primary principles of a definite subject to true consequences, but a deduction from opinion to opinion, which may be true or false. Sophistry appeared to him to be like it, except that it is a fallacious deduction either from merely apparent probabilities in its matter or itself merely apparently syllogistic in its form (cf. *Topics*, i. 1). Moreover, he compared dialectic and sophistry, on account of their generality, with primary philosophy in the *Metaphysics* (Γ 2, 1004 b 17-26); to the effect that all three concern themselves with all things, but that about everything metaphysics is scientific, dialectic tentative, sophistry apparent, not real. He means that a sophist like Protagoras will teach superficially anything as wisdom for money; and that even a dialectician like Plato will write a dialogue, such as the *Republic*, nominally about justice, but really about all things from the generality of the form of good, instead of from appropriate moral principles; but that a primary philosopher selects as a definite subject all things as such without interfering with the special sciences of different things each in its kind (*Met.* Γ 1), and investigates the axioms or common principles of things as things (*ib.* 3), without pretending, like Plato, to deduce from any common principle the special principles of each science (*Post. An.* i. 9, 32). Aristotle at once maintains the primacy of metaphysics and vindicates the independence of the special sciences. He is at the same time the only Greek philosopher who clearly discriminated discovery and disputation, science and dialectic, the knowledge of a definite subject from its appropriate principles and the discussion of anything whatever from opinions and authority. On one side he places science and philosophy, on the other dialectic and sophistry.

Such is the great mind of Aristotle manifested in the large map of learning, by which we have now to determine the order of his extant philosophical writings, with a view to studying them in their real order, which is neither chronological nor traditional, but philosophical and scientific. Turning over the pages of the Berlin edition, but passing over works which are perhaps spurious, we should put first and foremost speculative philosophy, and therein the primary philosophy of his *Metaphysics* (980 a 21-1093 b 29); then the secondary philosophy of his *Physics*, followed by his other physical works, general and biological, including among the latter the *Historia Animalium* as preparatory to the *De Partibus Animalium*, and the *De Anima* and *Parva Naturalia*, which he called "physical" but we call "psychological" (184 a 10-967 b 27); next, the practical philosophy of the *Ethics*, including the *Eudemian Ethics* and the *Magna Moralia* as earlier and the *Nicomachean Ethics* as later (1094-1249 b 25), and of the *Politics* (1252-1342), with the addition of the newly discovered *Athenian Constitution* as ancillary to it; finally, the productive science, or art, of the *Rhetoric*, including the earlier *Rhetoric to Alexander* and the later *Rhetorical Art*, and of the *Poetics*, which was unfinished (1354-end). This is the real order of Aristotle's system, based on his own theory and classification of sciences.

But what has become of Logic, with which the traditional order of Andronicus begins Aristotle's works (1-148 b 8)? So far from coming first, Logic comes nowhere in his classification of science. Aristotle was the founder of Logic; because, though others, and especially Plato, had made occasional remarks about reason (λόγος), Aristotle was the first to conceive it as a definite subject of investigation. As he says at the end of the *Sophistical Elenchi* on the syllogism, he had no predecessor, but took pains and laboured a long time in investigating it. Nobody, not even Plato, had discovered that the process of deduction is a combination of premisses (συλλογισμός) to produce a new conclusion. Aristotle, who made this great discovery, must have had great difficulty in developing the new investigation of reasoning processes out of dialectic, rhetoric, poetics, grammar, metaphysics, mathematics, physics and ethics; and in disengaging it from other kinds of learning. He got so far as gradually to write short discourses and long treatises, which we, not he, now arrange in the order of the *Categorics* or names; the *De Interpretatione* on propositions; the *Analytics*, *Prior* on syllogism, *Posterior* on scientific syllogism; the *Topics* on dialectical syllogism; the *Sophistici Elenchi* on eristical or sophistical syllogism; and, except that he had hardly a logic of induction, he covered the ground. But after all this original research he got no further. First, he did not combine all these works into a system. He may have laid out the sequence of syllogisms from the *Analytics* onwards; but how about the *Categories* and the *De Interpretatione*? Secondly, he made no division of logic. In the *Categories* he distinguished names and propositions for the sake of the classification of names; in the *De Interpretatione* he distinguished nouns and verbs from sentences with a view to the enunciative sentence: in the *Analytics* he analysed the syllogism into premisses and premisses into terms and copula, for the purpose of syllogism. But he never called any of these a division of all logic. Thirdly, he had no one name for logic. In the *Posterior Analytics* (i. 22, 84 a 7-8) he distinguishes two modes of investigation, analytically (ἀναλυτικῶς) and logically (λογικῶς). But "analytical" means scientific inference from appropriate principles, and "logical" means dialectical inference from general considerations; and the former gives its name to the *Analytics*, the latter suits the *Topics*, while neither analytic nor logic is a name for all the works afterwards called logic. Fourthly, and consequently, he gave no place to any science embracing the whole of those works in his classification of science, but merely threw out the hint that we should know analytics before questioning the acceptance of the axioms of being (*Met.* Γ 3).

It is a commentator's blunder to suppose that the founder of logic elaborated it into a system, and then applied it to the sciences. He really left the Peripatetics to combine his scattered discourses and treatises into a system, to call it logic, and logic *Organon*, and to put it first as the instrument of sciences; and it was the Stoics who first called logic a science, and assigned it the first place in their triple classification of science into logic, physics, ethics. Would Aristotle have consented? Would he not rather have given the first place to primary philosophy?

Dialectic was distinguished from science by Aristotle. Is logic, then, according to him, not science but dialectic? The word logically (λογικῶς) means the same as dialectically (διαλεκτικῶς). But the general discussion of opinions, signified by both words, is only a subordinate part of Aristotle's profound investigation of the whole process of reasoning. The *Analytics*, the most important part, so far from being dialectic or logic in that narrow sense, is called by him not logic but analytic science (ἀναλυτικὴ ἐπιστήμη, *Rhet.* i. 4, 1359 b 10; cf, 1356 b 9, 1357 a 30, b 25); and in the *Metaphysics* he evidently refers to it as "the science which considers demonstration and science," which he distinguishes from the three speculative sciences, mathematics, physics and primary philosophy (*Met.* K 1, 1059 b 9-21). The *Analytics* then, which from the beginning claims to deal with science, is a science of sciences, without however forming any part of the classification. On the other hand, it does not follow that Aristotle would have regarded the *Topics*, which he calls "the investigation" and "the investigation of dialectic" (ἡ πραγματεία, *Top*, i. 1, ἡ πραγματεία ἡ περὶ τὴν διαλεκτικήν, Pr. *An.* i. 30, 46 a 30), or the *De Interpretatione*, which he calls "the present theory" (τῆς νῦν θεωρίας, *De Int.* 6, 17 a 7), as science. In fact, as to the *Categories* as well as the *De Interpretatione*, we are at a complete loss. But about the *Topics* we may venture to make the suggestion that, as in describing consciousness Aristotle says we perceive that we perceive, and understand that we understand, and as he calls *Analytics* a science of sciences, so he might have called the *Topics* a dialectical investigation of dialectic. Now, this suggestion derives support from his own description of the allied art of Rhetoric. "Rhetoric is counterpart to dialectic" is the first sentence of the *Rhetoric*; and the reason is that both are concerned with common objects of no definite science. Afterwards dialectic and rhetoric are said to differ from other arts in taking either side of a question (i. 1, 1355 a 33-35); rhetoric, since its artificial evidences involve characters, passions and reasoning, is called a kind of offshoot of dialectic and morals, and a copy of dialectic, because neither is a science of anything definite, but both faculties (δυνάμεις) of providing arguments (i. 2, 1356 a 33); and, since rhetorical arguments are examples and enthymemes analysed in the *Analytics*, rhetoric is finally regarded as a compound of analytic science and of

morals, while it is like dialectical and sophistic arguments (i. 4, 1359 b 2-17).

As then Aristotle himself regarded rhetoric as partly science and partly dialectic, perhaps he would have said that his works on reasoning are some science and others not, and that, while the investigation of syllogism with a view to scientific syllogism in the *Analytics* is analytic science, the investigation of dialectical syllogism, in the *Topics*, with its abuse, eristical syllogism, in the *Sophistici Elenchi*, is dialectic. At any rate, these miscellaneous works on reasoning have no right to stand first in Aristotle's writings under any one name, logic or *Organon*. As he neither put them together, nor on any one definite plan, we are left to convenience; and the most convenient place is with the psychology of the *De Anima*.

As for dialectic itself, it would have been represented by Aristotle's early dialogues, had they not been lost except a few fragments. But none of his extant writings is so much dialectic, like a Platonic dialogue. They contain however many relics of dialectic. The *Rhetoric* is declared by him to be partly dialectic. The *Topics* is at least an investigation of dialectic, which has had an immense influence on the method of argument. The *Magna Moralia* almost runs into dialogue. Besides, all the extant works, though apparently didactic, are full of dialectical matter in the way of opinions (λεγόμενα), difficulties and doubts (ἀπορήματα, ἀπορίαι), solutions (λύσεις), and of dialectical style in the way of conversational expressions. It is probable also that the "extraneous discourses" (οἱ ἐξωτερικοὶ λόγοι) sometimes mentioned in them here mean dialectical discussions of a subject from opinions extraneous to its nature, as opposed to scientific deduction from its appropriate principles. From the eight passages, which refer to the extraneous discourses, we find (1) that Platonic forms were made by them matters of common talk (τεθρύληται, *Met.* M 1, 1076 a 28); (2) that time was made by them matter of doubts, which in this case are Aristotle's own doubts (*Phys.* iv. 10, 217 b 31-218 a 30); (3) that the discussions of Platonic forms in them and in philosophical discourses were different (*E.E.* i. 8, 1217 b 22); (4) that the ordinary distinction between goods of mind, body and estate is one which we make (διαιρούμεθα) in them (*E.E.* ii. 1, 1218 b 34); (5) that in them appeared the division of soul into irrational and rational, used by Aristotle (*E.N.* i. 13, 1102 a 26), and attributed to Plato; (6) that the distinction between action and production accepted by Aristotle appeared in them (*E.N.* vi. 4, 1140 a 3); (7) that a distinction between certain kinds of rule is one which we make often (διοριζόμεθα . . . πολλάκις) in them (*Pol.* Γ 6, 1278 b 31); (8) that a discussion about the best life, used by Aristotle, was made in them (*Pol.* H 1, 1323 a 22). On the whole, the interpretation which best suits all the passages is that extraneous discourses mean any extra-scientific dialectical discussions, oral or written, occurring in dialogues by Plato, or by Aristotle, or by anybody else, or in ordinary conversation, on any subject under the sun.

Among all the eight passages mentioned above, the most valuable is that from the *Eudemian Ethics* (A 8), which discriminates extraneous discourses and philosophical (καὶ ἐν τοῖς ἐξωτερικοῖς λόγοις καὶ ἐν τοῖς κατὰ φιλοσοφίαν, 1217 b 22-23); and it is preceded (A 6, 1216 b 35-37 a 17), by a similar distinction between foreign discourses (ἀλλοτριοι λόγοι) and discourses appropriate to the thing (οἰκεῖοι λόγοι τοῦ πράγματος), which marks even better the opposition intended between dialectic and philosophy. Now, as in all eight passages Aristotle speaks, somewhat disparagingly, of "even (καὶ) extraneous discourses," and as these include his own early dialogues, they must be taken to mean that though he might quote them, he no longer wished to be judged by his early views, and therefore drew a strong line of demarcation between his early dialogues and the mature treatises of his later philosophical system. Now, both were in the hands of his readers in the time of Andronicus. Therefore his contemporary, Cicero, who knew the early dialogues on *Philosophy*, the *Eudemus* and the *Protrepticus*, and also among the mature scientific writings the *Topics*, *Rhetoric*, *Politics*, *Physics* and *De Coelo*, to some extent, was justified by Aristotle's example and precept in drawing the line between two kinds of books, one written popularly, called exoteric, the other more accurately (Cic. *De Finibus*, v. 5). But there was no doubt a tendency to extend the term "exoteric" from the dialectical to the more popular of the scientific writings of Aristotle, to make a new distinction between exoteric and acroamatic or esoteric, and even to make out that Aristotle was in the habit of teaching both exoterically and acroamatically day by day as head of the Peripatetic school at Athens. Aulus Gellius in the 2nd century A.D. supplies the best proof of this growth of tradition in his *Noctes Atticae* (xx. 5). He says that Aristotle (1) divided his *commentationes* and arts taught to his pupils into ἐξωτερικά and ἀκροατικά; (2) taught the latter in the morning walk (ἑωθινὸν περίπατον), the former in the evening walk (δειλινὸν περίπατον); (3) divided his books in the same manner; (4) defended himself against Alexander's letter, complaining that it was not right to his pupils to have published his acroamatic works, by replying in a letter that they were published and not published, because they are intelligible only to those who heard them. Gellius then quotes this correspondence, also given by Plutarch, and quotes it *ex Andronici philosophi libro*. The answer to the first three points is that Aristotle did not make any distinction between exoteric and acroamatic, and was not likely to have any longer taught his exoteric dialogues when he was teaching his mature philosophy at Athens, but may have alternated the teaching of the latter between the more abstruse and the more popular parts which had gradually come to be called "exoteric." As regards the last point, the authority of Andronicus proves that he at all events did not exaggerate his own share in publishing Aristotle's works; but it does not prove either that this correspondence between Alexander and Aristotle took place, or that Aristotle called his philosophical writings acroamatic, or that he had published them wholesale to the world.

The literary career of Aristotle falls into three periods. (1) The early period; when he was writing and publishing exoteric dialogues, but also tending to write didactic works, and beginning his scientific writings, *e.g.* the *Politics* in 357, the *Meteorologica* in 356. (2) The immature period; when he was continuing his didactic and scientific works, and composing first drafts, *e.g.* the *Categories*, the *Eudemian Ethics*, the *Magna Moralia*, the *Rhetoric to Alexander*. (3) The mature period; when he was finishing his scientific works, completing his system, and not publishing it but teaching it in the Peripatetic school; when he would teach not his early dialogues, nor his immature writings and first drafts, but mature works, *e.g.* the *Metaphysics*, the *Nicomachean Ethics*, the *Rhetoric;* and above all teach his whole system as far as possible in the real order of his classification of science.

VI. The Aristotelian Philosophy

We have now (1) sketched the life of Aristotle as a reader and a writer from early manhood; (2) have watched him as a Platonist, partly imitating but gradually emancipating himself from his master to form a philosophy of his own; (3) have traced the gradual composition of his writings from Plato's time onwards; (4) have distinguished earlier, more Platonic and rudimentary, from later, more independent and mature, writings; (5) have founded the real order of his writings, not on chronology, nor on tradition, but on his classification of science and learning. It remains to answer the final question:—What is the Aristotelian philosophy, which its author gradually formed with so much labour? Here we have only room for its spirit, which we shall try to give as if he were himself speaking to us, as head of the Peripatetic school at Athens, and holding no longer the early views of his dialogues, or the immature views of such treatises as the *Categories*, but only his mature views, such as he expresses in the *Metaphysics*. Aristotle was primarily a metaphysician, a philosopher of things, who uses the objective method of proceeding from being to thinking. We shall begin therefore with that primary philosophy which is the real basis of his philosophy, and proceed in the order of his classification of science to give his chief doctrines on:—

(1) Speculative philosophy, metaphysical and physical, including his psychology, and with it his logic.
(2) Practical philosophy, ethics and politics.
(3) Productive science, or art.

Things are substances (οὐσίαι), each of which is a separate individual (χωριστόν, τόδε τι, καθ' ἕκαστον) and is variously affected as quantified, qualified, related, active, passive and so forth, in categories of things which are attributes (συμβεβηκότα), different from the category of substance, but real only as predicates belonging to some substance, and are in fact only the substance itself affected (αὐτὸ πεπονθός). The essence of each substance, being what it is (τὸ τί ἐστι, τὸ τί ἦν εἶναι), is that substance; *e.g.* this rational animal, Socrates. Substances are so similar that the individuals of a species are even the same in essence or substance, *e.g.* Callias and Socrates differ in matter but are the same in essence, as rational animals. The universal (τὸ καθόλου) is real only as one predicate belonging to many individual substances: it is therefore not a substance. There are then no separate universal forms, as Plato supposed. There are attributes and universals, real as belonging to individual substances, whose being is their being. The mind, especially in mathematics, abstracts numbers, motions, relations, causes, essences, ends, kinds; and it over-abstracts things mentally separate into things really separate. But reality consists only of individual substances, numerous, moving, related, active as efficient causes, passive as material causes, essences as formal causes, ends as final causes, and in classes which are real

universals only as real predicates of individual substances. Such is Aristotle's realism of individuals and universals, contained in his primary philosophy, as expressed in the *Metaphysics*, especially in Book Z, his authoritative pronouncement on being and substance.

The individual substances, of which the universe is composed, fall into three great irreducible kinds: nature, God, man.

I. *Nature.*—The obvious substances are natural substances or bodies (*φυσικαὶ οὐσίαι, σώματα*), *e.g.* animals, plants, water, earth, moon, sun, stars. Each natural substance is a compound (*σύνθετον, συνθέτη οὐσία*) of essence and matter; its essence (*εἶδος, μορφή, τὸ τί ἐστι, τὸ τί ἦν εἶναι*) being its actual substance, its matter (*ὕλη*) not; its essence being determinate, its matter not; its essence being immateriate, its matter conjoined with the essence; its essence being one in all individuals of a species, its matter different in each individual; its essence being cause of uniformity, its matter cause of accident. At the same time, matter is not nothing, but something, which, though not substance, is potentially substance; and it is either proximate to the substance, or primary; proximate, as a substance which is potentially different, *e.g.* wood potentially a table; primary, as an indeterminate something which is a substratum capable of becoming natural substances, of which it is always one; and it is primarily the matter of earth, water, air, fire, the four simple bodies (*ἁπλᾶ σώματα*) with natural rectilineal motions in the terrestrial world (*De Gen. et Cor.* ii. 1 seq.); while aether (*αἰθήρ*) is a fifth simple body, with natural circular motion, being the element of the stars (*τὸ τῶν ἄστρων στοιχεῖον*) in the celestial world. Each natural substance is a formal cause, as being what it is; a material cause, as having passive power to be changed; an efficient cause, as having active power to change, by communicating the selfsame essence into different matter so as to produce therein a homogeneous effect in the same species; and a final cause, as an end to be realized. Moreover, though each natural substance is corruptible (*φθαρτόν*), species is eternal (*ἀΐδιον*), because there was always some individual of it to continue its original essence (expressed by the imperfect tense in *τὸ τί ἦν εἶναι*), which is ungenerated and incorruptible; the natural world therefore is eternal; and nature is for ever aiming at an eternal propagation, by efficient acting on matter, of essence as end. For even nature does nothing in vain, but aims at final causes, which she uniformly realizes, except so far as matter by its spontaneity (*ἀπὸ τοῦ αὐτομάτου*) causes accidental effects; and the ends of nature are no form of good, nor even the good of man, but the essences of natural substances themselves, and, above them all, the good God Himself. Such is Aristotle's natural realism, pervading his metaphysical and physical writings.

II. *God.*—Nature is but one kind of being (*ἓν γάρ τι γένος τοῦ ὄντος ἡ φύσις, Met.* Γ 3, 1005 a 34). Above all natural substances, the objects of natural science, there stands a supernatural substance, the object of metaphysics as theology. Nature's boundary is the outer sphere of the fixed stars, which is eternally moved day after day in a uniform circle round the earth. Now, an actual cause is required for an actual effect. Therefore, there must be a prime mover of that prime movable, and equally eternal and uniform. That prime mover is God, who is not the creator, but the mover directly of the heavens, and indirectly through the planets of sublunary substances. But God is no mechanical mover. He moves as motive (*κινεῖ δὲ ὡς ἐρώμενον, Met.* Λ 7, 1072 b 3); He is the efficient only as the final cause of nature. For God is a living being, eternal, very good (*ζῷον ἀΐδιον ἄριστον, ib.* 1072 b 29). While nature aims at Him as design, as an end, a motive, a final cause, God's occupation (*διαγωγή*) is intelligence (*νόησις*); and since essence, not indeed in all being, but in being understood, becomes identical with intelligence, God in understanding essence is understanding Himself; and in short, God's intelligence is at once intelligence of Himself, of essence and of intelligence,—*καὶ ἔστιν ἡ νόησις νοήσεως νόησις* (*Met.* Λ 7, 1074 b 34). But at the same time the essence of good exists not only in God and God's intelligence on the one hand, but also on the other hand on a declining scale in nature, as both in a general and in his army; but rather in God, and more in some parts of nature than in others. Thus even God is a substance, a separate individual, whose differentiating essence is to be a living being, eternal and very good; He is however the only substance whose essence is entirely without matter and unconjoined with matter; and therefore He is a substance, not because He has or is a substratum beneath attributes, but wholly because He is a separate individual, different both from nature and men, yet the final good of the whole universe. Such is Aristotle's theological realism without materialism and the origin of all spiritualistic realism, contained in his *Metaphysics* (Λ 6-end).

III. *Man.*—There is a third kind of substance, combining something both of the natural and of the divine: we men are that privileged species. Each man is a substance, like any other, only because he is a separate individual. Like any natural substance, he is composed of matter and immateriate essence. But natural substances are inorganic and organic; and a man is an organic substance composed of an organic body (*ὀργανικὸν σῶμα*) as matter, and a soul (*ψυχή*) as essence, which is the primary actuality of an organic body capable of life (*ζωή*). Still a man is not the only organism; and every organism has a soul, whose immediate organ is the spirit (*πνεῦμα*), a body which—analogous to a body diviner than the four so-called elements, namely the aether, the element of the stars—gives to the organism its non-terrestrial vital heat, whether it be a plant or an animal. In an ascending scale, a plant is an organism with a nutritive soul; an animal is a higher organism with a nutritive, sensitive, orectic and locomotive soul; a man is the highest organism with a nutritive, sensitive, orectic, locomotive and rational soul. What differentiates man from other natural and organic substances, and approximates him to a supernatural substance, God, is reason (*λόγος*), or intellect (*νοῦς*). Now, though only one of the powers of the soul, intellect alone of these powers has no bodily organ; it alone is immortal: it alone is divine. While the soul is propagated, like any other essence, by the efficient, which is the seed, to the matter, which is the germ, of the embryo man, intellect alone enters from without (*θύραθεν*), and is alone divine (*θεῖον*, not *θεός*), because its activity communicates with no bodily activity (*De Gen.* ii. 3, 736-737). A man then is a third kind of substance, like a natural substance in bodily matter, like a supernatural substance in divine reason or intellect. Such is Aristotle's dual, or rather triple, realism, continued in his *De Anima* and other biological writings, especially *De Generatione Animalium*, ii.

There are three points about a man's life which both connect him with, and distinguish him from, God. God's occupation is speculative; man's is speculation, practice and production.

1. *Speculation* (*θεωρία*).—Since things are individuals, and there is nothing, and nothing universal, beyond them, there are two kinds of knowledge (*γνῶσις*), sense (*αἴσθησις*) of individuals, intellect (*νοῦς*) of universals. Both powers know by being passively receptive of essence propagated by an efficient cause; but, while in sense the efficient cause is an external object (*ἔξωθεν*), in intelligence it is active intellect (*νοῦς τῷ ποιεῖν*) propagating its essence in passive intellect (*νοῦς παθητικός*). Nevertheless, without sense there is no knowledge. Sense receives from the external world an essence, *e.g.* of white, which is really universal as well as individual, but apprehends it only as individual, *e.g.* this white substance: intellect thereupon discovers the universal essence but only in the individuals of sense. This intellectual discovery requires sensation and retention of sensation; so that sense (*αἴσθησις*) receives impressions, imagination (*φαντασία*) retains them as images, intellect (*νοῦς*) generalizes the universal, and, when it is intelligence of essence, is always true.

This is the origin of knowledge, psychologically regarded (in the *De Anima*). Logically regarded, the origin of all teaching and learning of an intellectual kind is a process of induction (*ἐπαγωγή*) from particulars to universal, and of syllogism (*συλλογισμός*) from universal to further particulars; induction, whenever it starts from sense, becomes the origin of scientific knowledge (*ἐπιστήμη*); while there is also a third process of example (*παράδειγμα*) from particular to particular, which produces only persuasion. In acquiring scientific knowledge, syllogism cannot start from universals without induction, nor induction acquire universals without sense. At the same time, there are three species of syllogism, scientific, dialectical and eristical or sophistical; and in consequence there are different ways of acquiring premisses. In order to acquire the knowledge of the true and primary principles of scientific knowledge, and especially the

Intelligence of the universal essence of the subject, which is always true, the process of knowledge consists of (1) sense (αἴσθησις), which receives the essence as individual, (2) memory (μνήμη), which is a retention of sensible impression, (3) experience (ἐμπειρία), which consists of a number of similar memories, (4) induction (ἐπαγωγή), which infers the universal as a fact (τὸ ὅτι), (5) intellect (νοῦς), which apprehends the principle (ἀρχή); because it is a true apprehension that the universal induced is the very essence and formal cause of the subject: thereupon, scientific syllogism (ἐπιστημονικὸς συλλογισμός), making the definition (ὁρισμός) of this essence the middle term (τὸ μέσον), becomes a demonstration (ἀπόδειξις) of the consequences which follow from the essence in the conclusion. Such then is science. In order to acquire the probabilities (τὰ ἔνδοξα) of opinion (δόξα), which are the premisses of dialectical syllogism, the process is still induction, as in science, but dialectical induction by interrogation from the opinions of the answerers until the universal is conceded: thereupon the dialectical syllogism (διαλεκτικὸς συλλογισμός) deduces consequent opinions in the conclusion. Nor does the process of acquiring the premisses of eristical syllogism, which is fallacious either in its premisses or in its process, differ, except that, when the premisses are fallacious, the dialectical interrogations must be such as to cause this fallacy. Hence, as science and dialectic are different, so scientific induction and syllogism must be distinguished from dialectical induction and syllogism. Dialectic is useful, for exercise, for conversation and for philosophical sciences, where by being critical it has a road to principles. But it is by a different process of sense, memory, experience, induction, intelligence, syllogism, that science becomes knowledge of real causes, of real effects, and especially of real essences from which follow real consequences, not beyond, but belonging to real substances. So can we men, not, as Plato thought, by having in our souls universal principles innate but forgotten, but by acquiring universal principles from sense, which is the origin of knowledge, arrive at judgments which are true, and true because they agree with the things which we know by sense, by inference and by science. Such is Aristotle's psychological and logical realism, contained in the *De Anima* and logical treatises.

2. *Practice* (πρᾶξις).—In this natural world of real substances, human good is not an imitation of a supernatural universal form of the good, but is human happiness; and this good is the same both of the individual as a part and of the state as a whole. Ethics then is a kind of Politics. But in Ethics a man's individual good is his own happiness; and his happiness is no mere state, but an activity of soul according to virtue in a mature life, requiring as conditions moderate bodily and external goods of fortune; his virtue is (1) moral virtue, which is acquired by habituation, and is a purposive habit of performing actions in the mean determined by right reason or prudence; requiring him, not to exclude, but to moderate his desires; and (2) intellectual virtue, which is either prudence of practical, or wisdom of speculative intellect; and his happiness is a kind of ascending scale of virtuous activities, in which moral virtue is limited by prudence, and prudence by wisdom; so that the speculative life of wisdom is the happiest and most divine, and the practical life of prudence and moral virtue secondary and human. Good fortune in moderation is also required as a condition of his happiness. Must we then, on account of misfortunes, look with Solon at the end, and call no man happy till he is dead? Or is this altogether absurd for us who say that happiness is an activity? Virtuous activities determine happiness, and a virtuous man is happy in this life, in spite of misfortunes unless they be too great; while after death he will not feel the misfortunes of the living so much as to change his happiness. Still, for perfect happiness a man should prefer the speculative life of divine intellect, and immortalize (ἀθανατίζειν) as far as possible. For intellect is what mainly makes a man what he is, and is divine and immortal.

To turn from Ethics to Politics, the good of the individual on a small scale becomes on a large scale the good of the citizen and the state, whose end should be no far-off form of good, and no mere guarantee of rights, but the happiness of virtuous action, the life according to virtue, which is the general good of the citizen. Hence, the citizen of the best state is he who has the power and the purpose to be governed and govern for the sake of the life according to virtue.

A right government is one which aims at the general good, whereas any government which aims at its own good is a deviation. Hence governments are to be arranged from best to worst in the following order:—

I. Right governments (ὀρθαὶ πολιτεῖαι), aiming at the general good:—
  i. Monarchy, of one excelling in virtue:
  ii. Aristocracy, of a class excelling in virtue:
  iii. Commonwealth, of the majority excelling in virtue.

II. Deviations (παρεκβάσεις), aiming at the good of the government:—
  i. Democracy, aiming at the good of the majority:
  ii. Oligarchy, aiming at the good of the few:
  iii. Tyranny, aiming at the good of one.

Such is Aristotle's practical philosophy, contained in his matured *Nicomachean Ethics*, and his unfinished *Politics*.

3. *Production* (ποίησις).—Production differs from practice in being an activity (ἐνέργεια; *e.g.* building) which is always a means to a work (ἔργον; *e.g.* a house) beyond itself. Productive science, or art, is an intellectual habit of true reasoning from appropriate principles, acquired from experiences, and applied to the production of the work which is the end of the art. All the arts are therefore at once rational and productive. They are either for necessity (*e.g.* medicine) or for occupation (*e.g.* poetry), the former being inferior to the latter. Rhetoric is a faculty on any subject of investigating what may be persuasive (πιθανόν), which is the work of no other art; its means are artificial and inartificial evidences (πίστεις), and, among artificial evidences, especially the logical arguments of example and enthymeme. Poetry is the art of producing representations; (1) in words, rhythm and harmony (ἁρμονία, "harmony" in the original sense); (2) of men like ourselves, or better as in tragedy, or worse as in comedy; (3) by means of narrative as in epic, or by action as in the drama. The cause of poetry is man's instinct of representation and his love of representations caused by the pleasure of learning. Comedy is representation of men inferior in being ludicrous: epic is like tragedy a representation of superior men, but by means of narrative and unlimited in time: tragedy is a representation of an action superior and complete, in a day if possible, by means of action, and accomplishing by pity and fear the purgation of such passions (*Poetics*, 1449 b 24). Music is a part of moral education; and for this end we should use the most moral harmonies. But music has also other ends and uses, and on the whole four; namely amusement, virtue, occupation and purgation of the affections; for some men are liable more than others to pity and fear and enthusiasm, but from sacred melodies we see them, when they have heard those which act orgiastically on the soul, becoming settled by a kind of medicine and purgation (κάθαρσις), and being relieved with pleasure. Finally, art is not morality, because its end is always a work of art, not virtuous action: on the other hand, art is subordinate to morality, because all the ends of art are but means to the end of life, and therefore a work of art which offends against morality is opposed to the happiness and the good of man. Such is Aristotle's productive science or art, contained in his *Rhetoric* and *Poetics*, compared with his *Ethics* and *Politics*.

Aristotle, even in this sketch of his system, shows himself to be the philosopher of facts, who can best of all men bear criticism; and indeed it must be confessed that he retained many errors of Platonism and laid himself open to the following objections. Two substances, being individuals, *e.g.* Socrates and Callias, are in no way the same, but only similar, even in essence, *e.g.* Socrates is one rational animal, Callias another. A universal, *e.g.* the species man, is not predicate of many individuals (ἐν κατὰ πολλῶν, *Post. An.* i. 11), but a whole number of similar individuals, *e.g.* all men; and not a whole species, but only an individual, is a predicate of such individual, *e.g.* Socrates is a man, not all men, and one white thing, not all white things. Consequently, a species or genus is not a substance, as Aristotle says it is in the *Categories* (inconsistently with his own doctrine of substances), but a whole number of substances, *e.g.* all men, all animals. Similarly, the universal essence of a species is not one and the same as each individual essence, but is the whole number of similar individual essences of the similar individuals of the species, *e.g.* all rational animals. Consequently, the universal essence of a species of substances is not one and the same eternal essence in all the individuals of a species but only similar, and is not substance as Aristotle calls it in the *Metaphysics*, inconsistently with his own doctrine of substance, but is a whole number of similar substances, *e.g.* all rational animals which are what all men are. Hence again, the natural world of species and essences is not eternal, but only endures as long as there are individual substances. Hence, moreover, a natural substance or body as an efficient cause or force causes an effect on another, not by propagating one eternal essence of a species into the matter of the other, but so far as we really understand force, by their reciprocally preventing one another from occupying the same place at the same moment on account of the mutual resistance of any two bodies. The essence of a natural substance, *e.g.* wood, is not immateriate, but is the whole body as what it is. The matter of a natural substance is not a primary matter which is one indeterminate substratum of all natural substances, but is only one body as able to be changed by a force which is another substance able to change it, *e.g.* a seed becoming wood, wood becoming coal, &c. A natural substance or body, therefore, is not a heterogeneous compound of essence and matter, but is essence as what it is, matter as able passively to be changed, force as able actively to change. The simple bodies which are the matter of the rest are not terrestrial earth, water, air, fire,

and a different celestial aether, but whatever elementary bodies natural science, starting anew from mechanics and chemistry, may determine to be the matter of all other bodies whatever. Nature does not aim at God as end, but God, thinking and willing ends, produces and acts on nature. Soul is not an immateriate essence of an organic body capable, but an immateriate conscious substance within an organic body. Sensation is not the reception of the selfsame essence of an external body, but one's perception of one's sentient organism as affected, and especially of its organs resisting one another, *e.g.* one's lips, hands, &c., preventing one another from occupying the same place at the same moment within one's organism. Intelligence does not differ from sense by having no bodily organ, but the nervous system is the bodily organ of both. Intelligence is not active intellect propagating universal essence in passive intellect, but only logical inference starting from sense, and both requiring nervous body and conscious soul. It is not always a true apprehension of essence, but often, especially in physical matter, such as sound or heat or light, takes superficial effects to be the essence of the thing. Aristotle did not altogether solve the question, What is, and scarcely solved at all the question, How do we know the external world?

We might continue to object. But at bottom there remains the fundamental position of Aristotelianism, that all things are substances, individuals separate though related; that some things are attributes, real only as being some individual substance somehow affected, or, as we should say, modified or determined; and that without individual substances there is nothing, and nothing universal apart from individuals. There remains too the consequence that there are different substances, separate from but related to one another; and these substances of three irreducible kinds, natural, supernatural, human. Aristotelianism has to be considered against the philosophy which preceded it and against the philosophy which has since followed it. Platonism preceded it, and was the metaphysical doctrine that all things are supernatural—forms, gods, souls. Idealism has since followed it, and is the metaphysical doctrine that all things are mind and states of mind. Aristotelianism intervenes between ancient Platonism and modern Idealism, and is the metaphysical doctrine that all things are substances, natural and supernatural and human. It is a philosophy of substantial things, standing as a *via media* between a philosophy of the supernatural and a philosophy of mind. There are three alternatives, which may be put as questions which every thinker must ask himself. Are the things which surround me in what I call the environment,—the men, the animals, the plants, the ground, the stones, the water, the air, the moon, the sun, the stars and God—are they shadows, unsubstantial things, as formerly Platonism made all things to be except the supernatural world of forms, gods and souls? Or are they, as modern Idealism says, mind and states of mind? Or are they really substances separate from, though related to, myself, who am also a substance? The Aristotelian answer is —" Yes, all things are substances, but not all supernatural, nor all mental; for some are natural substances, or bodies "; and by that answer Aristotelianism stands or falls.

LITERATURE.—The Aristotelian philosophy is to be studied, first in Aristotle's works, which are the best commentaries on one another; the best complete edition is the Berlin edition (1831–1870), by Bekker and Brandis, in which also are the fragments collected by V. Rose, the scholia collected by Brandis, and the index compiled by Bonitz. After reading the remains of the Peripatetic school, the Greek commentators should be further studied in this edition. The Latin commentators, the Arabians and the schoolmen show how Aristotle has been the chief author of modern culture; while the vindication of modern independence comes out in his critics, the greatest of whom were Roger and Francis Bacon. Since the modern discovery of the science of motion by Galileo which changed natural science, and the modern revolution of philosophy by Descartes which changed metaphysics, the study of Aristotle has become less universal; but it did not die out, and received a fresh stimulus especially from Julius Pacius, who going back through G. Zabarella to the Arabians, and himself gifted with great logical powers, always deserves study in his editions of the *Organon* and the *Physics*, and in his *Doctrinae Peripateticae*. In more recent times, as part of the growing conviction of the essentiality of everything Greek, Aristotle has received marked attention. In France there are the works of Cousin (1835), Félix Ravaisson, who wrote on the *Metaphysics* (1837–1846), and Barthélemy St Hilaire, who translated the *Organon* and other works (1844 seq.). In Germany there has been a host of commentaries, among which we may mention the *Organon* edited (1844–1846) by F. Th. Waitz (not so well as by Pacius), the *De Anima* edited (1833) by F. A. Trendelenburg and later by A. Torstrik, the *Historia Animalium* by H. Aubert and F. Wimmer (1868), the *Ethics* by K. L. Michelet (1827), the *Metaphysics* by A. Schwegler (1847) and (best of all) by H. Bonitz (1848), who is the most faithful of all commentators, because to great industry and acumen he adds the rare gift of confessing when he does not understand, and when he does not know what Aristotle might have thought. With Aristotle's works before one, with the *Index Aristotelicus*, and the edition and translation of the *Metaphysics* by Bonitz on one side, and Zeller's *Die Philosophie der Griechen*, ii. 2, " Aristoteles " (trans. by Costelloe and Muirhead), on the other side, one can go a considerable way towards understanding the foundations of Aristotelianism.

In England scholars tend to take up certain parts of Aristotle's philosophy. Grote indeed intended to write a general account of Aristotle like that of Plato; but his *Aristotle* went little further than the logical writings. From Cambridge we have J. W. Blakesley's *Life of Aristotle*, E. M. Cope's *Rhetoric*, Dr Henry Jackson's *Nicomachean Ethics*, v., S. H. Butcher's *Poetics*, Hicks's *De Anima*, J. E. Sandys's *Athenian Constitution*, Jebb's *Rhetoric* (ed. Sandys). Oxford in particular, since the beginning of the 19th century, has kept alive the study of Aristotle. E. Cardwell in his edition of the *Nicomachean Ethics* (1828) had the wisdom to found his text on the Laurentian Manuscript (Kb); E. Poste wrote translations of the *Posterior Analytics* and *Sophistici Elenchi*; R. Congreve edited the *Politics*; A. Grant edited the *Nicomachean Ethics*; E. Wallace translated and annotated the *De Anima*; B. Jowett translated the *Politics*; W. L. Newman has edited the *Politics* in four volumes; Dr Ogle has translated the *De Partibus Animalium*, with notes; R. Shute wrote a *History of the Aristotelian Writings*; Professor J. A. Stewart has written *Notes on the Nicomachean Ethics*; Professor J. Burnet has issued an annotated edition of the *Nicomachean Ethics*, and W. D. Ross has translated the *Metaphysics*. All these are, or were, Oxford men; and it remains to mention two others: I. Bywater, who as an Aristotelian scholar has done much for the improvement of Bekker's text, especially of the *Nicomachean Ethics* and the *Poetics*; and F. G. Kenyon, who has the proud distinction of having been the first modern editor of the *Ἀθηναίων πολιτεία*. (T. Ca.)

ARISTOXENUS, of Tarentum (4th century B.C.), a Greek peripatetic philosopher, and writer on music and rhythm. He was taught first by his father Spintharus, a pupil of Socrates, and later by the Pythagoreans, Lamprus of Erythrae and Xenophilus, from whom he learned the theory of music. Finally he studied under Aristotle at Athens, and was deeply annoyed, it is said, when Theophrastus was appointed head of the school on Aristotle's death. His writings, said to have numbered four hundred and fifty-three, were in the style of Aristotle, and dealt with philosophy, ethics and music. The empirical tendency of his thought is shown in his theory that the soul is related to the body as harmony to the parts of a musical instrument. We have no evidence as to the method by which he deduced this theory (cf. T. Gomperz, *Greek Thinkers*, Eng. trans. 1905, vol. iii. p. 43). In music he held that the notes of the scale are to be judged, not as the Pythagoreans held, by mathematical ratio, but by the ear. The only work of his that has come down to us is the three books of the *Elements of Harmony* (*ῥυθμικὰ στοιχεῖα*), an incomplete musical treatise. Grenfell and Hunt's *Oxyrhynchus Papyri* (vol. i., 1898) contains a five-column fragment of a treatise on metre, probably this treatise of Aristoxenus.

The best edition is by Paul Marquard, with German translation and full commentary, *Die harmonischen Fragmente des Aristoxenus* (Berlin, 1868). The fragments are also given in C.W. Müller, *Frag. Hist. Graec.*, ii. 269 sqq.; and R. Westphal, *Melik und Rhythmik d. klass. Hellenenthums* (2nd vol. edited by F. Saran, Leipzig, 1893). Eng. trans. by H. S. Macran (Oxford, 1902). See also W. L. Mahne, *Diatribe de Aristoxeno* (Amsterdam, 1793); B. Brill, *Aristoxenus' rhythmische und metrische Messungen* (1871); R. Westphal, *Griechische Rhythmik und Harmonik* (Leipzig, 1867); L. Laloy, *Aristoxène de Tarente et la musique de l'antiquité* (Paris, 1904). See PERIPATETICS, PYTHAGORAS (*Music*) and art. " Greek Music " in Grove's *Dict. of Music* (1904). For the Oxyrhynchus fragment see *Classical Review* (January 1898), and C. van Jan in Bursian's *Jahresbericht*, civ. (1901).

ARISUGAWA, the name of one of the royal families of Japan, going back to the seventh son of the mikado Go-Yozei (d. 1638). After the revolution of 1868, when the mikado Mutsu-hito was restored, his uncle, Prince Taruhito Arisugawa (1835–1895), became commander-in-chief, and in 1875 president of the senate.

After his suppression of the Satsuma rebellion he was made a field-marshal, and he was chief of the staff in the war with China (1894–95). His younger brother, Prince Takehito Arisugawa (b. 1862), was from 1879 to 1882 in the British navy, serving in the Channel Squadron, and studied at the Naval College, Greenwich. In the Chino-Japanese War of 1894–95 he was in command of a cruiser, and subsequently became admiral-superintendent at Yokosuka. Prince Arisugawa represented Japan in England together with Marquis Ito at the Diamond Jubilee (1897), and in 1905 was again received there as the king's guest.

ARITHMETIC (Gr. ἀριθμητική, *sc.* τέχνη, the art of counting, from ἀριθμός, number), the art of dealing with numerical quantities in their numerical relations.

1. Arithmetic is usually divided into *Abstract Arithmetic* and *Concrete Arithmetic*, the former dealing with numbers and the latter with concrete objects. This distinction, however, might be misleading. In stating that the sum of 11d. and 9d. is 1s. 8d. we do not mean that nine pennies when added to eleven pennies produce a shilling and eight pennies. The sum of money corresponding to 11d. may in fact be made up of coins in several different ways, so that the symbol "11d." cannot be taken as denoting any definite concrete objects. The arithmetical fact is that 11 and 9 may be regrouped as 12 and 8, and the statement "11d.+9d. = 1s. 8d." is only an arithmetical statement in so far as each of the three expressions denotes a numerical quantity (§ 11).

2. The various stages in the study of arithmetic may be arranged in different ways, and the arrangement adopted must be influenced by the purpose in view. There are three main purposes, the practical, the educational, and the scientific; *i.e.* the subject may be studied with a view to technical skill in dealing with the arithmetical problems that arise in actual life, or for the sake of its general influence on mental development, or as an elementary stage in mathematical study.

3. The practical aspect is an important one. The daily activities of the great mass of the adult population, in countries where commodities are sold at definite prices for definite quantities, include calculations which have often to be performed rapidly, on data orally given, and leading in general to results which can only be approximate; and almost every branch of manufacture or commerce has its own range of applications of arithmetic. Arithmetic as a school subject has been largely regarded from this point of view.

4. From the educational point of view, the value of arithmetic has usually been regarded as consisting in the stress it lays on accuracy. This aspect of the matter, however, belongs mainly to the period when arithmetic was studied almost entirely for commercial purposes; and even then accuracy was not found always to harmonize with actuality. The development of physical science has tended to emphasize an exactly opposite aspect, viz. the impossibility, outside a certain limited range of subjects, of ever obtaining absolute accuracy, and the consequent importance of not wasting time in attempting to obtain results beyond a certain degree of approximation.

5. As a branch of mathematics, arithmetic may be treated logically, psychologically, or historically. All these aspects are of importance to the teacher: the logical, in order that he may know the end which he seeks to attain; the psychological, that he may know how best to attain this end; and the historical, for the light that history throws on psychology.

The logical arrangement of the subject is not the best for elementary study. The division into abstract and concrete, for instance, is logical, if the former is taken as relating to number and the latter to numerical quantity (§ 11). But the result of a rigid application of this principle would be that the calculation of the cost of 3 lb of tea at 2s. a lb would be deferred until after the study of logarithms. The psychological treatment recognizes the fact that the concrete precedes the abstract and that the abstract is based on the concrete; and it also recognizes the futility of attempting a strictly continuous development of the subject.

On the other hand, logical analysis is necessary if the subject is to be understood. As an illustration, we may take the elementary processes of addition, subtraction, multiplication and division. These are still called in text-books the "four simple rules"; but this name ignores certain essential differences. (i) If we consider that we are dealing with numerical quantities, we must recognize the fact that, while addition and subtraction might in the first instance be limited to such quantities, multiplication and division necessarily introduce the idea of pure number. (ii) If on the other hand we regard ourselves as dealing with pure number throughout, then, as multiplication is continued addition, we ought to include in our classification involution as continued multiplication. Or we might say that, since multiplication is a form of addition, and division a form of subtraction, there are really only two fundamental processes, viz. addition and subtraction. (iii) The inclusion of the four processes under one general head fails to indicate the essential difference between addition and multiplication, as direct processes, on the one hand, and subtraction and division, as inverse processes, on the other (§ 59).

6. The present article deals mainly with the principles of the subject, for which a logical arrangement is on the whole the more convenient. It is not suggested that this is the proper order to be adopted by the teacher.

I. Number

7. *Ordinal and Cardinal Numbers.*—One of the primary distinctions in the use of number is between ordinal and cardinal numbers, or rather between the ordinal and the cardinal aspects of number. The usual statement is that *one, two, three,* . . . are cardinal numbers, and *first, second, third,* . . . are ordinal numbers. This, however, is an incomplete statement; the words one, two, three, . . . and the corresponding symbols 1, 2, 3, . . . or I, II, III, . . . are used sometimes as ordinals, *i.e.* to denote the place of an individual in a series, and sometimes as cardinals, *i.e.* to denote the total number since the commencement of the series.

On the whole, the ordinal use is perhaps the more common. Thus "100" on a page of a book does not mean that the page is 100 times the page numbered 1, but merely that it is the page after 99. Even in commercial transactions, in dealing with sums of money, the statement of an amount often has reference to the last item added rather than to a total; and geometrical measurements are practically ordinal (§ 26).

For ordinal purposes we use, as symbols, not only figures, such as 1, 2, 3, . . . but also letters, as *a,b,c,* . . . Thus the pages of a book may be numbered 1, 2, 3, . . . and the chapters I, II, III, . . . but the sheets are lettered A, B, C, ... Figures and letters may even be used in combination; thus 16 may be followed by 16*a* and 16*b*, and these by 17, and in such a case the ordinal 100 does not correspond with the total (cardinal) number up to this point.

Arithmetic is supposed to deal with cardinal, not with ordinal numbers; but it will be found that actual numeration, beyond about three or four, is based on the ordinal aspect of number, and that a scientific treatment of the subject usually requires a return to this fundamental basis.

One difference between the treatment of ordinal and of cardinal numbers may be noted. Where a number is expressed in terms of various denominations, a cardinal number usually begins with the largest denomination, and an ordinal number with the smallest. Thus we speak of one thousand eight hundred and seventy-six, and represent it by MDCCCLXXVI or 1876; but we should speak of the third day of August 1876, and represent it by 3. 8. 1876. It might appear as if the writing of 1876 was an exception to this rule; but in reality 1876, when used in this way, is partly cardinal and partly ordinal, the first three figures being cardinal and the last ordinal. To make the year completely ordinal, we should have to describe it as the 6th year of the 8th decade of the 9th century of the 2nd millennium; *i.e.* we should represent the date by 3. 8. 6. 8. 9. 2, the total number of years, months and days completed being 1875. 7. 2.

In using an ordinal we direct our attention to a term of a series, while in using a cardinal we direct our attention to the interval between two terms. The total number in the series is the sum of the two cardinal numbers obtained by counting up to any interval from the beginning and from the end respectively; but if we take the ordinal numbers from the beginning and from the end we count one term twice over. Hence, if there are 365 days in a year, the 100th day from the beginning is the 266th, not the 265th, from the end.

8. *Meaning of Names of Numbers.*—What do we mean by any particular number, *e.g.* by *seven*, or by *two hundred and fifty-three?* We can define *two* as *one and one*, and *three* as *one and one and one;* but we obviously cannot continue this method for ever. For the definition of large numbers we may employ either of two methods, which will be called the *grouping* method and the *counting* method.

(i) *Method of Grouping.*—The first method consists in defining the first few numbers, and forming larger numbers by groups or aggregates, formed partly by multiplication and partly by addition. Thus, on the denary system (§ 16) we can give independent definitions to the numbers up to ten, and then regard (*e.g.*) fifty-three as a composite number made up of five tens and three ones. Or, on the quinary-binary system, we need only give independent definitions to the numbers up to five; the numbers *six*, *seven*,. . . can then be regarded as *five and one*, *five and two*, . . . , a fresh series being started when we get to *five and five* or *ten*. The grouping method introduces multiplication into the definition of large numbers; but this, from the teacher's point of view, is not now such a serious objection as it was in the days when children were introduced to millions and billions before they had any idea of elementary arithmetical processes.

(ii) *Method of Counting.*—The second method consists in taking a series of names or symbols for the first few numbers, and then repeating these according to a regular system for successive numbers, so that each number is defined by reference to the number immediately preceding it in the series. Thus *two* still means *one and one*, but *three* means *two and one*, not *one and one and one*. Similarly *two hundred and fifty-three* does not mean two hundreds, five tens and three ones, but *one* more than *two hundred and fifty-two;* and the number which is called one hundred is not defined as ten tens, but as one more than ninety-nine.

9. *Concrete and Abstract Numbers.*—Number is concrete or abstract according as it does or does not relate to particular objects. On the whole, the grouping method refers mainly to concrete numbers and the counting method to abstract numbers. If we sort objects into groups of ten, and find that there are five groups of ten with three over, we regard the five and the three as names for the actual sets of groups or of individuals. The three, for instance, are regarded as a whole when we name them *three*. If, however, we count these three as one, two, three, then the number of times we count is an abstract number. Thus number in the abstract is the number of times that the act of counting is performed in any particular case. This, however, is a description, not a definition, and we still want a definition for "number" in the phrase "number of times."

10. *Definition of "Number."*—Suppose we fix on a certain sequence of names "one," "two," "three," . . . , or symbols such as 1, 2, 3, . . . ; this sequence being always the same. If we take a set of concrete objects, and name them in succession "one," "two," "three," . . . , naming each once and once only, we shall not get beyond a certain name, *e.g.* "six." Then, in saying that the number of objects is six, what we mean is that the name of the last object named is six. We therefore only require a definite law for the formation of the successive names or symbols. The symbols 1, 2, . . . 9, 10, . . . , for instance, are formed according to a definite law; and in giving 253 as the *number* of a set of objects we mean that if we attach to them the symbols 1, 2, 3, . . . in succession, according to this law, the symbol attached to the last object will be 253. If we say that this act of attaching a symbol has been performed 253 times, then 253 is an *abstract* (or *pure*) *number*.

Underlying this definition is a certain assumption, viz. that if we take the objects in a different order, the last symbol attached will still be 253. This, in an elementary treatment of the subject, must be regarded as axiomatic; but it is really a simple case of mathematical induction. (See ALGEBRA.) If we take two objects A and B, it is obvious that whether we take them as A, B, or as B, A, we shall in each case get the sequence 1, 2. Suppose this were true for, say, eight objects, marked 1 to 8. Then, if we introduce another object anywhere in the series, all those coming after it will be displaced so that each will have the mark formerly attached to the next following; and the last will therefore be 9 instead of 8. This is true, whatever the arrangement of the original objects may be, and wherever the new one is introduced; and therefore, if the theorem is true for 8, it is true for 9. But it is true for 2; therefore it is true for 3; therefore for 4, and so on.

11. *Numerical Quantities.*— If the term *number* is confined to number in the abstract, then number in the concrete may be described as *numerical quantity*. Thus £3 denotes £1 taken 3 times. The £1 is termed the *unit*. A numerical quantity, therefore, represents a certain *unit*, taken a certain *number of times*. If we take £3 twice, we get £6; and if we take 3s. twice, we get 6s., *i.e.* 6 times 1s. Thus arithmetical processes deal with numerical quantities by dealing with numbers, provided the unit is the same throughout. If we retain the unit, the arithmetic is concrete; if we ignore it, the arithmetic is abstract. But in the latter case it must always be understood that there is some unit concerned, and the results have no meaning until the unit is reintroduced.

II. Notation, Numeration and Number-Ideation

12. *Terms used.*—The representation of numbers by spoken sounds is called *numeration;* their representation by written signs is called *notation*. The systems adopted for numeration and for notation do not always agree with one another; nor do they always correspond with the idea which the numbers subjectively present. This latter presentation may, in the absence of any accepted term, be called *number-ideation;* this word covering not only the perception or recognition of particular numbers, but also the formation of a number-concept.

13. *Notation of Numbers.*—The system which is now almost universally in use amongst civilized nations for representing cardinal numbers is the Hindu, sometimes incorrectly called the Arabic, system. The essential features which distinguish this from other systems are (1) the limitation of the number of different symbols, only ten being used, however large the number to be represented may be; (2) the use of the *zero* to indicate the absence of number; and (3) the principle of local value, by which a symbol in effect represents different numbers, according to its position. The symbols denoting a number are called its *digits*.

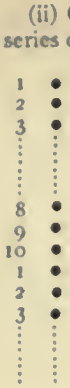
A brief account of the development of the system will be found under NUMERAL. Here we are concerned with the principle, the explanation of which is different according as we proceed on the grouping or the counting system.

(i) On the grouping system we may in the first instance consider that we have separate symbols for numbers from "one" to "nine," but that when we reach ten objects we put them in a group and denote this group by the symbol used for "one," but printed in a different type or written of a different size or (in teaching) of a different colour. Similarly when we get to ten tens we denote them by a new representation of the figure denoting one. Thus we may have:

ones	1	2	3	4	5	6	7	8	9
tens	1	2	3	4	5	6	7	8	9
hundreds, &c.	1	2	3	4	5	6	7	8	9
			&c.			&c.			

On this principle 24 would represent twenty-four, 24 two hundred and forty, and 24 two hundred and four. To prevent confusion the *zero* or "nought" is introduced, so that the successive figures, beginning from the right, may represent ones, tens, hundreds, . . . We then have, *e.g.*, 240 to denote two hundreds and four tens; and we may now adopt a uniform type for all the figures, writing this 240.

(ii) On the counting system we may consider that we have a series of objects (represented in the adjoining diagram by dots), and that we attach to these objects in succession the symbols 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, repeating this series indefinitely. There is as yet no distinction between the first object marked 1 and the second object marked 1. We can, however, attach to the 0's the same symbols, 1, 2, . . . 0 in succession, in a separate column, repeating the series indefinitely; then do the same with every 0 of this new series; and so on. Any particular object is then defined completely by the combination of the symbols last written down in each series; and this combination of symbols can equally be used to denote the number of objects up to and including the last one (§ 10).



In writing down a number in excess of 1000 it is (except where the number represents a particular year) usual in England and America to group the figures in sets of three, starting from the right, and to mark off the sets by commas. On the continent of Europe the figures are taken in sets of three, but are merely spaced, the comma being used at the end of a number to denote the commencement of a decimal.

The zero, called "nought," is of course a different thing from the letter O of the alphabet, but there may be a historical connexion between them (§ 79). It is perhaps interesting to note that the latter-day telephone operator calls 1907 "nineteen O seven" instead of "nineteen nought seven."

14. *Direction of the Number-Series.*—There is no settled convention as to the direction in which the series of symbols denoting the successive numbers one, two, three, . . . is to be written.

(i) If the numbers were written down in succession, they would naturally proceed from left to right, thus:—1, 2, 3, . . . This system, however, would require that in passing to "double figures" the figure denoting tens should be written either above or below the figure denoting ones, *e.g.*

$$\overset{1}{1,2,\ldots,8,9,0,1,2,\ldots} \text{ or } 1,2,\ldots,8,9,\underset{1}{0},1,2,\ldots$$

The placing of the tens-figure to the left of the ones-figure will not seem natural unless the number-series runs either up or down.

(ii) In writing down any particular number, the successive powers of ten are written from right to left, *e.g.* 5,462,198 is

(6)	(5)	(4)	(3)	(2)	(1)	(0)
5	4	6	2	1	9	8

the small figures in brackets indicating the successive powers. On the other hand, in writing decimals, the sequence (of negative powers) is from left to right.

(iii) In making out lists, schedules, mathematical tables (*e.g.* a multiplication-table), statistical tables, &c., the numbers are written vertically downwards. In the case of lists and schedules the numbers are only ordinals; but in the case of mathematical or statistical tables they are usually regarded as cardinals, though, when they represent values of a continuous quantity, they must be regarded as ordinals (§§ 26, 93).

(iv) In graphic representation measurements are usually made upwards; the adoption of this direction resting on certain deeply rooted ideas (§ 23).

This question of direction is of importance in reference to the development of useful number-forms (§ 23); and the existence of the two methods mentioned under (iii) and (iv) above produces confusion in comparing numerical tabulation with graphical representation. It is generally accepted that the horizontal direction of increase, where a horizontal direction is necessary, should be from left to right; but uniformity as regards vertical direction could only be attained either by printing mathematical tables upwards or by taking "downwards," instead of "upwards," as the "positive" direction for graphical purposes.

200
50
3
253

The downwards direction will be taken in this article as the normal one for succession of numbers (*e.g.* in multiplication), and, where the arrangement is horizontal, it is to be understood that this is for convenience of printing. It should be noticed that, in writing the components of a number 253 as 200, 50 and 3, each component beneath the next larger one, we are really adopting the downwards principle, since the figures which make up 253 will on this principle be successively 2, 5 and 3 (§ 13 (ii)).

15. *Roman Numerals.*—Although the Roman numerals are no longer in use for representing cardinal numbers, except in certain special cases (*e.g.* clock-faces, milestones and chemists' prescriptions), they are still used for ordinals.

The system differs completely from the Hindu system. There are no single symbols for two, three, &c.; but numbers are represented by combinations of symbols for one, five, ten, fifty, one hundred, five hundred, &c., the numbers which have single symbols, viz. I, V, X, L, C, D, M, proceeding by multiples of five and two alternately. Thus 1878 is MDCCCLXXVIII, *i.e.* thousand five-hundred hundred hundred hundred fifty ten ten five one one one.

The system is therefore essentially a cardinal and grouping one, *i.e.* it represents a number as the sum of sets of other numbers. It is therefore remarkable that it should now only be used for ordinal purposes, while the Hindu system, which is ordinal in its nature, since a single series is constantly repeated, is used almost exclusively for cardinal numbers. This fact seems to illustrate the truth that the counting principle is the fundamental one, to which the interpretation of grouped numbers must ultimately be referred.

The normal process of writing the larger numbers on the left is in certain cases modified in the Roman system by writing a number in front of a larger one to denote subtraction. Thus *four*, originally written IIII, was later written IV. This may have been due to one or both of two causes; a primitive tendency to refer numbers, in numeration, to the nearest large number (§ 24 (iv)), and the difficulty of perceiving the number of a group of objects beyond about three (§ 22). Similarly IX, XL and XC were written for nine, forty and ninety respectively. These, however, were later developments.

16. *Scales of Notation.*—In the Hindu system the numbering proceeds by tens, tens of tens, &c.; thus the figure in the fifth place, counting from the right, denotes the product of the corresponding number by four tens in succession. The notation is then said to be in the *scale* of which ten is the *base*, or in the *denary scale*. The Roman system, except for the use of symbols for five, fifty, &c., is also in the denary scale, though expressed in a different way. The introduction of these other symbols produces a compound scale, which may be called a *quinary-binary*, or, less correctly, a *quinary-denary* scale.

The figures used in the Hindu notation might be used to express numbers in any other scale than the denary, provided new symbols were introduced if the base of the scale exceeded ten. Thus 1878 in the *quinary-binary* scale would be 1131213, and 1828 would be 1130213; the meaning of these is seen at once by comparison with MDCCCLXXVIII and MDCCCXXVIII. Similarly the number which in the denary scale is 215 would in the quaternary scale (base 4) be 3113, being equal to $3.4.4.4+1.4.4+1.4+3$.

The use of the denary scale in notation is due to its use in numeration (§ 18); this again being due (as exemplified by the use of the word *digit*) to the primitive use of the fingers for counting. If mankind had had six fingers on each hand and six toes on each foot, we should be using a *duodenary scale* (base twelve), which would have been far more convenient.

17. *Notation of Numerical Quantities.*—Over a large part of the civilized world the introduction of the metric system (§ 118) has caused the notation of all numerical quantities to be in the denary scale. In Great Britain and her colonies, however, and in the United States, other systems of notation still survive, though there is none which is consistently in one scale, other than the denary. The method is to form quantities into groups, and these again into larger groups; but the number of groups making one of the next largest groups varies as we proceed along the scale. The successive groups or units thus formed are called *denominations*. Thus twelve pennies make a shilling, and twenty shillings a pound, while the penny is itself divided into four farthings (or

two halfpennies). There are, therefore, four denominations, the bases for conversion of one denomination into the next being successively four (or two), twelve and twenty. Within each denomination, however, the denary notation is employed exclusively, *e.g.* "twelve shillings" is denoted by 12*s*.

The diversity of scales appears to be due mainly to four causes: (i) the tendency to group into scores (§ 20); (ii) the tendency to subdivide into twelve; (iii) the tendency to subdivide into two or four, with repetitions, making subdivision into sixteen or sixty-four; and (iv) the independent adoption of different units for measuring the same kind of magnitude.

Where there is a division into sixteen parts, a binary scale may be formed by dividing into groups of two, four or eight. Thus the weights ordinarily in use for measuring from $\frac{1}{4}$ oz. up to 2 lb give the basis for a binary scale up to not more than eight figures, only 0 and 1 being used. The points of the compass might similarly be expressed by numbers in a binary scale; but the numbers would be ordinal, and the expressions would be analogous to those of decimals rather than to those of whole numbers.

In order to apply arithmetical processes to a quantity expressed in two or more denominations, we must first express it in terms of a single denomination by means of a varying scale of notation. Thus £254, 13s. 6d. may be written $£254 \overset{(20)}{\cdot} 13s. \overset{(12)}{\cdot} 6d.$; each of the numbers in brackets indicating the number of units in one denomination that go to form a unit in the next higher denomination. To express the quantity in terms of £, it ought to be written $£254 \overset{(20)}{\cdot} 13 \overset{(12)}{\cdot} 6$; this would mean $£254\ \frac{13\frac{6}{12}}{20}$ or $£(254+\frac{13}{20}+\frac{6}{20\cdot 12})$, and therefore would involve a fractional number.

A quantity expressed in two or more denominations is usually called a *compound number* or *compound quantity*. The former term is obviously incorrect, since a quantity is not a number; and the latter is not very suggestive. For agreement with the terminology of fractional numbers (§ 62) we shall describe such a quantity as a *mixed quantity*. The letters or symbols descriptive of each denomination are usually placed after or (in actual calculations) above the figures denoting the numbers of the corresponding units; but in a few cases, *e.g.* in the case of £, the symbol is placed before the figures. There would be great convenience in a general adoption of this latter method; the combination of the two methods in such an expression as £123, 16s. 4½d. is especially awkward.

18. *Numeration.*—The names of numbers are almost wholly based on the denary scale; thus eighteen means eight and ten, and twenty-four means twice ten and four. The words *eleven* and *twelve* have been supposed to suggest etymologically a denary basis (see, however, NUMERAL).

Two exceptions, however, may be noted.

(i) The use of *dozen*, *gross* (=dozen dozen), and *great gross* (=dozen gross) indicates an attempt at a duodenary basis. But the system has never spread; and the word "dozen" itself is based on the denary scale.

(ii) The *score* (twenty) has been used as a basis, but to an even more limited extent. There is no essential difference, however, between this and the denary basis. As the latter is due to finger-reckoning, so the use of the fingers and the toes produced a vigesimal scale. Examples of this are given in § 20; it is worthy of notice that the vigesimal (or, rather, quinary-quaternary) system was used by the Mayas of Yucatan, and also, in a more perfect form, by the Nahuatl (Aztecs) of Mexico.

The number ten having been taken as the basis of numeration, there are various methods that might consistently be adopted for naming large numbers.

(i) We might merely name the figures contained in the number. This method is often adopted in practical life, even as regards mixed quantities; thus £57,593, 16s. 4d. would be read as *five seven, five nine three, sixteen and four pence.*

(ii) The word *ten* might be introduced, *e.g.* 593 would be *five ten ten ninety* (=nine ten) *and three.*

(iii) Names might be given to the successive powers of ten, up to the point to which numeration of ones is likely to go. Partial applications of this method are found in many languages.

(iv) A compromise between the last two methods would be to have names for the series of numbers, beginning with ten, each of which is the "square" of the preceding one. This would in effect be analysing numbers into components of the form $a.\ 10^b$ where a is less than 10, and the index b is expressed in the binary scale, *e.g.* 7,000,000 would be $7.10^4.10^2$, and 700,000 would be $7.10^4.10^1$.

The British method is a mixture of the last two, but with an index-scale which is partly ternary and partly binary. There are separate names for ten, ten times ten (=*hundred*), and ten times ten times ten (=*thousand*); but the next single name is *million*, representing a thousand times a thousand. The next name is *billion*, which in Great Britain properly means a million million, and in the United States (as in France) a thousand million.

19. *Discrepancies between Numeration and Notation.*—Although numeration and notation are both ostensibly on the denary system, they are not always exactly parallel. The following are a few of the discrepancies.

(i) A set of written symbols is sometimes read in more than one way, while on the other hand two different sets of symbols (at any rate if denoting numerical quantities) may be read in the same way. Thus 1820 might be read as *one thousand eight hundred and twenty* if it represented a number of men, but it would be read as *eighteen hundred and twenty* if it represented a year of the Christian era; while 1s. 6d. and 18d. might both be read as *eightcenpence*. As regards the first of these two examples, however, it would be more correct to write 1,820 for the former of the two meanings (cf. § 13).

(ii) The symbols 11 and 12 are read as *eleven* and *twelve*, not (except in elementary teaching) as *ten-one* and *ten-two*.

(iii) The names of the numbers next following these, up to 19 inclusive, only faintly suggest a *ten*. This difficulty is not always recognized by teachers, who forget that they themselves had to be told that *eighteen* means *eight-and-ten*.

(iv) Even beyond twenty, up to a hundred, the word *ten* is not used in numeration, *e.g.* we say *thirty-four*, not *three ten four*.

(v) The rule that the greater number comes first is not universally observed in numeration. It is not observed, for instance, in the names of numbers from 13 to 19; nor was it in the names from which *eleven* and *twelve* are derived. Beyond twenty it is usually, but not always, observed; we sometimes instead of *twenty-four* say *four and twenty*. (This latter is the universal system in German, up to 100, and for any portion of 100 in numbers beyond 100.)

20. *Other Methods of Numeration and Notation.*—It is only possible here to make a brief mention of systems other than those now ordinarily in use.

(i) *Vigesimal Scale.*—The system of counting by twenties instead of by tens has existed in many countries; and, though there is no corresponding notation, it still exhibits itself in the names of numbers. This is the case, for instance, in the Celtic languages; and the Breton or Gaulish names have affected the Latin system, so that the French names for some numbers are on the vigesimal system. This system also appears in the Danish numerals. In English the use of the word *score* to represent twenty—*e.g.* in "threescore and ten" for seventy—is superimposed on the denary system, and has never formed an essential part of the language. The word, like *dozen* and *couple*, is still in use, but rather in a vague than in a precise sense.

(ii) *Roman System.*—The Roman notation has been explained above (§ 15). Though convenient for exhibiting the composition of any particular number, it was inconvenient for purposes of calculation; and in fact calculation was entirely (or almost entirely) performed by means of the abacus (*q.v.*). The numeration was in the denary scale, so that it did not agree absolutely with the notation. The principle of subtraction from a higher number, which appeared in notation, also appeared in numeration, but not for exactly the same numbers or in exactly the same way; thus XVIII was two-from-twenty, and the next number was one-from-twenty, but it was written XIX, not IXX.

(iii) *Other Systems of Antiquity.*—The Egyptian notation was purely denary, the only separate signs being those for 1, 10, 100, &c. The ordinary notation of the Babylonians was denary, but they also used a sexagesimal scale, *i.e.* a scale whose base was 60. The Hebrews had a notation containing separate signs (the letters of the alphabet) for numbers from 1 to 10, then for multiples of 10 up to 100, and then for multiples of 100 up to 400, and later up to 1000.

The earliest Greek system of notation was similar to the Roman, except that the symbols for 50, 500, &c., were more complicated. Later, a system similar to the Hebrew was adopted, and extended by reproducing the first nine symbols of the series, preceded by accents, to denote multiplication by 1000.

On the island of Ceylon there still exists, or existed till recently, a system which combines some of the characteristics of the later Greek (or Semitic) and the modern European notation; and it is conjectured that this was the original Hindu system.

For a further account of the above systems see NUMERAL, and the authorities quoted at the end of the present article.

21. *The Number-Concept.*—It is probable that very few people have any definite mental presentation of individual numbers (*i.e.* numbers proceeding by differences of *one*) beyond 100, or at any rate beyond 144. Larger numbers are grasped by forming numbers into groups or by treating some large number as a unit. A person would appreciate the difference between 93,000,000 m. and 94,000,000 m. as the distance of the centre of the sun from the centre of the earth at a particular moment; but he certainly would not appreciate the relative difference between 93,000,000 m. and 93,000,001 m. In order to get an idea of 93,000,000, he must take a million as his unit. Similarly, in the metric system he cannot mentally compare two units, one of which is 1000 times the other. The metre and the kilometre, for instance, or the metre and the millimetre, are not directly comparable; but the metre can be conceived as containing 100 centimetres.

On the other hand, it would seem that, for most educated people, sixteen and seventeen or twenty-six and twenty-seven, and even eighty-six and eighty-seven, are single numbers, just as six and seven are, and are not made up of groups of tens and ones. In other words, the denary scale, though adopted in notation and in numeration, does not arise in the corresponding mental concept until we get beyond 100.

Again, in the use of decimals, it is unusual to give less than two figures. Thus 3·142 or 3·14 would be quite intelligible; but 3·1 does not convey such a good idea to most people as either $3\frac{1}{10}$ or 3·10, *i.e.* as an expression denoting a fraction or a percentage.

There appears therefore to be a tendency to use some larger number than ten as a basis for grouping into new units or for subdivision into parts. The Babylonians adopted 60 for both these purposes, thus giving us the sexagesimal division of angles and of time.

This view is supported, not only by the intelligibility of percentages to ordinary persons, but also by the tendency, noted above (§ 19), to group years into centuries, and to avoid the use of thousands. Thus 1876 is not 1 thousand, 8 hundred, 7 tens and 6, but 18 hundred and 76, each of the numbers 18 and 76 being named as if it were a single number. It is also in accordance with what is so far known about number-forms (§ 23).

If there is this tendency to adopt 100 as a basis instead of 10, the teaching of decimals might sometimes be simplified by proceeding from percentages to percentages of percentages, *i.e.* by commencing with *centesimals* instead of with *decimals*.

22. *Perception of Number.*—In using material objects as a basis for developing the number-concept, it must be remembered that it is only when there are a few objects that their number can be perceived without either counting or the performance of some arithmetical process such as addition. If four coins are laid on a table, close together, they can (by most adults) be seen to be four, without counting; but seven coins have to be separated mentally into two groups, the numbers of which are added, or one group has to be seen and the remaining objects counted, before the number is known to be seven.

The actual limit of the number that can be "seen"—*i.e.* seen without counting or adding—depends for any individual on the shape and arrangement of the objects, but under similar conditions it is not the same for all individuals. It has been suggested that as many as six objects can be seen at once; but this is probably only the case with few people, and with them only when the objects have a certain geometrical arrangement. The limit for most adults, under favourable conditions, is about four. Under certain conditions it is less; thus IIII, the old Roman notation for *four*, is difficult to distinguish from III, and this may have been the main reason for replacing it by IV (§ 15).

In the case of young children the limit is probably two. That this was also the limit in the case of primitive races, and that the classification of things was into one, two and many, before any definite process of counting (*e.g.* by the fingers) came to be adopted, is clear from the use of the "dual number" in language, and from the way in which the names for three and four are often based on those for one and two. With the individual, as with the race, the limit of the number that can be seen gradually increases up to four or five.

The statement that a number of objects can be seen to be three or four is not to be taken as implying that there is a simultaneous perception of all the objects. The attention may be directed in succession to the different objects, so that the perception is rhythmical; the distinctive rhythm thus aiding the perception of the particular number.

In consequence of this limitation of the power of perception of number, it is practically impossible to use a pure denary scale in elementary number-teaching. If a quinary-binary system (such as would naturally fit in with counting on the fingers) is not adopted, teachers unconsciously resort to a binary-quinary system. This is commonly done where cubes are used; thus seven is represented by three pairs of cubes, with a single cube at the top.

23. *Visualization of the Series.*—A striking fact, in reference to ideas of number, is the existence of number-forms, *i.e.* of definite arrangements, on an imagined plane or in space, of the mental representations of the successive numbers from 1 onwards. The proportion of persons in whom number-forms exist has been variously estimated; but there is reason to believe that the forms arise at a very early stage of childhood, and that they did at some time exist in many individuals who have afterwards forgotten them. Those persons who possess them are also apt to make spatial arrangements of days of the week or the month, months of the year, the letters of the alphabet, &c.; and it is practically certain that only children would make such arrangements of letters of the alphabet. The forms seem to result from a general tendency to visualization as an aid to memory; the letter-forms may in the first instance be quite as frequent as the number-forms, but they vanish in early childhood, being of no practical value, while the number-forms continue as an aid to arithmetical work.

The forms are varied, and have few points in common; but the following tendencies are indicated.

(i) In the majority of cases the numbers lie on a continuous (but possibly zigzag) line.

(ii) There is nearly always (at any rate in English cases) a break in direction at 12. From 1 to 12 the numbers sometimes lie in the circumference of a circle, an arrangement obviously suggested by a clock-face; in these cases the series usually mounts upwards from 12. In a large number of cases, however, the direction is steadily upwards from 1 to 12, then changing. In some cases the initial direction is from right to left or from left to right; but there are very few in which it is downwards.

(iii) The multiples of 10 are usually strongly marked; but special stress is also laid on other important numbers, *e.g.* the multiples of 12.

(iv) The series sometimes goes up to very high numbers, but sometimes stops at 100, or even earlier. It is not stated, in most cases, whether all the numbers within the limits of the series have definite positions, or whether there are only certain numbers which form an essential part of the figure, while others only

exist potentially. Probably the latter is almost universally the case.

These forms are developed spontaneously, without suggestion from outside. The possibility of replacing them by a standard form, which could be utilized for performing arithmetical operations, is worthy of consideration; some of the difficulties in the way of standardization have already been indicated (§ 14). The general tendency to prefer an upward direction is important; and our current phraseology suggests that this is the direction which increase is naturally regarded as taking. Thus we speak of counting *up* to a certain number; and similarly mathematicians speak of *high* and *ascending* powers, while engineers speak of high pressure, high speed, high power, &c. This tendency is probably aided by the use of bricks or cubes in elementary number-teaching.

24. *Primitive Ideas of Number.*—The names of numbers give an idea of the way in which the idea of number has developed. Where civilization is at all advanced, there are usually certain names, the origin of which cannot be traced; but, as we go farther back, these become fewer, and the names are found to be composed on certain systems. The systems are varied, and it is impossible to lay down any absolute laws, but the following seem to be the main conclusions.

(i) Amongst some of the lowest tribes, as (with a few exceptions) amongst animals, the only differentiation is between one and many, or between one, two and many, or between one, two, three and many. As it becomes necessary to use higher but still small numbers, they are formed by combinations of one and two, or perhaps of three with one or two. Thus many of the Australasian and South American tribes use only one and two; seven, for instance, would be two two two one.

(ii) Beyond ten, and in many cases beyond five, the names have reference to the use of the fingers, and sometimes of the toes, for counting; and the scale may be quinary, denary or vigesimal, according as one hand, the pair of hands, or the hands and feet, are taken as the new unit. *Five* may be signified by the word for hand; and either *ten* or *twenty* by the word for *man*. Or the words signifying these numbers may have reference to the completion of some act of counting. Between five and ten, or beyond ten, the names may be due to combinations, *e.g.* 16 may be 10+5+1; or they may be the actual names of the fingers last counted.

(iii) There are a few, but only a few, cases in which the number 6 or 8 is named as twice 3 or twice 4; and there are also a few cases in which 7, 8 and 9 are named as 6+1, 6+2 and 6+3. In the large majority of cases the numbers 6, 7, 8 and 9 are 5+1, 5+2, 5+3 and 5+4, being named either directly from their composition in this way or as the fingers on the second hand.

(iv) There is a certain tendency to name 4, 9, 14 and 19 as being one short of 5, 10, 15 and 20 respectively; the principle being thus the same as that of the Roman IV, IX, &c. It is possible that at an early stage the number of the fingers on one hand or on the two hands together was only thought of vaguely as a large number in comparison with 2 or 3, and that the number did not attain definiteness until it was linked up with the smaller by insertion of the intermediate ones; and the linking up might take place in both directions.

(v) In a few cases the names of certain small numbers are the names of objects which present these numbers in some conspicuous way. Thus the word used by the Abipones to denote 5 was the name of a certain hide of five colours. It has been suggested that names of this kind may have been the origin of the numeral words of different races; but it is improbable that direct visual perception would lead to a name for a number unless a name based on a process of counting had previously been given to it.

25. *Growth of the Number-Concept.*—The general principle that the development of the individual follows the development of the race holds good to a certain extent in the case of the number-concept, but it is modified by the existence of language dealing with concepts which are beyond the reach of the child, and also, of course, by the direct attempts at instruction. One result is the formation of a number-series as a mere succession of names without any corresponding ideas of number; the series not being necessarily correct.

When numbering begins, the names of the successive numbers are attached to the individual objects; thus the numbers are originally ordinal, not cardinal.

The conception of number as cardinal, *i.e.* as something belonging to a group of objects as a whole, is a comparatively late one, and does not arise until the idea of a whole consisting of its parts has been formed. This is the *quantitative* aspect of number.

The development from the name-series to the quantitative conception is aided by the numbering of material objects and the performance of elementary processes of comparison, addition, &c., with them. It may also be aided, to a certain extent, by the tendency to find rhythms in sequences of sounds. This tendency is common in adults as well as in children; the strokes of a clock may, for instance, be grouped into fours, and thus eleven is represented as two fours and three. Finger-counting is of course natural to children, and leads to grouping into fives, and ultimately to an understanding of the denary system of notation.

26. *Representation of Geometrical Magnitude by Number.*—The application of arithmetical methods to geometrical measurement presents some difficulty. In reality there is a transition from a cardinal to an ordinal system, but to an ordinal system which does not agree with the original ordinal system from which the cardinal system was derived. To see this, we may represent ordinal numbers by the ordinary numerals 1, 2, 3, . . . and cardinal numbers by the Roman I, II, III, . . . Then in the earliest stage each object counted is indivisible; either we are counting it as a whole, or we are not counting it at all. The symbols 1, 2, 3, . . . then refer to the individual objects, as in fig. 1; this is the primary ordinal stage. Figs. 2 and 3 represent the cardinal stage; fig. 2

Fig. 1.

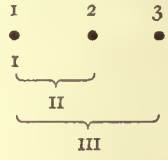


Fig. 2.

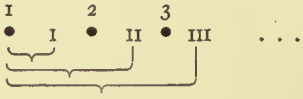


Fig. 3.

showing how the I, II, III, . . . denote the successively larger groups of objects, while fig. 3 shows how the name II of the whole is determined by the name 2 of the last one counted.

When now we pass to geometrical measurement, each "one" is a thing which is itself divisible, and it cannot be said that at any moment we are counting it; it is only when one is completed that we can count it. The names 1, 2, 3, . . . for the individual objects cease to have an intelligible meaning, and measurement is effected by the cardinal numbers I, II, III, . . . , as in fig. 4.

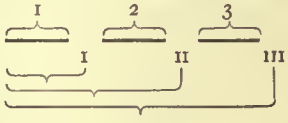


Fig. 4.

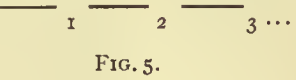


Fig. 5.

These cardinal numbers have now, however, come to denote individual points in the line of measurement, *i.e.* the points of separation of the individual units of length. The point III in fig. 4 does not include the point II in the same way that the number III includes the number II in fig. 2, and the points must therefore be denoted by the ordinal numbers 1, 2, 3, . . . as in fig. 5, the zero o falling into its natural place immediately before the commencement of the first unit.

Thus, while arithmetical numbering refers to units, geometrical numbering does not refer to units but to the intervals between units.

III. Arithmetic of Integral Numbers

(i.) *Preliminary*

27. *Equality and Identity.*—There is a certain difference between the use of words referring to equality and identity in

arithmetic and in algebra respectively; what is an *equality* in the former becoming an *identity* in the latter. Thus the statement that 4 times 3 is equal to 3 times 4, or, in abbreviated form, $4\times3=3\times4$ (§ 28), is a statement not of identity but of equality; *i.e.* 4×3 and 3×4 mean different things, but the operations which they denote produce the same result. But in algebra $a\times b=b\times a$ is called an identity, in the sense that it is true whatever a and b may be; while $n\times X=A$ is called an equation, as being true, when n and A are given, for one value only of X. Similarly the numbers represented by $\frac{6}{7}$ and $\frac{1}{2}$ are not identical, but are equal.

28. *Symbols of Operation.*— The failure to observe the distinction between an identity and an equality often leads to loose reasoning; and in order to prevent this it is important that definite meanings should be attached to all symbols of operation, and especially to those which represent elementary operations. The symbols − and + mean respectively that the first quantity mentioned is to be reduced or divided by the second; but there is some vagueness about + and ×. In the present article $a+b$ will mean that a is taken first, and b added to it; but $a\times b$ will mean that b is taken first, and is then multiplied by a. In the case of numbers the × may be replaced by a dot; thus 4.3 means 4 times 3. When it is necessary to write the multiplicand before the multiplier, the symbol ⋊ will be used, so that $b\rtimes a$ will mean the same as $a\times b$.

29. *Axioms.*—There are certain statements that are sometimes regarded as axiomatic; *e.g.* that if equals are added to equals the results are equal, or that if A is greater than B then A+X is greater than B+X. Such statements, however, are capable of logical proof, and are generalizations of results obtained empirically at an elementary stage; they therefore belong more properly to the laws of arithmetic (§ 58).

(ii.) *Sums and Differences.*

30. *Addition and Subtraction.* — *Addition* is the process of expressing (in numeration or notation) a whole, the parts of which have already been expressed; while, if a whole has been expressed and also a part or parts, *subtraction* is the process of expressing the remainder.

Except with very small numbers, addition and subtraction, on the grouping system, involve analysis and rearrangement. Thus the sum of 8 and 7 cannot be expressed as ones; we can either form the whole, and regroup it as 10 and 5, or we can split up the 7 into 2 and 5, and add the 2 to the 8 to form 10, thus getting $8+7=8+(2+5)=(8+2)+5=10+5=15$. For larger numbers the rearrangement is more extensive; thus $24+31=(20+4)+(30+1)=(20+30)+(4+1)=50+5=55$, the process being still more complicated when the ones together make more than ten. Similarly we cannot subtract 8 from 15, if 15 means 1 ten + 5 ones; we must either write $15-8=(10+5)-8=(10-8)+5=2+5=7$, or else resolve the 15 into an inexpressible number of ones, and then subtract 8 of them, leaving 7.

Numerical quantities, to be added or subtracted, must be in the same denomination; we cannot, for instance, add 55 shillings and 100 pence. any more than we can add 3 yards and 2 metres.

31. *Relative Position in the Series.*—The above method of dealing with addition and subtraction is synthetic, and is appropriate to the grouping method of dealing with number. We commence with processes, and see what they lead to; and thus get an idea of sums and differences. If we adopted the counting method, we should proceed in a different way, our method being analytic.

One number is less or greater than another, according as the symbol (or ordinal) of the former comes earlier or later than that of the latter in the number-series. Thus (writing ordinals in light type, and cardinals in heavy type) 9 comes after 4, and therefore **9** is greater than **4**. To find how much greater, we compare two series, in one of which we go up to 9, while in the other we stop at 4 and then recommence our counting. The series are shown below, the numbers being placed horizontally for convenience of printing, instead of vertically (§ 14):—

1	2	3	4	5	6	7	8	9
1	2	3	4	1	2	3	4	5

This exhibits **9** as the sum of **4** and **5**; it being understood that the sum of **4** and **5** means that we add 5 to **4**. That this gives the same result as adding **4** to **5** may be seen by reckoning the series backwards.

It is convenient to introduce the zero; thus

0	1	2	3	4	5	6	7	8	9
				0	1	2	3	4	5

indicates that after getting to 4 we make a fresh start from 4 as our zero.

To subtract, we may proceed in either of two ways. The subtraction of **4** from **9** may mean either "What has to be added to **4** in order to make up a total of **9**," or "To what has **4** to be added in order to make up a total of **9**." For the former meaning we count forwards, till we get to 4, and then make a new count, parallel with the continuation of the old series, and see at what number we arrive when we get to 9. This corresponds to the concrete method, in which we have **9** objects, take away **4** of them, and recount the remainder. The alternative method is to retrace the steps of addition, *i.e.* to count backwards, treating 9 of one (the standard) series as corresponding with 4 of the other, and finding which number of the former corresponds with 0 of the latter. This is a more advanced method, which leads easily to the idea of negative quantities, if the subtraction is such that we have to go behind the 0 of the standard series.

32. *Mixed Quantities.*—The application of the above principles, and of similar principles with regard to multiplication and division, to numerical quantities expressed in any of the diverse British denominations, presents no theoretical difficulty if the successive denominations are regarded as constituting a varying scale of notation (§17). Thus the expression 2 ft. 3 in. implies that in counting inches we use 0 to eleven instead of 0 to 9 as our first repeating series, so that we put down 1 for the next denomination when we get to twelve instead of when we get to ten. Similarly 3 yds. 2 ft. means

yds. 0			1			2			3			.
ft. 0	1	2	0	1	2	0	1	2	0	1	2	

The practical difficulty, of course, is that the addition of two numbers produces different results according to the scale in which we are for the moment proceeding; thus the sum of 9 and 8 is 17, 15, 13 or 11 according as we are dealing with shillings, pence, pounds (avoirdupois) or ounces. The difficulty may be minimized by using the notation explained in § 17.

(iii.) *Multiples, Submultiples and Quotients.*

33. *Multiplication* and *Division* are the names given to certain numerical processes which have to be performed in order to find the result of certain arithmetical operations. Each process may arise out of either of two distinct operations; but the terminology is based on the processes, not on the operations to which they belong, and the latter are not always clearly understood.

34. *Repetition and Subdivision.*—*Multiplication* occurs when a certain number or numerical quantity is treated as a *unit* (§ 11), and is taken a certain *number* of times. It therefore arises in one or other of two ways, according as the unit or the number exists first in consciousness. If pennies are arranged in groups of five, the total amounts arranged are successively once 5d., twice 5d., three times 5d., . . .; which are written 1×5d., 2×5d., 3×5d., . . . (§ 28). This process is *repetition*, and the quantities 1×5d., 2×5d., 3×5d., . . . are the successive *multiples* of 5d. If, on the other hand, we have a sum of 5s., and treat a shilling as being equivalent to twelve pence, the 5s. is equivalent to 5×12d.; here the multiplication arises out of a *subdivision* of the original unit 1s. into 12d.

Although multiplication may arise in either of these two ways, the actual process in each case is performed by commencing with the unit and taking it the necessary number of times. In the above case of subdivision, for instance, each of the 5 shillings is separately converted into pence, so that we do in fact find in succession once 12d., twice 12d., . . . ; *i.e.* we find the multiples of 12d. up to 5 times.

The result of the multiplication is called the *product* of the unit by the number of times it is taken.

35. *Diagram of Multiplication.*—The process of multiplication is performed in order to obtain such results as the following:—

If 1 boy receives 7 apples,
then 3 boys receive 21 apples;

or

If 1s. is equivalent to 12d.,
then 5s. is equivalent to 60d.

The essential portions of these statements, from the arithmetical point of view, may be exhibited in the form of the diagrams A and B:—

A

1 boy	7 apples
3 boys	21 apples

B

1s.	12d.
5s.	60d.

or more briefly, as in C or C′ and D or D′:—

C

1	7 apples
3	21 apples

C′

	7 apples
3	21 apples

D

1	12d.
5	60d.

D′

	12d.
5	60d.

the general arrangement of the diagram being as shown in E or E′:—

E

1	Unit
Number	Product

E′

	Unit
Number	Product

Multiplication is therefore equivalent to completion of the diagram by entry of the product.

36. *Multiple-Tables.*—The diagram C or D of § 35 is part of a complete table giving the successive multiples of the particular unit. If we take several different units, and write down their successive multiples in parallel columns, preceded by the number-series, we obtain a *multiple-table* such as the following:—

1	1	2	9	1s. 5d.	3 yds. 2 ft.	17359	.....
2	2	4	18	2s. 10d.	7 yds. 1 ft.	34718	.....
3	3	6	27	4s. 3d.	11 yds. 0 ft.	52077	.....
4	4	8	36	5s. 8d.	14 yds. 2 ft.	69436	.....
5	5	10	45	7s. 1d.	18 yds. 1 ft.	86795	.....
.	.	.	.	.	.	.	.....
.	.	.	.	.	.	.	.....
.	.	.	.	.	.	.	.....
.	.	.	.	.	.	.	.....

It is to be considered that each column may extend downwards indefinitely.

37. *Successive Multiplication.*—In multiplication by repetition the unit is itself usually a multiple of some other unit, *i.e.* it is a product which is taken as a new unit. When this new unit has been multiplied by a number, we can again take the product as a unit for the purpose of another multiplication; and so on indefinitely. Similarly where multiplication has arisen out of the subdivision of a unit into smaller units, we can again subdivide these smaller units. Thus we get successive multiplication; but it represents quite different operations according as it is due to repetition, in the sense of § 34, or to subdivision, and these operations will be exhibited by different diagrams. Of the two diagrams below, A exhibits the successive multiplication of £3 by 20, 12 and 4, and B the successive reduction of £3 to shillings, pence and farthings. The principle on which the diagrams are constructed is obvious from § 35. It should be noticed that in multiplying £3 by 20 we find the value of 20.3, but that in reducing £3 to shillings, since each £ becomes 20s., we find the value of 3.20.

A

		1	£3
	1	20	£60
1	12		£720
4			£2880

B

		1d.	4f.
	1s.	12d.	
£1	20s.		
£3	60s.	720d.	2880f.

38. *Submultiples.*—The relation of a unit to its successive multiples as shown in a multiple-table is expressed by saying that it is a submultiple of the multiples, the successive submultiples being *one-half, one-third, one-fourth,* . . . Thus, in the diagram of § 36, 1s. 5d. is one-half of 2s. 10d., one-third of 4s. 3d., one-fourth of 5s. 8d., . . . ; these being written "$\frac{1}{2}$ of 2s. 10d.," "$\frac{1}{3}$ of 4s. 3d.," "$\frac{1}{4}$ of 5s. 8d.," . . .

The relation of submultiple is the converse of that of multiple; thus if a is $\frac{1}{5}$ of b, then b is 5 times a. The determination of a submultiple is therefore equivalent to completion of the diagram E or E′ of § 35 by entry of the unit, when the number of times it is taken, and the product, are given. The operation is the converse or repetition; it is usually called *partition*, as representing division into a number of equal shares.

39. *Quotients.*—The converse of subdivision is the formation of units into groups, each constituting a larger unit; the number of the groups so formed out of a definite number of the original units is called a *quotient.* The determination of a quotient is equivalent to completion of the diagram by entry of the number when the unit and the product are given. There is no satisfactory name for the operation, as distinguished from partition; it is sometimes called *measuring*, but this implies an equality in the original units, which is not an essential feature of the operation.

40. *Division.*—From the commutative law for multiplication, which shows that $3\times4\text{d.}=4\times3\text{d.}=12\text{d.}$, it follows that the number of pence in one-fourth of 12d. is equal to the quotient when 12 pence are formed into units of 4d.; each of these numbers being said to be obtained by *dividing* 12 by 4. The term *division* is therefore used in text-books to describe the two processes described in §§ 38 and 39; the product mentioned in § 34 is the *dividend*, the number or the unit, whichever is given, is called the *divisor*, and the unit or number which is to be found is called the *quotient.* The symbol ÷ is used to denote both kinds of division; thus $A\div n$ denotes the unit, n of which make up A, and $A\div B$ denotes the number of times that B has to be taken to make up A. In the present article this confusion is avoided by writing the former as $\frac{1}{n}$ of A.

Methods of division are considered later (§§ 106-108).

41. *Diagrams of Division.*—Since we write from left to right or downwards, it may be convenient for division to interchange the rows or the columns of the multiplication-diagram. Thus the uncompleted diagram for partition is F or G, while for measuring it is usually H; the vacant compartment being for the unit in

F

1	
Number	Product

G

Number	Product
1	

H

Unit	1
Product	

K

12d.	1s.
60d.	

F or G, and for the number in H. In some cases it may be convenient in measuring to show both the units, as in K.

42. *Successive Division* may be performed as the converse of successive multiplication. The diagrams A and B below are the converse (with a slight alteration) of the corresponding diagrams

In § 37; A representing the determination of $\frac{1}{20}$ of $\frac{1}{12}$ of $\frac{1}{4}$ of 2880 farthings, and B the conversion of 2880 farthings into £.

A

		4	2880f.
	12	1	720f.
20	1		60f.
1			3f.

B

		20s.	£1
	12d.	1s.	
4f.	1d.		
2880f.	720d.	60s.	£3

(iv.) *Properties of Numbers.*

(A) Properties not depending on the Scale of Notation.

43. *Powers, Roots and Logarithms.*—The standard series 1, 2, 3, . . . is obtained by successive additions of 1 to the number last found. If instead of commencing with 1 and making successive additions of 1 we commence with any number such as 3 and make successive multiplications by 3, we get a series 3, 9, 27, . . . as shown below the line in the margin. The first member of the series is 3; the second is the product of two numbers, each equal to 3; the third is the product of three numbers, each equal to 3; and so on. These are written 3^1 (or 3), 3^2, 3^3, 3^4, . . . where n^p denotes the product of p numbers, each equal to n. If we write $n^p = N$, then, if any two of the three numbers n, p, N are known, the third is determinate.

0	$1 = 3^0$	n^0
1	$3 = 3^1$	n^1
2	$9 = 3^2$	n^2
3	$27 = 3^3$	n^3
4	$81 = 3^4$	n^4
:	:	:
:	:	:

If we know n and p, p is called the *index*, and n, n^2, . . . n^p are called the *first power*, *second power*, . . . p*th power* of n, the series itself being called the *power-series*. The *second power* and *third power* are usually called the *square* and *cube* respectively. If we know p and N, n is called the p*th root* of N, so that n is the *second* (or *square*) *root* of n^2, the *third* (or *cube*) *root* of n^3, the *fourth root* of n^4, . . . If we know n and N, then p is the *logarithm* of N to *base* n.

The calculation of powers (*i.e.* of N when n and p are given) is *involution*; the calculation of roots (*i.e.* of n when p and N are given) is *evolution*; the calculation of logarithms (*i.e.* of p when n and N are given) has no special name.

Involution is a direct process, consisting of successive multiplications; the other two are inverse processes. The calculation of a logarithm can be performed by successive divisions; evolution requires special methods.

The above definitions of logarithms, &c., relate to cases in which n and p are whole numbers, and are generalized later.

44. *Law of Indices.*—If we multiply n^p by n^q, we multiply the product of p n's by the product of q n's, and the result is therefore n^{p+q}. Similarly, if we divide n^p by n^q, where q is less than p, the result is n^{p-q}. Thus multiplication and division in the power-series correspond to addition and subtraction in the index-series, and vice versa.

If we divide n^p by n^p, the quotient is of course 1. This should be written n^0. Thus we may make the power-series commence with 1, if we make the index-series commence with 0. The added terms are shown above the line in the diagram in § 43.

45. *Factors, Primes and Prime Factors.*—If we take the successive multiples of 2, 3, . . . as in § 36, and place each multiple opposite the same number in the original series, we get an arrangement as in the adjoining diagram. If any number N occurs in the vertical series commencing with a number n (other than 1) then n is said to be a *factor* of N. Thus 2, 3 and 6 are factors of 6; and 2, 3, 4, 6 and 12 are factors of 12.

1	..	..	..	..	..	..	..	..
2	2	..	..	..	..	..	..	..
3	..	3	..	..	..	..	..	..
4	4	..	4	..	..	..	..	..
5	..	..	..	5	..	..	..	..
6	6	6	..	..	6	..	..	..
7	..	..	..	..	..	7	..	..
8	8	..	8	..	..	..	..	8
9	..	9	..	..	..	..	..	..
10	10	..	..	10	..	..	..	..
11	..	..	..	..	..	..	..	..
12	12	12	12	..	12	..	..	..
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.

A number (other than 1) which has no factor except itself is called a *prime number*, or, more briefly, a *prime*. Thus 2, 3, 5, 7 and 11 are primes, for each of these occurs twice only in the table. A number (other than 1) which is not a prime number is called a *composite* number.

If a number is a factor of another number, it is a factor of any multiple of that number. Hence, if a number has factors, one at least of these must be a prime. Thus 12 has 6 for a factor; but 6 is not a prime, one of its factors being 2; and therefore 2 must also be a factor of 12. Dividing 12 by 2, we get a submultiple 6, which again has a prime 2 as a factor. Thus any number which is not itself a prime is the product of several factors, each of which is a prime, *e.g.* 12 is the product of 2, 2 and 3. These are called *prime factors*.

The following are the most important properties of numbers in reference to factors:—

(i) If a number is a factor of another number, it is a factor of any multiple of that number.

(ii) If a number is a factor of two numbers, it is a factor of their sum or (if they are unequal) of their difference. (The words in brackets are inserted to avoid the difficulty, at this stage, of saying that every number is a factor of 0, though it is of course true that $0 . n = 0$, whatever n may be.)

(iii) A number can be resolved into prime factors in one way only, no account being taken of their relative order. Thus $12 = 2\times2\times3 = 2\times3\times2 = 3\times2\times2$, but this is regarded as one way only. If any prime occurs more than once, it is usual to write the number of times of occurrence as an index; thus $144 = 2\times2\times2\times2\times3\times3 = 2^4 . 3^2$.

The number 1 is usually included amongst the primes; but, if this is done, the last paragraph requires modification, since 144 could be expressed as $1 . 2^4 . 3^2$, or as $1^2 . 2^4 . 3^2$, or as $1^p . 2^4 . 3^2$, where p might be anything.

If two numbers have no factor in common (except 1) each is said to be *prime to* the other.

The multiples of 2 (including 1.2) are called *even* numbers; other numbers are *odd* numbers.

46. *Greatest Common Divisor.*—If we resolve two numbers into their prime factors, we can find their *Greatest Common Divisor* or *Highest Common Factor* (written G.C.D. or G.C.F. or H.C.F.), *i.e.* the greatest number which is a factor of both. Thus $144 = 2^4 . 3^2$, and $756 = 2^2 . 3^3 . 7$, and therefore the G.C.D. of 144 and 756 is $2^2 . 3^2 = 36$. If we require the G.C.D. of two numbers, and cannot resolve them into their prime factors, we use a process described in the text-books. The process depends on (ii) of § 45, in the extended form that, if x is a factor of a and b, it is a factor of $pa - qb$, where p and q are any integers.

The G.C.D. of three or more numbers is found in the same way.

47. *Least Common Multiple.*—The *Least Common Multiple*, or L.C.M., of two numbers, is the least number of which they are both factors. Thus, since $144 = 2^4 . 3^2$, and $756 = 2^2 . 3^3 . 7$, the L.C.M. of 144 and 756 is $2^4 . 3^3 . 7$. It is clear, from comparison with the last paragraph, that the product of the G.C.D. and the L.C.M. of two numbers is equal to the product of the numbers themselves. This gives a rule for finding the L.C.M. of two numbers. But we cannot apply it to finding the L.C.M. of three or more numbers; if we cannot resolve the numbers into their prime factors, we must find the L.C.M. of the first two, then the L.C.M. of this and the next number, and so on.

(B) Properties depending on the Scale of Notation.

48. *Tests of Divisibility.*—The following are the principal rules for testing whether particular numbers are factors of a given number. The number is divisible—

(i) by 10 if it ends in 0;

(ii) by 5 if it ends in 0 or 5;

(iii) by 2 if the last digit is even;

(iv) by 4 if the number made up of the last two digits is divisible by 4;

(v) by 8 if the number made up of the last three digits is divisible by 8;

(vi) by 9 if the sum of the digits is divisible by 9;

(vii) by 3 if the sum of the digits is divisible by 3;

(viii) by 11 if the difference between the sum of the 1st, 3rd, 5th, . . . digits and the sum of the 2nd, 4th, 6th, . . . is zero or divisible by 11.

(ix) To find whether a number is divisible by 7, 11 or 13, arrange the number in groups of three figures, beginning from the end, treat each group as a separate number, and then find the difference between the sum of the 1st, 3rd, . . . of these numbers and the sum of the 2nd, 4th, . . . Then, if this difference is zero or is divisible by 7, 11 or 13, the original number is also so divisible; and conversely. For example, 31521 gives 521−31 =490, and therefore is divisible by 7, but not by 11 or 13.

49. *Casting out Nines* is a process based on (vi) of the last paragraph. The remainder when a number is divided by 9 is equal to the remainder when the sum of its digits is divided by 9. Also, if the remainders when two numbers are divided by 9 are respectively a and b, the remainder when their product is divided by 9 is the same as the remainder when $a.b$ is divided by 9. This gives a rule for testing multiplication, which is found in most text-books. It is doubtful, however, whether such a rule, giving a test which is necessarily incomplete, is of much educational value.

(v.) *Relative Magnitude.*

50. *Fractions.*—A *fraction* of a quantity is a submultiple, or a multiple of a submultiple, of that quantity. Thus, since 3×1s. 5d.=4s. 3d., 1s. 5d. may be denoted by $\frac{1}{3}$ of 4s. 3d.; and any multiple of 1s. 5d., denoted by n×1s. 5d., may also be denoted by $\frac{n}{3}$ of 4s. 3d. We therefore use "$\frac{n}{a}$ of A" to mean that we find a quantity X such that a×X=A, and then multiply X by n.

It must be noted (i) that this is a definition of "$\frac{n}{a}$ of," not a definition of "$\frac{n}{a}$," and (ii) that it is not necessary that n should be less than a.

51. *Subdivision of Submultiple.*—By $\frac{5}{7}$ of A we mean 5 times the unit, 7 times which is A. If we regard this unit as being 4 times a lesser unit, then A is 7.4 times this lesser unit, and $\frac{5}{7}$ of A is 5.4 times the lesser unit. Hence $\frac{5}{7}$ of A is equal to $\frac{5.4}{7.4}$ of A; and, conversely, $\frac{5.4}{7.4}$ of A is equal to $\frac{5}{7}$ of A. Similarly each of these is equal to $\frac{5.3}{7.3}$ of A. Hence the value of a fraction is not altered by substituting for the numerator and denominator the corresponding numbers in any other column of a multiple-table (§ 36). If we write $\frac{5.4}{7.4}$ in the form $\frac{4.5}{4.7}$ we may say that the value of a fraction is not altered by multiplying or dividing the numerator and denominator by any number.

52. *Fraction of a Fraction.*—To find $\frac{1}{4}$ of $\frac{5}{7}$ of A we must convert $\frac{5}{7}$ of A into 4 times some unit. This is done by the preceding paragraph. For $\frac{5}{7}$ of A=$\frac{5.4}{7.4}$ of A=$\frac{4.5}{7.4}$ of A; *i.e.* it is 4 times a unit which is itself 5 times another unit, 7.4 times which is A. Hence, taking the former unit 11 times instead of 4 times,

$$\tfrac{1}{4} \text{ of } \tfrac{5}{7} \text{ of A} = \frac{11.5}{7.4} \text{ of A.}$$

A fraction of a fraction is sometimes called a *compound fraction.*

53. *Comparison, Addition and Subtraction of Fractions.*—The quantities $\frac{3}{4}$ of A and $\frac{5}{7}$ of A are expressed in terms of different units. To compare them, or to add or subtract them, we must express them in terms of the same unit. Thus, taking $\frac{1}{28}$ of A as the unit, we have (§ 51)

$$\tfrac{3}{4} \text{ of A} = \tfrac{21}{28} \text{ of A}; \quad \tfrac{5}{7} \text{ of A} = \tfrac{20}{28} \text{ of A.}$$

Hence the former is greater than the latter; their sum is $\frac{41}{28}$ of A; and their difference is $\frac{1}{28}$ of A.

Thus the fractions must be reduced to a *common denominator.* This denominator must, if the fractions are in their lowest terms (§ 54), be a multiple of each of the denominators; it is usually most convenient that it should be their L.C.M. (§ 47).

54. *Fraction in its Lowest Terms.*—A fraction is said to be *in its lowest terms* when its numerator and denominator have no common factor; or to be reduced to its lowest terms when it is replaced by such a fraction. Thus $\frac{8}{22}$ of A is said to be reduced to its lowest terms when it is replaced by $\frac{4}{11}$ of A. It is important always to bear in mind that $\frac{4}{11}$ of A is not the *same as* $\frac{8}{22}$ of A, though it is *equal to* it.

55. *Diagram of Fractional Relation.*—To find $\frac{10}{24}$ of 14s. we have to take 10 of the units, 24 of which make up 14s. Hence the required amount will, in the multiple-table of § 36, be opposite 10 in the column in which the amount opposite 24 is 14s.; the quantity at the head of this column, representing the unit, will be found to be 7d. The elements of the multiple-table with which we are concerned are shown in the diagram in the margin. This diagram serves equally for the two statements that (i) $\frac{10}{24}$ of 14s. is 5s. 10d., (ii) $\frac{24}{10}$ of 5s. 10d. is 14s. The two statements are in fact merely different aspects of a single relation, considered in the next section.

1	7d.
10	5s. 10d.
24	14s.

56. *Ratio.*—If we omit the two upper compartments of the diagram in the last section, we obtain the diagram A. This diagram exhibits a relation between the two amounts 5s. 10d. and 14s. on the one hand, and the numbers 10 and 24 of the standard series on the other, which is expressed by saying that 5s. 10d. is to 14s. in the *ratio* of 10 to 24, or that 14s. is to 5s. 10d. in the ratio of 24 to 10. If we had taken 1s. 2d. instead of 7d. as the unit for the second column, we should have obtained the diagram B. Thus we must regard the ratio of a to b as being the same as the ratio of c to d, if the fractions $\frac{a}{b}$ and $\frac{c}{d}$ are equal. For this reason the ratio of a to b is sometimes written $\frac{a}{b}$, but the more correct method is to write it $a:b$.

A

10	5s. 10d.
24	14s.

B

5	5s. 10d.
12	14s.

If two quantities or numbers P and Q are to each other in the ratio of p to q, it is clear from the diagram that p times Q= q times P, so that Q=$\frac{q}{p}$ of P.

57. *Proportion.*—If from any two columns in the table of § 36 we remove the numbers or quantities in any two rows, we get a diagram such as that here shown. The pair of compartments on either side may, as here, contain numerical quantities, or may contain numbers. But the two pairs of compartments will correspond to a single pair of numbers, *e.g.* 2 and 6, in the standard series, so that, denoting them by M, N and P, Q respectively, M will be to N in the same ratio that P is to Q. This is expressed by saying that M is to N as P to Q, the relation being written M : N :: P : Q; the four quantities are then said to be *in proportion* or to be *proportionals.*

2s. 10d.	7 yds. 1 ft.
8s. 6d.	22 yds.

M	P
N	Q

This is the most general expression of the relative magnitude of two quantities; *i.e.* the relation expressed by proportion includes the relations expressed by multiple, submultiple, fraction and ratio.

If M and N are respectively m and n times a unit, and P and Q are respectively p and q times a unit, then the quantities are in proportion if $mq=np$; and conversely.

IV. Laws of Arithmetic

58. *Laws of Arithmetic.*—The arithmetical processes which we have considered in reference to positive integral numbers are subject to the following laws:—

(i) *Equalities and Inequalities.*—The following are sometimes called *Axioms* (§ 29), but their truth should be proved, even if at an early stage it is assumed. The symbols "$>$" and "$<$" mean respectively "is greater than" and "is less than." The numbers represented by a, b, c, x and m are all supposed to be positive.

(*a*) If $a=b$, and $b=c$, then $a=c$;
(*b*) If $a=b$, then $a+x=b+x$, and $a-x=b-x$;
(*c*) If $a>b$, then $a+x>b+x$, and $a-x>b-x$;
(*d*) If $a<b$, then $a+x<b+x$, and $a-x<b-x$;
(*e*) If $a=b$, then $ma=mb$, and $a+m=b+m$;
(*f*) If $a>b$, then $ma>mb$, and $a+m>b+m$;
(*g*) If $a<b$, then $ma<mb$, and $a+m<b+m$.

(ii) *Associative Law for Additions and Subtractions.*—This law includes the *rule of signs*, that $a-(b-c)=a-b+c$; and it states that, subject to this, successive operations of addition or subtraction may be grouped in sets in any way; *e.g.* $a-b+c+d+e-f=a-(b-c)+(d+e-f)$.

(iii) *Commutative Law for Additions and Subtractions*, that additions and subtractions may be performed in any order; *e.g.* $a-b+c+d=a+c-b+d=a+d+c-b$.

(iv) *Associative Law for Multiplications and Divisions.*—This law includes a rule, similar to the rule of signs, to the effect that $a+(b+c)=a+b\times c$; and it states that, subject to this, successive operations of multiplication or division may be grouped in sets in any way; *e.g.* $a+b\times c\times d\times e+f=a\div(b+c)\times(d\times e+f)$.

(v) *Commutative Law for Multiplications and Divisions*, that multiplications and divisions may be performed in any order: *e.g.* $a+b\times c\times d=a\times c\div b\times d=a\times d\times c\div b$.

(vi) *Distributive Law*, that multiplications and divisions may be distributed over additions and subtractions, *e.g.* that $m(a+b-c)=m.a+m.b-m.c$, or that $(a+b-c)\div n=(a+n)+(b\div n)-(c\div n)$.

In the case of (ii), (iii) and (vi), the letters $a, b, c, \ldots$ may denote either numbers or numerical quantities, while m and n denote numbers; in the case of (iv) and (v) the letters denote numbers only.

59. *Results of Inverse Operations.*—Addition, multiplication and involution are direct processes; and, if we start with positive integers, we continue with positive integers throughout. But, in attempting the inverse processes of subtraction, division, and either evolution or determination of index, the data may be such that a process cannot be performed. We can, however, denote the result of the process by a symbol, and deal with this symbol according to the laws of arithmetic. In this way we arrive at (i) negative numbers, (ii) fractional numbers, (iii) surds, (iv) logarithms (in the ordinary sense of the word).

60. *Simple Formulae.*—The following are some simple formulae which follow from the laws stated in § 58.

(i) $(a+b+c+\ldots)(p+q+r+\ldots)=(ap+aq+ar+\ldots)+(bp+bq+br+\ldots)+(cp+cq+cr+\ldots)+\ldots$; *i.e.* the product of two or more numbers, each of which consists of two or more parts, is the sum of the products of each part of the one with each part of the other.

(ii) $(a+b)(a-b)=a^2-b^2$; *i.e.* the product of the sum and the difference of two numbers is equal to the difference of their squares.

(iii) $(a+b)^2=a^2+2ab+b^2=a^2+(2a+b)b$.

V. Negative Numbers

61. *Negative Numbers* may be regarded as resulting from the commutative law for addition and subtraction. According to this law, $10+3+6-7=10+3-7+6=3+6-7+10=$ &c. But, if we write the expression as $3-7+6+10$, this means that we must first subtract 7 from 3. This cannot be done; but the result of the subtraction, if it could be done, is something which, when 6 is added to it, becomes $3-7+6=3+6-7=2$. The result of $3-7$ is the same as that of $0-4$; and we may write it "-4," and call it a *negative number*, if by this we mean something possessing the property that $-4+4=0$.

This, of course, is unintelligible on the grouping system of treating number; on the counting system it merely means that we count backwards from 0, just as we might count inches backwards from a point marked 0 on a scale. It should be remembered that the counting is performed with something as unit. If this unit is A, then what we are really considering is -4A; and this means, not that A is multiplied by -4, but that A is multiplied by 4, and the product is taken negatively. It would therefore be better, in some ways, to retain the unit throughout, and to describe -4A as a *negative quantity*, in order to avoid confusion with the "negative numbers" with which operations are performed in formal algebra.

The positive quantity or number obtained from a negative quantity or number by omitting the "$-$" is called its *numerical value*.

VI. Fractional and Decimal Numbers

62. *Fractional Numbers.*—According to the definition in § 50 the quantity denoted by $\frac{3}{8}$ of A is made up of a number, 3, and a unit, which is one-sixth of A. Similarly $\frac{p}{n}$ of A, $\frac{q}{n}$ of A, $\frac{r}{n}$ of A, . . . mean quantities which are respectively p times, q times r times, . . . the unit, n of which make up A. Thus any arithmetical processes which can be applied to the numbers $p, q, r, \ldots$ can be applied to $\frac{p}{n}, \frac{q}{n}, \frac{r}{n}, \ldots$, the denominator n remaining unaltered.

If we denote the unit $\frac{1}{n}$ of A by X, then A is n times X, and $\frac{p}{n}$ of n times X is p times X; *i.e.* $\frac{p}{n}$ of n times is p times.

Hence, so long as the denominator remains unaltered, we can deal with $\frac{p}{n}, \frac{q}{n}, \frac{r}{n}, \ldots$ exactly as if they were numbers, any operations being performed on the numerators. The expressions $\frac{p}{n}, \frac{q}{n}, \frac{r}{n}, \ldots$ are then *fractional numbers*, their relation to ordinary or *integral* numbers being that $\frac{p}{n}$ times n times is equal to p times.

This relation is of exactly the same kind as the relation of the successive digits in numbers expressed in a scale of notation whose base is n. Hence we can treat the fractional numbers which have any one denominator as constituting a number-series, as shown in the adjoining diagram. The result of taking 13 sixths of A is then seen to be the same as the result of taking twice A and one-sixth of A, so that we may regard $1\frac{3}{6}$ as being equal to $2\frac{1}{6}$. A fractional number is called a *proper fraction* or an *improper fraction* according as the numerator is or is not less than the denominator; and an expression such as $2\frac{1}{6}$ is called a *mixed number*. An improper fraction is therefore equal either to an integer or to a mixed number. It will be seen from § 17 that a mixed number corresponds with what is there called a *mixed quantity*. Thus £3, 17s. is a mixed quantity, being expressed in pounds and shillings; to express it in terms of pounds only we must write it $£3\frac{17}{20}$.

Ones.	Sixths.
0	0
	1
	2
	3
	4
	5
1	0
	1
	2
	3
	4
	5
2	0
	1
.	.
.	.
.	.

63. *Fractional Numbers with different Denominators.*—If we divided the unit into halves, and these new units into thirds, we should get sixths of the original unit, as shown in A; while, if we divided the unit into thirds, and these new units into halves, we should again get sixths, but as shown in B. The series of halves in the one case, and of thirds in the other, are entirely different series of fractional numbers, but we can compare them by putting each in its proper position in relation to the series of sixths. Thus $\frac{1}{2}$ is equal to $\frac{3}{6}$, and $\frac{2}{3}$ is equal to $\frac{4}{6}$, and conversely; in other words, any fractional number is equivalent to the fractional number obtained by multiplying or dividing the numerator and denominator by any integer. We can thus find fractional numbers equivalent to the sum or difference of any two fractional numbers. The process is the same as that of finding the sum or difference of 3 sixpences and 5 fourpences; we cannot subtract 3 sixpenny-bits from 5 fourpenny-bits, but we can express each as an equivalent number of

A

Ones.	Halves.	Sixths.
0	0	0
		1
		2
	1	0
		1
		2
1	0	0
		.
		.
		.

B

Ones.	Thirds.	Sixths.
0	0	0
		1
	1	0
		1
	2	0
		1
1	0	0
		.
		.
		.

pence, and then perform the subtraction. Generally, to find the sum or difference of two or more fractional numbers, we must replace them by other fractional numbers having the same denominator; it is usually most convenient to take as this denominator the L.C.M. of the original fractional numbers (cf. § 53).

64. *Complex Fractions.*—A fraction (or fractional number), the numerator or denominator of which is a fractional number, is called a *complex* fraction (or fractional number), to distinguish it from a *simple* fraction, which is a fraction having integers for numerator and denominator. Thus $\frac{5\frac{2}{3}}{11\frac{1}{3}}$ of A means that we take a unit X such that $11\frac{1}{3}$ times X is equal to A, and then take $5\frac{2}{3}$ times X. To simplify this, we take a new unit Y, which is $\frac{1}{3}$ of X. Then A is 34 times Y, and $\frac{5\frac{2}{3}}{11\frac{1}{3}}$ of A is 17 times Y, *i.e.* it is $\frac{1}{2}$ of A.

65. *Multiplication of Fractional Numbers.*—To multiply $\frac{8}{3}$ by $\frac{5}{7}$ is to take $\frac{5}{7}$ times $\frac{8}{3}$. It has already been explained (§ 62) that $\frac{5}{7}$ times is an operation such that $\frac{5}{7}$ times 7 times is equal to 5 times. Hence we must express $\frac{8}{3}$, which itself means $\frac{8}{3}$ times, as being 7 times something. This is done by multiplying both numerator and denominator by 7; *i.e.* $\frac{8}{3}$ is equal to $\frac{7.8}{7.3}$, which is the same thing as 7 times $\frac{8}{7.3}$. Hence $\frac{5}{7}$ times $\frac{8}{3}=\frac{5}{7}$ times 7 times $\frac{8}{7.3}=5$ times $\frac{8}{7.3}=\frac{5.8}{7.3}$. The rule for multiplying a fractional number by a fractional number is therefore the same as the rule for finding a fraction of a fraction.

66. *Division of Fractional Numbers.*—To divide $\frac{8}{3}$ by $\frac{5}{7}$ is to find a number (*i.e.* a fractional number) x such that $\frac{5}{7}$ times x is equal to $\frac{8}{3}$. But $\frac{7}{5}$ times $\frac{8}{3}$ times x is, by the last section, equal to x. Hence x is equal to $\frac{7}{5}$ times $\frac{8}{3}$. Thus to divide by a fractional number we must multiply by the number obtained by interchanging the numerator and the denominator, *i.e.* by the *reciprocal* of the original number.

If we divide 1 by $\frac{5}{7}$ we obtain, by this rule, $\frac{7}{5}$. Thus the reciprocal of a number may be defined as the number obtained by dividing 1 by it. This definition applies whether the original number is integral or fractional.

By means of the present and the preceding sections the rule given in § 63 can be extended to the statement that a fractional number is equal to the number obtained by multiplying its numerator and its denominator by any fractional number.

67. *Negative Fractional Numbers.*—We can obtain negative fractional numbers in the same way that we obtain negative integral numbers; thus $-\frac{5}{7}$ or $-\frac{5}{7}$A means that $\frac{5}{7}$ or $\frac{5}{7}$A is taken negatively.

68. *Genesis of Fractional Numbers.*—A fractional number may be regarded as the result of a measuring division (§ 39) which cannot be performed exactly. Thus we cannot divide 3 in. by 11 in. exactly, *i.e.* we cannot express 3 in. as an integral multiple of 11 in.; but, by extending the meaning of "times" as in § 62, we can say that 3 in. is $\frac{3}{11}$ times 11 in., and therefore call $\frac{3}{11}$ the quotient when 3 in. is divided by 11 in. Hence, if p and n are numbers, $\frac{p}{n}$ is sometimes regarded as denoting the result of dividing p by n, whether p and n are integral or fractional (mixed numbers being included in fractional).

The idea and properties of a fractional number having been explained, we may now call it, for brevity, a *fraction*. Thus "$\frac{2}{3}$ of A" no longer means two of the units, three of which make up A; it means that A is multiplied by the fraction $\frac{2}{3}$, *i.e.* it means the same thing as "$\frac{2}{3}$ times A."

69. *Percentage.*—In order to deal, by way of comparison or addition or subtraction, with fractions which have different denominators, it is necessary to reduce them to a common denominator. To avoid this difficulty, in practical life, it is usual to confine our operations to fractions which have a certain standard denominator. Thus (§ 79) the Romans reckoned in twelfths, and the Babylonians in sixtieths; the former method supplied a basis for division by 2, 3, 4, 6 or 12, and the latter for division by 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, or 60. The modern method is to deal with fractions which have 100 as denominator; such fractions are called *percentages*. They only apply accurately to divisions by 2, 4, 5, 10, 20, 25 or 50; but they have the convenience of fitting in with the denary scale of notation, and they can be extended to other divisions by using a mixed number as numerator. One-fortieth, for instance, can be expressed as $\frac{2\frac{1}{2}}{100}$, which is called $2\frac{1}{2}$ *per cent.*, and usually written $2\frac{1}{2}$ %. Similarly $3\frac{1}{3}$ % is equal to one-thirtieth.

If the numerator is a multiple of 5, the fraction represents twentieths. This is convenient, *e.g.* for expressing *rates in the pound*; thus 15 % denotes the process of taking 3s. for every £1, *i.e.* a rate of 3s. in the £.

In applications to money "per cent." sometimes means "per £100." Thus "£3, 17s. 6d. per cent." is really the complex fraction $\frac{3\frac{17\frac{6}{12}}{20}}{100}$.

70. *Decimal Notation of Percentage.*—An integral percentage, *i.e.* a simple fraction with 100 for denominator, can be expressed by writing the two figures of the numerator (or, if there is only one figure, this figure preceded by 0) with a dot or "point" before them; thus ·76 means 76 %, or $\frac{76}{100}$. If there is an integral number to be taken as well as a percentage, this number is written in front of the point; thus 23·76 × A means 23 times A, with 76 % of A. We might therefore denote 76 % by 0·76.

If as our unit we take X = $\frac{1}{100}$ of A = 1 % of A, the above quantity might equally be written 2376 X = $\frac{2376}{100}$ of A; *i.e.* 23·76 × A is equal to 2376 % of A.

71. *Approximate Expression by Percentage.*—When a fraction cannot be expressed by an integral percentage, it can be so expressed approximately, by taking the *nearest* integer to the numerator of an equal fraction having 100 for its denominator. Thus $\frac{1}{7}=\frac{14\frac{2}{7}}{100}$, so that $\frac{1}{7}$ is approximately equal to 14 %; and $\frac{2}{7}=\frac{28\frac{4}{7}}{100}$, which is approximately equal to 29 %. The difference between this approximate percentage and the true value is less than $\frac{1}{2}$ %, *i. e.* is less than $\frac{1}{200}$.

If the numerator of the fraction consists of an integer and $\frac{1}{2}$—*e.g.* in the case of $\frac{3}{8}=\frac{37\frac{1}{2}}{100}$—it is uncertain whether we should take the next lowest or the next highest integer. It is best in such cases to retain the $\frac{1}{2}$; thus we can write $\frac{3}{8}=37\frac{1}{2}$ %$=\cdot37\frac{1}{2}$.

72. *Addition and Subtraction of Percentages.*—The sum or difference of two percentages is expressed by the sum or difference of the numbers expressing the two percentages.

73. *Percentage of a Percentage.*—Since 37 % of 1 is expressed by 0·37, 37 % of 1 % (*i.e.* of 0·01) might similarly be expressed by 0·00·37. The second point, however, is omitted, so that we write it 0·0037 or ·0037, this expression meaning $\frac{37}{100}$ of $\frac{1}{100}=\frac{37}{10000}$.

On the same principle, since 37 % of 45 % is equal to $\frac{37}{100}$ of $\frac{45}{100}$ $=\frac{1665}{100000}=\frac{1665}{10000}+(\frac{665}{10000}$ of $\frac{1}{100})$, we can express it by ·1665; and 3 % of 2 % can be expressed by ·0006. Hence, to find a percentage of a percentage, we multiply the two numbers, put 0's in front if necessary to make up four figures (not counting fractions), and prefix the point.

74. *Decimal Fractions.*—The percentage-notation can be extended to any fraction which has any power of 10 for its denominator. Thus $\frac{153}{1000}$ can be written ·153 and $\frac{15300}{1000000}$ can be written ·15300. These two fractions are equal to each other, and also to ·1530. A fraction written in this way is called a *decimal fraction*; or we might define a decimal fraction as a fraction having a power of 10 for its denominator, there being a special notation for writing such fractions.

A mixed number, the fractional part of which is a decimal fraction, is expressed by writing the integral part in front of the point, which is called the *decimal point*. Thus $27\frac{1530}{10000}$ can be written 27·1530. This number, expressed in terms of the fraction $\frac{1}{10000}$ or ·0001, would be 271530. Hence the successive figures after the decimal point have the same relation to each other and to the figures before the point as if the point did not exist. The point merely indicates the *denomination* in which the number is expressed: the above number, expressed in terms

of $\frac{1}{10}$, would be 271·530, but expressed in terms of 100 it would be ·271530.

Fractions other than decimal fractions are usually called *vulgar fractions*.

75. *Decimal Numbers.*—Instead of regarding the ·153 in 27·153 as meaning $\frac{1}{10}\frac{5}{10^2}\frac{3}{10^3}$, we may regard the different figures in the expression as denoting numbers in the successive orders of submultiples of 1 on a denary scale. Thus, on the grouping system, 27·153 will mean $2.10+7+1/10+5/10^2+3/10^3$, while on the counting system it will mean the result of counting through the tens to 2, then through the ones to 7, then through tenths to 1, and so on. A number made up in this way may be called a *decimal number*, or, more briefly, a *decimal*. It will be seen that the definition includes integral numbers.

76. *Sums and Differences of Decimals.*—To add or subtract decimals, we must reduce them to the same denomination, *i.e.* if one has more figures after the decimal point than the other, we must add sufficient 0's to the latter to make the numbers of figures equal. Thus, to add 5·413 to 3·8, we must write the latter as 3·800. Or we may treat the former as the sum of 5·4 and ·013, and recombine the ·013 with the sum of 3·8 and 5·4.

77. *Product of Decimals.*—To multiply two decimals *exactly*, we multiply them as if the point were absent, and then insert it so that the number of figures after the point in the product shall be equal to the sum of the numbers of figures after the points in the original decimals.

In actual practice, however, decimals only represent approximations, and the process has to be modified (§ 111).

78. *Division by Decimal.*—To divide one decimal by another, we must reduce them to the same denomination, as explained in § 76, and then omit the decimal points. Thus $5·413 \div 3·8 = \frac{5}{1}\frac{4}{0}\frac{1}{0}\frac{3}{0} \div \frac{3}{1}\frac{8}{0}\frac{0}{0} = 5413 \div 3800$.

79. *Historical Development of Fractions and Decimals.*—The fractions used in ancient times were mainly of two kinds: unit-fractions, *i.e.* fractions representing aliquot parts (§ 103), and fractions with a definite denominator.

The Egyptians as a rule used only unit-fractions, other fractions being expressed as the sum of unit-fractions. The only known exception was the use of $\frac{2}{3}$ as a single fraction. Except in the case of $\frac{2}{3}$ and $\frac{1}{2}$, the fraction was expressed by the denominator, with a special symbol above it.

The Babylonians expressed numbers less than 1 by the numerator of a fraction with denominator 60; the numerator only being written. The choice of 60 appears to have been connected with the reckoning of the year as 360 days; it is perpetuated in the present subdivision of angles.

The Greeks originally used unit-fractions, like the Egyptians; later they introduced the sexagesimal fractions of the Babylonians, extending the system to four or more successive subdivisions of the unit representing a degree. They also, but apparently still later and only occasionally, used fractions of the modern kind. In the sexagesimal system the numerators of the successive fractions (the denominators of which were the successive powers of 60) were followed by $'$, $''$, $'''$, $''''$, the denominator not being written. This notation survives in reference to the minute ($'$) and second ($''$) of angular measurement, and has been extended, by analogy, to the foot ($'$) and inch ($''$). Since ξ represented 60, and o was the next letter, the latter appears to have been used to denote absence of one of the fractions; but it is not clear that our present sign for zero was actually derived from this. In the case of fractions of the more general kind, the numerator was written first with $'$, and then the denominator, followed by $''$, was written twice. A different method was used by Diophantus, accents being omitted, and the denominator being written above and to the right of the numerator.

The Romans commonly used fractions with denominator 12; these were described as *unciae* (ounces), being twelfths of the *as* (pound).

The modern system of placing the numerator above the denominator is due to the Hindus; but the dividing line is a later invention. Various systems were tried before the present notation came to be generally accepted. Under one system, for instance, the continued sum $\frac{4}{5}+\frac{1}{7\times5}+\frac{3}{8\times7\times5}$ would be denoted by $\frac{3}{8}\frac{1}{7}\frac{4}{5}$; this is somewhat similar in principle to a decimal notation, but with digits taken in the reverse order.

Hindu treatises on arithmetic show the use of fractions, containing a power of 10 as denominator, as early as the beginning of the 6th century A.D. There was, however, no development in the direction of decimals in the modern sense, and the Arabs, by whom the Hindu notation of integers was brought to Europe, mainly used the sexagesimal division in the $' \ '' \ '''$ notation. Even where the decimal notation would seem to arise naturally, as in the case of approximate extraction of a square root, the portion which might have been expressed as a decimal was converted into sexagesimal fractions. It was not until A.D. 1585 that a decimal notation was published by Simon Stevinus of Bruges. It is worthy of notice that the invention of this notation appears to have been due to practical needs, being required for the purpose of computation of compound interest. The present decimal notation, which is a development of that of Stevinus, was first used in 1617 by H. Briggs, the computer of logarithms.

80. *Fractions of Concrete Quantities.*—The British systems of coinage, weights, lengths, &c., afford many examples of the use of fractions. These may be divided into three classes, as follows:—

(i) The fraction of a concrete quantity may itself not exist as a concrete quantity, but be represented by a token. Thus, if we take a shilling as a unit, we may divide it into 12 or 48 smaller units; but corresponding coins are not really portions of a shilling, but objects which help us in counting. Similarly we may take the farthing as a unit, and invent smaller units, represented either by tokens or by no material objects at all. Ten marks, for instance, might be taken as equivalent to a farthing; but 13 marks are not equivalent to anything except one farthing and three out of the ten acts of counting required to arrive at another farthing.

(ii) In the second class of cases the fraction of the unit quantity is a quantity of the same kind, but cannot be determined with absolute exactness. Weights come in this class. The ounce, for instance, is one-sixteenth of the pound, but it is impossible to find 16 objects such that their weights shall be exactly equal and that the sum of their weights shall be exactly equal to the weight of the standard pound.

(iii) Finally, there are the cases of linear measurement, where it is theoretically possible to find, by geometrical methods, an exact submultiple of a given unit, but both the unit and the submultiple are not really concrete objects, but are spatial relations embodied in objects.

Of these three classes, the first is the least abstract and the last the most abstract. The first only involves number and counting. The second involves the idea of *equality* as a necessary characteristic of the units or subunits that are used. The third involves also the idea of *continuity* and therefore of unlimited subdivision. In weighing an object with ounce-weights the fact that it weighs more than 1 lb 3 oz. but less than 1 lb 4 oz. does not of itself suggest the necessity or possibility of subdivision of the ounce for purposes of greater accuracy. But in measuring a distance we may find that it is "between" two distances differing by a unit of the lowest denomination used, and a subdivision of this unit follows naturally.

VII. Approximation

81. *Approximate Character of Numbers.*—The numbers (integral or decimal) by which we represent the results of arithmetical operations are often only approximately correct. All numbers, for instance, which represent physical measurements, are limited in their accuracy not only by our powers of measurement but also by the accuracy of the measure we use as our unit. Also most fractions cannot be expressed exactly as decimals; and this is also the case for surds and logarithms, as well as for the numbers expressing certain ratios which arise out of geometrical relations.

Even where numbers are supposed to be exact, calculations based on them can often only be approximate. We might, for instance, calculate the exact cost of 3 lb 5 oz. of meat at 9½d. a lb, but there are no coins in which we could pay this exact amount.

When the result of any arithmetical operation or operations is represented approximately but not exactly by a number, the excess (positive or negative) of this number over the number which would express the result exactly is called the *error*.

82. *Degree of Accuracy.*—There are three principal ways of expressing the degree of accuracy of any number, *i.e.* the extent to which it is equal to the number it is intended to represent.

(i) A number can be *correct to* so many *places of decimals*. This means (cf. § 71) that the number differs from the true value by less than one-half of the unit represented by 1 in the last place of decimals. For instance, ·143 represents $\frac{1}{7}$ correct to 3 places of decimals, since it differs from it by less than ·0005. The final figure, in a case like this, is said to be *corrected*.

This method is not good for comparative purposes. Thus ·143 and 14·286 represent respectively $\frac{1}{7}$ and $\frac{100}{7}$ to the same number of places of decimals, but the latter is obviously more exact than the former.

(ii) A number can be correct to so many *significant figures*. The significant figures of a number are those which commence with the first figure other than zero in the number; thus the significant figures of 13·027 and of ·00013027 are the same.

This is the usual method; but the relative accuracy of two numbers expressed to the same number of significant figures depends to a certain extent on the magnitude of the first figure. Thus ·14286 and ·85714 represent $\frac{1}{7}$ and $\frac{6}{7}$ correct to 5 significant figures; but the latter is relatively more accurate than the former. For the former shows only that $\frac{1}{7}$ lies between ·142855 and ·142865, or, as it is better expressed, between ·14285½ and ·14286½; but the latter shows that $\frac{6}{7}$ lies between ·85713½ and ·85714½, and therefore that $\frac{1}{7}$ lies between ·14285$\frac{7}{12}$ and ·14285$\frac{9}{12}$.

In either of the above cases, and generally in any case where a number is known to be within a certain limit on each side of the stated value, the *limit of error* is expressed by the sign ±. Thus the former of the above two statements would give $\frac{1}{7}$ = ·14286 ± ·000005. It should be observed that the numerical value of the error is to be subtracted from or added to the stated value according as the error is positive or negative.

(iii) The limit of error can be expressed as a fraction of the number as stated. Thus $\frac{1}{7}$ = ·143 ± ·0005 can be written $\frac{1}{7}$ = ·143(1 ± $\frac{1}{286}$).

83. *Accuracy after Arithmetical Operations.*—If the numbers which are the subject of operations are not all exact, the accuracy of the result requires special investigation in each case.

Additions and subtractions are simple. If, for instance, the values of a and b, correct to two places of decimals, are 3·58 and 1·34, then 2·24, as the value of $a-b$, is not necessarily correct to two places. The limit of error of each being ±·005, the limit of error of their sum or difference is ±·01.

For multiplication we make use of the formula (§ 60 (i)) $(a' \pm \alpha)(b' \pm \beta) = a'b' + a\beta \pm (a'\beta + b'\alpha)$. If a' and b' are the stated values, and $\pm\alpha$ and $\pm\beta$ the respective limits of error, we ought strictly to take $a'b' + a\beta$ as the product, with a limit of error $\pm (a'\beta + b'\alpha)$. In practice, however, both $a\beta$ and a certain portion of $a'b'$ are small in comparison with $a'\beta$ and $b'\alpha$, and we therefore replace $a'b' + a\beta$ by an approximate value, and increase the limit of error so as to cover the further error thus introduced. In the case of the two numbers given in the last paragraph, the product lies between 3·575 × 1·335 = 4·772625 and 3·585 × 1·345 = 4·821825. We might take the product as (3·58 × 1·34) + (·005)² = 4·797225, the limits of error being ±·005(3·58 + 1·34) = ±·0246; but it is more convenient to write it in such a form as 4·797 ± ·025 or 4·80 ± ·03.

If the number of decimal places to which a result is to be accurate is determined beforehand, it is usually not necessary in the actual working to go to more than two or three places beyond this. At the close of the work the extra figures are dropped, the last figure which remains being corrected (§ 82 (i)) if necessary.

VIII. Surds and Logarithms

84. *Roots and Surds.*—The pth root of a number (§43) may, if the number is an integer, be found by expressing it in terms of its prime factors; or, if it is not an integer, by expressing it as a fraction in its lowest terms, and finding the pth roots of the numerator and of the denominator separately. Thus to find the cube root of 1728, we write it in the form $2^6.3^3$, and find that its cube root is $2^2.3 = 12$; or, to find the cube root of 1·728, we write it as $\frac{1728}{1000} = \frac{216}{125} = \frac{2^3.3^3}{5^3}$ and find that the cube root is $\frac{2.3}{5} = 1{\cdot}2$. Similarly the cube root of 2197 is 13. But we cannot find any number whose cube is 2000.

It is, however, possible to find a number whose cube shall approximate as closely as we please to 2000. Thus the cubes of 12·5 and of 12·6 are respectively 1953·125 and 2000·376, so that the number whose cube differs as little as possible from 2000 is somewhere between 12·5 and 12·6. Again the cube of 12·59 is 1995·616979, so that the number lies between 12·59 and 12·60. We may therefore consider that there is some number x whose cube is 2000, and we can find this number to any degree of accuracy that we please.

A number of this kind is called a *surd*; the surd which is the pth root of N is written $\sqrt[p]{N}$, but if the index is 2 it is usually omitted, so that the square root of N is written $\sqrt{N}$.

85. *Surd as a Power.*—We have seen (§§ 43,44) that, if we take the successive powers of a number N, commencing with 1, they may be written N^0, N^1, N^2, N^3, . . . , the series of indices being the standard series; and we have also seen (§ 44) that multiplication of any two of these numbers corresponds to addition of their indices. Hence we may insert in the power-series numbers with fractional indices, provided that the multiplication of these numbers follows the same law. The number denoted by $N^{\frac{1}{3}}$ will therefore be such that $N^{\frac{1}{3}} \times N^{\frac{1}{3}} \times N^{\frac{1}{3}} = N^{\frac{1}{3}+\frac{1}{3}+\frac{1}{3}} = N$; *i.e.* it will be the cube root of N. By analogy with the notation of fractional numbers, $N^{\frac{2}{3}}$ will be $N^{\frac{1}{3}+\frac{1}{3}} = N^{\frac{1}{3}} \times N^{\frac{1}{3}}$; and, generally, $N^{\frac{p}{q}}$ will mean the product of p numbers, the product of q of which is equal to N. Thus $N^{\frac{2}{3}}$ will not mean the *same* as $N^{\frac{1}{3}}$, but will mean the square of $N^{\frac{1}{3}}$; but this will be *equal* to $N^{\frac{1}{3}}$, *i.e.* $(\sqrt[3]{N})^2 = \sqrt[3]{N}$.

86. *Multiplication and Division of Surds.*—To add or subtract fractional numbers, we must reduce them to a common denominator; and similarly, to multiply or divide surds, we must express them as power-numbers with the same index. Thus $\sqrt[3]{2} \times \sqrt{5} = 2^{\frac{1}{3}} \times 5^{\frac{1}{2}} = 2^{\frac{2}{6}} \times 5^{\frac{3}{6}} = 4^{\frac{1}{6}} \times 125^{\frac{1}{6}} = 500^{\frac{1}{6}} = \sqrt[6]{500}$.

87. *Antilogarithms.*—If we take a fixed number, *e.g.* 2, as base, and take as indices the successive decimal numbers to any particular number of places of decimals, we get a series of *antilogarithms* of the indices to this base. Thus, if we go to two places of decimals, we have as the integral series the numbers 1, 2, 4, 8, . . . which are the values of 2^0, 2^1, 2^2, . . . and we insert within this series the successive powers of x, where x is such that $x^{100} = 2$. We thus get the numbers $2^{\cdot 01}$, $2^{\cdot 02}$, $2^{\cdot 03}$, . . . , which are the antilogarithms of ·01, ·02, ·03, . . . to base 2; the first antilogarithm being $2^{\cdot 00} = 1$, which is thus the antilogarithm of 0 to this (or any other) base. The series is formed by successive multiplication, and any antilogarithm to a larger number of decimal places is formed from it in the same way by multiplication. If, for instance, we have found $2^{\cdot 31}$, then the value of $2^{\cdot 316}$ is found from it by multiplying by the 6th power of the 1000th root of 2.

For practical purposes the number taken as base is 10; the convenience of this being that the increase of the index by an integer means multiplication by the corresponding power of 10, *i.e.* it means a shifting of the decimal point. In the same way, by dividing by powers of 10 we may get negative indices.

88. *Logarithms.*—If N is the antilogarithm of p to the base a, *i.e.* if $N = a^p$, then p is called the logarithm of N to the base a, and is written $\log_a N$. As the table of antilogarithms is formed by successive multiplications, so the logarithm of any given

number is in theory found by successive divisions. Thus, to find the logarithm of a number to base 2, the number being greater than 1, we first divide repeatedly by 2 until we get a number between 1 and 2; then divide repeatedly by $^{10}\sqrt{2}$ until we get a number between 1 and $^{10}\sqrt{2}$; then divide repeatedly by $^{100}\sqrt{2}$; and so on. If, for instance, we find that the number is approximately equal to $2^3 \times (^{10}\sqrt{2})^5 \times (^{100}\sqrt{2})^7 \times (^{1000}\sqrt{2})^4$, it may be written $2^{3.574}$, and its logarithm to base 2 is 3·574.

For a further explanation of logarithms, and for an explanation of the treatment of cases in which an antilogarithm is less than 1, see LOGARITHM.

For practical purposes logarithms are usually calculated to base 10, so that $\log_{10} 10 = 1$, $\log_{10} 100 = 2$, &c.

IX. UNITS

89. *Change of Denomination* of a numerical quantity is usually called *reduction*, so that this term covers, *e.g.*, the expression of £153, 7s. 4d. as shillings and pence and also the expression of 3067s. 4d. as £, s. and d.

The usual statement is that to express £153, 7s. as shillings we multiply 153 by 20 and add 7. This, as already explained (§37), is incorrect. £153 denotes 153 units, each of which is £1 or 20s.; and therefore we must multiply 20s. by 153 and add 7s., *i.e.* multiply 20 by 153 (the unit being now 1s.) and add 7. This is the expression of the process on the grouping method. On the counting method we have a scale with every 20th shilling marked as a £; there are 153 of these 20's, and 7 over.

A

	1s.	12d.
£1	20s.	
£153, 7s. 4d.	3067s. 4d.	36808d.

The simplest case, in which the quantity can be expressed as an integral number of the largest units involved, has already been considered (§§ 37, 42). The same method can be applied in other cases by regarding a quantity expressed in several denominations as a fractional number of units of the largest denomination mentioned; thus 7s. 4d. is to be taken as meaning $7\frac{4}{12}$s., but £0, 7s. 4d. as £$0\frac{7\frac{1}{3}}{20}$ (§17). The reduction of £153, 7s. 4d. to pence, and of 36808d. to £, s. d., on this principle, is shown in diagrams A and B above.

B

	20s.	£1
12d.	1s.	
36808d.	3067s. 4d.	£153, 7s. 4d.

For reduction of pounds to shillings, or shillings to pounds, we must consider that we have a multiple-table (§ 36) in which the multiples of £1 and of 20s. are arranged in parallel columns; and similarly for shillings and pence.

90. *Change of Unit.*—The statement "£153 = 3060s." is not a statement of *equality* of the same kind as the statement "153 × 20 = 3060," but only a statement of *equivalence* for certain purposes; in other words, it does not convey an absolute truth. It is therefore of interest to see whether we cannot replace it by an absolute truth.

To do this, consider what the ordinary processes of multiplication and division mean in reference to concrete objects. If we want to give, to 5 boys, 4 apples each, we are said to multiply 4 apples by 5. We cannot multiply 4 apples by 5 boys, for then we should get 20 "boy-apples," an expression which has no meaning. Or, again, to distribute 20 apples amongst 5 boys, we are not regarded as dividing 20 apples by 5 boys, but as dividing 20 apples by the number 5. The multiplication or division here involves the omission of the unit "boy," and the operation is incomplete. The complete operation, in each case, is as follows.

(i) In the case of multiplication we commence with the conception of the number "5" and the unit "boy"; and we then convert this unit into 4 apples, and thus obtain the result, 20 apples. The conversion of the unit may be represented as multiplication by a factor $\frac{4 \text{ apples}}{1 \text{ boy}}$, so that the operation is $\frac{4 \text{ apples}}{1 \text{ boy}} \times 5 \text{ boys} = 5 \times \frac{4 \text{ apples}}{1 \text{ boy}} \times 1 \text{ boy} = 5 \times 4 \text{ apples} = 20 \text{ apples}$. Similarly, to convert £153 into shillings we must multiply it by a factor $\frac{20\text{s.}}{£1}$, so that we get

$$\frac{20\text{s.}}{£1} \times £153 = 153 \times \frac{20\text{s.}}{£1} \times £1 = 153 \times 20\text{s.} = 3060\text{s.}$$

Hence we can only regard £153 as being equal to 3060s. if we regard this converting factor as unity.

(ii) In the case of partition we can express the complete operation if we extend the meaning of division so as to enable us to divide 20 apples by 5 boys. We thus get $\frac{20 \text{ apples}}{5 \text{ boys}} = \frac{4 \text{ apples}}{1 \text{ boy}}$, which means that the distribution can be effected by distributing at the rate of 4 apples per boy. The converting factor mentioned under (i) therefore represents a *rate*; and partition, applied to concrete cases, leads to a rate.

In reference to the use of the sign × with the converting factor, it should be observed that "$\frac{7 \text{ lb}}{4 \text{ lb}} \times$" symbolizes the replacing of so many times 4 lb by the same number of times 7 lb, while "$\frac{7}{4} \times$" symbolizes the replacing of 4 times something by 7 times that something.

X. ARITHMETICAL REASONING

91. *Correspondence of Series of Numbers.*— In §§ 33-42 we have dealt with the parallelism of the original number-series with a series consisting of the corresponding multiples of some unit, whether a number or a numerical quantity; and the relations arising out of multiplication, division, &c., have been exhibited by diagrams comprising pairs of corresponding terms of the two series. This, however, is only a particular case of the correspondence of two series. In considering addition, for instance, we have introduced two parallel series, each being the original number-series, but the two being placed in different positions. If we add 1,2,3, . . . to 6, we obtain a series 7,8,9, . . . , the terms of which correspond with those of the original series 1,2,3, . . .

Again, in §§61-75 and 84-88 we have considered various kinds of numbers other than those in the original number-series. In general, these have involved two of the original numbers, *e.g.* 5^3 involves 5 and 3, and $\log_2 8$ involves 2 and 8. In some cases, however, *e.g.* in the case of negative numbers and reciprocals, only one is involved; and there might be three or more, as in the case of a number expressed by $(a+b)^n$. If all but one of these constituent elements are settled beforehand, *e.g.* if we take the numbers 5, 5^2, 5^3, . . . , or the numbers $^2\sqrt{1}, ^2\sqrt{2}, ^2\sqrt{3}, \ldots$ or $\log_{10} 1{\cdot}001$, $\log_{10} 1{\cdot}002$, $\log_{10} 1{\cdot}003$ . . . we obtain a series in which each term corresponds with a term of the original number-series.

This correspondence is usually shown by *tabulation*, *i.e.* by the formation of a table in which the original series is shown in one column, and each term of the second series is placed in a second column opposite the corresponding term of the first series, each column being headed by a description of its contents. It is sometimes convenient to begin the first series with 0, and even to give the series of negative numbers; in most cases, however, these latter are regarded as belonging to a different series, and they need not be considered here. The diagrams, A, B, C are simple forms of tables; A giving a sum-series, B a multiple-series, and C a series of square roots, calculated approximately.

A

n	$6+n$
0	6
1	7
2	8
3	9
.	.
.	.
.	.

B

n	$4n$
0	0
1	4
2	8
3	12
.	.
.	.
.	.

C

n	$\sqrt{n}$
0	·000
1	1·000
2	1·414
3	1·732
.	.
.	.
.	.

92. *Correspondence of Numerical Quantities.*—Again, in § 89, we have considered cases of multiple-tables of numerical quantities, where each quantity in one series is *equivalent* to the corresponding quantity in the other series. We might extend this principle to cases in which the terms of two series, whether of numbers or

of numerical quantities, merely *correspond* with each other, the correspondence being the result of some relation. The volume of a cube, for instance, bears a certain relation to the length of an edge of the cube. This relation is not one of proportion; but it may nevertheless be expressed by tabulation, as shown at D.

D.

Length of edge in inches.	Volume of cube.
0	*Nil.*
1	1 cub. in.
2	8 cub. in.
3	27 cub. in.
.	.
.	.
.	.

93. *Interpolation.*—In most cases the quantity in the second column may be regarded as increasing or decreasing continuously as the number in the first column increases, and it has intermediate values corresponding to intermediate (*i.e.* fractional or decimal) numbers not shown in the table. The table in such cases is not, and cannot be, complete, even up to the number to which it goes. For instance, a cube whose edge is $1\frac{1}{2}$ in. has a definite volume, viz. $3\frac{3}{8}$ cub. in. The determination of any such intermediate value is performed by *Interpolation* (*q.v.*).

In treating a fractional number, or the corresponding value of the quantity in the second column, as *intermediate*, we are in effect regarding the numbers 1, 2, 3, . . . , and the corresponding numbers in the second column, as denoting points between which other numbers lie, *i.e.* we are regarding the numbers as *ordinal*, not cardinal. The transition is similar to that which arises in the case of geometrical measurement (§ 26), and it is an essential feature of all reasoning with regard to continuous quantity, such as we have to deal with in real life.

94. *Nature of Arithmetical Reasoning.*—The simplest form of arithmetical reasoning consists in the determination of the term in one series corresponding to a given term in another series, when the relation between the two series is given; and it implies, though it does not necessarily involve, the establishment of each series as a whole by determination of its unit. A method involving the determination of the unit is called a *unitary* method. When the unit is not determined, the reasoning is algebraical rather than arithmetical. If, for instance, three terms of a proportion are given, the fourth can be obtained by the relation given at the end of § 57, this relation being then called the *Rule of Three*; but this is equivalent to the use of an algebraical formula.

More complicated forms of arithmetical reasoning involve the use of series, each term in which corresponds to particular terms in two or more series jointly; and cases of this kind are usually dealt with by special methods, or by means of algebraical formulae. The old-fashioned problems about the amount of work done by particular numbers of men, women and boys, are of this kind, and really involve the solution of simultaneous equations. They are not suitable for elementary purposes, as the arithmetical relations involved are complicated and difficult to grasp.

XI. Methods of Calculation

(i.) *Exact Calculation.*

95. *Working from Left.*—It is desirable, wherever possible, to perform operations on numbers or numerical quantities from the left, rather than from the right. There are several reasons for this. In the first place, an operation then corresponds more closely, at an elementary stage, with the concrete process which it represents. If, for instance, we had one sum of £3, 15s. 9d. and another of £2, 6s. 5d., we should add them by putting the coins of each denomination together and commencing the addition with the £. In the second place, this method fixes the attention at once on the larger, and therefore more important, parts of the quantities concerned, and thus prevents arithmetical processes from becoming too abstract in character. In the third place, it is a better preparation for dealing with approximate calculations. Finally, experience shows that certain operations in which the result is written down at once—*e.g.* addition or subtraction of two numbers or quantities, and multiplication by some small numbers—are with a little practice performed more quickly and more accurately from left to right.

96. *Addition.*—There is no difference in principle between addition (or subtraction) of numbers and addition (or subtraction) of numerical quantities. In each case the grouping system involves rearrangement, which implies the commutative law, while the counting system requires the expression of a quantity in different denominations to be regarded as a notation in a varying scale (§§ 17, 32). We need therefore consider numerical quantities only, our results being applicable to numbers by regarding the digits as representing multiples of units in different denominations.

When the result of addition in one denomination can be partly expressed in another denomination, the process is technically called *carrying*. The name is a bad one, since it does not correspond with any ordinary meaning of the verb. It would be better described as *exchanging*, by analogy with the "changing" of subtraction. When, *e.g.*, we find that the sum of 17s. and 18s. is 35s., we take out 20 of the 35 shillings, and exchange them for £1.

To add from the left, we have to look ahead to see whether the next addition will require an exchange. Thus, in adding £3, 17s. 0d. to £2, 18s. 0d., we write down the sum of £3 and £2 as £6, not as £5, and the sum of 17s. and 18s. as 15s., not as 35s.

When three or more numbers or quantities are added together, the result should always be checked by adding both upwards and downwards. It is also useful to look out for pairs of numbers or quantities which make 1 of the next denomination, *e.g.* 7 and 3, or 8d. and 4d.

97. *Subtraction.*—To subtract £3, 5s. 4d. from £9, 7s. 8d., on the grouping system, we split up each quantity into its denominations, perform the subtractions independently, and then regroup the results as the "remainder" £6, 2s. 4d. On the counting system we can count either forwards or backwards, and we can work either from the left or from the right. If we count forwards we find that to convert £3, 5s. 4d. into £9, 7s. 8d. we must successively add £6, 2s. and 4d. if we work from the left, or 4d., 2s. and £6 if we work from the right. The intermediate values obtained by the successive additions are different according as we work from the left or from the right, being £9, 5s. 4d. and £9, 7s. 4d. in the one case, and £3, 5s. 8d. and £3, 7s. 8d. in the other. If we count backwards, the intermediate values are £3, 7s. 8d. and £3, 5s. 8d. in the one case, and £9, 7s. 4d. and £9, 5s. 4d. in the other.

The determination of each element in the remainder involves reference to an addition-table. Thus to subtract 5s. from 7s. we refer to an addition-table giving the sum of any two quantities, each of which is one of the series 0s., 1s., . . . 19s.

Subtraction by counting forward is called *complementary addition.*

To subtract £3, 5s. 8d. from £9, 10s. 4d., on the grouping system, we must *change* 1s. out of the 10s. into 12d., so that we subtract £3, 5s. 8d. from £9, 9s. 16d. On the counting system it will be found that, in determining the number of shillings in the remainder, we subtract 5s. from 9s. if we count forwards, working from the left, or backwards, working from the right; while, if we count backwards, working from the left, or forwards, working from the right, the subtraction is of 6s. from 10s. In the first two cases the successive values (in direct or reverse order) are £3, 5s. 8d., £9, 5s. 8d., £9, 9s. 8d. and £9, 10s. 4d.; while in the last two cases they are £9, 10s. 4d., £3, 10s. 4d., £3, 6s. 4d. and £3, 5s. 8d.

In subtracting from the left, we look ahead to see whether a 1 in any denomination must be reserved for changing; thus in subtracting 274 from 637 we should put down 2 from 6 as 3, not as 4, and 7 from 3 as 6.

98. *Multiplication-Table.*—For multiplication and division we use a *multiplication-table*, which is a multiple-table, arranged as explained in § 36, and giving the successive multiples, up to 9 times or further, of the numbers from 1 (or better, from 0) to 10, 12 or 20. The column (vertical) headed 3 will give the multiples of 3, while the row (horizontal) commencing with 3 will give the values of 3×1, 3×2, . . . To multiply by 3 we use the row. To divide by 3, in the sense of partition, we also use the row; but to divide by 3 as a unit we use the column.

99. *Multiplication by a Small Number.*—The idea of a large

multiple of a small number is simpler than that of a small multiple of a large number, but the calculation of the latter is easier. It is therefore convenient, in finding the product of two numbers, to take the smaller as the multiplier.

To find 3 times 427, we apply the distributive law (§ 58 (vi)) that $3.427 = 3(400+20+7) = 3.400+3.20+3.7$. This, if we regard 3.427 as $427+427+427$, is a direct consequence of the commutative law for addition (§ 58 (iii)), which enables us to add separately the hundreds, the tens and the ones. To find 3.400, we treat 100 as the unit (as in addition), so that $3.400 = 3.4.100 = 12.100 = 1200$; and similarly for 3.20. These are examples of the associative law for multiplication (§ 58 (iv)).

100. *Special Cases.*—The following are some special rules:—

(i) To multiply by 5, multiply by 10 and divide by 2. (And conversely, to divide by 5, we multiply by 2 and divide by 10.)

(ii) In multiplying by 2, from the left, add 1 if the next figure of the multiplicand is 5, 6, 7, 8 or 9.

(iii) In multiplying by 3, from the left, add 1 when the next figures are not less than 33 . . . 334 and not greater than 66 . . . 666, and 2 when they are 66 . . . 667 and upwards.

(iv) To multiply by 7, 8, 9, 11 or 12, treat the multiplier as 10-3, 10-2, 10-1, 10+1 or 10+2; and similarly for 13, 17, 18, 19, &c.

(v) To multiply by 4 or 6, we can either multiply from the left by 2 and then by 2 or 3, or multiply from the right by 4 or 6; or we can treat the multiplier as $5-1$ or $5+1$.

101. *Multiplication by a Large Number.*—When both the numbers are large, we split up one of them, preferably the multiplier, into separate portions. Thus $231.4273 = (200+30+1)\ 4273 = 200.4273+30.4273+1.4273$. This gives the *partial products*, the sum of which is the complete product. The process is shown fully in A below,—

A

	4273
200	854600
30	128190
1	4273
231	987063

B

	4273
	8546
231	12819
	4273
	987063

C

1 –	04273
2 –	08546
3 –	12819
.	.
.	.
.	.
10 –	042730

and more concisely in B. To multiply 4273 by 200, we use the commutative law, which gives $200.4273 = 2\times100\times4273 = 2\times4273\times100 = 8546\times100 = 854600$; and similarly for 30.4273. In B the terminal o's of the partial products are omitted. It is usually convenient to make out a preliminary table of multiples up to 10 times; the table being checked at 5 times (§ 100) and at 10 times.

The main difficulty is in the correct placing of the curtailed partial products. The first step is to regard the product of two numbers as containing as many digits as the two numbers put together. The table of multiples will then be as in C. The next step is to arrange the multiplier and the multiplicand above the partial products. For elementary work the multiplicand may come immediately after the multiplier, as in D; the last figure of each partial product then comes immediately under the corresponding figure of the multiplier. A better method, which leads

D

	4273 | 231
	0854 | 6
231	128 | 19
	04 | 273
	0987 | 063

E

	4273 231
	08546
231	12819
	04273
	0987063

up to the multiplication of decimals and of approximate values of numbers, is to place the first figure of the multiplier under the first figure of the multiplicand, as in E; the first figure of each partial product will then come under the corresponding figure of the multiplier.

102. *Contracted Multiplication.*—The partial products are sometimes omitted; the process saves time in writing, but is not easy. The principle is that, *e.g.*, $(a.10^2+b.10+c)(p.10^2+q.10+r) = ap.10^4+(aq+bp)10^3+(ar+bq+cp)10^2+(br+cq)10+cr$. Hence the digits are multiplied in pairs, and grouped according to the power of 10 which each product contains. A method of performing the process is shown here for the case of 162.427. The principle is that $162.427 = 100.427+60.427+2.427 = 1.42700+6.4270+2.427$; but, instead of writing down the separate products, we (in effect) write 42700, 4270 and 427 in separate rows, with the multipliers 1, 6, 2 in the margin, and then multiply each number in each column by the corresponding multiplier in the margin, making allowance for any figures to be "carried." Thus the second figure (from the right) is given by $1+2.2+6.7 = 47$, the 1 being carried.

1	427
6	427
2	427
	69174

103. *Aliquot Parts.*—For multiplication by a proper fraction or a decimal, it is sometimes convenient, especially when we are dealing with mixed quantities, to convert the multiplier into the sum or difference of a number of fractions, each of which has 1 as its numerator. Such fractions are called *aliquot parts* (from Lat. *aliquot*, some, several). This can usually be done in a good many ways. Thus $\frac{5}{8} = 1-\frac{1}{8}$, and also $= \frac{1}{2}+\frac{1}{8}$, and $15\% = .15 = \frac{1}{10}+\frac{1}{20} = \frac{1}{8}-\frac{1}{80} = \frac{1}{8}+\frac{1}{40}$. The fractions should generally be chosen so that each part of the product may be obtained from an earlier part by a comparatively simple division. Thus $\frac{1}{2}+\frac{1}{20}-\frac{1}{40}$ is a simpler expression for $\frac{58}{100}$ than $\frac{1}{2}+\frac{8}{100}$.

The process may sometimes be applied two or three times in succession; thus $\frac{58}{100} = \frac{4}{5}\cdot\frac{7}{8} = (1-\frac{1}{5})\ (1-\frac{1}{8})$, and $\frac{33}{44} = \frac{3}{4}\cdot\frac{11}{11} = (1-\frac{1}{4})\ (1+\frac{1}{10})$.

104. *Practice.*—The above is a particular case of the method called *practice*, but the nomenclature of the method is confusing. There are two kinds of practice, *simple practice* and *compound practice*, but the latter is the simpler of the two. To find the cost of 2 lb 8 oz. of butter at 1s. 2d. a lb, we multiply 1s. 2d. by $2\frac{8}{16} = 2\frac{1}{2}$. This straightforward process is called "compound" practice. "Simple" practice involves an application of the commutative law. To find the cost of n articles at £a, bs. cd. each, we express £a, bs. cd. in the form £$(a+f)$, where f is a fraction (or the sum of several fractions); we then say that the cost, being $n\times$£$(a+f)$, is equal to $(a+f)\times$£n, and apply the method of compound practice, *i.e.* the method of aliquot parts.

105. *Multiplication of a Mixed Number.*—When a mixed quantity or a mixed number has to be multiplied by a large number, it is sometimes convenient to express the former in terms of one only of its denominations. Thus, to multiply £7, 13s. 6d. by 469, we may express the former in any of the ways £7·675, $\frac{5}{4}\frac{3}{0}\frac{6}{0}\frac{7}{0}$ of £1, 153½s., 153·5s., 307 sixpences, or 1842 pence. Expression in £ and decimals of £1 is usually recommended, but it depends on circumstances whether some other method may not be simpler.

A sum of money cannot be expressed exactly as a decimal of £1 unless it is a multiple of ¾d. A rule for approximate conversion is that 1s. = ·05 of £1, and that 2½d. = ·01 of £1. For accurate conversion we write ·1£ for each 2s., and ·001£ for each farthing beyond 2s., their number being first increased by one twenty-fourth.

106. *Division.*—Of the two kinds of division, although the idea of partition is perhaps the more elementary, the process of measuring is the easier to perform, since it is equivalent to a series of subtractions. Starting from the dividend, we in theory keep on subtracting the unit, and count the number of subtractions that have to be performed until nothing is left. In actual practice, of course, we subtract large multiples at a time. Thus, to divide 987063 by 427, we reverse the procedure of § 101, but with intermediate stages. We first construct the multiple-table C, and then subtract successively 200 times, 30 times and 1 times; these numbers being the *partial quotients*. The theory of the process is shown fully in F. Treating x as the unknown quotient corresponding to the original dividend,

F

	4273
x	0987063
200	0854600
$x-200$	132463
30	128190
$x-230$	04273
1	04273
$x-231$	0000

we obtain successive dividends corresponding to quotients $x-200$, $x-230$ and $x-231$. The original dividend is written as 0987063, since its initial figures are greater than those of the divisor; if the dividend had commenced with (*e.g.*) 3 . . . it would not have been necessary to insert the initial 0. At each stage of the division the number of digits in the reduced dividend is decreased by one. The final dividend being 0000, we have $x-231=0$, and therefore $x=231$.

107. *Methods of Division.*—What are described as different methods of division (by a single divisor) are mainly different methods of writing the successive figures occurring in the process. In *long division* the divisor is put on the left of the dividend, and the quotient on the right; and each partial product, with the remainder after its subtraction, is shown in full. In *short division* the divisor and the quotient are placed respectively on the left of and below the dividend, and the partial products and remainders are not shown at all. The *Austrian* method (sometimes called in Great Britain the *Italian* method) differs from these in two respects. The first, and most important, is that the quotient is placed above the dividend. The second, which is not essential to the method, is that the remainders are shown, but not the partial products; the remainders being obtained by working from the right, and using complementary addition. It is doubtful whether the brevity of this latter process really compensates for its greater difficulty.

The advantage of the Austrian arrangement of the quotient

G

4273	2
0987063	
08546	

H

4273	
2	
0987063	
08546	

lies in the indication it gives of the true value of each partial quotient. A modification of the method, corresponding with D of § 101, is shown in G; the fact that the partial product 08546 is followed by two blank spaces shows that the figure 2 represents a partial quotient 200. An alternative arrangement, corresponding to E of § 101, and suited for more advanced work, is shown in H.

108. *Division with Remainder.*—It has so far been assumed that the division can be performed exactly, *i.e.* without leaving an ultimate remainder. Where this is not the case, difficulties are apt to arise, which are mainly due to failure to distinguish between the two kinds of division. If we say that the division of 41d. by 12 gives quotient 3d. with remainder 5d., we are speaking loosely; for in fact we only distribute 36d. out of the 41d., the other 5d. remaining undistributed. It can only be distributed by a subdivision of the unit; *i.e.* the true result of the division is $3\frac{5}{12}$d. On the other hand, we can quite well express the result of dividing 41d. by 1s (=12d.) as 3 with 5d. (not "5") over, for this is only stating that 41d.=3s. 5d.; though the result might be more exactly expressed as $3\frac{5}{12}$s.

Division with a remainder has thus a certain air of unreality, which is accentuated when the division is performed by means of factors (§ 42). If we have to divide 935 by 240, taking 12 and 20 as factors, the result will depend on the fact that, in the notation of § 17, $935=3\ {}^{(20)}{}''17''{}^{(12)}\ 11$. In incomplete partition the quotient is 3, and the remainders 11 and 17 are in effect disregarded; if, after finding the quotient 3, we want to know what remainder would be produced by a direct division, the simplest method is to multiply 3 by 240 and subtract the result from 935. In complete partition the successive quotients are $77\frac{11}{12}$ and $3\frac{17\frac{11}{12}}{20}=3\frac{215}{240}$. Division in the sense of measuring leads to such a result as 935d.=£3, 17s. 11d.; we may, if we please, express the 17s. 11d. as 215d., but there is no particular reason why we should do so.

109. *Division by a Mixed Number.*—To divide by a mixed number, when the quotient is seen to be large, it usually saves time to express the divisor as either a simple fraction or a decimal of a unit of one of the denominations. Exact division by a mixed number is not often required in real life; where approximate division is required (*e.g.* in determining the rate of a "dividend"), approximate expression of the divisor in terms of the largest unit is sufficient.

110. *Calculation of Square Root.*—The calculation of the square root of a number depends on the formula (iii) of § 60. To find the square root of N, we first find some number a whose square is less than N, and subtract a^2 from N. If the complete square root is $a+b$, the remainder after subtracting a^2 is $(2a+b)b$. We therefore guess b by dividing the remainder by $2a$, and form the product $(2a+b)\ b$. If this is equal to the remainder, we have found the square root. If it exceeds the square root, we must alter the value of b, so as to get a product which does not exceed the remainder. If the product is less than the remainder, we get a new remainder, which is $N-(a+b)^2$; we then assume the full square root to be c, so that the new remainder is equal to $(2a+2b+c)\ c$, and try to find c in the same way as we tried to find b.

An analogous method of finding cube root, based on the formula for $(a+b)^3$, used to be given in text-books, but it is of no practical use. To find a root other than a square root we can use logarithms, as explained in § 113.

(ii.) *Approximate Calculation.*

111. *Multiplication.*—When we have to multiply two numbers, and the product is only required, or can only be approximately correct, to a certain number of significant figures, we need only work to two or three more figures (§ 83), and then correct the final figure in the result by means of the superfluous figures.

A common method is to reverse the digits in one of the numbers; but this is only appropriate to the old-fashioned method of writing down products from the right. A better method is to ignore the positions of the decimal points, and multiply the numbers as if they were decimals between ·1 and 1·0. The method E of § 101 being adopted, the multiplicand and the multiplier are written with a space after as many digits (of each) as will be required in the product (on the principle explained in §101); and the multiplication is performed from the left, two extra figures being kept in. Thus, to multiply 27·343 by 3·1415927 to one decimal place, we require 2+1+1=4 figures in the product. The result is 085·9=85·9, the position of the decimal point being determined by counting the figures before the decimal points in the original numbers.

2734 3	
3141 59	
0820 29	
027 34	
10 94	
0 27	
14	
2	
0859	

112. *Division.*—In the same way, in performing approximate division, we can at a certain stage begin to abbreviate the divisor, taking off one figure (but with correction of the final figure of the partial product) at each stage. Thus, to divide 85·9 by 3·1415927 to two places of decimals, we in effect divide ·0859 by ·31415927 to four places of decimals. In the work, as here shown, a 0 is inserted in front of the 859, on the principle explained in § 106. The result of the division is 27·34.

3141 5927	
2734	
0859 00	
0628 32	
230 68	
219 91	
10 77	
9 42	
1 35	
1 26	

113. *Logarithms.*—Multiplication, division, involution and evolution, when the results cannot be exact, are usually most simply performed, at any rate to a first approximation, by means of a table of logarithms. Thus, to find the square root of 2, we have $\log\sqrt{2}=\log(2^{\frac{1}{2}})=\frac{1}{2}\log 2$. We take out log 2 from the table, halve it, and then find from the table the number of which this is the logarithm. (See Logarithm.) The *slide-rule* (see Calculating Machines) is a simple apparatus for the mechanical application of the methods of logarithms.

When a first approximation has been obtained in this way, further approximations can be obtained in various ways. Thus, having found $\sqrt{2}=1\cdot414$ approximately, we write $\sqrt{2}=1\cdot414+\theta$, whence $2=(1\cdot414)^2+(2\cdot818)\theta+\theta^2$. Since θ^2 is less than $\frac{1}{4}$ of

$(\cdot001)^2$, we can obtain three more figures approximately by dividing $2-(1\cdot414)^2$ by 2·818.

114. *Binomial Theorem.*—More generally, if we have obtained a as an approximate value for the pth root of N, the binomial theorem gives as an approximate formula $\sqrt[p]{N}=a+\theta$, where $N=a^p+pa^{p-1}\theta$.

115. *Series.*—A number can often be expressed by a series of terms, such that by taking successive terms we obtain successively closer approximations. A decimal is of course a series of this kind, *e.g.* 3·14159 . . . means $3+1/10+4/10^2+1/10^3+5/10^4+9/10^5+\ldots$. A series of aliquot parts is another kind, *e.g.* 3·1416 is a little less than $3+\frac{1}{7}-\frac{1}{7\,0\,0}$.

Recurring Decimals are a particular kind of series, which arise from the expression of a fraction as a decimal. If the denominator of the fraction, when it is in its lowest terms, contains any other prime factors than 2 and 5, it cannot be expressed exactly as a decimal; but after a certain point a definite series of figures will constantly recur. The interest of these series is, however, mainly theoretical.

116. *Continued Products.*—Instead of being expressed as the sum of a series of terms, a number may be expressed as the product of a series of factors, which become successively more and more nearly equal to 1. For example,

$3\cdot1416=3\times\frac{10000}{9999}=3\times\frac{10000}{9801}=3\times\frac{100}{99}\times\frac{100}{99}=3(1+\frac{1}{99})(1-\frac{1}{9900})$.

Hence, to multiply by 3·1416, we can multiply by $3\frac{1}{7}$, and subtract $\frac{1}{2200}$ (=·0004) of the result; or, to divide by 3·1416, we can divide by 3, then subtract $\frac{1}{22}$ of the result, and then add $\frac{1}{220}$ of the new result.

117. *Continued Fractions.*—The theory of *continued fractions* (*q.v.*) gives a method of expressing a number, in certain cases, as a continued product. A continued fraction, of the kind we are considering, is an expression of the form $a+\cfrac{1}{b+\cfrac{1}{c+\cfrac{1}{d+}}}$ &c. where $b, c, d, \ldots$ are integers, and a is an integer or zero. The expression is usually written, for compactness, $a+\frac{1}{b+}\frac{1}{c+}\frac{1}{d+}$ &c. The numbers $a, b, c, d, \ldots$ are called the *quotients*.

Any exact fraction can be expressed as a continued fraction, and there are methods for expressing as continued fractions certain other numbers, *e.g.* square roots, whose values cannot be expressed exactly as fractions.

The successive values $\frac{a}{1}, \frac{ab+1}{b}, \ldots$, obtained by taking account of the successive quotients, are called *convergents*, *i.e.* convergents to the true value. The following are the main properties of the convergents.

(i) If we precede the series of convergents by $\frac{0}{1}$ and $\frac{1}{0}$, then the numerator (or denominator) of each term of the series $\frac{0}{1}, \frac{1}{0}, \frac{a}{1}, \frac{ab+1}{b}\ldots$, after the first two, is found by multiplying the numerator (or denominator) of the last preceding term by the corresponding quotient and adding the numerator (or denominator) of the term before that. If a is zero, we may regard $\frac{1}{b}$ as the first convergent, and precede the series by $\frac{1}{0}$ and $\frac{0}{1}$.

(ii) Each convergent is a fraction in its lowest terms.

(iii) The convergents are alternately less and greater than the true value.

(iv) Each convergent is nearer to the true value than any other fraction whose denominator is less than that of the convergent.

(v) The difference of two successive convergents is the reciprocal of the product of their denominators; *e.g.* $\frac{ab+1}{b}-\frac{a}{1}=\frac{1}{1.b}$, and $\frac{abc+c+a}{bc+1}-\frac{ab+1}{b}=\frac{-1}{b(bc+1)}$.

It follows from these last three properties that if the successive convergents are $\frac{p_1}{1}, \frac{p_2}{q_2}, \frac{p_3}{q_3}, \ldots$ the number can be expressed in the form $p_1(1+\frac{1}{p_1q_2})(1-\frac{1}{p_2q_3})(1+\frac{1}{p_3q_4})\ldots$, and that if we go up to the factor $1\pm\frac{1}{p_nq_n+1}$ the product of these factors differs from the true value of the number by less than $\pm\frac{1}{q_nq_n+1}$.

In certain cases two or more factors can be combined so as to produce an expression of the form $1\pm\frac{1}{k}$, where k is an integer. For instance, $3\cdot1415927=3(1+\frac{1}{3\cdot7})(1-\frac{1}{22\cdot106})(1+\frac{1}{333\cdot113})\ldots$; but the last two of these factors may be combined as $(1-\frac{1}{22\cdot113})$. Hence $3\cdot1415927=\frac{4}{1}\cdot\frac{3}{4}\cdot\frac{5}{4}\cdot\frac{4}{5}\cdot\frac{6}{5}\cdot\frac{5}{6}\ldots$

XII. Applications

(i.) *Systems of Measures.*[1]

118. *Metric System.*—The metric system was adopted in France at the end of the 18th century. The system is decimal throughout. The principal units of length, weight and volume are the *metre*, *gramme* (or *gram*) and *litre*. Other units are derived from these by multiplication or division by powers of 10, the names being denoted by prefixes. The prefixes for multiplication by 10, 10^2, 10^3 and 10^4 are *deca-*, *hecto-*, *kilo-* and *myria-*, and those for division by 10, 10^2 and 10^3 are *deci-*, *centi-* and *milli-*; the former being derived from Greek, and the latter from Latin. Thus *kilogramme* means 1000 grammes, and *centimetre* means $\frac{1}{100}$ of a metre. There are also certain special units, such as the *hectare*, which is equal to a square hectometre, and the *micron*, which is $\frac{1}{1\,000\,000}$ of a millimetre.

The metre and the gramme are defined by standard measures preserved at Paris. The litre is equal to a cubic decimetre. The gramme was intended to be equal to the weight of a cubic centimetre of pure water at a certain temperature, but the equality is only approximate.

The metric system is now in use in the greater part of the civilized world, but some of the measures retain the names of old disused measures. In Germany, for instance, the *Pfund* is ½ kilogramme, and is approximately equal to $1\frac{1}{10}$lb English.

119. *British Systems.*—The British systems have various origins, and are still subject to variations caused by local usage or by the usage of particular businesses. The following tables are given as illustrations of the arrangement adopted elsewhere in this article; the entries in any column denote multiples or sub-multiples of the unit stated at the head of the column, and the entries in any row give the expression of one unit in terms of the other units.

Length

Inch.	Foot.	Yard.	Chain.	Furlong.	Mile.
1	$\frac{1}{12}$	$\frac{1}{36}$	$\frac{1}{792}$	$\frac{1}{7920}$	$\frac{1}{63360}$
12	1	$\frac{1}{3}$	$\frac{1}{66}$	$\frac{1}{660}$	$\frac{1}{5280}$
36	3	1	$\frac{1}{22}$	$\frac{1}{220}$	$\frac{1}{1760}$
792	66	22	1	$\frac{1}{10}$	$\frac{1}{80}$
7920	660	220	10	1	$\frac{1}{8}$
63360	5280	1760	80	8	1

Weight (Avoirdupois)

Ounce.	Pound.	Stone.	Quarter.	Hundred-weight.	Ton.
1	$\frac{1}{16}$	$\frac{1}{224}$	$\frac{1}{448}$	$\frac{1}{1792}$	$\frac{1}{35840}$
16	1	$\frac{1}{14}$	$\frac{1}{28}$	$\frac{1}{112}$	$\frac{1}{2240}$
224	14	1	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{1}{160}$
448	28	2	1	$\frac{1}{4}$	$\frac{1}{80}$
1792	112	8	4	1	$\frac{1}{20}$
35840	2240	160	80	20	1

(Also 7000 grains = 1lb avoirdupois.)

120. *Change of System.*—It is sometimes necessary, when a quantity is expressed in one system, to express it in another,

[1] See also Weights and Measures.

The following are the ratios of some of the units; each unit is expressed approximately as a decimal of the other, and their ratio is shown as a continued product (§ 116), a few of the corresponding convergents to the continued fraction (§ 117) being added in brackets. It must be remembered that the number expressing any quantity in terms of a unit is *inversely proportional* to the magnitude of the unit, *i.e.* the number of new units is to be found by multiplying the number of old units by the ratio of the old unit to the new unit.

$$\frac{\text{Yard}}{\text{Metre}} = \frac{9144}{10000} = \frac{10000}{10936} = \frac{11}{12}\cdot\frac{384}{385}\cdot\frac{8225}{8214}\cdots\left(\frac{11}{12}, \frac{32}{35} = \frac{8}{7}\cdot\frac{4}{5}, \frac{285}{257}\right).$$

$$\frac{\text{Inch}}{\text{Centimetre}} = \frac{25400}{10000} = \frac{10000}{3937} = \frac{5}{2}\cdot\frac{66}{65}\cdot\frac{1651}{1650} \cdots \left(\frac{5}{2}, \frac{33}{13}, \frac{127}{50}\right).$$

$$\frac{\text{Mile}}{\text{Kilometre}} = \frac{16093}{10000} = \frac{10000}{6214} = \frac{8}{5}\cdot\frac{185}{184}\cdot\frac{2369}{2368} \cdots \left(\frac{8}{5}, \frac{37}{23}, \frac{103}{64}\right).$$

$$\frac{\text{Square yard}}{\text{Square metre}} = \frac{8361}{10000} = \frac{10000}{11960} = \frac{5}{6}\cdot\frac{306}{305}\cdot\frac{15250}{15249} \cdots \left(\frac{5}{6}, \frac{51}{61}, \frac{250}{293}\right).$$

$$\frac{\text{Acre}}{\text{Hectare}} = \frac{4047}{10000} = \frac{10000}{24711} = \frac{2}{5}\cdot\frac{85}{84}\cdot\frac{5820}{5821} \cdots \left(\frac{2}{5}, \frac{17}{42}, \frac{380}{939}\right).$$

$$\frac{\text{Quart}}{\text{Litre}} = \frac{11365}{10000} = \frac{10000}{8799} = \frac{8}{7}\cdot\frac{175}{176}\cdot\frac{8976}{8975} \cdots \left(\frac{8}{7}, \frac{25}{22}, \frac{408}{359}\right).$$

$$\frac{\text{Pound}}{\text{Kilogramme}} = \frac{4536}{10000} = \frac{10000}{22046} = \frac{1}{2}\cdot\frac{10}{11}\cdot\frac{4084}{4085}\cdot\frac{29391}{29392}\cdots\left(\frac{1}{2}, \frac{5}{11}, \frac{44}{97}, \frac{3083}{6685}\right).$$

(ii.) *Special Applications.*

121. *Commercial Arithmetic.*—This term covers practically all dealings with money which involve the application of the principle of proportion. A simple class of cases is that which deals with equivalence of sums of money in different currencies; these cases really come under § 120. In other cases we are concerned with a proportion stated as a *numerical percentage*, or as a *money percentage* (*i.e.* a sum of money per £100), or as a *rate* in the £ or the shilling. The following are some examples. Percentage: *Brokerage, commission, discount, dividend, interest, investment, profit and loss.* Rate in the £: *Discount, dividend, rates, taxes.* Rate in the shilling: *Discount.*

Text-books on arithmetic usually contain explanations of the chief commercial transactions in which arithmetical calculations arise; it will be sufficient in the present article to deal with interest and discount, and to give some notes on percentages and rates in the £. *Insurance* and *Annuities* are matters of general importance, which are dealt with elsewhere under their own headings.

122. *Percentages and Rates in the £.*—In dealing with percentages and rates it is important to notice whether the sum which is expressed as a percentage of a rate on another sum is a part of or an addition to that sum, or whether they are independent of one another. Income tax, for instance, is calculated on income, and is in the nature of a deduction from the income; but local rates are calculated in proportion to certain other payments, actual or potential, and could without absurdity exceed 20s. in the £.

It is also important to note that if the increase or decrease of an amount A by a certain percentage produces B, it will require a different percentage to decrease or increase B to A. Thus, if B is 20% less than A, A is 25% greater than B.

123. *Interest* is usually calculated yearly or half-yearly, at a certain rate per cent. on the principal. In legal documents the rate is sometimes expressed as a certain sum of money "per centum per annum"; here "centum" must be taken to mean "£100."

Simple interest arises where unpaid interest accumulates as a debt not itself bearing interest; but, if this debt bears interest, the total, *i.e.* interest and interest on interest, is called *compound interest.* If 100r is the rate per cent. per annum, the simple interest on £A for n years is £nrA, and the compound interest (supposing interest payable yearly) is £$[(1+r)^n-1]$A. If n is large, the compound interest is most easily calculated by means of logarithms.

124. *Discount* is of various kinds. Tradesmen allow discount for ready money, this being usually at so much in the shilling or £. Discount may be allowed twice in succession off quoted prices; in such cases the second discount is off the reduced price, and therefore it is not correct to add the two rates of discount together. Thus a discount of 20%, followed by a further discount of 25%, gives a total discount of 40%, not 45%, off the original amount. When an amount will fall due at some future date, the *present value* of the debt is found by deducting discount at some rate per cent. for the intervening period, in the same way as interest to be added is calculated. This discount, of course, is not equal to the interest which the present value would produce at that rate of interest, but is rather greater, so that the present value as calculated in this way is less than the theoretical present value.

125. Applications to *Physics* are numerous, but are usually only of special interest. A case of general interest is the measurement of *temperature.* The graduation of a thermometer is determined by the freezing-point and the boiling-point of water, the interval between these being divided into a certain number of degrees, representing equal increases of temperature. On the Fahrenheit scale the points are respectively 32° and 212°; on the Centigrade scale they are 0° and 100°; and on the Réaumur they are 0° and 80°. From these data a temperature as measured on one scale can be expressed on either of the other two scales.

126. *Averages* occur in statistics, economics, &c. An average is found by adding together several measurements of the same kind and dividing by the number of measurements. In calculating an average it should be observed that the addition of any numerical quantity (positive or negative) to each of the measurements produces the addition of the same quantity to the average, so that the calculation may often be simplified by taking some particular measurement as a new zero from which to measure.

AUTHORITIES.—For the history of the subject, see W. W. R. Ball, *Short History of Mathematics* (1901), and F. Cajori, *History of Elementary Mathematics* (1896); or more detailed information in M. Cantor, *Vorlesungen über Geschichte der Mathematik* (1894–1901). L. C. Conant, *The Number-Concept* (1896), gives a very full account of systems of numeration. For the latter, and for systems of notation, reference may also be made to Peacock's article "Arithmetic" in the *Encyclopaedia Metropolitana*, which contains a detailed account of the Greek system. F. Galton, *Inquiries into Human Faculty* (1883), contains the first account of number-forms; for further examples and references see D. E. Phillips, "Genesis of Number-Forms," *American Journal of Psychology*, vol. viii. (1897). There are very few works dealing adequately but simply with the principles of arithmetic. Homersham Cox, *Principles of Arithmetic* (1885), is brief and lucid, but is out of print. *The Psychology of Number*, by J. A. McLellan and J. Dewey (1895), contains valuable suggestions (some of which have been utilized in the present article), but it deals only with number as the measure of quantity, and requires to be read critically. This work contains references to Grube's system, which has been much discussed in America: for a brief explanation, see L. Seeley, *The Grube Method of Teaching Arithmetic* (1890). On the teaching of arithmetic, and of elementary mathematics generally, see J. W. A. Young, *The Teaching of Mathematics in the Elementary and the Secondary School* (1907); D. E. Smith, *The Teaching of Elementary Mathematics* (1900), also contains an interesting general sketch; W. P. Turnbull, *The Teaching of Arithmetic* (1903), is more elaborate. E. M. Langley, *A Treatise on Computation* (1895), has notes on approximate and abbreviated calculation. Text-books on arithmetic in general and on particular applications are numerous, and any list would soon be out of date. Recent English works have been influenced by the brief *Report on the Teaching of Elementary Mathematics*, issued by the Mathematical Association (1905); but this is critical rather than constructive. The Association has also issued a *Report on the Teaching of Mathematics in Preparatory Schools* (1907). In the United States of America the *Report of the Committee of Ten* on secondary school studies (1893) and the *Report of the Committee of Fifteen* on elementary education (1893–1894), both issued by the United States Bureau of Education, have attracted a good deal of attention. Sir O. Lodge, *Easy Mathematics, chiefly Arithmetic* (1905), treats the subject broadly in its practical aspects. The student who is interested in elementary teaching should consult the annual bibliographies in the *Pedagogical Seminary*; an article by D. E. Phillips in vol. v. (October 1897) contains references to works dealing with the psychological aspect of number. For an account of German methods, see W. King, *Report on Teaching of Arithmetic and Mathematics in the Higher Schools of Germany* (1903). (W. F. Sh.)

ARIUS (Ἄρειος), a name celebrated in ecclesiastical history, not so much on account of the personality of its bearer as of the "Arian" controversy which he provoked. Our knowledge of Arius is scanty, and nothing certain is known of his birth or of his early training. Epiphanius of Salamis, in his well-known treatise against eighty heresies (*Haer.* lxix. 3), calls him a Libyan by birth, and if the statement of Sozomen, a church historian of the 5th century, is to be trusted, he was, as a member of the Alexandrian church, connected with the Meletian schism (see

Meletius of Lycopolis), and on this account excommunicated by Peter of Alexandria, who had ordained him deacon. After the death of Peter (November 25, 311), he was received into communion by Peter's successor, Achillas, elevated to the presbytery, and put in charge of one of the great city churches, Baucalis, where he continued to discharge his duties with apparent faithfulness and industry after the accession of Alexander. This bishop also held him in high repute. Theodoret (*Hist. Eccl.* i. 2) indeed does not hesitate to say that Arius was chagrined because Alexander, instead of himself, had been appointed to the see of Alexandria, and that the beginning of his heretical attitude is, in consequence, to be attributed to discontent and envy. But this must be rejected, for it is a common explanation of heretical movements with the early church historians, and there is no evidence for it in the original sources. However, Arius was ambitious. Epiphanius, using older documents, describes him as a man inflamed with his own opinionativeness, of a soft and smooth address, calculated to persuade and attract, especially women: "in no time he had drawn away seven hundred virgins from the church to his party." When the controversy broke out, Arius was an old man.

The real causes of the controversy lay in differences as to dogma. Arius had received his theological education in the school of the presbyter Lucian of Antioch, a learned man, and distinguished especially as a biblical scholar. The latter was a follower of Paul of Samosata, bishop of Antioch, who had been excommunicated in 269, but his theology differed from that of his master in a fundamental point. Paul, starting with the conviction that the One God cannot appear substantially (*οὐσιωδῶς*) on earth, and, consequently, that he cannot have become a person in Jesus Christ, had taught that God had filled the man Jesus with his Logos (*σοφία*) or Power (*δύναμις*). Lucian, on the other hand, presisted in holding that the Logos became a person in Christ. But since he shared the above-mentioned belief of his master, nothing remained for him but to see in the Logos a second essence, created by God before the world, which came down to earth and took upon itself a human body. In this body the Logos filled the place of the intellectual or spiritual principle. Lucian's Christ, then, was not "perfect man," for that which constituted in him the personal element was a divine essence; nor was he "perfect God," for the divine essence having become a person was other than the One God, and of a nature foreign to him. It is this idea which Arius took up and interpreted unintelligently. His doctrinal position is explained in his letters to his patron Eusebius, bishop of the imperial city of Nicomedia, and to Alexander of Alexandria, and in the fragments of the poem in which he set forth his dogmas, which bears the enigmatic title of "Thalia" (*θάλεια*), used in Homer, in the sense of "a goodly banquet," most unjustly ridiculed by Athanasius as an imitation of the licentious style of the drinking-songs of the Egyptian Sotades (270 B.C.). From these writings it can even nowadays be seen clearly that the principal object which he had in view was firmly to establish the unity and simplicity of the eternal God. However far the Son may surpass other created beings, he remains himself a created being, to whom the Father before all time gave an existence formed out of not being (*ἐξ οὐκ ὄντων*); hence the name of *Exoukontians* sometimes given to Arius's followers. On the other hand, Arius affirmed of the Son that he was "perfect God, only-begotten" (*πλήρης θεὸς μονογενής*); that through him God made the worlds (*αἰῶνες*, ages); that he was the product or offspring of the Father, and yet not as one among things made (*γέννημα ἀλλ' οὐχ ὡς ἓν τῶν γεγενημένων*). In his eyes it was blasphemy when he heard that Alexander proclaimed in public that "as God is eternal, so is his Son,—when the Father, then the Son,—the Son is present in God without birth (*ἀγεννήτως*), ever-begotten (*ἀειγενής*), an unbegotten-begotten (*ἀγεννητογενής*)." He detected in his bishop Gnosticism, Manichaeism and Sabellianism, and was convinced that he himself was the champion of pure doctrine against heresy. He was quite unconscious that his own monotheism was hardly to be distinguished from that of the pagan philosophers, and that his Christ was a demi-god.

For years the controversy may have been fermenting in the college of presbyters at Alexandria. Sozomen relates that Alexander only interfered after being charged with remissness in leaving Arius so long to disturb the faith of the church. According to the general supposition, the negotiations which led to the excommunication of Arius and his followers among the presbyters and deacons took place in 318 or 319, but there are good reasons for assigning the outbreak of the controversy to the time following the overthrow of Licinius by Constantine, *i.e.* to the year 323. In any case, from this time events followed one another to a speedy conclusion. Arius was not without adherents, even outside Alexandria. Those bishops who, like him, had passed through the school of Lucian were not inclined to let him fall without a struggle, as they recognized in the views of their fellow-student their own doctrine, only set forth in a somewhat radical fashion. In addressing to Eusebius of Nicomedia a request for his help, Arius ended with the words: "Be mindful of our adversity, thou faithful comrade of Lucian's school (*συλλουκιανιστής*)"; and Eusebius entered the lists energetically on his behalf. But Alexander too was active; by means of a circular letter he published abroad the excommunication of his presbyter, and the controversy excited more and more general interest.

It reached even the ears of Constantine. Now sole emperor, he saw in the one Catholic church the best means of counteracting the movement in his vast empire towards disintegration; and he at once realized how dangerous dogmatic squabbles might prove to its unity. His letter, preserved by the imperial biographer, Eusebius of Caesarea, is a state document inspired by a wisely conciliatory policy; it made out both parties to be equally in the right and in the wrong, at the same time giving them both to understand that such questions, the meaning of which would be grasped only by the few, had better not be brought into public discussion; it was advisable to come to an agreement where the difference of opinion was not fundamental. This well-meaning attempt at reconciliation, betraying as it did no very deep understanding of the question, came to nothing. No course was left for the emperor except to obtain a general decision. This took place at the fist oecumenical council, which was convened in Nicaea (*q.v.*) in 325. After various turns in the controversy, it was finally dicided, against Arius, that the Son was "of the same substance" (*ὁμοούσιος*) with the Father, and all thought of his being created or even subordinate had to be excluded. Constantine accepted the decision of the council and resolved to uphold it. Arius and the two bishops of Marmarica Ptolemais, who refused to subscribe the creed, were excommunicated and banished to Illyria, and even Eusebius of Nicomedia, who accepted the creed, but not its anathemas, was exiled to Gaul. Alexander returned to his see triumphant, but died soon after, and was succeeded by Athanasius (*q.v.*), his deacon, with whose indomitable fortitude and strange vicissitudes the further course of the controversy is bound up.

It only remains for us here to sketch what is known of the future career of Arius and the Arians. Although defeated at the council of Nicaea, the Arians were by no means subdued. Constantine, while strongly disposed at first to enforce the Nicene decrees, was gradually won to a more conciliatory policy by the influence especially of Eusebius of Caesarea and Eusebius of Nicomedia, the latter of whom returned from exile in 328 and won the ear of the emperor, whom he baptized on his death-bed. In 330 even Arius was recalled from banishment. Athanasius, on the other hand, was banished to Trèves in 335. During his absence Arius returned to Alexandria, but even now the people are said to have raised a fierce riot against the heretic. In 336 the emperor was forced to summon him to Constantinople. Bishop Alexander reluctantly assented to receive him once more into the bosom of the church, but before the act of admission was completed, Arius was suddenly taken ill while walking in the streets, and died in a few moments. His death seems to have exercised no influence worth speaking of on the course of events. His theological radicalism had in any case never found many convinced adherents. It was mainly the opposition to the Homoousios, as a formula

open to heretical misinterpretation, and not borne out by Holy Writ, which kept together the large party known as Semiarians, who under the leadership of the two Eusebiuses carried on the strife against the Nicenes and especially Athanasius. Under the sons of Constantine Christian bishops in numberless synods cursed one another turn by turn. In the western half of the empire Arianism found no foothold, and even the despotic will of Constantius, sole emperor after 351, succeeded only for the moment in subduing the bishops exiled for the sake of their belief. In the east, on the other hand, the Semiarians had for long the upper hand. They soon split up into different groups, according as they came to stand nearer to or farther from the original position of Arius. The actual centre was formed by the *Homoii*, who only spoke generally of a likeness (ὁμοιότης) of the Son to the Father; to the left of them were the *Anomoii*, who, with Arius, held the Son to be unlike (ἀνόμοιος) the Father; to the right, the *Homoiousians* who, taking as their catchword "likeness of nature" (ὁμοιότης κατ' οὐσίαν), thought that they could preserve the religious content of the Nicene formula without having to adopt the formula itself. Since this party in the course of years came more and more into sympathy with the representatives of the Nicene party, the *Homoousians*, and notably with Athanasius, the much-disputed formula became more and more popular, till the council summoned in 381 at Constantinople, under the auspices of Theodosius the Great, recognized the Nicene doctrine as the only orthodox one. Arianism, which had lifted up its head again under the emperor Valens, was thereby thrust out of the state church. It lived to flourish anew among the Germanic tribes at the time of the great migrations. Goths, Vandals, Suebi, Burgundians and Langobardi embraced it; here too as a distinctive national type of Christianity it perished before the growth of medieval Catholicism, and the name of Arian ceased to represent a definite form of Christian doctrine within the church, or a definite party outside it.

The best account of the proceedings, both political and theological, may be found in the following books:—H. M. Gwatkin, *Studies of Arianism* (2nd edit., Cambridge, 1900); A. Harnack, *History of Dogma* (Eng. trans., 1894–1899); J. F. Bethune-Baker, *An Introduction to the Early History of Christian Doctrine* (London, 1903); W. Bright, *The Age of the Fathers* (London, 1903). Cardinal Newman's celebrated *Arians of the Fourth Century* is interesting more from the controversial than from the historical point of view. See also Paavo Snellman, *Der Anfang des arianischen Streites* (Helsingfors, 1904); Sigismund Rogala, *Die Anfänge des arianischen Streites* (Paderborn, 1907). (G. K.)

ARIZONA (from the Spanish-Indian *Arizonac*, of unknown meaning,—possibly "few springs,"—the name of an 18th-century mining camp in the Santa Cruz valley, just S. of the present border of Arizona), a state on the S.W. border of the United States of America, lying between 31° 20′ and 37° N. lat. and 109° 2′ and 114° 45′ W. long. It is bounded N. by Utah, E. by New Mexico, S. by Mexico and W. by California and Nevada, the Colorado river separating it from California and in part from Nevada. On the W. is the Great Basin. Arizona itself is mostly included in the great arid mountainous uplift of the Rocky Mountain region, and partly within the desert plain region of the Gulf of California, or Open Basin region. The whole state lies on the south-western exposure of a great roof whose crest, along the continental divide in western New Mexico, pitches southward. Its altitudes vary from 13,000 ft. to less than 100 ft. above the sea. Of its total area of 113,956 sq. m. (water surface, 116 sq. m.), approximately 39,000 lie below 3000 ft., 27,000 from 3000 to 5000 ft., and 47,000 above 5000 ft.

Physical Features.—Three characteristic physiographic regions are distinctly marked: first the great Colorado Plateau, some 45,000 sq. m. in area, embracing all the region N. and E. of a line drawn from the Grand Wash Cliffs in the N.W. corner of the state to its E. border near Clifton; next a broad zone of compacted mountain ranges with a southern limit of similar trend; and lastly a region of desert plains, occupying somewhat more than the S.W. quarter of the state. The plateau region has an average elevation of 6000–8000 ft. eastward, but it is much broken down in the west. The plateau is not a plain. It is dominated by high mountains, gashed by superb canyons of rivers, scarred with dry gullies and washes, the beds of intermittent streams, varied with great shallow basins, sunken deserts, dreary levels, bold buttes, picturesque mesas, forests and rare verdant bits of valley. In the N.W. there is a giddy drop into the tremendous cut of the Grand Canyon (*q.v.*) of the Colorado river. The surface in general is rolling, with a gentle slope northward, and drains through the Little Colorado (or Colorado Chiquito), Rio Puerco and other streams into the Grand Canyon. Along the Colorado is the Painted Desert, remarkable for the bright colours—red, brown, blue, purple, yellow and white—of its sandstones, shales and clays. Within the desert is a petrified forest, the most remarkable in the United States. The trees are of mesozoic time, though mostly washed down to the foot of the mesas in which they were once embedded, and lying now amid deposits of a later age. Blocks and logs of agate, chalcedony, jasper, opal and other silicate deposits lie in hundreds over an area of 60 sq. m. The forest is now protected as a national reserve against vandalism and commercialism. Everywhere are evidences of water and wind erosion, of desiccation and differential weathering. This is the history of the mesas, which are the most characteristic scenic feature of the highlands. The marks of volcanic action, particularly lava-flows, are also abundant and widely scattered.

Separating the plateau from the mountain region is an abrupt transition slope, often deeply eroded, crossing the entire state as has been indicated. In localities the slope is a true escarpment falling 150 and even 250 ft. per mile. In the Aubrey Cliffs and along the Mogollon mesa, which for about 200 m. parts the waters of the Gila and the Little Colorado, it often has an elevation of 1000 to 2000 ft., and the ascent is impracticable through long distances to the most daring climber. It is not of course everywhere so remarkable, or even distinct, and especially after its trend turns southward W. of Clifton, it is much broken down and obscured by erosion and lava deposits. The mountain region has a width of 70 to 150 m., and is filled with short parallel ranges trending parallel to the plateau escarpment. Many of the mountains are extinct volcanoes. In the San Francisco mountains, in the north central part of the state, three peaks rise to from 10,000 to 12,794 ft.; three others are above 9000 ft.; all are eruptive cones, and among the lesser summits are old cinder cones. The S.E. corner of Arizona is a region of greatly eroded ranges and gentle aggraded valleys. This mountain zone has an average elevation of not less than 4000 ft., while in places its crests are 5000 ft. above the plains below. The line dividing the two regions runs roughly from Nogales on the Mexican border, past Tucson, Florence and Phoenix to Needles (California), on the W. boundary. These plains, the third or desert region of the state, have their mountains also, but they are lower, and they are not compacted; the plains near the mountain region slope toward the Gulf of California across wide valleys separated by isolated ranges, then across broad desert stretches traversed by rocky ridges, and finally there is no obstruction to the slope at all. Small parts of the desert along the Mexican boundary are shifting sand.

Climate.—As may be inferred from the physical description, Arizona has a wide variety of local climates. In general it is characterized by wonderfully clear air and extraordinarily low humidity. The scanty rainfall is distributed from July to April, with marked excess from July to September and a lesser maximum in December. May and June are very dry. Often during a month, sometimes for several months, no rain falls over the greatest part of Arizona. Very little rain comes from the Pacific or the Gulf of California, the mountains and desert, as well as the adverse winds, making it impossible. Rain and snow fall usually from clouds blown from the Gulf of Mexico and not wholly dried in Texas. The mountainous areas are the only ones of adequate precipitation; the northern slope of the Colorado Plateau is almost destitute of water; the region of least precipitation is the "desert" region. The mean annual rainfall varies from amounts of 2 to 5·5 in. at various points in the lower gulf valley, and on the western border to amounts of 25 to

ARIZONA
Scale, 1:3,160,000
English Miles
Indian Reserves
County Seats
County Boundaries
Railways
Canals
Navajo Reserve
Moqui Reserve
Painted Desert
Hualpai Ind. Reserve
Gila River Reserve
Salt River Reserve
White Mt. Apache Res.
Natanes Plateau
Mogollon Mesa
Coconino
Navajo
Apache
Yavapai
Maricopa
Pinal
Gila
Graham
Greenlee
Cochise
Santa Cruz
Yuma
La Paz
Mohave
Pima
Colorado
Utah
New Mexico
California
Sonora
Mexico
Gulf of California
International Boundary Line
Longitude West 114° of Greenwich
Grand Canyon
Colorado R.
San Juan R.
Little Colorado R.
Gila R.
Salt R.
Verde R.
Virgin R.
Bill Williams Fork
Big Sandy R.
Santa Maria R.
Williams
Flagstaff
Winslow
Holbrook
Prescott
Phoenix
Tucson
Yuma
Kingman
Seligman
Ash Fork
Jerome
Clarkdale
Cottonwood
Sedona
Globe
Miami
Superior
Florence
Casa Grande
Coolidge
Eloy
Tempe
Mesa
Chandler
Gilbert
Glendale
Peoria
Buckeye
Wickenburg
Parker
Quartzsite
Ajo
Gila Bend
Tacna
Somerton
San Luis
Nogales
Douglas
Bisbee
Tombstone
Benson
Willcox
Safford
Thatcher
Duncan
Clifton
Morenci
Solomonsville
Globe
Miami
Superior
Winkelman
Hayden
Kearny
Mammoth
Oracle
Catalina
Rillito
Red Rock
Picacho
Arizona
Casa Grande
Eloy
Coolidge
Florence
Maricopa
Gila Bend
Ajo
Tacna
Somerton
San Luis
Yuma
Wellton
Mohawk
Tacna
Nogales
Lochiel
Patagonia
Sonoita
Arivaca
Oro Blanco
Calabasas
Tumacacori
Rio Rico
Amado
Sahuarita
Green Valley
Vail
Pantano
Rosemont
Greaterville
Fairbank
Helvetia
Quijotoa
Papago Res.
San Xavier
Tucson
Wilmot
Redington
Pool
Kingcots
Johnson
Cochise
Dragoon
Pearce
Paradise
Teviston
Orange Butte
Hoobers Butte
Ft. Grant
Bonita
Military Reserve
Solomonsville
Duncan
Clifton
Morenci
Metcalf
Orowoc
Gothic
Sanchez
Pinaleno Mts.
Graham Mts.
Galiuro Mts.
Santa Rita Mts.
Huachuca Mts.
Chiricahua Mts.
Dos Cabezos Mts.
Whetstone Mts.
Rincon Mts.
Tortolita Mts.
Catalina Mts.
Santa Catalina Mts.
Superstition Mts.
Mazatzal Mts.
Sierra Ancha Mts.
Pinal Mts.
Four Peaks
Salt River Canyon
Tonto Basin
Roosevelt Dam
Apache Lake
Canyon Lake
Theodore Roosevelt Dam
Horseshoe Dam
Bartlett Dam
Verde R.
Oak Creek Canyon
Sedona
Jerome
Clarkdale
Cottonwood
Camp Verde
Fort McDowell
Fort Apache (Mil. Reserve)
Fort Huachuca (Mil. Res.)
Ft. Grant Military Reserve
Meteor Crater
Petrified Forest
Painted Desert
Navajo Monument
Canyon de Chelly
Canyon del Muerto
Monument Valley
Rainbow Bridge
Lake Powell
Glen Canyon
Marble Canyon
Vermilion Cliffs
Kaibab Plateau
Grand Canyon
Havasu Canyon
Supai
Hualapai Peak
Aquarius Mts.
Hurricane Ledge
Mt. Trumbull
Mt. Logan
Mt. Dellenbaugh
Mt. Wilson
Mt. Hope
Mt. Bangs
Mt. Floyd
Mt. Union
Mt. Tipton
Mt. Ord
Mt. Graham
Mt. Lemmon
Mt. Baldy
Mt. Turnbull
Mt. Trumbull
Mt. Logan
Mt. Dellenbaugh
Mt. Wilson
Mt. Hope
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Mt. Fremont
Mt. Emerson
Mt. Doyle

30 in. in the mountains. The highest recorded maximum in Arizona is 35 in. The proportion of perfectly clear days in the year varies at different points from a half to two-thirds; of the rest not more than half are without brilliant sunshine part of the day. Local thunderstorms and cloud-bursts are a characteristic phenomenon, inundating limited areas and transforming dried-up streams into muddy torrents carrying boulders and débris. Often in the plateau country the dry under-air absorbs the rain as it falls; and rarely in the Hopi country do flooded gullies " run through " to the Little Colorado. The country of the cliff-dwellers in the N.E. is desert-like. Only points high in altitude catch much rain. Mountain snows feed the Gila, the Little Colorado, and the Colorado rivers. The Colorado, apart from the Gila, draws little water from Arizona. The mountain zone W. of Prescott drains into the Colorado, and to the S. and E. into the Gila; and the latter is by far the heavier drainage in volume. The floods come in May and June, and during the wet season the rivers, all with steep beds in their upper courses, wash along detritus that lower down narrows, and on smaller streams almost chokes, their courses. These gradients enable the inconstant streams tributary to the Colorado to carve their canyons, some of which are in themselves very remarkable, though insignificant beside the Grand Canyon. Many streams that are turned in spring or by summer cloud-bursts into torrents are normally mere water films or dry gulches. Even the Gila is dry in its bed part of the year at its mouth near Yuma. From the Gila to the southern boundary the parched land gives no water to the sea, and the international boundary runs in part through a true desert. In the hot season there is almost no surface water. Artesian wells are used in places, as in the stock country of the Baboquivari valley.

The temperature of Arizona is somewhat higher than that of points of equal latitude on the Atlantic and Gulf of Mexico coasts. In the mountains on the plateau it ranges from that of the temperate zone to that of regions of perpetual snow; S. of the mountains it ranges from temperate heats in the foothills to semi-tropic heat in the lower valleys of the Gila and Colorado. The average annual temperature over the region N. of 34° N. is about 55°; that of the region S. is about 68°. The warmest region is the lower Gila valley. Here the hottest temperature of the year hovers around 130°, the mean for the hottest month (July) is about 98°, and the mean for the year is from 68.9°–74.4° F. at different points. Some parts of the Santa Cruz valley are equally hot. In the hottest (western) portions of the true desert on the Mexican border the daily maximum temperature is about 110° F.; but owing to the rapid radiation in the dry, clear, cloudless air the temperature frequently falls 40–50° in the night. The coldest points on the high plateau have annual means as low as 45–48°, and a mean for the coldest month at times below 20° F. The range from high to low extreme on the plateau may be as great as 125°, but in the S.W. it is only about 70–80° F. The daily variation (not uncommonly 60° F.) is of course greatest in the most arid regions, where radiation is most rapid. And of all Arizona it should be said that owing to the extreme dryness of the air, evaporation from moist surfaces is very rapid,[1] so that the high temperatures here are decidedly less oppressive than much lower temperatures in a humid atmosphere. The great difference between absolute and sensible temperature is a very important climatic characteristic of Arizona. Generally speaking, during two-thirds of the year the temperature is really delightful; the nights are cool, the mornings bracing, the days mild though splendid. Intense heat prevails in July, August and September. In lowness of humidity (mean annual relative humidity at Yuma about 39, at Phoenix 36.7, at Tucson 37.8) and clarity of atmosphere, southern Arizona rivals Upper Egypt and other famous arid health resorts.

Fauna and Flora.—Within the borders of Arizona are areas representative of every life zone save the humid tropical. From the summit of the San Francisco Mountains one may pass rapidly through all these down into the Painted Desert. The Boreal-Canadian, Transition and Upper Sonoran embrace the highlands. Coyotes are very common; wild cats and mountain lions are fairly plentiful. Deer and antelope are represented by various species. Prairie-dogs, jack-rabbits, crows and occasional ravens, quail, grouse, pheasants and wild turkeys are also noteworthy in a rather scant animal life. Characteristic forms of the Upper Sonoran zone are the burrowing owl, Nevada sage-thrush, sage-thrasher and special species of orioles, kangaroo rats, mice, rabbits and squirrels. The Lower Sonoran covers the greatest part of southern and western Arizona, as well as the immediate valleys of the Colorado and Little Colorado rivers. Its animal life is in the main distinguished in species only from that of the Upper Sonoran belt, including among birds, the desert sparrow, desert thrasher, mocking-bird, hooded oriole; and among mammals small nocturnal species of kangaroo rats, pocket mice, mice and bats. Jaguars occasionally stray into Arizona from Mexico. Lizards and toads are conspicuous in the more desert areas. Snakes are not numerous. The Gila-monster, tarantula, the scorpion and thelyphonus, scolopender and julus occur in some localities in the rainy season. The Arid-Tropical zone is represented by a narrow belt along the lower Colorado river, with a short arm extending into the valley of the Gila. The country is so arid that it supports only desert birds and mammals. Camels were very successfully employed as pack animals on the Tule desert in the palmy days of Virginia City, Nevada, before the advent of railways.

The general conditions of distribution of the fauna of Arizona are shown even more distinctly by the flora. There are firs and spruces on the mountains, characteristic of the Boreal zone; pines characteristic of the Transition zone; piñon juniper, greasewood and the universally conspicuous sage-brush, characteristic of the Upper Sonoran zone. In the Lower Sonoran belt, soapweed, acacias (Palo Verde or *Parkinsonia torreyana*), agaves, yuccas and dasylirions, the creosote bush and mesquite tree, candle wood, and about seventy-five species of cactuses—among them omnipresent opuntiae and great columnar " Chayas "—make up a striking vegetation, which in its colours of dull grey and olive harmonizes well with the rigidity and forbidding barrenness of the plains. It has exercised profound influence upon the industries, arts, faiths and general culture of the Indians. In places the giant cactus grows in groves, attaining a height of 40 and even 50 ft. The mesquite varies in size from a tangled thorny shrub to a spreading tree as much as 3 ft. in diameter and 50 ft. high; it is normally perhaps half as high, and 6–8 in. in diameter. Enduring hardily great extremes of heat and moisture, it is throughout the arid South-west the most important, and in many localities the only important, native tree. From the great juicy, leafless, branchless stalk of the yucca, soap is prepared, and strong fibres useful in making paper, rope and fabrics. The fibre of the agave is also made into rope and its juice into pulque. The canaigre grows wild and is also cultivated. It is easy to exaggerate greatly the barrenness of an arid country. There are fine indigenous grasses that spring up over the mesas after the summer rains, furnishing range for live-stock; some are extraordinarily independent of the rainfall. In the most arid regions there is a small growth of green in the rainy season, and a rich display of small wild-flowers, as well as the enormous flower clusters of the yucca, and blooms in pink and orange, crimson, yellow and scarlet of the giant cactus and its fellows. Even in the Mexican border, desert oak, juniper and manzanita cover the mountains, and there is a vigorous though short-lived growth of grasses and flower from July to October. The cliff-dweller country supports a scant vegetation—a few cottonwood in the washes, a few cedars on the mesas.

Continuous forest areas are scant. A fair variety of trees—cottonwood, sycamore, ash, willow, walnut and cherry—grow in thickets in the canyons, and each mountain range is a forest area. Rainfall varying with the altitude, the lower timber line below which precipitation is insufficient to sustain a growth of trees is about 7000 ft., and the upper timber line about 11,500 ft.

[1] At Yuma, Phoenix and Tucson, the records of twenty-six, eighteen and fifteen years respectively show a rate of evaporation 35·2, 12·7, and 7·7 times as great as the mean annual rainfall, which was 2·84 in., 7·06 in. and 11·7 in. for the places named.

Oaks, juniper, piñon, cedars, yellow pine, fir and spruce grow on the mountains and over large areas of the plateau country.[1] The Coconino forest is one of the largest unbroken pine forests (about 6000 sq. m.) in the United States. Since 1898 about 86% of the wooded lands have been made reservations, and work has been done also to preserve the forest areas in the mountains in the south-east, from which there are few streams of permanent flow to the enclosing arid valleys.

Soil.—The soils in the southern part of Arizona are mainly sandy loams, varying from light loam to heavy, close adobe; on the plateaus is what is known as "mesa" soil; and along the rivers are limited overflow plains of fine sediment—especially along the Colorado and the river Verde. These soils are in general rich, but deficient in nitrogen and somewhat in humus; and in limited areas white alkaline salts are injuriously in excess. Virgin soils are densely compact. By far the most useful crops are leguminous green manures, especially alfalfa, which grows four to seven cuttings in a year and as a soil flocculator and nitrogen-storer has proved of the greatest value. The greatest obstacle to agriculture is lack of water. Artesian wells are much used in the south-east. For the reservation of the water-partings —in the past considerably denuded by lumbermen and ranchmen —the increase of the forest areas, and the creation of reservoirs along the rivers, to control their erratic flow[2] and impound their flood waste for purposes of irrigation, much has been done by the national government. The irrigated areas are only little spots along the permanent streams. In 1900 the farm area was only 2.7% of the total area of the state and only 0·31% was actually improved (including Indian reservations, 0·35%; in 1906, 0·92% was cultivated); of the land actually under crops, 88·5% was irrigated. The improved acreage more than quintupled from 1880 to 1900. The total irrigated area in 1900 was 185,000 acres and in 1902, 247,250 acres. The increase in land values by irrigation from 1890 to 1900 is estimated at $3,500,000. A reservoir was begun in 1904 just below the junction of the Tonto and the Salt with capacity to store 1,330,000 acre-ft. for irrigation, and develop also an electric power sufficient to pump underground water for an additional 50,000 acres at the lowest estimate[3] of lands lying too high for supply by gravity. Another important undertaking begun about the same time was the throwing of an East Indian weir dam (the only one in the United States) across the Colorado near Yuma, and the confinement of both sides of the lower Gila and Colorado with levees.

Agriculture.—Strawberries and Sahara dates; alfalfa, wheat, barley, corn and sorghum; oranges, lemons, wine grapes, limes, olives, figs, dates, peanuts and sweet potatoes; yams and sugar beets, show the range of agricultural products. The date palm fruits well; figs grow luxuriantly, though requiring much irrigation; almonds do well if protected from spring frosts; sea-island cotton grows in the finest grades, but is not of commercial importance. The country about Yuma is particularly suited to subtropical fruits. Temperate fruits—peaches, pears, apples, apricots and small fruits—do excellently; as do all important vegetables. The fruit industry is becoming more and more important. Farming is very intensive, and crop follows crop in swift succession; in 1905 the yield of barley per acre, 44 bushels, was greater than in any other state or territory, as was the farm price per bushel on the 1st of December, 81 cents; the average yield per acre of hay was the highest in the Union in 1903, 3·46 tons, the general average being 1·54 tons, was fourth in 1904, 2·71 tons (Utah 3·54, Idaho 3·07, Nevada 3·04), the general average being 1·52 tons, and was highest in 1905, 3·75 tons, the general average for the country being 1·54 tons; and in the same three years the average value per acre of hay was greater in Arizona than in any other state of the Union, being $35·78 in 1903, $40·22 in 1904, and $46·39 in 1905, the general averages for the country being $13·93, $13·23 and $13·11 respectively, for the three years. Of the total farm acreage of the state 97·6% were held in 1900 by the whites; and of these 80·2% owned in whole or in part the land they cultivated.

Stock-raising is a leading industry, but it has probably attained its full development. The over-stocking of the ranges has caused much loss in the past, and the almost total eradication of fine native grasses over extended areas. Of the neat cattle (7,042,635) almost 98%, and of the sheep (861,761) almost 100%, were in 1900 pastured wholly or in part upon the public domain. The extension of national forest reserves and the regulations enforced by the United States government for the preservation of the ranges have put limits to the industry. In 1900 the value of live-stock represented 15·7% of the capital invested in agriculture; the value of animals sold or slaughtered for food ($3,204,758) was half the total value of all farm products ($6,997,097). Ostrich farms have been successfully established in the Salt river valley since 1893; in 1907 there were six farms in the Salt river valley, on which there were about 1354 birds; the most successful food for the ostrich is alfalfa.

Minerals.—Mining is the leading industry of Arizona. Contrary to venerable traditions there is no evidence that mining was practised beyond the most inconsiderable extent by aborigines, Spanish *conquistadores*, or Jesuits. In 1738 an extraordinary deposit of silver nuggets, quickly exhausted (1741), was discovered at Arizonac. At the end of the 18th century the Mexicans considerably developed the mines in the south-east. The second half of the 19th century witnessed several great finds; first, of gold placers on the lower Gila and Colorado (1858–1869); later, of lodes at Tombstone, which flourished from 1879–1886, then decayed, but in 1905 had again become the centre of important mining interests; and still later the development of copper mines at Jerome and around Bisbee. Several of the Arizona copper mines are among the greatest of the world. The Copper Queen at Bisbee from 1880–1902 produced 378,047,210 lb of crude copper, which was practically the total output of the territory till after 1900, when other valuable mines were opened; the Globe, Morenci and Jerome districts are secondary to Bisbee. Important mines of gold and silver, considerable deposits of wolframite, valuable ores of molybdenum and vanadium, and quarries of onyx marble, are also worked. Low-grade coal deposits occur in the east central part of the state and near the junction of the Gila and San Pedro rivers. Some fine gems of peridot, garnet and turquoise have been found. The mineral products of Arizona for 1907 were valued at $56,753,650; of which $51,355,687 (more than that of any other state) was the value of copper; $2,664,000, gold; and $1,916,000, silver. In 1907 the legislature passed an elaborate act providing for the taxation of mines, its principal clause being that the basis of valuation for taxation in each year be one-fourth of the output of the mines in question for the next preceding year.

Manufactures.—The manufacturing industries are of relatively slight importance, though considerable promise attends the experiments with canaigre as a source of tannin. The Navaho and Moqui Indians make woollen blankets and rugs and the Pimas baskets. Onyx marbles of local source are polished at Phoenix. The capital invested in manufacturing industries increased from $9,517,573 in 1900 to $14,395,654 in 1905, or 51·3%, and the value of products from $20,438,987 in 1900 to $28,083,192 in 1905, or 37·4%. Of the total product in 1905 the product of the principal industry, the smelting and refining of copper ($22,761,981), represented 81·1%; it was 9·4% of all the smelting and refining of copper done in the United States in that year. The other manufactures were of much less importance, the principal ones being cars and general shop construction, including repairs by steam railway companies ($1,329,308), lumber and timber products ($960,778), and flour and grist mill products ($743,124).

Two transcontinental railway systems, the Southern Pacific and Santa Fé, were built across Arizona in 1878–1883. They are connected by one line, and a feeder runs S. into Sonora.

[1] The San Francisco yellow pine forest, with an area of some 4700 sq. m., is the finest forest of the arid south-west.

[2] The combined flow of the Salt and Verde varies from 100 to more than 10,000 cub. ft. per second.

[3] The dam locks a narrow canyon. The height is 284 ft., the water rising 230 ft. against it. The storage capacity is exceeded by probably but one reservoir in the world—the Wachusett reservoir near Boston.

The railway mileage of Arizona on the 1st of January 1908 was 1935·35 m.

Population.—The population of Arizona in 1880 was 40,440; in 1890, 59,620; in 1900, 122,931 (including 28,623 reservation Indians not counted before); in 1910, 204,354. The native population is of the most diverse origin; the foreign element is equally heterogeneous, but more than half (in 1900, 14,172 out of 24,283 foreign-born) are Mexicans, many of whom are not permanent residents; after 1900, immigrants were largely mine labourers, and included Slavonians and Italians. The largest towns in 1900 were Tucson, Phoenix, which is the capital, Prescott (pop. 3559), Jerome (pop. 1890, 250; in 1900, 2861); Winslow (pop. 1890, 363; in 1900, 1305), Nogales (pop. 1900, 1761), and Bisbee. The last was an insignificant mining camp in 1880, still unincorporated in 1900, but with an estimated population of 6000 in 1904. It is crowded picturesquely into several narrow confluent ravines. Railway connexion with El Paso was established in 1902. Douglas is another growing camp.

Over thirty Indian tribes are represented in the Indian schools of Arizona. The more important are the Hualapais or Apache-Yumas; the Mohaves; the Yavapais or Apache-Mohaves; the Yumas, whose lesser neighbours on the lower Colorado are the most primitive Indians of the United States in habits; the Maricopas; the Pimas and Papagoes, who figure much in early Arizona history, and who are superior in intelligence, adaptability, application and character; the Hopis or Moquis, possessed of the same good qualities and notably temperate and provident, famous for their prehistoric culture (Tusuyan); the Navaho, and the kindred Apaches, perhaps the most relentless and savage of Indian warriors. All the Indians of Arizona live on reservations save the few non-tribal Indians taxed and treated as active citizens. Even the Apaches after being whipped by relentless war into temporary submission have been bound by treaties which the gifts, vices and virtues of the reservation system have tempted them to observe. The Pimas and Papagoes were early converted by the Spaniards, and retain to-day a smattering of Christianity plentifully alloyed with paganism. Apaches, Pimas, Papagoes have been employed by the United States on great irrigation works, and have proved industrious and faithful labourers. In 1900 there were 1836 taxed Indians, 26,480 reservation Indians not taxed, and in addition many friendly Papagoes unenumerated.

In 1906 the Indian population was estimated as being 14 % of the whole population of Arizona, and that they are singularly law-abiding is argued from the fact that in the same year the Indians furnished only 3 % of the convicts in the territorial prison.

Government and Education.—Arizona became a territory of the first (or practically autonomous) class in 1863. Her organic law thereafter until 1910 consisted of various sections of the Revised Statutes of the United States. From the beginning she had a territorial legislature. Congress retained ultimately direct control of all government, administration being in the hands of resident officials appointed by the president and Senate. Special mention must be made of the secret police, the Arizona Rangers, organized in 1901 to police the cattle ranges; they are "fearless men, trained in riding, roping, trailing and shooting," a force whose *personnel* is not known to the general public. The legislature repealed the law licensing public gambling in 1907; enacted a law requiring the payment of $300 per annum as licence fee by retail liquor dealers; and provided for juvenile courts and probationary control of children. In 1907 the total tax valuation of property was $77,705,251; the net debt of the territory $1,022,972, and that of counties and towns $3,123,275. The receipts of the territorial treasury for the year ending on the 30th of June 1907 were $687,386, and the disbursements for the same period were $601,568. A homestead provision (1901) exempts from liability for debts (except mortgages or liens placed before the homestead claim) any homestead belonging to the head of a family, existing in one compact body and valued at not more than $2500; such a homestead a married man may not sell, lease or put a lien on without his wife's consent. Personal property to the value of $500 is exempt from the same liability. The public school system was established in 1871. A compulsory attendance law applies to children between 6 and 14 years of age, but it is not generally obeyed by the Mexican element of population. In 1907 there was an enrolment of 24,962 out of 33,167 children of school age; there were six high schools—three new in 1906; and the average number of school days was 128·4. In the fiscal year ending June 1907, the total receipts for schools were $697,762, and the expenditures were $701,102. Illiteracy is high, amounting in 1900 to 23·1 % of native males, above 21 years of age, and 30·5 % of foreign males, principally because of the large number of Indians, Chinese, Japanese and Mexicans in the state. There are two normal schools at Tempe (1886) and Flagstaff (1899), a university at Tucson with an agricultural experiment station that has done much for the industries of Arizona; there is a considerable number of Indian schools, the largest of which are maintained by the national government, and the funds of the university come largely from the same source. The first juvenile reform school, called the Territorial Industrial school, was opened in 1903 at Benson. The territorial prison, formerly at Yuma, was abandoned for a modern building at Florence, Pinal county; and a hospital for the insane is 3 m. from Phoenix.

History.—The history of the South-west is full of interest to the archaeologist. A prehistoric culture widely distributed has left abundant traces. Pueblo ruins are plentiful in the basins of the Gila and Colorado rivers and their tributaries. Geographical conditions and a hard struggle against nature fixed the character of this "aridian" culture, and determined its migrations; the onslaughts of nomad Indians determined the sedentary civilization of the cliff dwellers. A co-operative social economy is evidenced by the traces of great public works, such as canals many miles in length. The pueblos of the Gila valley are held to be older than those of the Colorado. Casa Grande, 15 m. S.E. of a railway station of the same name on the Southern Pacific railway, is the most remarkable of plain ruins in the South-west, the only one of its type in the United States. It resembles the Casa Grande ruin of Chihuahua, Mexico, with its walls of sun-dried puddled clay, and its area of rooms, courts and plazas, surrounded by a wall. It was already a ruin when discovered in 1694 by the Jesuit father Kino. John Russel Bartlett described it in 1854, and in 1889 Congress voted that it be protected as a government reservation; in 1892 it was set apart by the government. Excavations were made there in 1906–1907 by Dr J. Walter Fewkes. Migration was northward. The valleys of the Salt river and its affluents, the Agua Fria, Verde and Tonto, are strewn with aboriginal remains; but especially important in migrations of culture was the Little Colorado. A very considerable population must have lived once in this valley. It is represented to-day by the still undeserted habitats of Zuñi (in New Mexico) and Tusayan; the Moquis, after the Zuñis, are in customs and traditions the best survival of the ancient civilization.

Arizona north of the Gila, save for a very limited and intermittent missionary effort and for scant exploring expeditions, was practically unknown to the whites until well after the beginning of American rule. The Santa Cruz valley, however, has much older annals of a past that charms by its picturesque contrasts with the present. Arizona history begins with the arrival in Sonora in 1536 of Alvar Nuñez Cabeza de Vaca, who, although he had not entered Arizona or New Mexico, had heard of them, and by his stories incited the Spaniards to explore the unknown north in hope of wealth. Marcos de Niza, a Franciscan friar to whom the first reconnaissance was entrusted, was the first Spaniard to enter the limits of Arizona. He crossed the south-eastern corner to Zuñi in 1539, passing through the Santa Cruz valley; and F. V. de Coronado (*q.v.*) was led by Fray Marcos over the same route in 1540; while Hernando Alarcon explored the Gulf of California and the lower Colorado river. Members of Coronado's expedition explored the Moqui country and reached the Grand Canyon, and after this a succession of remarkable and heroic explorations followed through the century; which however accomplished little for geography, further confusing

and embellishing rather than clearing up its mysteries. All this has left traces in still living myths about the early history of the South-west. Early in the 17th century considerable progress had been made in Christianizing the Pimas, Papagoes and Moquis. Following 1680 came a great Indian revolt in New Mexico and Arizona, and thereafter the Moquis remained independent of Spanish and Christian domination, although visited fitfully by rival Jesuits and Franciscans. In 1732 (possibly in 1720) regular Jesuit missions were founded at Bac (known as an Indian rancheria since the 17th century) and at Guevavi. The region south of the Gila had already been repeatedly explored. In the second half of the century there was a presidio at Tubac (whose name first appears 1752) and some half-dozen pueblos de visita, including the Indian settlement of Tucson.

A few errors should be corrected and some credit given with reference to this early period. The Inquisition never had any jurisdiction whatever over the Indians; compulsory labour by the Indians was never legalized except on the missions, and the law was little violated; they were never compelled to work mines; of mining by the Indians for precious metals there is no evidence; nor by the Jesuits (expelled in 1767, after which their missions and other properties were held by the Franciscans), except to a small extent about the presidio of Tubac, although they did some prospecting. Persistent traditions have greatly exaggerated the former prosperity of the old South-west. The Spaniards probably provoked some inter-tribal intercourse among the Indians, and did something among some tribes for agriculture. Their own farms and settlements, save in the immediate vicinity of the presidio, were often plundered and abandoned, and such settlement as there was was confined to the Santa Cruz valley. From about 1790 to 1822 was a period of peace with the Apaches and of comparative prosperity for church and state. The fine Indian mission church at Bac, long abandoned and neglected, dates from the last decade of the 18th century. The establishment of a presidio at Tucson in 1776 marks its beginning as a Spanish settlement.

The decay of the military power of the presidios during the Mexican war of independence, the expulsion of loyal Spaniards —notably friars—and the renewal of Apache wars, led to the temporary abandonment of all settlements except Tubac and Tucson. The church practically forsook the field about 1828.

American traders and explorers first penetrated Arizona in the first quarter of the 19th century. As a result of the Mexican War, New Mexico, which then included all Arizona north of the Gila, was ceded to the United States. California gold discoveries drew particular attention to the country south of the Gila, which was wanted also for a transcontinental railway route. This strip, known as the " Gadsden Purchase " (see GADSDEN, JAMES), was bought in 1854 by the United States, which took possession in 1856. This portion was also added to New Mexico. The Mexicans, pressed by the Apaches, had, in 1848, abandoned even Tubac and Tamacácori, first a visita of Guevavi, and after 1784 a mission. The progress of American settlement was interrupted by the Civil War, which caused the withdrawal of the troops and was the occasion for the outbreak of prolonged Indian wars.

Meanwhile a convention at Tucson in 1856 sent a delegate to Congress and petitioned for independent territorial government. This movement and others that followed were ignored by Congress owing to its division over the general slavery question, and especially the belief of northern members that the control of Arizona was an object of the pro-slavery party. A convention held in April 1860 at Tucson undertook to " ordain and establish," of its own motion, a provisional constitution until Congress should " organize a territorial government." This provisional territory constituted all New Mexico south of 34° 40′ N. Officials were appointed and New Mexican legislation for the Arizona counties ignored, but nothing further was done. In 1861 it was occupied by a Texan force, declared for the Confederacy, and sent a delegate (who was not admitted) to the Confederate congress. That body in January 1862 passed a formal act organizing the territory, including in it New Mexico, but in May 1862 the Texans were driven out by a Union force from California. By act of the 24th of February 1863 Congress organized Arizona territory as the country west of 109° W. long. In December an itinerant government sent out complete from Washington crossed the Arizona line and effected a formal organization. The territorial capital was first at Prescott (1863–1867), then at Tucson (1867–1877), again at Prescott (1877–1889), and finally at Phoenix (since 1889).

There have been boundary difficulties with every contiguous state or territory. The early period of American rule was extremely unsettled. The California gold discoveries and overland travel directed many prospecting adventurers to Arizona. For some years there was considerable sentiment favouring filibustering in Sonora. The Indian wars, breeding a habit of dependence on force, and the heterogeneous elements of cattle thieves, Sonoran cowboys, mine labourers and adventurers led to one of the worst periods of American border history. But since about 1880 there is nothing to chronicle but a continued growth in population and prosperity. Agitation for statehood became prominent in territorial politics for some years. In accordance with an act of Congress, approved on the 16th of June 1906, the inhabitants of Arizona and New Mexico voted on the 6th of November 1906 on the question of uniting the territories into a single state to be called Arizona; the vote of New Mexico was favourable to union and statehood, but these were defeated by the vote of Arizona (16,265 against, and 3141 for statehood). In June 1910 the President approved an enabling act providing for the admission of Arizona and New Mexico as separate states.

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ARJUNA, in Hindu mythology, a semi-divine hero of the *Mahabharata*. He was the third son of Pandu, son of Indra. His character as sketched in the great epic is of the noblest kind. He is the central figure of that portion of the epic known as the *Bhagwad-gita*, where he is represented as horrified at the impending slaughter of a battle and as being comforted by Krishna.

ARK (a word common to Teutonic languages, cf. Ger. *Arche*, adapted from the Lat. *arca*, chest, cf. *arcere*, to shut up, enclose), a chest, basket or box. The Hebrew word *tebah*, translated in the A.V. by " ark," is used in the Old Testament (1) of the box made

of bulrushes in which Pharaoh's daughter found the infant Moses (Exodus ii. 3), and (2) of the great vessel or ship in which Noah took refuge during the flood (Genesis vi.–ix.).

Noah's Ark.— According to the story in Genesis, Noah's ark was large enough to contain his family and representatives of each kind of animal. Its dimensions are given as 300 cubits long, 50 cubits broad and 30 cubits high (cubit = 18–22 in.). It was made of "gopher" wood, which has been variously identified with cypress, pine and cedar. Before the days of the "higher criticism" and the rise of the modern scientific views as to the origin of species, there was much discussion among the learned, and many ingenious and curious theories were advanced, as to the number of the animals and the space necessary for their reception, with elaborate calculations as to the subdivisions of the ark and the quantities of food, &c., required to be stored. It may be interesting to recall the account given in the first edition of the *Encyclopaedia Britannica* (1771), which contained a summary of some of these various views (substantially repeated up to the publication of the eighth edition, 1853). "Some have thought the dimensions of the ark as given by Moses too scanty . . . and hence an argument has been drawn against the authority of the relation. To solve this difficulty many of the ancient Fathers and the modern critics have been put to miserable shifts. But Buteo and Kircher have proved geometrically that, taking the cubit of a foot and a half, the ark was abundantly sufficient for all the animals supposed to be lodged in it. Snellius computes the ark to have been above half an acre in area . . . and Dr Arbuthnot computes it to have been 81,062 tuns . . . if we come to a calculation the number of species of animals will be found much less than is generally imagined, not amounting to a hundred species of quadrupeds, nor to two hundred of birds. . . . Zoologists usually reckon but an hundred and seventy species in all." The progress of the "higher criticism," and the gradual surrender of attempts to square scientific facts with a literal interpretation of the Bible, are indicated in the shorter account given in the eighth edition, which concludes as follows:—"the insuperable difficulties connected with the belief that all the existing species of animals were provided for in the ark, are obviated by adopting the suggestion of Bishop Stillingfleet, approved by Matthew Poole, Pye Smith, le Clerc, Rossenmüller and others, that the deluge did not extend beyond the region of the earth then inhabited, and that only the animals of that region were preserved in the ark." The first edition also gives an engraving of the ark (repeated in the editions up to the fifth), in shape like a long roofed box, floating on the waters; the animals are seen in separate stalls. By the time of the ninth edition (1875) precise details are no longer considered worthy of inclusion; and the age of scientific comparative mythology has been reached.

For a comparative study of the occurrence of the ark in the various deluge myths, in the present edition, see DELUGE; COSMOGONY; BABYLONIA AND ASSYRIA.

The *Ark of the Law*, in the Jewish synagogue, is a chest or cupboard containing the scrolls of the Torah (Pentateuch), and is placed against or in the wall in the direction of Jerusalem. It forms one of the most decorative features of the synagogue, and often takes an architectural design, with columns, arches and a dome. There is a fine example in the synagogue at Great St Helens, London. (X.)

Ark of the Covenant, Ark of the Revelation, Ark of the Testimony, are the full names of the sacred chest of acacia wood overlaid with gold which the Israelites took with them on their journey into Palestine. The Biblical narratives reveal traces of a considerable development in the traditions regarding this sacred object, and those which furnish the most complete detail are of post-exilic date when the original ark had been lost. The fuller titles of the ark originate in the belief that it contained the "covenant" (*bĕrīth*) or "testimony" (*ʾēdūth*), the technical terms for the Decalogue (*q.v.*); primarily, however, it would seem to have been called "the ark of Yahweh" (or "Elohim"), or simply "the ark." The word itself (*ārōn*) designates an ordinary chest (cp. Gen. l. 26; 2 Kings xii. 10), and the (late) description of its appearance represents it as an oblong box 2½ cubits long, 1½ cubits in breadth and height (roughly 1·2 by ·75 metres). It was lined within and without with gold, and through four golden rings were placed staves of acacia wood, by means of which it was carried. A slab of the same metal (the so-called "mercy-seat," *kappōreth*, Gr. *hilastērion*) covered the top, and this was surmounted by two Cherubim (Ex. xxv. 10-22, xxxvii. 1-9). The latter, however, are not mentioned in earlier passages (Deut. x. 1, 3), and would naturally increase the weight of the ark, which, according to 2 Sam. xv. 29, could be carried by two men.

The ark was borne by the Levites (Deut. x. 8), and the latest narratives amplify the statement with a wealth of detail characteristic of the post-exilic interest in this order. (See LEVITES.) An interesting passage relating the commencement of an Israelite journey vividly illustrates the power of the sacred object. As the ark started, it was hailed with the cry, "Arise, Yahweh, let thine enemies be scattered, let them that hate thee flee from before thee," and when it came to rest, the cry again rang out, "Return, O Yahweh, to the myriads of families of Israel" (Num. x. 33-36). This saying appears to imply a settled life in Canaan, but both affirm the warlike significance of Yahweh and the ark. Thus it is the permanent pledge of Yahweh's gracious presence; it guides the people on their journey and leads them to victory. It is no mere receptacle, but a sacrosanct object as much to be feared as Yahweh himself. To presume to fight without it was to invite defeat, and on one notable occasion the Israelites attempted to attack their enemy north of Kadesh without its aid, and were defeated (Num. xiv. 44 sq.). There are many gaps in its history, and although at the crossing of the Jordan and at the fall of Jericho the ark figures prominently (Josh. iii. sq., vi. sq.), it is unaccountably missing in stories of greater national moment. Once it is found at Bethel (Judges xx. 27 sq.). It is met with again at Shiloh, where it is under the care of Eli and his sons, descendants of an ancient family of priests (1 Sam. ii. 28; cp. Josh. xviii. 1). After a great defeat of Israel by the Philistines it was brought into the field, but was captured by the enemy. The trophy was set up in the Philistine temple of Ashdod, but vindicated its superiority by overthrowing the god Dagon. A plague smote the city, and when it was removed to Ekron, pestilence followed in its wake. After taking counsel the Philistines placed the ark with a votive offering upon a new cart drawn by two cows. The beasts went of their own accord to Beth-shemesh, where it remained in the field of a certain Joshua. Again a disaster happened through some obscure cause, and seventy of the sons of Jeconiah were smitten (1 Sam. vi. 19, R.V., margin). Thence it was removed to the house of Abinadab of Kirjath-jearim, who consecrated his son to its service (1 Sam. iv.–vii. 1). For many years the ark remained untouched—apparently forgotten. Shiloh disappears from history; neither Saul nor even Samuel, whose youth had been spent with it, takes any further thought of it. After a remarkable period of obscurity, the ark enters suddenly into the history of David (2 Sam. vi.). Some time after the capture of Jerusalem the ark was brought from Baal-Judah, but at the threshing-floor of Nacon (an unintelligible name) Abinadab's son Uzzah laid hands upon it and was struck down for his impiety. On this account the place is said to have received the name Perez-Uzzah ("breach of Uzzah"). It was taken into the house of Obed-edom the Gittite (*i.e.* of Gath), and brought a blessing upon his house during the three months that it remained there. Finally the king had it conveyed to the city of David, where a tent was prepared to shelter it. Once at Jerusalem, it seems to have lost its unique value as the token of Yahweh's presence; its importance was apparently merged with that of the Temple which Solomon built. The foundation of the capital would pave the way for the belief that the national god had taken a permanent dwelling-place in the royal seat. The prophets themselves lay no weight upon the ark as the central point of Jerusalem's holiness. The real Deuteronomic code does not mention it, and to Jeremiah (iii. 16) it was a thing of no consequence. Later, in the age of the priestly schools, the ark received much attention, although it must obviously be very doubtful how far a true recollection of its history has survived. But nowhere is any light thrown upon its fate. The invasion of Shishak, the

capture of Jerusalem by Joash (2 Kings xiv. 13,14), the troublous reign of Manasseh, the destruction of Jerusalem by Nebuchadrezzar, have found each its supporters. The wild legends of its preservation at the taking of Jerusalem (2 Macc. ii. and elsewhere) only show that the popular mind was unable to share the view that the ark was an obsolete relic. More poetical is the tradition that the ark was raised to heaven, there to remain till the coming of the Messiah, a thought which embodies the spiritual idea that a heavenly pledge of God's covenant and faithfulness had superseded the earthly symbol.[1]

A critical examination of the history of the Israelite ark renders it far from certain that the object was originally the peculiar possession of all Israel. Many different traditions have gathered around the story of the Exodus, and the ark was not the only divinely sent guide or forerunner which led the Israelites. Its presence at Shiloh, and its prominence in the life of Joshua, support the view that it was the palladium of the Joseph tribes, but the traditions in question conflict with others. The account of the commencement of the ark's journey associates it with Moses and his kin (Num. x. 29 sqq.)—that is, with the south Palestinian clans with which the term "Levites" appears to be closely connected. (See LEVITES.) A distinct movement direct into Judah is implied by certain old traditions (see CALEB), but this is subordinated to the more comprehensive account of the journey round by the east of the Jordan. (See EXODUS, THE.) The narratives in 1 Sam. iv.–vi. stand on a plane by themselves, and the gap between them and 2 Sam. vi. has not been satisfactorily fixed. But it is not certain that the two belong to the same cycle of tradition; Kirjath-jearim and Baal-Judah are identified only in later writings, and the behaviour of Saul's daughter (2 Sam. vi. 15 sqq.) may conceivably imply that the ark was an unknown object to Benjamites. It is of course possible that the ark was originally the sacred shrine of the clans which came direct to Judah, and that the traditions in 1 Sam. iv.–vi., Josh. iii. sqq. are of secondary origin, and are to be associated with its appearance at Shiloh, the fall of which place, although attributed to the time of Samuel, is apparently regarded by Jeremiah (xxvi. 6) as a recent event. Of these two divergent traditions, it would seem that the one which associates it with the kin of Moses and David may be traced farther in those late narratives which connect the ark closely with the Levites and even attribute its workmanship to Bezalel, a Calebite (Ex. xxxi. 2; 1 Chron. ii. 19 sqq.). The tradition in Psalms cxxxii. 6 of the search for the ark at Jaar (Kirjath-jearim) and Ephratah is not clear; but a comparison with 1 Chron. ii. 50 seems to show that it recognized the "Calebite" origin of the ark.

See, on this, S.A.Cook, *Critical Notes on O. T. History* (*Index* s.v.), and, for other views, Kosters, *Theol. Tijd.* xxvii. 361 sqq.; Cheyne, *Encyc. Bib.* "Ark"; G. Westphal, *Yahwes Wohnstätten*, pp. 55 sqq., 85 sqq. (Giessen, 1908).

Whether the ark originally contained some symbol of Yahweh or not has been the subject of much discussion. Thus, it has been held that it contained stone fetishes (meteoric stones and the like) from Yahweh's original abode on Sinai or Horeb. As the palladium of the Joseph tribes, it has even been suggested that the bones of Joseph were treasured in the ark. Others have regarded it as an empty portable throne,[2] or as a receptacle for sacred serpents (analogies in Frazer, *Pausanias*, iv. pp. 292, 344). That it contained the tables of the law (Deut. x. 2; 1 Kings viii. 9) was the later Israelite view, and the subsequent development is illustrated in Heb. ix. 4. It is enough to decide that the ark represented in some way or other the presence of Yahweh and that the safety of his followers depended upon its security (analogies in Frazer, *Paus.* x. p. 283). The Semitic world affords many examples of the belief that a man's religion was part of his political connexion and that the change of nationality involved change of cult. He who leaves his land to enter another, leaves his god and is influenced by the religion of his new home (1 Sam. xxvi. 19; Ruth i. 16 sqq.), but strangers know not "the cult of the God of the land" (2 Kings xvii. 26). No nation willingly changes its god (Jer. ii. 11), and there are means whereby the follower of Yahweh may continue his worship even when outside Yahweh's land (2 Kings v. 17). When a people migrate they may take with them their god, and if they conceive him to be a spiritual being who cannot be represented by an image, they may desire a symbolical expression of or, rather, a substitute for his presence. Accordingly the conception of the ark must be based in the first instance upon the beliefs of the particular clans or tribes whose sacred object it was.

[1] Cp. Rev. xi. 19, and W. R. Smith, *Old Test. in Jew. Church*, *Index*. For later traditional material, see Buxtorf, *De Arca Foederis* (Basel, 1659).

[2] But see Budde, *Expos. Times* (1898), pp. 398 sqq.; *Theolog. Stud. u. Krit.* (1906), pp. 489-507. The possibility must be conceded that there were several arks in the course of Hebrew history and that separate tribes or groups of tribes had their own sacred object.

See further, W. R. Smith, *Religion of the Semites*, p. 37; Schwally, *Kriegsaltertümer*, i. p. 9; *Revue biblique* (1903), pp. 249 sqq.; and on the ark, generally, in addition to the literature already cited, Kautzsch, Hastings' *Dict. Bible*, v. p. 628; A. R. S. Kennedy, *Century Bible: Samuel* (*Appendix*); E. Meyer, *Die Israeliten*, *Index* s.v. "*Lade*,"; and R. H. Kennett, *Enc. of Rel. and Ethics*. (S. A. C.)

ARKANSAS, a river of the United States of America, rising in the mountains of central Colorado, near Leadville, in lat. 39° 20′ N., long. 106° 15′ W., and emptying into the Mississippi, at Napoleon, Arkansas, in lat. 33° 40′ N. Its total length is about 2000 m., and its drainage basin (greater than that of the Upper Mississippi) about 185,000 sq. m. It is the greatest western affluent of the Missouri-Mississippi system. It rises in a pocket of lofty peaks at an altitude of 10,400 ft. on a sharply sloping plateau, down which it courses as a mountain torrent, dropping 4625 ft. in 120 m. At Canyon City it passes out of the Rockies through the Grand Canyon of the Arkansas; then turning eastward, and soon a turbid, shallow stream, depositing its mountain detritus, it flows with steadily lessening gradient and velocity in a broad, meandering bed across the prairies and lowlands of eastern Colorado, Kansas, Oklahoma and Arkansas, shifting its direction sharply to the south-east in central Kansas. The Arkansas ordinarily receives little water from its tributaries save in time of floods. In topography and characteristics and in the difficulties of its regulation the Arkansas is in many ways typical of the rivers in the arid regions of the western states. The gradient below the mountains averages 7·5 ft. per mile between Canyon City and Wichita, Kansas (543 m.), about 1·5 ft. between Wichita and Little Rock (659 m.), and 0·65 of a foot from Little Rock to the mouth (173 m.). The shores are sand, clay or loam throughout some 1300 m., with very rare rock ridges or rapids, and the banks rise low above ordinary water. The waters are constantly rising and falling, and almost never is the discharge at any point uniform. Every year there are, normally, two distinct periods of high water; one an early freshet due mainly to the heavy winter rainfall on the lower river, when the upper river is still frozen hard; the other in the late spring, due to the setting in of rains along the upper courses also, and to the melting of the snow in the mountains. The lowest waters are from August to December. In the summer there are sometimes violent floods due to cloud-bursts. Everywhere along the river there is a never-ending variation of velocity and discharge, and an equally ceaseless transformation of the river's bed and contour. These changes become revolutionary in times of flood. All these characteristics are accentuated below Little Rock. The depth of water at this point has been known to vary from 27 ft. to only half-a-foot, and the discharge to fall to 1170 cub. ft. per second. There is often no more than 1·5 ft. of water, and far below Little Rock a depth of 3 ft. on crossings is not infrequent. In many places there are different channels for high and low water, the latter being partly filled by each freshet, and recut after each subsidence; and the river meanders tortuously through the alluvial bottom in scores of great bends, loops and cut-offs. It is estimated that the eating and caving of the shore below Little Rock averages 7·64 acres per mile every year (as against 1·99 acres above Little Rock). By way of the White river cut-off the Arkansas finds an additional outlet through the valley of that river in times of high water, and the White, when the current in its natural channel is deadened by the backwaters of the Mississippi, finds an outlet by the same cut-off through the valley

of the Arkansas. This backwater, where it meets and checks the current of the Arkansas, occasions the precipitation of enormous alluvial deposits, and vast quantities of snags. The banks are disintegrated along this part of the river and built up again on the opposite side to their original height in the extraordinarily short time of two or three years, the channel remaining all the while narrow. At the mouth of the White, the Arkansas and the Mississippi the level of recurrent floods is 6 or 8 ft. above the timber-bearing soil along the banks, and all along the lower river the country is liable to overflow; and as the land backward from the stream slopes downward from the banks heaped up by successive flood-deposits, each overflow creates along the river a fringe of swamps. These features, although exaggerated in the portion of the river now in question, are qualitatively characteristic of its entire course below the mountains.

Up to the 30th of June 1907 the government of the United States expended $2,384,557 on improvements along the Arkansas. Almost half of this sum was required for snagging operations alone. There is a considerable traffic on the river within the borders of Arkansas in miscellaneous freights, and a slight passenger movement. The river is rarely navigable above Fort Smith, and during a considerable part of the year not above Pine Bluff. Steamer service is maintained the year round between this point and Memphis. Ordinarily there are some 400 m. of channel open to steamers part of the year, and in time of high flood considerably more. To the mouth of the Grand river (460 m.) the river is open about four months in a year for vessels of 4 ft. draft and about eight months for vessels of 2 ft. draft.

Bibliography.—General descriptions of different portions of the river are indicated in the Index to the *Reports of the Chief of Engineers, U. S. Army* (many volumes, 1879–1900). See also H. Gannett, *Profiles of Rivers in the U. S.* (U. S. Geolog. Survey, 1901); Greenleaf, "Western Floods," in *Engin. Mag.* xii. 945-958; U. S. Geolog. Survey, *Bull.* 140; I. C. Russell, *Rivers of North America* (1898); T. J. Vivian, *Transportation, Rivers of the Miss. Valley* (U. S. Census, 1890, special Rp.).

ARKANSAS, one of the South Central states of the United States of America, situated between 89° 40′ N. and 94° 42′ W., bounded N. by Missouri, E. by the Mississippi river, separating it from Tennessee and Mississippi, and W. by Texas and Oklahoma. Its area is 53,335 sq. m., of which 810 are water surface.

Arkansas lies in the drainage basin of the lower Mississippi, and has a remarkable river system. The Arkansas bisects the state from W. to E.; along its valley lie the oldest and largest settlements of the state. Nine other considerable streams drain the state; of these, the Red, the Ouachita, the White and the St Francis are the most important. There are a number of swamps and bayous in the eastern part.

Physical Features.—The surface of Arkansas is the most diversified of that of any state in the central Mississippi valley. It rises, sloping upward toward the N.W., from an average elevation of less than 300 ft. in the south-east to heights of 2000 ft. and more in the north-western quarter. There are four physiographic regions: two of highlands; one of river valley plain separating the two highland areas; while the fourth is a region of hills, lowlands and scanty prairie. The last covers the E. half of the state, and is part of the Gulf or coastal plain province of the United States. If a line be drawn from the point where the Red river cuts the western boundary to where the Black cuts the northern, E. of it is the Gulf plain and W. of it are the highlands (over 500 ft.) and the mineral regions of the state. They are divided by the valley of the Arkansas river into two regions, which are also structurally different. South of the river are the Ouachita Mountains, and north of it are the Boston Mountains. The Ouachita Mountains are characterized by close folding and faulting. Their southern edge is covered with cretaceous deposits, and their eastern edge is covered as well with the tertiary deposits of the Gulf plains. The Arkansas valley is marked by wide and open folding. The Boston Mountains are substantially a continuation of the Ozark dome of Missouri. Their northern border is marked by an escarpment of 500 to 700 ft. in height. The trend is from E. to W. between Batesville and Wagoner, Oklahoma. In structure they are monoclinical, their rocks—sandstones and shales—being laid southward and blending on that side with the Arkansas valley region. The entire region is very much dissected by streams, and the topography is characteristically of a terrace and escarpment type. In the highlands N. of the Arkansas the country is very irregularly broken; S. of the river the hills lie less capriciously in short, high ranges, with low, fertile valleys between them. The Ouachitas extend 200 m., from within Oklahoma (near Atoka) to central Arkansas, near Little Rock. They are characterized by long, low ridges bearing generally W.–E., with wide, flat valleys. Near the western boundary of the state they attain a maximum altitude of 2900 ft. above the sea, and 2000 ft. above the valleys of the Arkansas and Red river; falling in elevation eastward (as westward) to 500–700 ft. at their eastern end. Five peaks rise above 2000 ft. Magazine Mountain, 2833 ft. above the sea-level and 2350 ft. above the surrounding country, is the highest point between the Alleghanies and the Rockies. Altitudes of 2250 ft. are attained in the Boston Mountains, which are the highest portion of the Ozark uplift, and the most picturesque. The streams are vigorous, and in their lower courses flow in deep-cut gorges, 500 to 1000 ft. deep, almost deserving the name of canyons. The main streams are tortuous, and their dendritic tributaries have cut the region into ridges. The mountains do not fill the N.W. quarter of the state, and are separated from a lower, greatly eroded highland region on their N. by a bold escarpment 500 to 1000 ft. in height. Along the upper course of the White river in the Bostons and in the country about Hot Springs in the Ouachitas is found the most beautiful scenery of the highlands; few regions are more beautiful. The valley region embraces the bottom-lands along the Mississippi, and up the Arkansas as far as Pine Bluff, and the cypress swamp country of the St Francis.

Climate.—The climate of the state is "southern," owing to the influence of the Gulf of Mexico. The mean temperatures for the different seasons are normally about 41·6°, 61·1°, 78·8° and 61·9° F. for winter, spring, summer and autumn respectively. The normal mean precipitations are about 11·7, 14·5, 10·5 and 10.2 in. for the same seasons. The extreme range of the monthly isotherms crossing the state is from about 35° in winter to 81° F. in summer, and the range of annual isotherms from about 54° to 60° F. That is, the variation of mean annual temperatures for different parts of the state is only 6° F. The variation of the mean annual temperature for the entire state is only 4° (from 59° to 63° F.). The variation of precipitation is as great as 30 in. (from 34 to 64 in.) according to locality. There is little snow, no severe winter cold, and no summer drought. Sheltered valleys in the interior produce spring crops three or four weeks earlier than is usual in Kansas. The climate is generally healthy.

Flora.—Arkansas lies in the humid, or Austroriparian, area of the Lower Austral life-zone, except the highlands of the Ozark uplift and Ouachita Mountains, which belong to the humid, or Carolinian, area of the Upper Austral. The state possesses a rich fauna and flora. From an economic standpoint its forests deserve special mention. The forest lands of the state include four-fifths of its area, and three-fourths are actually covered by standing timber. Valuable trees are of great variety: cottonwood, poplar, catalpa, red cedar, sweet-gum, birch-eye, sassafras, persimmon, ash, elm, sycamore, maple, a variety of pines, pecan, locust, dogwood, hickory, various oaks, beech, walnut and cypress are all abundant. There are one hundred and twenty-nine native species of trees. The yellow pine, the white oak and the cypress are the most valuable growths. The northern woods are mainly hard; the yellow pine is most characteristic of the heavy woods of the south central counties; and magnificent cypress abounds in the north-east. Hard woods grow even on the alluvial lands. "The hard-wood forests of the state are hardly surpassed in variety and richness, and contain inestimable bodies of the finest oak, walnut, hickory and ash timber" (U.S. Census, 1870 and 1900). The growth on the alluvial bottoms and the lower uplands in the E. is extraordinarily vigorous. The leading species of the Appalachian woodland maintain their

full vigour of growth nearer to the margin of forest growth in this part of the Mississippi valley than in any other part of the United States; and some species, such as the holly, the osage orange and the pecan, attain their fullest growth in Arkansas (Shaler). There are two Federal forest reserves (4968 sq. m.).

Soil.—The soils of Arkansas are of peculiar variety. That of the highlands is mostly but a thin covering, and their larger portion is relatively poorly fitted for agriculture. The uplands are generally fertile. Their poor soils are distinctively sandy, those of the lowlands clayey; but these elements are usually found combined in rich loams characterized by the predominance of one or the other constituent. Finally the alluvial bottoms are of wonderful richness.

Agriculture.—This variety of soils, a considerable range of moderate altitudes and favourable factors of heat and moisture promote a rich diversity in agriculture. Arkansas is predominantly an agricultural state. The farm area of 1860 was only 28·2 % of the whole area of the state, that of 1900 (16,636,719 acres) was 49 %; and while only a fifth of this farm area was actually improved in 1860, two-fifths were improved in 1900; thus, the part of the state's area actually cultivated approximately quadrupled in four decades. The value of products in 1900 ($79·6 millions) was 44 % of the total farm values ($181·4 millions). The rise in average value of farm lands since 1870 has not been a fifth of the increase of the aggregate value of all farm property.

The Civil War wrought a havoc from which a full recovery was hardly reached before 1890. The economic evolution of the state since Reconstruction has been in the main that common to all the old slave states developing from the plantation system of ante-bellum days, somewhat diversified and complicated by the special features of a young and border community. The farms of Arkansas increased in number 357·8 %, in area 73·7 % and in total true (as distinguished from tax) valuation about 53·8 % between 1860 and 1900; the decade of most extraordinary growth being that of 1870–1880. Thus Arkansas has shared that fall in the average size of farms common to all sections of the Union (save the north central) since 1850, but especially marked since the Civil War in the " Cotton States," owing to the subdivision of large holdings with the introduction of the tenant system. The rapidity of the movement has not been exceptional in Arkansas, but the size of its average farm, less in 1850 than that of the other cotton states, was in 1900, 93·1 acres (108·8 for white farmers alone, 49·0 for blacks alone), which was even less than that of the North Atlantic states (96·5 acres, the smallest sectional unit of the Union). The percentage of farms worked by owners fell from 69·1 % in 1880 to 54·6 % in 1900; the difference of the balances or 14·5 % indicates the increase of tenant holdings, two-thirds of these being for shares.

It is interesting to compare in this matter the whites and the negroes. In actual numbers the white farmers heavily predominate, whether as owners, tenants for cash or tenants on shares; but if we look at the numbers within each race holding by these respective tenures (65·0, 8·7 and 26·3 % respectively for whites; 25·6, 33·7 and 40·7 % for negroes, in 1900), we see the lesser independence of the negro farmer. The cotton counties, which are the counties of densest coloured habitancy, exemplify this fact with great clearness. The few negroes in the white counties of the uplands are much better off than those in the cotton lowlands; more than three times as large a part of them owners; the poorer element is segregated in the cotton region. In Arkansas, as elsewhere in the south, negro tenants, like white tenants, are more efficient than owners working their own lands. The black farmer is in bondage to cotton; for him still " Cotton is King." He gives it four-fifths of his land; while his white rival allows it only a quarter of his, less by half than the area he gives to live-stock, dairying, hay and grains. At Sunnyside, on the west bank of the Mississippi, negro tenant farmers have been practically forced out of business by Italians, who produced in 1899–1904 more than twice as much lint cotton per working hand, and 70 % more per acre. The general place of the negro in agriculture is shown also by the fact that more than four-fifths of the farm acreage and farm values of the state are in the hands of the whites. The white farmer gives an outlay in labour and fertilizers on his farm greater by 61·4 % than the black, gathers a produce greater by 22·5 %, and possesses a farm of a value 53·5 % greater (Census, 1900).

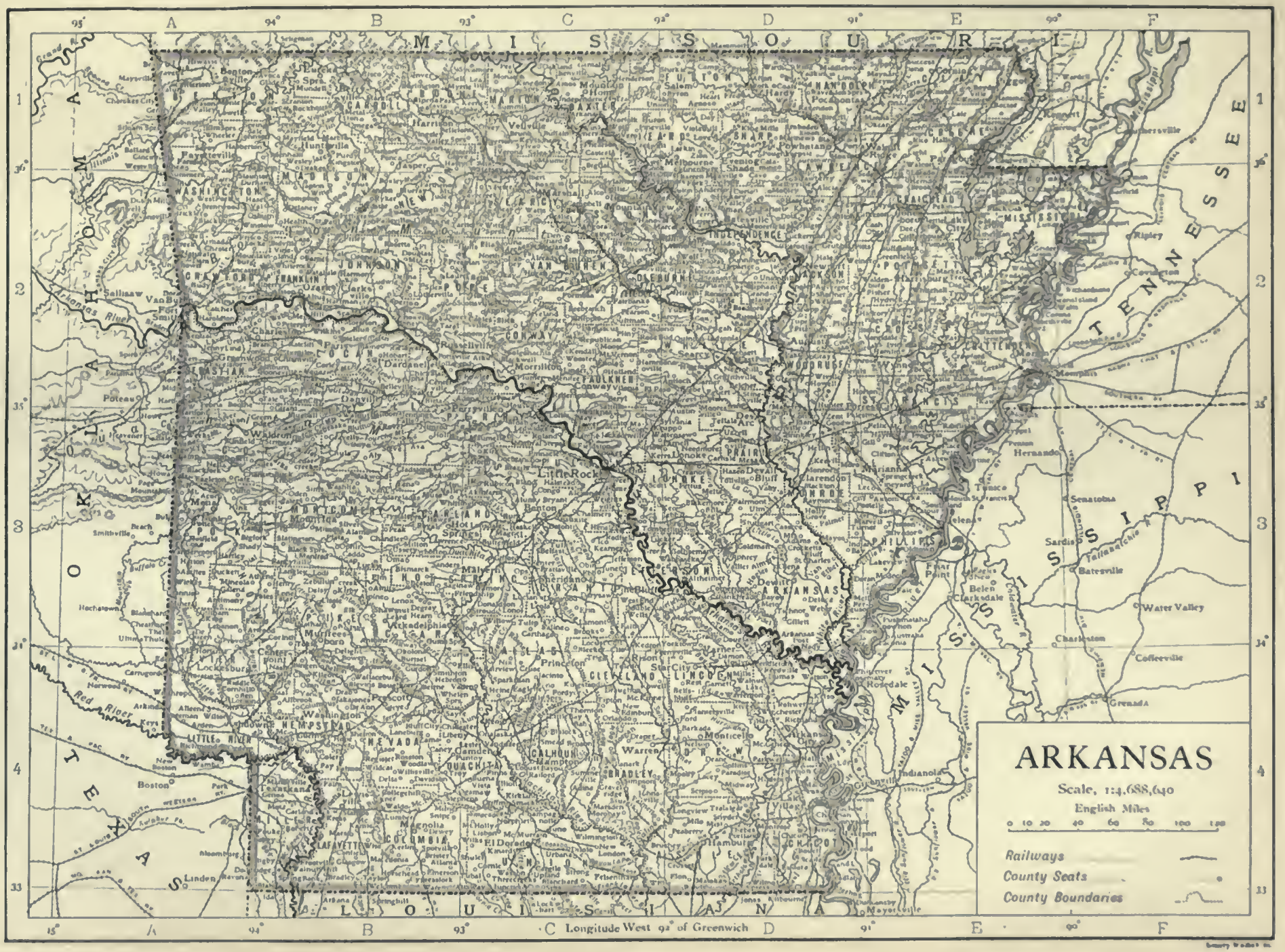
Cotton is the leading product. It absorbs about a third of the area under crops, and its returns ($28,000,000 in 1899) are about a half of the value of all crops. A part of the cotton lands of Arkansas are among the richest in the south. Other distinctively southern products (tobacco, &c.) are of no importance in Arkansas. Cereals are given more than twice as much acreage as cotton, but yield only a third as great aggregate returns, Indian corn being much the most remunerative; about three-fourths of the cereal acreage are given to its cultivation, and it ranks after cotton in value of harvest.[1] For all the other staple agricultural products of the central states the showing of Arkansas is uniformly good, but not noteworthy. But its rank as a fruit-growing country is exceptional. Plums, prunes, peaches, pears and grapes are cultivated very generally over the western half of the state (grapes in the east also), but with greatest success in the south-west; apples prosper best in the north-west. Small berries are a very important product. All fruits are of the finest quality. For apples the state makes probably a finer showing than that of any other state except Oregon. About ninety varieties are habitually entered in national competitions. The fruit industry generally has developed with extreme rapidity.

Manufactures.—Although Arkansas is rich in minerals and in forests, in 1900 only 2 % of its population were engaged in manufacturing. But the development has been rapid; the value of products multiplied seven times, the wages paid nine, and the capital invested twelve, in the years 1880–1900; and the increase in the same categories from 1900–1905 was 35, 42·8 and 82·4 % respectively.[2] It must be noted as characteristic of the state that of the total manufactures in 1905, 80·3 % were produced in rural districts (83·7 in 1900). About two-thirds of the increase between 1890 and 1900 was in the lumber industry, which was of slight importance before the former year; it represented more than half the total value of the manufactures of the state in 1905 (output, 1905, $28,065,171 and of mill products $3,786,772 additional); in the value of lumber and timber products the state ranked sixth among the states of the United States in 1900, and seventh in 1905. After the lumber and timber industry ranked in 1905 the manufacture of cotton-seed oil and cake ($4,939,919) and flour and grist milling. Cotton ginning increased 739 % from 1890 to 1900.

Minerals.—The progress of coal-mining has been a striking feature of the state's economy since 1880. The field extends from Oklahoma eastward to central Arkansas, along both sides of the Arkansas river. A production of 5000 tons (short) in 1882 became 542,000 tons in 1891 and 2,229,172 tons in 1903—a maximum for the state up to 1905; in 1907 the yield was 2,670,438 tons, valued at $4,473,693; the value of the product increased more than eight-fold in 1886–1900. The United States Geological Survey estimates that three-fourths of the coal area (over 1700 sq. m.) can made commercially productive. Apart from coal the great and varied mineral wealth of the state has been only slightly utilized. The great zinc and lead area along the northern border in the plateau portion of the Ozark region has proved a disappointment in development; the iron areas have hardly been touched, and the product of the exceptionally promising deposits of manganese lost ground after 1890 before

[1] For 1906 the *Yearbook* of the U. S. Department of Agriculture reported the following statistics for Arkansas:—Indian corn, 52,802,659 bu., valued at $24,817,207; oats 3,783,706 bu., valued at $1,589,157; wheat, 1,915,250 bu., valued at $1,436,438; rice, 131,440 bu., valued at $111,724; rye, 23,652 bu., valued at $19,631; potatoes, 1,666,960 bu., valued at $1,116,863; hay, 113,491 tons, valued at $1,123,561.

[2] The special census of the manufacturing industry for 1905 was concerned only with the establishment conducted under the so-called " factory system "; for purposes of comparison the figures for 1900 have been reduced to the same standard, and this fact should be borne in mind with regard to the percentages of increase given above.


ARKANSAS
Scale, 1:4,688,640
English Miles
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Railways
County Seats
County Boundaries
Longitude West 92° of Greenwich
MISSOURI
TENNESSEE
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OKLAHOMA
TEXAS
LOUISIANA
Little Rock
Fort Smith
Texarkana
Pine Bluff
Hot Springs
Jonesboro
Helena
Batesville
Blytheville
Osceola
Forrest City
Camden
El Dorado
Magnolia
Arkadelphia
Clarksville
Russellville
Conway
Searcy
Harrison
Mountain Home
Newport
Paragould
Jonesboro
Wynne
Marianna
Hernando
Senatobia
Water Valley
Charleston
Coffeeville
Grenada
Greenville
Indianola
Yazoo City
Rosedale
Clarksdale
Belen
Sardis
Tallahatchie
Red River
Little River
Arkansas River
Mississippi River
Ouachita River
White River
St. Francis River

the output of Virginia and Georgia. Among the products of the rich stone quarries of the state, only that of abrasive stones is important in the markets of the Union; the novaculites of Arkansas are among the finest whetstones in the world. Deposits of true chalk are utilized in the manufacture of Portland cement for local markets. The chalk region lies in the S. E. part of the state, S. of the Ouachita Mountains. Bauxite was discovered in the state in 1887, and the product increased from 5045 long tons in 1899 to 50,267 long tons in 1906, the production for the whole country in 1899 being 35,280 long tons and in 1906 75,332 long tons. The only other states in which bauxite was produced during the period were Alabama and Georgia, which in this respect have greatly declined in importance relatively to Arkansas. Extremely valuable and varied marls, kaolins and clays, fuller's earth, asphaltum and mineral waters show special promise in the state's industry. In 1906 diamonds were found in a peridotite dike in Pike county 2½ m. S. E. of Murfreesboro; this is the first place in North America where diamonds have been found *in situ*, and not in glacial deposit or in river gravel.

Communications.—The rivers afford for light craft (of not over 3 ft. draft) about 3000 m. of navigable waters, a river system unequalled in extent by that of any other state. The labours of the United States government have much extended and very greatly improved this navigation, materially lessening also the frequency and havoc of floods along the rich bottom-lands through which the rivers plough a tortuous way in the eastern and southern portions of the state. As a result of these improvements land and timber values have markedly risen, and great impetus has been given to traffic on the rivers, which carry a large part of the cotton, lumber, coal, stone, hay and miscellaneous freights of the state. The greatest of these internal improvements is the St Francis levee, from New Madrid, Missouri, to the mouth of the St Francis, 212 m. along the Mississippi; an area of 3500 sq. m., of exceptional fertility, is here reclaimed at a cost of about $1500 per sq. m. (as compared with $10,000 per sq. m. for the 2500 sq. m. reclaimed by the Nile works at Assuan and Assiut). Whether with regard to area or population, Arkansas is also relatively well supplied with railways (4,472·8 m. at the end of 1907). A state railway commission controls transportation rates, which are also somewhat checked by the competition of river freights. There is also a considerable passenger traffic on the Arkansas.

Population.—The population in 1910 was 1,574,449. The growth in 1880–1900 is shown by the following table:—

Census Year.	Total Pop.	%White Pop.	%Negro Pop.	Average per sq. m.	% Increase by decades.		
					Total.	Whites.	Negroes.
1880	802,525	73·7	26·3	15·1	65·6	63·3	72·4
1890	1,128,211	72·6	27·4	21·5	40·6	38·4	46·6
1900	1,311,564	72·0	28·0	25·0	16·3	15·4	18·7

In 1900 the rank of the state in total population was twenty-fifth, and in negro population tenth. The proportion of the coloured element steadily rose from 11 % in 1820 to 28 % in 1900, at which time there were more than a dozen counties along the border of the Mississippi and lower Arkansas in which the negroes numbered 50 to 89 % of the total. They have never been a large element in the highland counties; it was these counties which were most strongly Unionist at the time of the Civil War, and which to-day are the region of diversified industry. About a ninth of the state's population is gathered into towns of more than 2000 inhabitants. Fort Smith (pop. 11,587 in 1900), Little Rock, the state capital (38,307), and Pine Bluff (11,496) lie in the valley of the Arkansas. In 1900 a dozen other towns had a population exceeding 2500, the most important being Hot Springs (9973), Helena (5550), Texarkana (4914), Jonesboro (4508), Fayetteville (4061), Eureka Springs (3572), Mena (3423) and Paragould (3324). Foreign blood has only very slightly permeated the state; negroes and native whites of native parents make up more than 95 % of its population. Immigration is almost entirely from other southern states. The strongest religious sects are the Methodists and Baptists.

Government.—The present constitution of the state dates from 1874 (with amendments). Few features mark it off from the usual type of such documents. The governor holds office for two years; he has the pardoning and veto power, but his veto may be overridden by a simple majority in each house of the whole number elected to that house (a provision unusual among the state constitutions of the Union). There is no lieutenant-governor. The legislature is bicameral, senators holding office for four years, representatives (about thrice as numerous) for two. The length of the regular biennial legislative sessions is limited to sixty days, but by a vote of two-thirds of the members elected to each house the length of any session may be extended. Special sessions may be called by the governor. A majority of the members elected to each of the two houses suffices to propose a constitutional amendment, which the people may then accept by a mere majority of all votes cast at an election for the legislature (an unusually democratic provision); no more than three amendments, however, can be proposed or submitted at the same time. The supreme court has five members, elected by the people for eight years; they are re-eligible. The population of the state entitles it to seven representatives in the national House of Representatives, and to nine votes in the Electoral College (census of 1900). Elections of members of the state legislature and of Congress are not held at the same time—a very unusual provision. Elections are by Australian ballot; the constitution prescribes that no law shall "be enacted whereby the right to vote at any election shall be made to depend upon any previous registration of the elector's name" (extremely unusual). The qualifications for suffrage include one year's residence in the state, six months in the county, and one month in the voting district, next before election; idiots, insane persons, convicts, Indians not taxed, minors and women are disqualified; aliens who have declared their intention to become citizens of the United States vote on the same terms as actual citizens. An amendment of 1893 requires the exhibition of a poll-tax receipt by every voter (except those "who make satisfactory proof that they have attained the age of twenty-one years since the time of assessing taxes next preceding" the election). There is nothing in the constitution or laws of Arkansas with any apparent tendency to disfranchise the negroes; there are statutory provisions (1866–1867) against intermarriage of the races and constitutional and statutory (1886–1887) provisions for separate schools, a "Jim Crow" law (1891) requires railways to provide separate cars for negroes, and a law (1893) provides for separate railway waiting-rooms for negroes. Giving or accepting a challenge to a duel bars from office, but this survival of the ante-bellum social life is to-day only reminiscent. Declared atheists are similarly disqualified. There is no constitutional provision for a census. Marriage is pronounced a civil contract. A law for compulsory education was passed in 1909.

Finance.—The constitution makes 1 % on the assessed valuation of property a maximum limit of state taxation for ordinary expenses, but by an amendment of 1906 the legislature may levy three mills on the dollar per annum for common schools; and may "authorize school districts to levy by a vote of the qualified electors of such district a tax not to exceed seven mills on the dollar in any year for school purposes." The state debt in 1874 was $12,108,247, of which about $9,370,000 was incurred after the Civil War for internal improvement schemes. This new debt was practically repudiated in 1875 by a decision of the supreme court, and completely set aside in 1884 by constitutional amendment. Until 1900, when an adjustment of the matter was reached, there was also another disputed debt to the national government, owing to the collapse in 1839 of a so-called Real Estate Bank of Arkansas, in which the state had invested more than $500,000 paid to it by the United States in exchange for Arkansas bonds to be held as an investment for the Smithsonian Institution, on which bonds the state defaulted after 1839. If the unacknowledged debt be included (as it often is; and hence the necessity of reference to it), very few states—and those all western or southern—have a heavier burden per capita. But the acknowledged debt was in 1907 only $1,250,500, and this is

not a true debt, being a permanent school fund that is not to be paid off; of this total in 3% bonds, $1,134,500 is held by the common schools and $116,000 by the state university. In net combined state and local debt, Arkansas ranks very low among the states of the Union. The hired labourer suffers from the "truck" system, taking his pay in board and living, in goods, in trade on his employer's credit at the village store; the independent farmer suffers in his turn from unlimited credit at the same store, where he secures everything on the credit of his future crops; and if he is reduced to borrow money, he secures it by vesting the title to his property temporarily in his creditor. His legal protections under such "title bonds" are much slighter than under mortgages. Homesteads belonging to the head of a family and containing 80 to 160 acres (according to value) if in the country, or a lot of ¼ to one acre (according to value), if in town, village or city, are exempt from liability for debts, excepting liens for purchase money, improvements or taxes. A married man may not sell or mortgage a homestead without his wife's consent.

Education.—The legal beginnings of a public school system date from 1843; in 1867 the first tax was imposed for its support. Only white children were regarded by the laws before Reconstruction days. There are now separate race schools, with terms of equal length, and offering like facilities; the number of white and coloured teachers employed is approximately in the same proportion to the number of attending children of the respective races; in negro districts two out of three school directors are usually negroes. "The coloured race as a whole go to the schools as regularly and as numerously in proportion as do the whites" (Shinn). Of the current expenses of the common schools about three-fourths is borne by the localities; the state distributes its contribution annually among the counties. There is also a permanent school fund derived wholly from land grants from the national government. The total expenditure for the schools is creditable to the state; but before 1909 hardly half the school population attended; and in general the rural conditions of the state, the shortness of the school terms and the dependence of the schools primarily upon local funds and local supervision, make the schools of inadequate and quite varying excellence. The average expenditure in 1906 for tuition per child enrolled was $4·93, and the average length of the school term was only eighty-one days. In June 1906 there were 1102 school houses in the state valued at $100 or less. In 1905–1906 the Peabody Board gave $2000 to aid rural schools, and in general it has done much for the improvement of country public schools throughout the state. In 1906 an amendment to the state constitution, greatly increasing the tax resources available for educational work, was passed by a large popular vote. The University of Arkansas was opened at Fayetteville in 1872. The law and medical faculties are at Little Rock. A branch normal school, established 1873–1875 at Pine Bluff, provides for coloured students, who enjoy the same opportunities for work, and are accorded the same degrees, as the students at Fayetteville; they are about a fourth as numerous. In 1905–1906 there were 497 students in the college of liberal arts, sciences and engineering, 548 in the preparatory school and 26 in the conservatory of music and arts, all in Fayetteville; 171 in the medical school and 46 in the law school in Little Rock; and 240 in the branch normal college at Pine Bluff. The university and the normal school are supported by the Morrill Fund and by state appropriations. The state still suffered in 1906 from the lack of a separate and special training school for teachers; but in 1907 the legislature voted to establish a state normal school. Of the Morrill Fund (see MORRILL, JUSTIN SMITH), three-elevenths goes to the normal school. The agricultural experiment station of the university dates from 1887. The financial support of the university has been light, about three-fifths coming from the United States government. Besides the university there are about a score of denominational colleges or academies, of which half-a-dozen are for coloured students. Among the large denominational colleges are Philander Smith College, Little Rock (Methodist Episcopal, 1877); Ouachita College, Arkadelphia (Baptist, 1886); Hendrix College, Conway (Methodist Episcopal, South, 1884); and Arkansas College, Batesville (Presbyterian, 1872). There are few libraries in Arkansas. In this matter her showing has long been among the very poorest in the Union relatively to her population. Daily papers are few in number. The state charitable institutions—insane asylum, deaf-mute and blind institutes—and the penitentiary, are at Little Rock.

Local government is of the ordinary southern county type, without noteworthy variations. Municipal corporations rest upon a general state law, not upon individual charters. The liquor question is left by the state to county (*i.e.* including "local," or town) option, and prohibition is the most common county law, the alternative being high-licence.

History.—The first settlement by Europeans in Arkansas was made in 1686 by the French at Arkansas Post (later the residence of the French and Spanish governors, important as a trading post in the earlier days of the American occupation, and the first territorial capital, 1819–1820). In 1720 a grant on the Arkansas was made to John Law. In 1762 the territory passed to Spain, in 1780 back to France, and in 1803 to the United States as a part of the "Louisiana Purchase." Save in the beginnings of western frontier trade, and in a great mass of litigation left to the courts of later years by the curious and uncertain methods of land delimitation that prevailed among the French and Spanish colonists, the pre-American period of occupation has slight connexions with the later period, and scant historical importance.

From 1804 to 1812 what is now Arkansas was part of the district (and then the territory) of Louisiana, and from 1812 to 1819 of the territory of Missouri. Its earliest county organizations date from this time. It was erected successively into a territory of the first and second class by acts of Congress of the 2nd of March 1819 and the 21st of April 1820. By act of the 15th of June 1836 it was admitted into the Union as a slave state.

There is little of general interest in the history of ante-bellum days. Economic life centred in the slave plantation, and there was remarkable development up to the Civil War. The decade 1819–1829 saw the first newspaper (1819), the beginning of steamboating on Arkansas rivers, and the first weekly mail from the east. Trade was largely confined to the rivers and freighting for Sante Fé and Salt Lake before the war, but the first railway entered the state in 1853. Social life was sluggish in some ways and wild in others. An unhappy propensity to duelling, the origin in Arkansas of the bowie-knife,—from an alleged use of which Arkansas received the nickname, which it has always retained, of the "toothpick state,"—and other backwoods associations gave the state a reputation which to some extent has survived in spite of many years of sober history. The questions of the conduct of territorial affairs do not seem to have been contested systematically on national party lines until about 1825. The government of Arkansas before the Civil War was always in the hands of a few families closely intermarried. From the beginning the state has been unswervingly Democratic, save in the Reconstruction years, though often with heavy Whig or Republican minorities.

In February 1861 the people of Arkansas voted to hold a convention to consider the state of public affairs. The convention assembled on the 4th of March. Secession resolutions were defeated, and it was voted to submit to the people the question whether there should be "co-operation" through the Lincoln government, or "secession." The plan was endorsed of holding a convention of all the states to settle the slavery question, and delegates were chosen to the proposed Border State Convention that was to meet at Frankfort, Kentucky, on the 27th of May. Then came the fall of Fort Sumter and the proclamation of President Lincoln calling for troops to put down rebellion. The governor of Arkansas curtly refused its quota. A quick surge of ill-feeling, all the bitterer on account of the divided sentiments of the people, chilled loyalty to the Union. The convention reassembled on call of the governor, and on the 6th of May, with a single dissentient voice, passed an ordinance of secession. It then repealed its former vote submitting the question of secession

to the people. On the 16th of May Arkansas became one of the Confederate States of America.

In the years of war that followed, a very large proportion of the able-bodied men of the state served in the armies of the Confederacy; several regiments, some of coloured troops, served the Union. Union sentiment was strongest in the north. In 1862–1863 various victories threw more than half the state, mainly the north and east, under the Federal arms. Accordingly, under a proclamation of the president, citizens within the conquered districts were authorized to renew allegiance to the Union, and a special election was ordered for March 1864, to reorganize the state government. But meanwhile, a convention of delegates chosen mainly at polls opened at the army posts, assembled in January 1864, abolished slavery, repudiated secession and the secession war debt, and revised in minor details the constitution of 1836, restricting the suffrage to whites. This new fundamental law was promptly adopted by the people, *i.e.* by its friends, who alone voted. But the representatives of Arkansas under this constitution were never admitted to Congress.

The Federal and Confederate forces controlled at this time different parts of the state; there was some ebb and flow of military fortune in 1864, and for a short time two rival governments. Chaotic conditions followed the war. The fifteenth legislature (April 1864 to April 1865) ratified the Thirteenth Amendment, and passed laws against "bush-whacking," a term used in the Civil War for guerilla warfare, especially as carried on by pretended neutrals. Local militia, protecting none who refused to join in the common defence, and all serving "not as soldiers but as farmers mutually pledged to protect each other from the depredations of outlaws who infest the state," strove to secure such public order as was necessary to the gathering of crops, so as "to prevent the starvation of the citizens" (governor's circular, 1865). Struggling in these difficulties, the government of the state was upset by the first Reconstruction Act. The governor in these years (1865–1868) was a Republican, the caster of the single Union vote in the convention of 1861; but the sixteenth legislature (1866–1867) was largely Democratic. It undertook to determine the rights of persons of African descent, and regrettable conflicts followed. The first Reconstruction Act having declared that "no legal state government or adequate protection for life or property" existed in the "rebel states," Arkansas was included in one of the military districts established by Congress. A registration of voters, predominantly whites, was at once carried through, and delegates were chosen for another constitutional convention, which met at Little Rock in January 1868. The secessionist element was voluntarily or perforce excluded. This convention ratified the Fourteenth Amendment, and framed the third constitution of the state, which was adopted by a small majority at a popular election, marred by various irregularities, in March 1868. By its provisions negroes secured full political rights, and all whites who had been excluded from registration for the election of delegates to the convention were now practically stripped of political privileges. The organization of Arkansas being now acceptable to Congress, a bill admitting it to the Union was passed over President Johnson's veto, and on the 22nd of June 1868 the admission was consummated.

Arkansas now became for several years Republican, and suffered considerably from the rule of the "carpet-baggers." The debt of the state was increased about $9,375,000 from 1868 to 1874, largely for railroad and levee schemes; much of the money was misappropriated, and in a case involving the payment of railway aid bonds the action of the legislature in pledging the credit of the state was held nugatory by the state supreme court in 1875 on the ground that, contrary to the constitution, the bond issue had never been referred to popular vote. An amendment to the constitution approved by a popular vote in 1884 provided that the General Assembly should "have no power to levy any tax, or make any appropriation, to pay" any of the bonds issued by legislative action in 1868, 1869 and 1871. The current expenses of the state in the years of Reconstruction were also enormously increased. The climax of the Reconstruction period was the so-called Baxter-Brooks war.

Elisha Baxter (1827–1899) was the regular Republican candidate for governor in 1872. He was opposed by a disaffected Republican faction known as "brindletails," or, as they called themselves, "reformers," led by Joseph Brooks (1821–1877), and supported by the Democrats. Baxter was irregularly elected. The election was contested, and his choice was confirmed by the legislature, the court of last resort in such cases. He soon showed a willingness to rule as a non-partisan, and favoured the re-enfranchisement of white citizens. This would have put the Democrats again in power, and they rallied to Baxter, while the Brooks party now assumed the name of "regulars," and received the support of the "carpet-bag" and negro elements. After Baxter had been a year in office Brooks received a judgment of *ouster* against him from a state circuit judge, and got possession of the public buildings (April 1874). The state flew to arms. The legislature called for Federal intervention (May 1874), and Federal troops maintained neutrality while investigations were conducted by a committee sent out by Congress. As a result, President Grant pronounced for Baxter, and the Brooks forces disbanded.

The chief result was another convention. In 1873 the article of the constitution which had disfranchised the whites was repealed, and the Democrats thus regained power. By an overwhelming majority the people now voted for another convention, which (July to October 1874) framed the present constitution. It removed all disfranchisement, and embraced equitable amnesty and exemption features. It also took away all patronage from the governor, reduced his term to two years, forbade him to proclaim martial law or suspend the writ of *habeas corpus*, and abolished all registration laws: all these provisions being reflections of Reconstruction struggles. The people ratified the new constitution on the 13th of October 1874. After Reconstruction the state again became Democratic, and the main interest of its history has been the progress of economic development.

The following is a list of the territorial and state governors of Arkansas:—

Territorial.		
James Miller[1]	1819–1825	
George Izard	1825–1828	
John Pope[2]	1829–1835	
William S. Fulton	1835–1836	
State.		
James S. Conway	1836–1840	Democrat
Archibald Yell[3]	1840–1844	,,
Thomas S. Drew[4]	1844–1849	,,
John S. Roane	1849–1852	,,
Elias N. Conway	1852–1860	,,
Henry M. Rector[5]	1860–1862	,,
Harris Flannigan[6]	1862–1865	,,
Isaac Murphy[7]	1864–1868	Republican
C. H. Smith[8]	1867–1868	,,
Powell Clayton	1868–1871	,,
Ozra A. Hadley[9]	1871–1873	,,
Elisha Baxter	1873–1874	,,
August H. Garland	1874–1877	Democrat
William R. Miller	1877–1881	,,
Thomas J. Churchill	1881–1883	,,
James H. Berry	1883–1885	,,
Simon P. Hughes	1885–1889	,,
James P. Eagle	1889–1893	,,

[1] During this period Robert Crittenden, the secretary of the territory, was frequently the acting governor.
[2] Robert Crittenden was acting governor in 1828–1829.
[3] Samuel Adams was acting governor from the 29th of April to the 9th of November 1844.
[4] R. C. Byrd was acting governor from the 11th of January to the 19th of April 1849.
[5] Thomas Fletcher was acting governor from the 4th to the 15th of November 1862.
[6] Confederate governor.
[7] Union governor.
[8] United States military (sub) governor.
[9] Acting governor.

State—continued.

William M. Fishback	1893–1895	Democrat
James P. Clarke	1895–1897	,,
Daniel W. Jones	1897–1901	,,
Jefferson Davis	1901–1907	,,
John S. Little	1907–1908	,,
X. O. Pindall, Acting Gov.	1908	,,
George W. Donaghey	1909	,,

BIBLIOGRAPHY.—Information regarding the resources, climate, population and industries of Arkansas should be sought in the volumes of the United States Census, United States Department of Agriculture and the United States Geological Survey (for the last two there are various bibliographical guides); consult also the publications of the Arkansas (Agricultural) Experiment Station (at Fayetteville), the reports of the state horticulturist, the biennial reports of the state treasurer, of the auditor, and of the Bureau of Mines, Manufactures and Agriculture (all published at Little Rock).

The constitutional documents may best be consulted in the latest compiled *Statutes* of the state. See also J. H. Shinn, *Education in Arkansas* (U.S. Bur. of Education, 1900); W. F. Pope, *Early Days in Arkansas* (Little Rock, 1895); and F. Hempstead, *Pictorial History of Arkansas* (St Louis, 1890). Similar to the last in popular character, vast in bulk and loose in method, are a series of *Biographical and Pictorial Histories*, covering the different sections of the state (1 vol. by J. Hallum, Albany, 1887; four others compiled anonymously, Chicago, 1889–1891). For the Reconstruction period see especially the Poland Report in House Rp. No. 2, 43 Cong. 2 Sess., vol. i. (1874), and John M. Harrell's *The Brooks and Baxter War: A History of the Reconstruction Period in Arkansas* (St Louis, Missouri, 1893), which is frankly in favour of Baxter; also a paper by B. S. Johnson in vol. ii. (1908) of the *Publications of the Arkansas Historical Association*.

ARKANSAS CITY, a city of Cowley county, Kansas, U.S.A., situated near the S. boundary of the state, in the fork of the Arkansas and Walnut rivers. Pop. (1890) 8347; (1900) 6140, of whom 302 were negroes; (1905) 7634; (1910) 7508. The city is served by the Atchison, Topeka & Santa Fé, the Missouri Pacific, the St Louis & San Francisco, the Midland Valley and the Kansas South-Western railways. To the south is the Chilocco Indian school (in Key county, Oklahoma), established by the U.S. government in 1884. A canal joining the Arkansas and Walnut rivers furnishes good water power. The manufactories include flour mills, packing establishments, a creamery and a paint factory. The city is situated in the midst of a rich agricultural region and is a supply centre for southern Kansas and Oklahoma, with large jobbing interests. The municipality owns and operates the water-works. Arkansas City, first known as Creswell, was settled in 1870, was chartered as a city under its present name in 1872 and was rechartered in 1880.

ARKLOW, a seaport and market town of Co. Wicklow, Ireland, in the east parliamentary division, 49 m. S. of Dublin, by the Dublin & South-Eastern railway. Pop. (1901) 4944. Sea-fisheries are prosecuted, and there are oyster-beds on the coast, but the produce requires to be freed from a peculiar flavour by the purer waters of the Welsh and English coast before it is fit for food. The produce of the copper and lead mines of the Vale of Avoca is shipped from the port. There are cordite and explosives works, established by Messrs Kynoch of Birmingham, England. In 1882 an act was passed providing for the improvement of the harbour and for the appointment of harbour commissioners. The town hall and the Protestant church (1899) were gifts of the earl of Carysfort, in whose property the town is situated. There are slight ruins of an ancient castle of the Ormondes, demolished in 1649 by Cromwell. On the 9th of June 1798 the Irish insurgents, attacking the town, were defeated by the royal troops near Arklow Bridge, and their leader, Father Michael Murphy, was killed.

ARKWRIGHT, SIR RICHARD (1732–1792), English inventor, was born at Preston in Lancashire, on the 23rd of December 1732, of parents in humble circumstances. He was the youngest of thirteen children, and received but a very indifferent education. After serving his apprenticeship in his native town, he established himself as a barber at Bolton about 1750, and later amassed a little property from dealing in human hair and dyeing it by a process of his own. This business he gave up about 1767 in order to devote himself to the construction of the spinning frame. The spinning jenny, which was patented by James Hargreaves (d. 1778), a carpenter of Blackburn, Lancashire, in 1770, though he had invented it some years earlier, gave the means of spinning twenty or thirty threads at once with no more labour than had previously been required to spin a single thread. The thread spun by the jenny could not, however, be used except as weft, being destitute of the firmness or hardness required in the longitudinal threads or warp. Arkwright supplied this deficiency by the invention of the spinning-frame, which spins a vast number of threads of any degree of fineness and hardness.

The precise date of the invention is not known; but in 1767 he employed John Kay, a watchmaker at Warrington, to assist him in the preparation of the parts of his machine, and he took out a patent for it in 1769. The first model was set up in the parlour of the house belonging to the free grammar school at Preston. This invention having been brought to a fairly advanced stage, he removed to Nottingham in 1768, accompanied by Kay and John Smalley of Preston, and there erected his first spinning mill, which was worked by horses. But his operations were at first greatly fettered by want of capital, until Jedediah Strutt (*q.v.*), having satisfied himself of the value of the machines, entered with his partner, Samuel Need, into partnership with him, and enabled him in 1771 to build a second factory, on a much larger scale, at Cromford in Derbyshire, the machinery of which was turned by a water-wheel. A fresh patent, taken out in 1775, covered several additional improvements in the processes of carding, roving and spinning. As the value of his processes became known, he began to be troubled with infringements of his patents, and in 1781 he took action in the courts to vindicate his rights. In the first case, against Colonel Mordaunt, who was supported by a combination of manufacturers, the decision was unfavourable to him, on the sole ground that the description of the machinery in the specification was obscure and indistinct. In consequence he prepared a "case," which he at one time intended to lay before parliament, as the foundation of an application for an act for relief. But this intention was subsequently abandoned; and in a new trial (*Arkwright* v. *Nightingale*) in February 1785, the presiding judge having expressed himself favourably with respect to the sufficiency of the specification, a verdict was given for Arkwright. On this, as on the former trial, nothing was stated against the originality of the invention.

In consequence of these conflicting verdicts, the whole matter was brought, by a writ of *scire facias*, before the court of King's Bench, to have the validity of the patent finally settled, and it was not till this third trial, which took place in June 1785, that Arkwright's claim to the inventions which formed the subject of the patent was disputed. To support this new allegation, Arkwright's opponents brought forward, for the first time, Thomas Highs, or Hayes, a reed-maker at Bolton, who stated that he had invented a machine for spinning by rollers previously to 1768, and that he had employed the watchmaker Kay to make a model of that machine. Kay himself was produced to prove that he had communicated that model to Arkwright, and that this was the real source of all his pretended inventions. Having no idea that any attempt was to be made to overturn the patent on this new ground, Arkwright's counsel were not prepared with evidence to repel this statement, and the verdict went against him. On a motion for a new trial on the 10th of November of the same year it was stated that he was furnished with affidavits contradicting the evidence that had been given by Kay and others with respect to the originality of the invention; but the court refused to grant a new trial, on the ground that, whatever might be the fact as to the question of originality, the deficiency in the specification was enough to sustain the verdict, and the cancellation of the patents was ordered a few days afterwards. His fortunes, however, were not thereby seriously affected, for by this time his business capacity and organizing skill had enabled him to consolidate his position, in spite of the difficulties he had encountered not only from rival manufacturers but also from the working classes, who in 1779 displayed their antipathy to labour-saving appliances by destroying a large mill he had erected near Chorley.

Though a man of great personal strength, Arkwright never enjoyed good health, and throughout his career of invention and

discovery he laboured under a severe asthmatic affection. A complication of disorders at length terminated his life on the 3rd of August 1792, at his works at Cromford. He was knighted in 1786 when he presented a congratulatory address from the wapentake of Wirksworth to George III., on his escape from the attempt on his life by Margaret Nicholson.

ARLES, a town of south-eastern France, capital of an arrondissement in the department of Bouches-du-Rhône, 54 m. N.W. of Marseilles by rail. Pop. (1906) 16,191. A canal unites Arles with the harbour of Bouc on the Mediterranean. Arles stands on the left bank of the Rhone, just below the point at which the river divides to form its delta. A tubular bridge unites it with the suburb of Trinquetaille on the opposite bank. The town is hemmed in on the east by the railway line from Lyons to Marseilles, on the south by the Canal de Craponne. Its streets are narrow and irregular, and, away from the promenades which border it on the south, there is little animation. In the centre of the town stand the Place de la République, a spacious square overlooked by the hôtel de ville, the museum, and the old cathedral of St Trophime, the finest Romanesque church in Provence. Founded in the 7th century, St Trophime has been several times rebuilt, and was restored in 1870. Its chief portal, which dates from the 12th century, is a masterpiece of graceful arrangement and rich carving. The interior, plain in itself, contains interesting sculpture. The choir opens into a beautiful cloister, the massive vaulting of which is supported on heavy piers adorned with statuary, between which intervene slender columns arranged in pairs and surmounted by delicately carved capitals. Two of the galleries are Romanesque, while two are Gothic. Arles has two other churches of the Romanesque period, and others of later date. The hôtel de ville, a building of the 17th century, contains the library. Its clock tower, surmounted by a statue of Mars, dates from the previous century. The museum, occupying an old Gothic church, is particularly rich in Roman remains and in early Christian sarcophagi; there is also a museum of Provençal curiosities. The tribunal of commerce and the communal college are the chief public institutions. Arles is not a busy town and its port is of little importance. There are, however, flour mills, oil and soap works, and the Paris-Lyon-Méditerranée Railway Company have large workshops. Sheep-breeding is a considerable industry in the vicinity. The women of Arles have long enjoyed a reputation for marked beauty, but the distinctive type is fast disappearing owing to their intermarriage with strangers who have immigrated to the town.

Arles still possesses many monuments of Roman architecture and art, the most remarkable being the ruins of an amphitheatre (the *Arénes*), capable of containing 25,000 spectators, which, in the 11th and 12th centuries, was flanked with massive towers, of which three are still standing. There are also a theatre, in which, besides the famous Venus of Arles, discovered in 1651, many other remains have been found; an ancient obelisk of a single block, 47 ft. high, standing since 1676 in the Place de la République; the ruins of the palace of Constantine, the forum, the thermae and the remains of the Roman ramparts and of aqueducts. There is, besides, a Roman cemetery known as the Aliscamps (*Elysii Campi*), consisting of a short avenue once bordered by tombs, of which a few still remain.

The ancient town, *Arelate*, was an important place at the time of the invasion of Julius Caesar, who made it a settlement for his veterans. It was pillaged in A.D. 270, but restored and embellished by Constantine, who made it his principal residence, and founded what is now the suburb of Trinquetaille. Under Honorius, it became the seat of the prefecture of the Gauls and one of the foremost cities in the western empire. Its bishopric founded by St Trophimus in the 1st century, was in the 5th century the primatial see of Gaul; it was suppressed in 1790. After the fall of the Roman empire the city passed into the power of the Visigoths, and rapidly declined. It was plundered in 730 by the Saracens, but in the 10th century became the capital of the kingdom of Arles (see below). In the 12th century it was a free city, governed by a *podesta* and *consuls* after the model of the Italian republics, which it also emulated in commerce and navigation. In 1251 it submitted to Charles I. of Anjou, and from that time onwards followed the fortunes of Provence. A number of ecclesiastical synods have been held at Arles, as in 314 (see below), 354, 452 and 475.

See V. Clair, *Monuments d'Arles* (1837); J. J. Estrangin, *Description de la ville d'Arles* (1845); F. Beissier, *Le Pays d'Arles* (1889); Roger Peyre, *Nîmes, Arles, Orange* (1903). (R. Ta.)

Synod of Arles (314).—As negotiations held at Rome in October 313 had failed to settle the dispute between the Catholics and the Donatists, the emperor Constantine summoned the first general council of his western half of the empire to meet at Arles by the 1st of August following. The attempt of Seeck to date the synod 316 presupposes that the emperor was present in person, which is highly improbable. Thirty-three bishops are included in the most authentic list of signatures, among them three from Britain,—York, London and "Colonia Londinensium" (probably a corruption of Lindensium, or Lincoln, rather than of Legionensium or Caerleon-on-Usk). The twenty-two canons deal chiefly with the discipline of clergy and people. Husbands of adulterous wives are advised not to remarry during the lifetime of the guilty party. Reiteration of baptism in the name of the Trinity is forbidden. For the consecration of a bishop at least three bishops are required. It is noteworthy that British representatives assented to Canon I., providing that Easter be everywhere celebrated on the same day: the later divergence between Rome and the Celtic church is due to improvements in the *supputatio Romana* adopted at Rome in 343 and subsequently.

For the canons see Mansi ii. 471 ff.; Bruns ii. 107 ff.; Lauchert 26 ff. See also W. Smith and S. Cheetham, *Dictionary of Christian Antiquities* (Boston, 1875), i. 141 ff. (contains also notices of later synods at Arles); W. Bright, *Chapters of Early English Church History* (2nd edition, Oxford, 1888), 9 f.; Herzog-Hauck, *Realencyklopädie* (3rd edition), ii. 59, x. 238 ff.; W. Möller, *Kirchengeschichte* (2nd edition by H. von Schubert, Tübingen, 1902), i. 417. For full titles see COUNCIL. (W. W. R.*)

ARLES, KINGDOM OF, the name given to the kingdom formed about 933 by the union of the old kingdoms of Provence (*q.v.*) or Cisjurane Burgundy, and Burgundy (*q.v.*) Transjurane, and bequeathed in 1032 by its last sovereign, Rudolph III., to the emperor Conrad II. It comprised the countship of Burgundy (*Franche-Comté*), part of which is now Switzerland (the dioceses of Geneva, Lausanne, Sion and part of that of Basel), the Lyonnais, and the whole of the territory bounded by the Alps, the Mediterranean and the Rhone; on the right bank of the Rhone it further included the Vivarais. It is only after the end of the 12th century that the name "kingdom of Arles" is applied to this district; formerly it was known generally as the kingdom of Burgundy, but under the Empire the name of Burgundy came to be limited more and more to the countship of Burgundy, and the districts lying beyond the Jura. The authority of Rudolph III. over the chief lords of the land, the count of Burgundy and the count of Maurienne, founder of the house of Savoy, was already merely nominal, and the Franconian emperors (1039-1125), whose visits to the country were rare and of short duration, did not establish their power any more firmly. During the first fifty years of their domination they could rely on the support of the ecclesiastical feudatories, who generally favoured their cause, but the investiture struggle, in which the prelates of the kingdom of Arles mostly sided with the pope, deprived the Germanic sovereigns even of this support. The emperors, on the other hand, realized early that their absence from the country was a grave source of weakness; in 1043 Henry III. conferred on Rudolph, count of Rheinfelden (afterwards duke of Swabia), the title of *dux et rector Burgundiae*, giving him authority over the barons of the northern part of the kingdom of Arles. Towards the middle of the 12th century Lothair II. revived this system, conferring the rectorate on Conrad of Zähringen, in whose family it remained hereditary up to the death of the last representative of the house, Berthold V., in 1218; and it was the lords of Zähringen who were foremost in defending the cause of the Empire against its chief adversaries, the counts of Burgundy. In the time of the Swabian emperors, the Germanic sovereignty in the kingdom of Arles was again, during almost the whole period,

merely nominal, and it was only in consequence of fortuitous circumstances that certain of the heads of the Empire were able to exercise a real authority in these parts. Frederick I., by his marriage with Beatrix (1156), had become uncontested master of the countship of Burgundy; Frederick II., who was more powerful in Italy than his predecessors had been, and was extending his activities into the countries of the Levant, found Provence more accessible to his influence, thanks to the commercial relations existing between the great cities of this country and Italy and the East. Moreover, the heretics and enemies of the church, who were numerous in the south, upheld the emperor in his struggle against the pope. Henry VII. also, thanks to his good relations with the princes of Savoy, succeeded in exercising a certain influence over a part of the kingdom of Arles. The emperors further tried to make their power more effective by delegating it, first to a viceroy, William of Baux, prince of Orange (1215), then to an imperial vicar, William of Montferrat (1220), who was succeeded by Henry of Revello and William of Manupello. In spite of this, the history of the kingdom of Arles in the 13th century, and still more in the 14th, is distinguished particularly by the decline of the imperial authority and the progress of French influence in the country. In 1246 the marriage of Charles, the brother of Saint Louis, with Beatrice, the heiress to the countship of Provence, caused Provence to pass into the hands of the house of Anjou, and many plans were made to win the whole of the kingdom for a prince of this house. At the beginning of the 14th century the bishops of Lyons and Viviers recognized the suzerainty of the king of France, and in 1343 Humbert II., dauphin of Viennois, made a compact with the French king Philip VI. that on his death his inheritance should pass to a son or a grandson of the French king. Humbert, who was perhaps the most powerful noble in Arles, was induced to take this step as he had just lost his only son, and Philip had already cast covetous eyes on his lands. Then in 1349, being in want of money, he agreed to sell his possessions outright, and thus Viennois, or Dauphiné, passed into the hands of Philip's grandson, afterwards King Charles V. The emperor Charles IV. took an active part in the affairs of the kingdom, but without any consistent policy, and in 1378 he, in turn, ceded the imperial vicariate of the kingdom to the dauphin, afterwards King Charles VI. This date may be taken as marking the end of the history of the kingdom of Arles, considered as an independent territorial area.

See the monumental work of P. Fournier, *Le Royaume d'Arles et de Vienne* (Paris, 1890); Leroux, *Recherches critiques sur les relations politiques de la France avec l'Allemagne de 1292 à 1378* (Paris, 1882). For the early history of the kingdom, L. Jacob, *Le Royaume de Bourgogne sous les empereurs franconiens (1038–1129)*, (Paris, 1906). The question of the nature and extent of the rights of the Empire over the kingdom of Arles has given rise, ever since the 16th century, to numerous juridical polemics; the chief dissertations published on this subject are indicated in A. Leroux, *Bibliographie des conflits entre la France et l'Empire* (Paris, 1902). (R. Po.)

ARLINGTON, HENRY BENNET, Earl of (1618–1685), English statesman, son of Sir John Bennet of Dawley, Middlesex, and of Dorothy Crofts, was baptized at Little Saxham, Suffolk, in 1618, and was educated at Westminster school and Christ Church, Oxford. He gained some distinction as a scholar and a poet, and was originally destined for holy orders. In 1643 he was secretary to Lord Digby at Oxford, and was employed as a messenger between the queen and Ormonde in Ireland. Subsequently he took up arms for the king, and received a wound in the skirmish at Andover in 1644, the scar of which remained on his face through life.[1] And after the defeat of the royal cause he travelled in France and Italy, joined the exiled royal family in 1650, and in 1654 became official secretary to James on Charles's recommendation, who had already been attracted by his "pleasant and agreeable humour."[2] In March 1657 he was knighted, and the same year was sent as Charles's agent to Madrid, where he remained, endeavouring to obtain assistance for the royal cause, till after the Restoration. On his return to England in 1661 he was made keeper of the privy purse, and became the prime favourite. One of his duties was the procuring and management of the royal mistresses, in which his success gained him great credit. Allying himself with Lady Castlemaine, he encouraged Charles's increasing dislike to Clarendon; and he was made secretary of state in October 1662 in spite of the opposition of Clarendon, who had to find him a seat in parliament. He represented Callington from 1661 till 1665, but appears never to have taken part in debate. He served subsequently on the committees for explaining the Irish Act of Settlement and for Tangiers. In 1663 he obtained a peerage as Baron Arlington of Arlington, or Harlington, in Middlesex, and in 1667 was appointed one of the postmasters-general. The control of foreign affairs was entrusted to him, and he was chiefly responsible for the attack on the Smyrna fleet and for the first Dutch War. In 1665 he advised Charles to grant liberty of conscience, but this was merely a concession to gain money during the war; and he showed great activity later in oppressing the nonconformists. On the death of Southampton, whose administration he had attacked, his great ambition, the treasurership, was not satisfied; and on the fall of Clarendon, against whom he had intrigued, he did not, though becoming a member of the Cabal ministry, obtain the supreme influence which he had expected; for Buckingham first shared, and soon surpassed him, in the royal favour. With Buckingham a sharp rivalry sprang up, and they only combined forces when endeavouring to bring about some evil measure, such as the ruin of the great Ormonde, who was an opponent of their policy and their schemes. Another object of jealousy to Arlington was Sir William Temple, who achieved a great popular success in 1668 by the conclusion of the Triple Alliance; Arlington endeavoured to procure his removal to Madrid, and entered with alacrity into Charles's plans for destroying the whole policy embodied in the treaty, and for making terms with France. He refused a bribe from Louis XIV., but allowed his wife to accept a gift of 10,000 crowns[3]; in 1670 he was the only minister besides the Roman Catholic Clifford to whom the first secret treaty of Dover (May 1670), one clause of which provided for Charles's declaration of his conversion to Romanism, was confided (see Charles II.); and he was the chief actor in the deception practised upon the rest of the council.[4] He supported several other pernicious measures —the scheme for rendering the king's power absolute by force of arms; the "stop of the exchequer," involving a repudiation of the state debt in 1672; and the declaration of indulgence the same year, "that we might keep all quiet at home whilst we are busy abroad."[5] On the 22nd of April 1672 he was created an earl, and on the 15th of June obtained the Garter; the same month he proceeded with Buckingham on a mission, first to William at the Hague, and afterwards to Louis at Utrecht, endeavouring to force upon the Dutch terms of peace which were indignantly refused. But Arlington's support of the court policy was entirely subordinate to personal interests; and after the appointment of Clifford in November 1672 to the treasurership, his jealousy and mortification, together with his alarm at the violent opposition aroused in parliament, caused him to veer over to the other side. He advised Charles in March 1673 to submit the legality of the declaration of indulgence to the House of Lords, and supported the Test Act of the same year, which compelled Clifford to resign. He joined the Dutch party, and in order to make his peace with his new allies, disclosed the secret treaty of Dover to the staunch Protestants Ormonde and Shaftesbury.[6] Arlington had, however, lost the confidence of all parties, and these efforts to procure support met with little success. On the 15th of January 1674 he was impeached by the Commons, the specific charges being "popery," corruption and the betrayal of his trust—Buckingham in his own defence having accused him the day before of being the chief instigator of the French and anti-Protestant policy, of the scheme of governing by

[1] See his portrait in the earl of Arlington's *Letters to Sir W. Temple*, by Tho. Babington (1701).

[2] Clarendon's *Life and Continuation*, 397.

[3] *Memoirs of Great Britain and Ireland*, by Sir John Dalrymple (1790), i. 125.

[4] *Ibid.* 114 et seq.

[5] Arlington to Sir B. Gascoyn, in J. T. Brown's *Miscellanea Aulica* (1702), 66.

[6] On the authority of Colbert, 20th November 1673; Dalrymple's *Memoirs*, i. 131.

the army, of responsibility for the Dutch War, and of embezzlement. But the motion for his removal, owing chiefly to the influence of his brother-in-law, the popular Lord Ossory, was rejected by 166 votes to 127. His escape could not, however, prevent his fall, and he resigned the secretaryship on the 11th of September 1674, being appointed lord chamberlain instead. In 1675 he made another attempt to gain favour with the parliament by supporting measures against France and against the Roman Catholics, and by joining in the pressure put upon Charles to remove James from the court. In November he went on a mission to the Hague, with the popular objects of effecting a peace and of concluding an alliance with William and James's daughter Mary. In this he entirely failed, and he returned home completely discredited. He had again been disappointed of the treasurership when Danby succeeded Clifford; Charles having declared "that he had too much kindness for him to let him have it, for he was not fit for the office."[1] His intrigues with discontented persons in parliament to stir up an opposition to his successful rival came to nothing. From this time, though lingering on at court, he possessed no influence, and was treated with scanty respect. It was safe to ridicule his person and behaviour, and it became a common jest for "some courtier to put a black patch upon his nose and strut about with a white staff in his hand in order to make the king merry at his expense."[2] He was appointed a commissioner of the treasury in March 1679, was included in Sir William Temple's new modelled council the same year, and was a member of the inner cabinet which was almost immediately formed. In 1681 he was made lord lieutenant of Suffolk. He died on the 28th of July 1685, and was buried at Euston, where he had bought a large estate and had carried out extensive building operations. His residence in London was Goring House, on the site of which was built the present Arlington Street.

Arlington was a typical statesman of the Restoration, possessing outwardly an attractive personality, and according to Sir W. Temple "the greatest skill of court and the best turns of art in particular conversation,"[3] but thoroughly unscrupulous and self-seeking, without a spark of patriotism, faithless even to a bad cause, and regarding public office solely as a means of procuring pleasure and profit. His knowledge of foreign affairs and of foreign languages, gained during his residence abroad, was considerable, but long absence from England had also taught him a cosmopolitan indifference to constitutions and religions, and a careless disregard for English public opinion and the essential interests of the country. According to Clarendon, he "knew no more of the constitution and laws of England than he did of China, nor had he in truth a care or tenderness for church or state, but believed France was the best pattern in the world."[4] He was one of the chief promoters of the attempt to reintroduce into England arbitrary government after the French model, not because he imagined an absolute monarchy essential to the well-being and security of the state, but because under such an administration the favourites of a king enjoyed far greater privileges and profits than under a constitutional government. Of the same egotistical character was his religion, towards which his attitude was similar to that of Charles II. himself. He was credited with having inclined the king towards Romanism. Before the Restoration he had attended mass with the king abroad, and in opposition to Lord Bristol had urged Charles to declare publicly his conversion in order to obtain the long-expected succour from the foreign powers. But his religion sat lightly upon him as it did upon his master, and it was often convenient to disguise it. Like the king he continued to profess and practise Protestantism, and spent large sums in restoring the church at Euston; and, unlike Clifford, he took the Test in 1673 and remained in office, successfully concealing his faith till on his deathbed, when he declared himself an adherent of Roman Catholicism.[5]

[1] James's statement in Macpherson's *Orig. Pap.* i. 67.
[2] Eachard's *History of England* (1720), 911.
[3] *Memoirs of W. Temple*, ed. by T. P. Courtenay, ii. 27.
[4] *Life and Con.* 404.
[5] Cf. North's *Examen*, 26; Dalrymple's *Mem.* (1790) i. 40; Pepys's *Diary* (Feb. 17, 1663); *Cal. of Clarendon St. Pap.* iii. 295; T. Carte's *Life of the Duke of Ormonde* (1851), iv. 109.

He married Isabella of Beerwaert, daughter of Louis of Nassau, by whom he had one daughter, Isabella, who married Henry, duke of Grafton, the natural son of Charles II. and Lady Castlemaine.

AUTHORITIES.—In addition to those mentioned above, see *Biographia Britannica* (Kippis), accurate and careful, but too partial, and written without complete knowledge of Arlington's career; Wood's *Fasti Oxonienses* (Bliss), ii. 274; *Hist. of Great Britain* by J. Macpherson (1776), i. 132-133; *Lauderdale Papers* (Camden Soc. N.S., vols. 34, 36, 38), and MSS. in Brit. Mus.; *Original Letters of Sir R. Fanshaw* (1724); *Letters from the Secretaries of State to Francis Parry* (1817); *Add. MSS. Brit. Mus.* indexes; *Cal. of State Pap. Dom.*, and *Hist. MSS. Comm.—MSS. of Marquis of Ormonde, and Duke of Buccleugh at Montagu House*, ii. 49. (P. C. Y.)

ARLINGTON, a township of Middlesex county in E. Massachusetts, U.S.A. Pop. (1890) 5629; (1900) 8603, of whom 2387 were foreign-born; (1910 census) 11,187 Area, 5½ sq. m. It is served by the Boston & Maine railway. It has pleasant residential villages (Arlington, Arlington Heights, &c.) with attractive environs, and there is an excellent public library (the Robbins library). At Arlington Heights there are several well-known sanatoriums. Spy Pond (about 100 acres) is one of the prettiest bodies of water in the vicinity of Boston. Arlington is an important centre for market-gardening (in hot-houses), and along Mill Brook, in the township, are several factories, including chrome works, a large mill and a manufactory of pianoforte cases. In 1762 Arlington was made a "precinct" of Cambridge (of which it was a part from 1635 to 1807) under the name of Menotomy. In 1807 it became a separate township under the name (retained until 1867) of West Cambridge.

See B. and W. R. Cutter, *History of the Town of Arlington . . . 1637–1879* (Boston, 1880); and C. S. Parker, *The Town of Arlington, Past and Present* (Arlington, 1907).

ARLON, the chief town of the Belgian province of Luxemburg, situated on a hill about 1240 ft. above the sea. Pop. (1904) 10,894. It is a very ancient town, and in the time of the Romans was called Orolaunum, being a station on the Antoninian way connecting Reims and Trèves. Authorities dispute as to the origin of the name, some tracing it to *Ara Lunae*, a temple of Diana having been erected here, while others more plausibly derive it from the Celtic words *ar* (mount) and *lun* (wooded). Nowadays the woods have disappeared, and Arlon is chiefly notable for the extensive views obtainable from the church of St Donat which crowns the peak. Arlon is no longer fortified. When Vauban by order of Louis XIV. turned it into a fortress in 1671 great damage was done to the old Roman wall, the foundations of which were practically intact. In the local museum are many Roman antiquities collected on the spot, including several large sculptural stones similar to the celebrated monument at Igel near Trèves. In the middle ages Arlon was the seat of a powerful countship (later marquisate), held after 1235 by the dukes of Luxemburg. As an important strategic position it was several times seized by the French, *e.g.* in 1647 and 1651.

ARM (a common Teutonic word; the Indo-European root is *ar*, to join or fit; cf. the Lat. *armus*, shoulder, and the plural word *arma*, weapons, Gr. ἁρμός, joint, and the reduplicated ἀραρίσκειν, to join), the human upper limb from the shoulder to the wrist, and the fore limb of an animal. (See ANATOMY: *Superficial and Artistic*, and SKELETON: *Appendicular*.) The word is also used of any projecting limb, as of a crane, or balance, of a branch of a tree, and so, in a transferred sense, of the branch of a river or a nerve. Through the Fr. *armes*, from the Lat. *arma*, and so in English usually in the plural "arms," comes the use of the word for weapons of offence and defence, and in many expressions such as "men-at-arms," "assault-at-arms," and the like, and for the various branches, artillery, cavalry, infantry, of which an army is composed, the "arms of the service." "Arms" or "armorial bearings" are the heraldic devices displayed by knights in battle on the defensive armour or embroidered on the surcoat worn over the armour and hence called "coats of arms." These became hereditary and thus are borne by families, and similar insignia are used by nations, cities, episcopal sees and corporations generally. (See HERALDRY.)

ARMADA, THE. The Spanish or Invincible Armada was the great fleet (in Spanish, *armada*) sent against England by Philip II. in 1588. The marquis of Santa Cruz, to whom the command had first been given, died on the 9th of February 1588 (according to the Gregorian calendar then used by Spain; on the 31st of January by the Julian calendar used in England; the other dates given in this article will be in Old Style, or Julian calendar). Santa Cruz was succeeded by Don Alonso Perez de Guzman, duke of Medina Sidonia, a noble of large estate, but of no experience or capacity, who took the command unwillingly, and only on the reiterated order of the king. The fleet was collected at Lisbon, after many delays, and sailed on the 20th of May 1588. Its nominal strength was 132 vessels, of 59,190 tons, carrying 21,621 soldiers and 8066 sailors. But from a third to a half of the vessels were transports, galleys or very small boats, and some of them never reached the Channel. The effective force was far below the paper strength. On the 10th of June, when the Armada had rounded Cape Finisterre, it was scattered by squalls. Some of the vessels went on to the appointed rendezvous at the Scilly Isles, but the majority anchored on the north coast of Spain. Medina Sidonia, who found many defects in his fleet, did not finally sail till the 12th of July. On the English side all the royal navy, and such armed merchant ships as could be obtained from the ports, had been collected under the command of the lord high admiral Howard of Effingham, who had with him Hawkins, Drake and Frobisher as subordinate admirals. The number of vessels is put at 197, but the majority were very small. It is impossible to state with confidence what were the relative numbers of guns carried by the two fleets. The Spaniards had more pieces, but their gunnery was inferior. The English fleet carried 16,000 or 17,000 men, of whom the large majority were sailors. About 100 of their ships were at Plymouth with the lord high admiral. The others were in the Downs with Lord Henry Seymour and Sir William Winter, to co-operate with a Dutch squadron under Justinus of Nassau in blockading the Flemish ports, then occupied by the Spanish army of the duke of Parma. The object was to prevent the proposed junction of the forces of Medina Sidonia and Parma. On the 20th of July the Armada was seen off the Lizard. It sailed past Plymouth, and was followed by the English fleet. The Spaniards, who were heavy sailers, and were hampered by the transports, were much harassed by the more active English, and were defeated in all their attempts to board, which it was their wish to do in order to make use of their superior numbers of men. The flagship of the squadron of Andalucia, "Nuestra Señora del Rosario," commanded by Don Pedro de Valdes, was crippled, fell behind and had to surrender. On the 25th of July, when the fleets were near the Isle of Wight, a shift of the wind offered the Spaniards a chance of bringing on a close action, but it soon changed again. The English fleet, of which part had been in some danger, escaped uninjured, and the Spaniards stood on. They anchored on the 26th of July at Calais. The duke of Medina Sidonia now sent an officer to Parma, calling on him to come to sea and join in a landing on the shore of England. But Parma could not leave port in face of Justinus of Nassau's squadron. While these messages were going and coming, Lord Howard had been joined by Lord Henry Seymour and Sir William Winter from the Downs. A council of war was held, to decide on the measures to be taken to assail the Spaniards at Calais. The course taken was to send fireships among them. On the night of the 28th of July the fireships were sent in, and produced an utter panic in the Armada. Most of the Spanish vessels slipped their cables and ran to sea. Others weighed anchor, and escaped in a more orderly style. One great vessel ran ashore and was taken possession of by the English, who were however compelled to give her up by the French governor of Calais. On the 29th of July the scattered Spaniards, who were quite unable to restore order, were attacked by the English off Gravelines. The engagement was hot, and, though the English did not succeed in taking any of the Spaniards, they destroyed some of them, and their superiority in sailing force and gunnery was now so obvious that the duke of Medina Sidonia lost heart. His large vessels were indeed so helpless that only a timely shift of the wind saved many of them from drifting on to the banks of Flanders. Officers and men alike were completely discouraged. It was now recognized that an invasion of England could not be carried out in face of the more active English fleet and the proved impossibility of bringing about the proposed union with Parma's army. Suggestions were made that the Armada should sail to Hamburg, refit there, and renew the attack. But by this time the Spanish force was incapable of energetic action. Medina Sidonia and his council could think of nothing but of a return to Spain. As the wind was westerly, and the English fleet barred the way, it was impossible to sail down the Channel. The only alternative was to take the route between the north of Scotland and Norway. So the Armada sailed to the north. Lord Howard followed, after detaching Lord Henry Seymour to remain in the Downs. He watched the Spaniards to the Firth of Forth. The English had at that time little knowledge of the seas beyond the Firth, and they were beginning to run short of food and ammunition. On the 2nd of August, therefore, they gave up the pursuit. Medina Sidonia continued to the north, till his pilots told him that it was safe to turn to the west. Up to this time the loss of the Spaniards in ships had not been considerable. If the weather had been that of a normal summer, they would probably have reached home with no greater loss of men than was usually inflicted on all fleets of the age by scurvy and fever. But the summer of 1588 was marked by a succession of gales of unprecedented violence. The damaged and weakened Spanish ships, which were from the first greatly undermanned in sailors, were unable to contend with the storms. It is not possible to give the details of the disasters which overtook them. Nineteen of them are known to have been wrecked on the coasts of Scotland and Ireland. The crews who fell into the hands of the English officers in Ireland were put to the sword. Many more of them disappeared at sea. Of the total number of the vessels originally collected for the invasion of England one-half, if not more, perished, and the crews of those which escaped were terribly diminished by scurvy and starvation.

The failure of the Armada was mainly due to its own interior weakness, and as a military operation the English victory was less glorious than some other less renowned achievements of the British fleet. But the repulse of the great Spanish armament was an event of the first historical importance. It marked the final failure of King Philip II. of Spain to establish the supremacy of the Habsburg dynasty and of the Church of Rome, which he considered as being in a peculiar sense his charge, in Europe. From that time forward no serious attempt to invade England was, or could be, made. It became therefore the unconquerable supporter of that part of Europe which had thrown off the authority of the pope. The Armada had much of the character of a crusade. Though Philip II. had political reasons for hostility to Queen Elizabeth, they were so intimately bound up with the struggle between the Reformation and the Counter Reformation that the secular and the religious elements of the conflict cannot be separated from one another. The struggle was therefore not one between armed forces in national rivalry alone. It was a trial of strength between two widely different conceptions of life and of the state—between the medieval and the modern worlds. The volunteers of all ranks who came forward in large numbers on both sides were fighting for a religious cause as well as for the interests of their respective peoples.

AUTHORITIES.—The English side of the story of the Armada can best be studied in the *State Papers relating to the Defeat of the Spanish Armada*, edited by Sir J. K. Laughton, and printed for the Navy Records Society (London, 1894). The Spanish side will be found in *La Armada Invencible*, by Captain Cesareo Fernandez Duro (Madrid, 1884). Froude summarized the work of Captain Fernandez Duro in his brilliant *Spanish Story of the Armada* (London, 1892). (D. H.)

ARMADILLO, the Spanish designation for the small mail-clad Central and South American mammals of the order Edentata, constituting the family *Dasypodidae*. The armature consists of a bony case, partly composed of solid buckler-like plates, and partly of movable transverse bands, the latter differing in number with

the species, and giving to the body a considerable degree of flexibility. The bony plates are overlain by horny scales. Armadillos are omnivorous, feeding on roots, insects, worms, reptiles and carrion, and are mostly, though not universally,

Peba Armadillo (*Tatusia novemcincta*).

nocturnal. They are harmless and inoffensive creatures, offering no resistance when caught; their principal means of escape being the extraordinary rapidity with which they burrow in the ground, and the tenacity with which they retain their hold in their subterranean retreats. Notwithstanding the shortness of their limbs they run with rapidity. Most of the species are esteemed good eating by the natives of the countries in which they live. They are all inhabitants of the open plains or the forests of the tropical and temperate parts of South America, with the exception of a few species which range as far north as Texas. The largest species is the giant armadillo (*Priodon gigas*), measuring nearly a yard long, from the forests of Surinam and Brazil; while one of the smallest is *Dasypus minutus*, a near ally of the larger *D. sexcinctus*. The peba (*Tatusia novemcincta*) represents a group with a large number of movable bands in the armour; while the apar (*Tolypeutes tricinctus*) and the other members of the same genus are remarkable for their power of rolling themselves up into balls. For the distinctive characters of these and the other genera see EDENTATA.

ARMAGEDDON, a name occurring in the Authorized Version of the English Bible in Rev. xvi. 16. The Revised Version has Harmagedon. The form is commonly regarded as the Greek equivalent of the Hebrew *har megiddōn*, the mountain district of Megiddo. The writer is describing the place where the last decisive battle was to be fought at the Day of Judgment, and Harmagedon may have been chosen as the name because the district about Megiddo had been on several occasions the scene of great battles (cf. Judg. iv. 6 ff., v. 19). It has, however, been suggested in the *Zeitschrift für die Alttestamentliche Wissenschaft*, vii. 170 (1887), that the name is for *har migdo*, "his fruitful mountain"—the mountain land of Israel. Prof. Cheyne (*Encyc. Bibl.* s.v.) again, following suggestions of H. Gunkel, H. Zimmern and P. Jensen, compares the dragon of the Apocalypse with the Babylonian Tiāmat, thinks that some myth is referred to, and finds the μαγεδων of Αρμαγεδων in the divine name Ὑεσεμμιγαδων, a Babylonian god of the underworld. The name of the place where Tiāmat was defeated by Marduk perhaps included that of a god of the underworld. (See ANTICHRIST.) From the application of the word Armageddon to the great battle of the End of Time comes the use of the phrase "an Armageddon" to express any great slaughter or final conflict.

ARMAGH, an inland county of Ireland, in the province of Ulster, bounded N. by Lough Neagh, E. by Co. Down, S. by Louth and W. by Monaghan and Tyrone. The area is 327,704 acres, or about 512 sq. m. The general surface of the county is gently undulating and pleasantly diversified; but in the northern extremity, on the borders of Lough Neagh, there is a considerable tract of low, marshy land, and the southern border of the county is occupied by a barren range of hills, the highest of which, Slieve Gullion, attains an elevation of 1893 ft. In the western portion of the county are the Few Mountains, a chain of abrupt hills mostly incapable of cultivation. The county is well watered by numerous streams. The principal are the Callan, the Tynan and the Tallwater, flowing into the Blackwater, which, after forming the boundary between this county and Tyrone, empties itself into the south-western angle of Lough Neagh. The Tara and Newtown-Hamilton, the Creggan and the Fleury, flow into the bay of Dundalk. The Cam or Camlin joins the Bann, which, crossing the north-western corner of the county, falls into Lough Neagh to the east of the Blackwater. The Newry Canal, communicating with Carlingford Lough at Warrenpoint, 6 m. below Newry, proceeds northward through Co. Armagh for about 21 m., joining the Bann at Whitecoat. The Ulster Canal begins at Charlemont on the river Blackwater, near its junction with Lough Neagh, proceeding through the western border of the county, and passing thence to the south-west by Monaghan and Clones into Upper Lough Erne, after a course of 48 m. Part of Lough Neagh is in the county, and there are many small loughs, such as Gullion, Cam and Ross.

Geology.—The flat shore of Lough Neagh in the north is due to the thick deposit of pale-coloured clays with lignites, which are probably of Pliocene age, and indicate a reduction of the area of the lake in still later times. Between this lowland and Armagh city, the early Cainozoic basalts form slightly higher ground, while on the west a strip of Trias appears, overlying Carboniferous Limestone. A rough conglomerate containing blocks of this latter rock forms the hills on which Armagh itself is built; this outlier is probably Permian. The Carboniferous Limestone beneath it and around it is red-brown instead of grey, and is famous for its richness in fish remains. A hummocky irregular country spreads southward, where the Silurian axis is encountered, in continuation of the southern uplands of Scotland. Slates and fine-grained sandstones appear here freely through the glacial drift. In the south the granite core of this upland is revealed, and is quarried extensively about Bessbrook. It is penetrated by far younger intrusive masses at Slieve Gullion and Forkill. These rocks, which include some highly siliceous lavas, form part of the Eocene series that is so conspicuously displayed above Carlingford in Co. Louth. Lead-veins have been worked in various parts of the county from time to time.

Industries.—The soil of the northern portion of the county is a rich brown loam, on a substratum of clay or gravel. Towards Charlemont there is much reclaimable bog resting on a limestone substratum. The eastern portion of the county is generally of a light friable soil; the southern portion rocky and barren, with but little bog except in the neighbourhood of Newtown-Hamilton. The climate of Armagh is considered to be one of the most genial in Ireland, and less rain is supposed to fall in this than in any other county. Only about one-twentieth of the land is naturally barren, and Armagh offers a relatively large area of cultivable soil. Agriculture, however, is not far advanced, yet owing to the linen industry the inhabitants are generally in circumstances of comparative comfort. The principal crops are oats and potatoes, but all grain crops are decreasing, and flax, formerly grown to a considerable extent, is now practically neglected. The acreage under pasture slightly exceeds that of tillage. Cattle, sheep, pigs and poultry show a general increase in numbers. The principal manufacture, and that which has given a peculiar tone to the character of the population, is that of linen, though it has somewhat declined in modern times. It is not necessary to the promotion of this manufacture that the spinners and weavers should be congregated in large towns, or united in crowded and unwholesome factories. On the contrary, most of its branches can be carried on in the cottages of the peasantry. The men devote to the loom those hours which are not required for the cultivation of their little farms; the women spin and reel the yarn during the intervals of their other domestic occupations. Smooth lawns, pure springs and the open sky are necessary for perfecting the bleaching process. Hence the numerous bleachers dwell in the country with their assistants and machinery. Such is the effect

of this combination of agricultural occupations with domestic manufactures that the farmers are more than competent to supply the resident population of the county with vegetable, though not with animal food; and some of the less crowded and less productive parts of Ulster receive from Armagh a considerable supply of oats, barley and flour. Apples are grown in such quantities as to entitle the county to the title applied to it, the orchard of Ireland.

Communications are monopolized by the Great Northern railway company, whose main line from Belfast divides at Portadown, sending off lines to Omagh, to Clones and to Dublin. A branch from Omagh joins the Dublin line to Goraghwood, and from this line there is a branch to Newry in Co. Down. An electric tramway connects Bessbrook, a town with important linen manufactures and granite quarries, with Newry.

Population and Administration.—The population (72,286 in 1891; 65,619 in 1901) shows a heavy decrease, though emigration affects it less seriously than the majority of Irish counties. Of the total about 45% are Roman Catholics, 32% Protestant Episcopalians, and 16% Presbyterians, the Roman Catholic faith prevailing in the mountainous districts and the Protestant in the towns and lowlands. About 74% of the whole constitutes the rural population. The chief towns are Armagh (a city and the county town, pop. 7588), Lurgan (11,782), Portadown (10,092), Tanderagee (1427), Bessbrook (2977) and Keady (1466). Armagh is divided into eight baronies, and contains twenty-five parishes and parts of parishes, the greater number of which are in the Protestant and Roman Catholic dioceses of Armagh, and a few in the Roman Catholic diocese of Dromore. The constabulary has its headquarters at Armagh, the county being divided into five districts. Assizes are held at Armagh, and quarter sessions at Armagh, Ballybot, Lurgan, Markethill and Newtown-Hamilton. The parliamentary divisions are three: mid, north and south, each returning one member.

History and Antiquities.—Armagh, together with Louth, Monaghan and some smaller districts, formed part of a territory called Orgial or Urial, which was long subject to the occasional incursions of the Danes. The county was made shire ground in 1586, and called Armagh after the city by Sir John Perrott. When James I. proceeded to plant with English and Scottish colonists the vast tracts escheated to the crown in Ulster, the whole of the arable and pasture land in Armagh, estimated at 77,800 acres, was to have been allotted in sixty-one portions. Nineteen of these, comprising 22,180 acres, were to have been allotted to the church, and forty-two, amounting to 55,620 acres, to English and Scottish colonists, servitors, native Irish and four corporate towns—the swordsmen to be dispersed throughout Connaught and Munster. This project was not strictly adhered to in Co. Armagh, nor were the Irish swordsmen or soldiers transplanted into Connaught and Munster from this and some other counties. The antiquities consist of cairns and tumuli; the remains of the fortress of Emain near the city of Armagh (*q.v.*), once the residence of the kings of Ulster; and Danes Cast, an extensive fortification in the south-east of the county, near Poyntzpass, extending into Co. Down. Spears, battle-axes, collars, rings, amulets, medals of gold, ornaments of silver, jet and amber, &c., have also been found in various places. The religious houses were at Armagh, Killevy, Kilmore, Stradhailloyse and Tahenny. Of military antiquities the most remarkable are Tyrone's ditches, near Poyntzpass; and the pass of Moyry, the entry into the county from the south, which was fiercely contested by the Irish in 1595 and 1600, is defended by a castle. The summit of Slieve Gullion is crowned by a large cairn, which forms the roof of a singular cavern of artificial construction, probably an early burial-place.

ARMAGH, a city and market town, and the county town of Co. Armagh, Ireland, in the mid parliamentary division, 89½ m. N.N.W. of Dublin by the Great Northern railway, at the junction of the Belfast-Clones line. Pop. (1901) 7588. It is said to derive its name of *Ard-macha*, the Hill of Macha, from Queen Macha of the Golden Hair, who flourished in the middle of the 4th century B.C., but earlier it was named from its situation on the sides of a steep hill called Drumsailech, or the Hill of Sallows, which rises in the midst of a fertile plain near the Callan stream. Of high antiquity, and, like many other Irish towns, claiming (with considerable probability) to have been founded by St Patrick in the 5th century, it long possessed the more important distinction of being the metropolis of Ireland; and, as the seat of a flourishing college, was greatly frequented by students from other lands, among whom the English and Scots were said to have been so numerous as to give the name of Trian-Sassanagh, or Saxon Street, to one of the quarters of the city. St Patrick's bell, long preserved at Armagh, the oldest Irish relic of its kind, is now, with its shrine of the year 1091, preserved in the museum of the Royal Irish Academy at Dublin. Of a synod that was held at Armagh as early as 448, there is an interesting memorial in the *Book of Armagh*, an Irish MS. dating about A.D. 800. Exposed to the successive calamities of the Danish incursions, the English conquest and the English wars, and at last deserted by its bishops, who retired to Drogheda, the venerable city sank into an insignificant collection of cabins, with a dilapidated cathedral. From this state of decay, however, it was raised, in the second half of the 18th century, by the unwearied exertions of Archbishop Richard Robinson, 1st Lord Rokeby (1709–1794), which, seconded by similar devotion on the part of succeeding archbishops of the Beresford family, notably Archbishop Lord John George Beresford (1773–1862), made of Armagh one of the best built and most respectable towns in the country. As the ecclesiastical metropolis and seat of an archbishop (Primate of all Ireland) in both the Protestant and Roman organizations, it possesses two cathedrals and two archiepiscopal palaces. As the county town Armagh has a court-house, a prison, a lunatic asylum and a county infirmary. Besides these there is a fever hospital, erected by Lord John George Beresford; a college, which Primate Robinson was anxious to raise to the rank of a university; a public library founded by him, an observatory, which has become famous from the efficiency of its astronomers; a number of churches and schools, and barracks. Almost all the buildings are built of the limestone of the district, but the Anglican cathedral is of red sandstone. It stands boldly on the top of the hill, a cruciform structure dating from the 13th, but practically rebuilt in the 18th century, in accordance with its original plan. The Roman Catholic cathedral is in the Decorated style, and was consecrated in 1873. Armagh was a parliamentary borough until 1885; and, having been incorporated in 1613, so remained until 1835. The administration is in the hands of an urban district council. Two miles W. of Armagh is Emain, Emania, or Navan Fort, with large entrenchments and mounds, the site of a royal palace of Ulster, founded by that Queen Macha who gave her name to the city. In A.D. 335 it was destroyed during the inroad on the defeat of the king of Ulster by the three brothers Colla, cousins of Muredach, king of Ireland. Armagh itself fell before the king Brian Boroime, who was buried here; and before Edward Bruce in 1315, while previous to the English war after the Reformation, it had witnessed the struggles of Shane O'Neill (1564).

ARMAGNAC, formerly a province of France and the most important fief of Gascony, now wholly comprised in the department of Gers (*q.v.*). In the 15th century, when it attained its greatest extent, it included, besides Armagnac, the neighbouring territories of Fezensac, Fezensaguet, Pardiac, Pays de Gaure, Rivière Basse, Eauzan and Lomagne, and stretched from the Garonne to the Adour. Armagnac is a region of hills ranging to a height of 1000 ft., watered by the river Gers and other rivers which descend fanwise from the plateau of Lannemezan. On the slope of its hills grow the grapes from which the famous Armagnac brandy is made. In Roman Gaul this territory formed part of the diocese of Auch (*civitas Ausciorum*), which corresponded roughly with the later duchy of Gascony (*q.v.*). About the end of the 9th century Fezensac (*comitatus Fedentiacus*), in circumstances of which no trustworthy record remains, was erected into an hereditary countship. This latter was in its turn divided, the south-western portion becoming, about 960, the countship of Armagnac (*pagus Armaniacus*). The domain of

this countship, at first very limited in extent, continued steadily to increase in size, and about 1140 Count Gerald III. added the whole of Fezensac to his possessions. Under the English rule the counts of Armagnac were turbulent and untrustworthy vassals; and the administration of the Black Prince, tending to favour the towns of Aquitaine at the expense of the nobles, drove them to the side of France. The complaint against the English prince which Count John I., in defiance of the treaty of Brétigny, himself carried to Paris, was the principal cause of the resumption of hostilities of 1369, and of the incessant defeats sustained by the English until the accession of their king Henry V.

At that moment Count Bernard VII. was all-powerful at the French court; and Charles of Orleans, in order to be able to avenge his father, Louis of Orleans, who had been assassinated in 1407 by John the Fearless, duke of Burgundy, married Bonne, Bernard's daughter. This was the origin of the political party known as "the Armagnacs." With the object of combating the duke of Burgundy's preponderant influence, a league was formed at Gien, including the duke of Orleans and his father-in-law, the dukes of Berry, Bourbon and Brittany, the count of Alençon and all the other discontented nobles. Bernard VII. ravaged the environs of Paris; and the treaty of Bicêtre (November 2, 1410) only suspended hostilities for a few months, war breaking out afresh in the spring of 1411. Paris sided with the duke of Burgundy, and at his instigation Charles VII. collected an army to besiege the allies in Bourges. The peace of Bourges, confirmed at Auxerre on the 22nd of August, put an end to the war. Paris was dominated at that time by the party of the "butchers," or *Cabochiens*, which had been organized and armed by the count of Saint-Pol, brother-in-law of John the Fearless. But their excesses, and in particular the Cabochien ordinance of the 25th of May 1413, aroused public indignation; a reaction took place, and in the month of August the Armagnacs in their turn became masters of the government and of the king. The duke of Burgundy, besieged in Arras, only obtained peace (treaty of Arras, September 4, 1414), on condition of not returning to Paris.

Several months later Henry V. declared war against France; and when, in August 1415, the English landed in Normandy, the Armagnacs and Burgundians united against them, but were defeated in the battle of Agincourt (October 25, 1415). John the Fearless then began negotiations with the English, while Bernard VII., appointed constable in place of the count of Saint-Pol, who had been killed at Agincourt, returned to defend Paris. However, the excesses committed by the Armagnacs incensed the populace, and John the Fearless, who was ravaging the surrounding districts, re-entered the capital on the 29th of May 1418, in consequence of the treason of Perrinet Leclerc. On the 12th of June Bernard VII. and the members of his party were massacred. From this time onward the Armagnac party, with the dauphin, afterwards King Charles VII., at its head, was the national party, while the Burgundians united with the English. This division in France continued until the treaty of Arras, on the 21st of September 1435. The rivalry of the Burgundians and Armagnacs brought terrible disasters upon France, and for many years afterwards the name of "Armagnacs" was bestowed upon the bands of adventurers who were as much to be feared as the *Grandes Compagnies* of the preceding age.

In 1444–45 the emperor Frederick III. of Germany obtained from Charles VII. a large army of Armagnacs to enforce his claims in Switzerland, and the war which ensued took the name of the Armagnac war (*Armagnakenkrieg*). In Germany the name of the foreigners, who were completely defeated in the battle of St Jakob on the Birs, not far from Basel, was mockingly corrupted into *Arme Jacken*, Poor Jackets, or *Arme Gecken*, Poor Fools.

On the death of Charles of Armagnac, in 1497, the countship was united to the crown by King Charles VII., but was again bestowed on Charles, the nephew of that count, by Francis I., who at the same time gave him his sister Margaret in marriage. After the death of her husband, by whom she had no children, she married Henry of Albret, king of Navarre; and thus the countship of Armagnac came back to the French crown along with the other dominions of Henry IV. In 1645 Louis XIV. erected a countship of Armagnac in favour of Henry of Lorraine, count of Harcourt, in whose family it continued till the Revolution. James of Armagnac, grandson of Bernard VII., was made duke of Nemours in 1462, and was succeeded in the dukedom by his second son, John, who died without issue, and his third son, Louis, in whom the house of Armagnac became extinct in 1503.

In 1789 Armagnac was a province forming part of the *Gouvernement-général* of Guienne and Gascony; it was divided into two parts, High or White Armagnac, with Auch for capital, and Low or Black Armagnac. At the Revolution the whole of the original Armagnac was included in the department of Gers.

For authorities see U. Chevalier, *Répertoire des sources hist. du moyen âge*, s. Armagnac (Montbéliard, 1894). For the Armagnacs see Paul Dognon, "Les Armagnacs et les Bourguignons, le comte de Foix et le dauphin en Languedoc" (1416–1420) in *Annales du Midi* (1889); Rameau, "Guerre des Armagnacs dans le Mâconnais" (1418–1435) in the *Rév. soc. lit. de l'Ain* (1884); Berthold Zeller, *Les Armagnacs et les Bourguignons, la Commune de 1413*; E. Wülcker, *Urkunden und Schreiben betreffend den Zug der Armagnaken* (Frankfort, 1873); Witte, *Die Armagnaken im Elsass, 1439–1445* (Strassburg, 1889).

ARMATOLES (Gr. ἁρματωλός, a man-at-arms), the name given to some Greeks who discharged certain military and police functions under the Turkish government. When the Turks under Sultan Mahommed II. conquered Greece in the 15th century, many of the Greeks fled into the mountainous districts of Macedonia and northern Greece, and maintained a harassing warfare with the conquerors of their country. These men were called *Klephts* (modern Gr. κλέφτης, ancient κλέπτης, a thief, a brigand), and during the 16th century the Turkish pashas came to terms with some of them, and these men were allowed to retain their local customs, and were confirmed in the possession of certain districts, while in return they undertook some duties, such as the custody of the highroads. Those who accepted these terms were called *armatoles*, and the districts in which they lived *armatoliks*. Strengthened by a considerable number of Christian Albanians, they rendered good service in defending Greece, and to some extent repressed the ravages of the *Klephts*; but their power and independence were disliked by the Turks. After the peace of Belgrade in 1739 (between Austria and Turkey), the Turkish government sought to weaken the position of the *armatoles*. Their privileges were restricted, Mahommedan Albanians were introduced into the *armatoliks*, and towards the end of the 18th century their numbers were seriously reduced. Irritated by this policy the *armatoles* rendered considerable service to Ali Pasha of Iannina in his struggle with the Turks in 1820–22, and afforded valuable assistance to their countrymen during the Greek war of independence in 1830.

ARMATURE (from Lat. *armatura*, armour), a covering for defence. In zoology the word is used of the bony shell of the armadillo. In architecture it is applied to the iron stays by which the lead lights are secured in windows. (See STANCHION and SADDLE: *Saddle-Bars*.) In magnetism Dr William Gilbert applied the term to the piece of soft iron with which he "armed" or capped the lodestone in order to increase its power. It is also used for the "keeper" or piece of iron which is placed across the poles of a horse-shoe magnet, and held in place by magnetic attraction, in order to complete the magnetic circuit and preserve the magnetism of the steel; and hence, in dynamo-electric machinery, for the portion which is attracted by the electro-magnet, as the moving part of an electric motor, or, by extension, the moving part of a dynamo (*q.v.*).

ARMAVIR. (1) The ruins of the old capital of Armenia, on the S.E. slope of the extinct volcano Ala-geuz, according to legend, built by Armais, a grandson of Haik, in 1980 B.C., and the capital of the Armenian kings till the 2nd century A.D. Now a small village, Tapadibi, occupies its seat. (2) A district town of Russia, northern Caucasia, province of Kuban, on Kuban river, and on the main line of the Caucasian railway, 40 m. by rail west of Stavropol, built in 1848 for the settlement of Armenian mountaineers, and now a well-built, growing town with 8000 inhabitants, the merchants of which carry on a lively trade.

ARMENIA (old Persian *Armina*, Armenian *Hayasdan*, or *Hayq*), the popular modern name of a district south of the Caucasus and Black Sea, which formed part of the ancient Armenian kingdom. The name, which first occurs in the cuneiform inscriptions of Darius Hystaspis, supplanted the earlier Urardhu, or Ararat, but its origin is unknown. In its widest extent Armenia stretched from 37° to 49° E. long., and from 37½° to 41½° N. lat.; but this area was never, or only for a brief period, united under one king. Armenia is now divided between Persia, Russia and Turkey, and the three boundaries have a common point on Little Ararat.

Geographically, Armenia is a continuation westward of the great Iranian plateau. On the north it descends abruptly to the Black Sea; on the south it breaks down in rugged terraces to the lowlands of Mesopotamia; and on the east and west it sinks more gradually to the lower plateaus of Persia and Asia Minor. Above the general level of the plateau, 6000 ft., rise bare ranges of mountains, which run from north-east to south-west at an altitude of 8000–12,000 ft., and culminate in Ararat, 17,000 ft. Between the ranges are broad elevated valleys, through which the rivers of the plateau flow before entering the rugged gorges that convey their waters to lower levels. Geologically, Armenia consists of archaic rocks upon which, towards the north, are superimposed Palaeozoic, and towards the south later sedimentary rocks. The last have been pierced by volcanic outbursts that extend southward to Lake Van. Amongst the higher mountains are the two Ararats; Ala-geuz Dagh, north of the Aras; Bingeul Dagh, south of Erzerum; and the peaks near Lake Van. The rivers are the Euphrates, Tigris, Aras, Churuk Su (Chorokh) and Kelkit Irmak, all rising on the plateau. The more important lakes are Van, 5100 ft., about twice the size of the Lake of Geneva, and Urmia, 4000 ft., both salt; Gokcha or Sevan, 5870 ft., discharging into the Aras; and Chaldir, into the Kars Chai. The aspect of the plateau is dreary and monotonous. The valleys are wide expanses of arable land, and the hills are for the most part grass-covered and treeless. But the gorges of the Euphrates and Tigris, and their tributaries, cannot be surpassed in wildness and grandeur. The climate is varied. In the higher districts the winter is long and the cold severe; whilst the summer is short, dry and hot. In Erzerum the temperature ranges from −22° to 84° F., and snow sometimes falls in June. In the valley of the Aras, and in the western and southern districts, the climate is more moderate. Most of the towns lie high, from 4000 to 6000 ft. The villages are usually built on gentle slopes, in which the houses are partially excavated as a protection against the severity of the weather. Many of the early towns were on or near the Araxes, and amongst their ruins are the remains of churches which throw light on the history of Christian architecture in the East. Armenia is rich in mineral wealth, and there are many hot and cold mineral springs. The vegetation varies according to the locality. Cereals and hardy fruits grow on the higher ground, whilst rice is cultivated in the hot, well-watered valley of the Araxes. The summer is so hot that the vine grows at much higher altitudes than it does in western Europe, and the cotton tree and all southern fruit trees are cultivated in the deeper valleys. On the fine pasture lands which now support the flocks of the Kurds, the horses and mules, so celebrated in ancient times, were reared. Trout are found in the rivers, and a small herring in Lake Van. The country abounds in romantic scenery; that of the district of Ararat especially has been celebrated by patriotic historians like Moses of Chorene and Lazarus of Pharb.

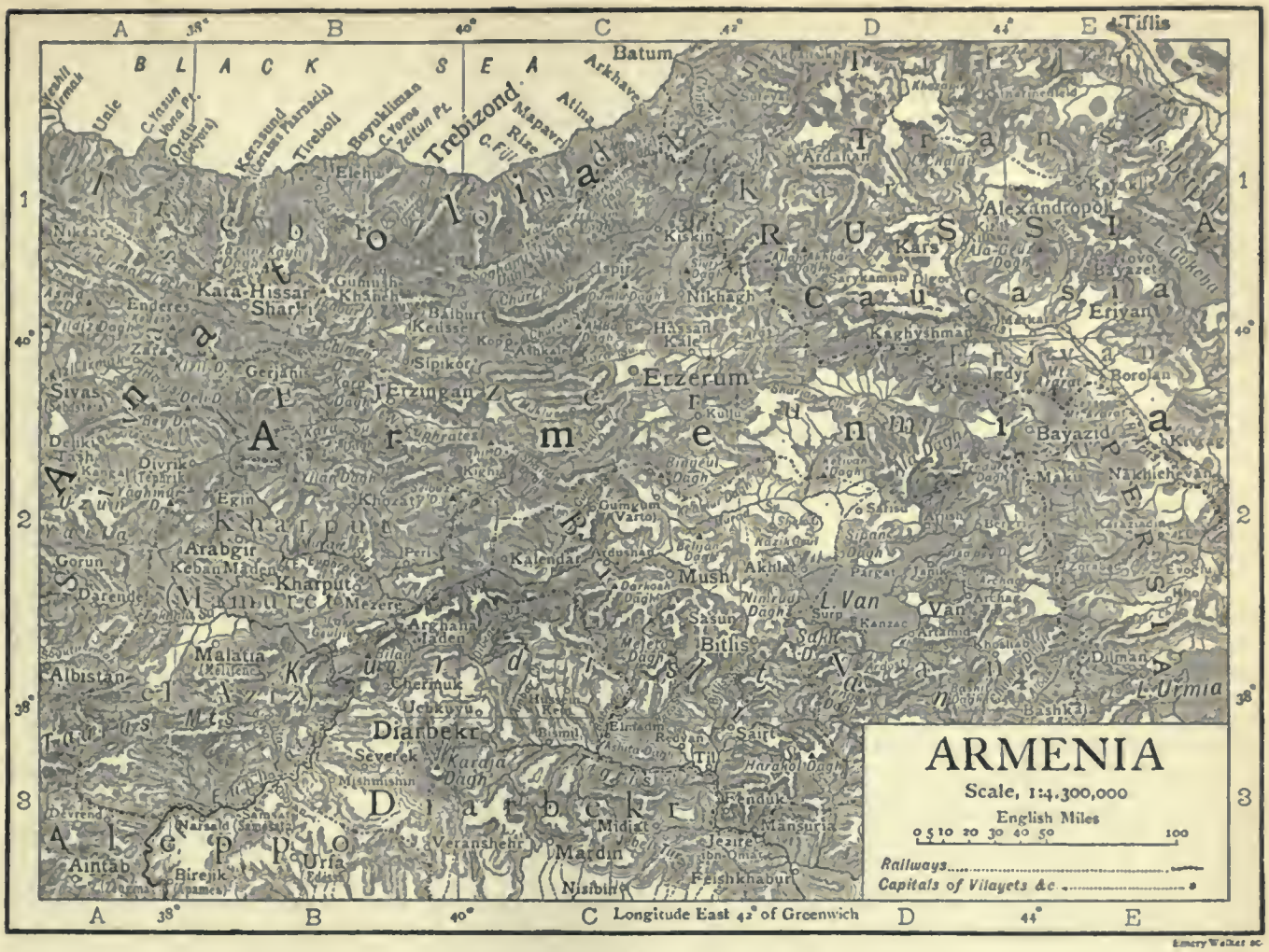
Population.—Accurate statistics cannot be obtained; but it is estimated that in the nine vilayets, which include Turkish Armenia, there are 925,000 Gregorian, Roman Catholic and Protestant Armenians, 645,000 other Christians, 100,000 Jews, Gypsies, &c., and 4,460,000 Moslems. The Armenians, taking the most favourable estimate, are in a majority in nine kazas or sub-districts only (seven near Van, and two near Mush) out of 159. In Russian Armenia there are 960,000 Armenians, and in Persian Armenia 130,000. According to an estimate made by General Zelenyi for the Caucasus Geographical Society (*Zapiski*, vol. xviii., Tiflis, 1896, with map), the population of the nine Turkish vilayets, Erzerum, Van, Bitlis, Kharput (Mamuret-el-Aziz), Diarbekr, Sivas, Aleppo, Adana and Trebizond, was 6,000,000 (Armenians, 913,875, or 15 %; other Christians, 632,875, or 11 %; and Moslems, 4,453,250, or 74 %). In the first five vilayets which contain most of the Armenians, the population was 2,642,000 (Armenians, 633,250, or 24 %; other Christians, 179,875, or 7 %; and Moslems, 1,828,875, or 69 %); and in the seven Armenian kazas the population was 282,375 (Armenians, 184,875, or 65 %; other Christians, 1000, or 0.3 %; and Moslems, 96,500, or 34·7 %). In 1897 there were 970,656 Armenians in Russia, of whom 827,634 were in the provinces of Erivan, Elisavetpol and Tiflis.

The total number of Armenians is estimated at 2,900,000 (in Turkey, 1,500,000; Russia, 1,000,000; Persia, 150,000; Europe, America and East Indies, 250,000).

History.—The history of Armenia has been largely influenced by its physical features. The isolation of the valleys, especially in winter, encouraged a tendency to separation, which invariably showed itself when the central power was weak. The rugged mountains have always been the home of hardy mountaineers impatient of control, and the sanctuary to which the lowlanders fled for safety in times of invasion. The country stands as an open doorway between the East and the West. Through its long valleys run the roads that connect the Iranian plateau with the fertile lands and protected harbours of Asia Minor, and for its possession nations have contended from the remotest past.

Ethnology.

The original inhabitants of Armenia are unknown, but, about the middle of the 9th century B.C., the mass of the people belonged to that great family of tribes which seems to have been spread over western Asia and to have had a common non-Aryan language. Mixed with these proto-Armenians, there was an important Semitic element of Assyrian and Hebrew origin. In the 7th century B.C., between 640 and 600, the country was conquered by an Aryan people, who imposed their language, and possibly their name, upon the vanquished, and formed a military aristocracy that was constantly recruited from Persia and Parthia. Politically the two races soon amalgamated, but, except in the towns, there was apparently little intermarriage, for the peasants in certain districts closely resemble the proto-Armenians, as depicted on their monuments. After the Arab and Seljuk invasions, there was a large emigration of Aryan and Semitic Armenians to Constantinople and Cilicia; and all that remained of the aristocracy was swept away by the Mongols and Tatars. This perhaps explains the diversity of type and characteristics amongst the modern Armenians. In the recesses of Mount Taurus the peasants are tall, handsome, though somewhat sharp-featured, agile and brave. In Armenia and Asia Minor they are robust, thick-set and coarse-featured, with straight black hair and large hooked noses. They are good cultivators of the soil, but are poor, superstitious, ignorant and unambitious, and they live in semi-subterranean houses as their ancestors did 800 years B.C. The townsmen, especially in the large towns, have more regular features—often of the Persian type. They are skilled artisans, bankers and merchants, and are remarkable for their industry, their quick intelligence, their aptitude for business, and for that enterprising spirit which led their ancestors, in Roman times, to trade with Scythia, China and India. The upper classes are polished and well educated, and many have occupied high positions in the public service in Turkey, Russia, Persia and Egypt. The Armenians are essentially an Oriental people, possessing, like the Jews, whom they resemble in their exclusiveness and widespread dispersion, a remarkable tenacity of race and faculty of adaptation to circumstances. They are frugal, sober, industrious and intelligent, and their sturdiness of character has enabled them to preserve their nationality and religion under the sorest trials. They are strongly attached to old manners and customs, but have also a real desire for progress which is full of promise. On the other hand they are greedy of gain, quarrelsome in small matters, self-seeking and wanting in stability; and they are gifted with a tendency to exaggeration and a love of intrigue which has had an unfortunate influence on their history. They are deeply separated by religious differences, and their mutual jealousies, their inordinate vanity,



their versatility and their cosmopolitan character must always be an obstacle to the realization of the dreams of the nationalists. The want of courage and self-reliance, the deficiency in truth and honesty sometimes noticed in connexion with them, are doubtless due to long servitude under an unsympathetic government.

The early history of Armenia, more or less mythical, is partly based on traditions of the Biainian kings (see ARARAT), and is interwoven with the Bible narrative, of which a knowledge was possibly obtained from captive Jews settled in the country by Assyrian and Babylonian monarchs. The legendary kings are but faint echoes of the kings of Biainas; the story of Semiramis and Ara is but another form of the myth of Venus and Adonis; and tradition has clothed Tigranes, the reputed friend of Cyrus, with the transient glory of the opponent of Lucullus. The fall of the Biainian kingdom, perhaps overthrown by Cyaxares, was apparently soon followed by an immigration of Aryan (Medo-Persian) races, including the progenitors of the Armenians. But they spread slowly, for the "Ten Thousand," when crossing the plateau to Trebizond, 401–400 B.C., met no Armenians after leaving the villages four days' march beyond the Teleboas, now Kara Su. Under the Medes and Persians Armenia was a satrapy governed by a member of the reigning family; and after the battle of Arbela, 331 B.C., it was ruled by Persian governors appointed by Alexander and his successors. Ardvates, 317–284 B.C., freed himself from Seleucid control; and after the defeat of Antiochus the Great by the Romans, 190 B.C., Artaxias (Ardashes), and Zadriades, the governors of Armenia Major and Armenia Minor, became independent kings, with the concurrence of Rome. (See TIGRANES.) Artaxias established his capital at Artaxata on the Araxes, and his most celebrated successor was Tigranes (Dikran), 94–56 B.C., the son-in-law of Mithradates VI., the Great. Tigranes founded a new capital, Tigranocerta, in northern Mesopotamia, which he modelled on Nineveh and Babylon, and peopled with Greek and other captives. Here, and at Antioch, he played the part of "great king" in Asia until his refusal to surrender his father-in-law involved him in war with Rome. Defeated, 69 B.C., by Lucullus beneath the walls of his capital, he surrendered his conquests to Pompey, 66 B.C., who had driven Mithradates across the Phasis, and was permitted to hold Armenia as a vassal state of Rome.

Ancient kingdom.

The campaigns of Lucullus and Pompey brought Rome into delicate relations with Parthia. Armenia, although politically dependent upon Rome, was connected with Parthia by geographical position, a common language and faith, intermarriage and similarity of arms and dress. It had never been Hellenized, as the provinces of Asia Minor had been; the Roman provincial system was never applied to it; and the policy of Rome towards it was never consistent. The country became the field upon which the East and West contended for mastery, and the struggle ended for a time in the partition of Armenia, A.D. 387, between Rome and Persia. The Roman portion was soon added to the Diocesis Pontica. The Persian portion, Pers-Armenia, remained a vassal state under an Arsacid prince until 428. It was afterwards governed by Persian and Armenian noblemen selected by the "great king," and entitled *marzbans*. Before the partition, Tiridates, converted by St Gregory, "the Illuminator," had established Christianity as the religion of the state, and set an example followed later by Constantine. After the partition, the invention of the Armenian alphabet, and the translation of the Bible into the vernacular, 410, drew the Armenians together, and the discontinuance of

Under later Empire.

Greek in the Holy Offices relaxed the ecclesiastical dependence on Constantinople, which ceased entirely when the Patriarch, 491, refused to accept the decrees of the council of Chalcedon. The rule of the *marzbans* was marked by relentless persecution of the Christians, foreed conversions to Magism, frequent insurrections and the rise to importance of the great families founded by men of Assyrian, Parthian, Persian, Syrian and Jewish origin, and in some cases of royal blood, who had been governors of districts, or holders of fiefs under the Arsacids. Amongst the *marzbans* were Jewish Bagratids and Persian Mamegonians; and one of the latter family, Vartan, made himself independent (571–578), with Byzantine aid. In 632 the victories of Heraclius restored Armenia to the Byzantines; but the war that followed the Arab invasion, 636, left the country in the hands of the caliphs, who set over it Arab and Armenian governors (*ostikans*). One of the governors, the Bagratid Ashod I., was crowned king of Armenia by the caliph Motamid, 885, and founded a dynasty which ended with Kagig II. in 1079. A little later the Ardzrunian Kagig, governor of Vaspuragan or Van, was crowned king of that province by the caliph Moktadir, 908, and his descendants ruled at Van and Sivas until 1080. The Bagratids founded dynasties at Kars, 962–1080, and in Georgia, which they held until its absorption, 1801, by Russia. From 984 to 1085 the country from Diarbekr to Melasgerd was ruled under the suzerainty first of Arabs then of Byzantines and Seljuks, by the Mervanid dynasty of Kurds, called princes of Abahuni (Ἀπαχουνῆς). The Arab invasion drove many Armenian noblemen to Constantinople, where they intermarried with the old Roman families or became soldiers of fortune. Artavasdes, an Arsacid, usurped the Byzantine throne for two years; Leo V., an Ardzrunian, and John Zimisces, became emperors; whilst Manuel, the Mamegonian, and others were amongst the best generals of the empire. In 991, and again in 1021, Basil II. invaded Armenia, and in the latter year Senekherim, king of Vaspuragan, exchanged his kingdom for Sivas and its territory, where he settled down with many Armenian emigrants. Basil's policy was to make the great Armenian fortresses, garrisoned by imperial troops, the first line of defence on his eastern frontier; but it failed in the hands of his feeble successors, who thought more of converting heretical Armenia than of defending its frontier. The king of Ani, Kagig II., was compelled to exchange his kingdom for estates in Cappadocia. The country was raided by Seljuks and harried by Byzantine soldiers, and the miseries of the people were regarded as gain to the Orthodox church. After the defeat and capture of Romanus IV. by Alp Arslan, 1071, Armenia formed part of the Seljuk empire until it split up, 1157, into petty states, ruled by Arabs, Kurds and Seljuks, who were in turn swept away by the Mongol invasion, 1235. For more than three centuries after the appearance of the Seljuks, Armenia was traversed by a long succession of nomad tribes whose one aim was to secure good pasturage for their flocks on their way to the richer lands of Asia Minor. The cultivators were driven from the plains, agriculture was destroyed, and the country was seriously impoverished when its ruin was completed by the ravages and wholesale butcheries of Timur. Many Armenians fled to the mountains, where they embraced Islam, and intermarried with the Kurds, or purchased security by paying blackmail to Kurdish chiefs. Others migrated to Cappadocia or to Cilicia, where the Bagratid Rhupen had founded, 1080, a small principality which, gradually extending its limits, became the kingdom of Lesser Armenia. This Christian kingdom in the midst of Moslem states, hostile to the Byzantines, giving valuable support to the leaders of the crusades, and trading with the great commercial cities of Italy, had a stormy existence of about 300 years. Internal disorders, due to attempts by the later Lusignan kings to make their subjects conform to the Roman Church, facilitated its conquest by Egypt, 1375. The memory of Kiligia (Cilicia) is enshrined in a popular song, and at Zeitun, in the recesses of Mount Taurus, a small Armenian community has hitherto maintained almost complete independence. After the death of Timur, Armenia formed part of the territories of the Turkoman dynasties of Ak- and Kara-Kuyunli, and under their milder rule the seat of the Catholicus, which, during the Seljuk invasion, had been moved first to Sivas, and then to Lesser Armenia, was re-established, 1441, at Echmiadzin.

Medieval partition.

In 1514, the Persian campaign of Selim I. gave Armenia to the Osmanli Turks, and its reorganization was entrusted to Idris, the historian, who was a Kurd of Bitlis. Idris found the rich arable lands almost deserted, and the mountains bristling with the castles of independent chieftains, of Kurd, Arab and Armenian descent, between whom there were long-standing feuds. He compelled the Kurds to settle on the vacant lands, and divided the country into small sanjaks which in the plains were governed by Turkish officials, and in the mountains by local chiefs. This policy gave rest to the country, but favoured the growth of Kurd influence and power, which by 1534 had spread westwards to Angora. Armenia was invaded by the Persians in 1575, and again in 1604, when Shah Abbas transplanted many thousand Armenians from Julfa to his new capital Isfahan. In 1639, the province of Erivan, which included Echmiadzin, was assigned by treaty to Persia, and it remained in her hands until it passed to Russia, 1828, under the treaty of Turkman-chai. The Turko-Russian War of 1828–29, which advanced the Russian frontier to the Arpa Chai, was followed by a large emigration of Armenians from Turkish to Russian territory, and a smaller exodus took place after the war of 1877–78, which gave Batum, Ardahan and Kars to Russia. In 1834 the independent power of the Kurds in Armenia was greatly curtailed; and risings under Bedr Khan Bey in 1843, and Sheik Obeidullah in 1880, were firmly suppressed.

Under Turkey.

After the capture of Constantinople, 1453, Mahommed II. organized his non-Moslem subjects in communities, or *millets*, under ecclesiastical chiefs to whom he gave absolute authority in civil and religious matters, and in criminal offences that did not come under the Moslem religious law. Under this system the Armenian bishop of Brusa, who was appointed patriarch of Constantinople by the sultan, became the civil, and practically the ecclesiastical head of his community (*Ermeni millet*), and a recognized officer of the imperial government with the rank of vizier. He was assisted by a council of bishops and clergy, and was represented in each province by a bishop. This *imperium in imperio* secured to the Armenians a recognized position before the law, the free enjoyment of their religion, the possession of their churches and monasteries, and the right to educate their children and manage their municipal affairs. It also encouraged the growth of a community life, which eventually gave birth to an intense longing for national life. On the other hand it degraded the priesthood. The priests became political leaders rather than spiritual guides, and sought promotion by bribery and intrigue. Education was neglected and discouraged, servility and treachery were developed, and in less than a century the people had become depraved and degraded to an almost incredible extent. After the issue, 1839, of the *hatt-i-sherif* of Gül-khaneh, the tradesmen and artisans of the capital freed themselves from clerical control. Under regulations, approved by the sultan in 1862, the patriarch remained the official representative of the community, but all real power passed into the hands of clerical and lay councils elected by a representative assembly of 140 members. The "community," which excluded Roman Catholics and Protestants, was soon called the "nation," "domestic" became "national" affairs, and the "representative" the "national" assembly.

Gregorian Armenians.

The connexion of "Lesser Armenia" with the Western powers led to the formation, 1335, of an Armenian fraternity, "the Unionists," which adopted the dogmas of the Roman church, and at the council of Florence, 1439, was entitled the "United Armenian Church." Under the millet system the unionists were frequently persecuted by the patriarchs, but this ended in 1830, when, at the intervention of France, they were made a community (*Katoluk millet*), with their own ecclesiastical head. The Roman Catholics, through the works issued by the Mechitharists at Venice, have greatly promoted the progress of education and the development of Armenian literature. They are most numerous at Constantinople, Angora and Smyrna.

Roman Catholics.

The Protestant movement, initiated at Constantinople by American missionaries in 1831, was opposed by the patriarchs and Russia. In 1846 the patriarch anathematized all Armenians with Protestant sympathies, and this led to the formation of the "Evangelical Church of the Armenians," which was made, after much opposition from France and Russia, a community (*Protestant millet*), at the instance of the British ambassador. The missionaries afterwards founded colleges on the Bosporus, at Kharput, Marsivan and Aintab, to supply the needs of higher university education, and they opened good schools for both sexes at all their stations. Everywhere they supplied the people with pure, wholesome literature, and represented progress and religious liberty.

Protestants.

When Abd-ul-Hamid came to the throne of Turkey in 1876, the condition of the Armenians was better than it had ever been under the Osmanlis; but with the close of the war of 1877–78 came the "Armenian Question." By the treaty of San Stefano, Turkey engaged to Russia to carry out reforms "in the provinces inhabited by the Armenians, and to guarantee their security against the Kurds and Circassians." By the treaty of Berlin, 13th of July 1878, a like engagement to the six signatory powers was substituted for that to Russia. By the Cyprus convention, 4th of June 1878, the sultan promised Great Britain to introduce necessary reforms "for the protection of the Christians and other subjects of the Porte" in the Turkish territories in Asia. The Berlin treaty encouraged the Armenians to look to the powers, and not to Russia for protection; and the convention, which did not mention the Armenians, was regarded as placing them under the special protection of Great Britain. This impression was strengthened by the action of England at Berlin in insisting that Russia should evacuate the occupied territory before reforms were introduced, and so removing the only security for their introduction. The presentation of identic and collective notes to the Porte by the powers, in 1880, produced no result, and in 1882 it was apparent that Turkey would only yield to compulsion. In 1881 a circular note from the British ministry to the five powers was evasively answered, and in 1883 Prince Bismarck intimated to the British government that Germany cared nothing about Armenian reforms and that the matter had better be allowed to drop. Russia had changed her policy towards the Armenians, and the other powers were indifferent. The so-called "Concert of Europe" was at an end, but British ministries continued to call the attention of the sultan to his obligations under the treaty of Berlin.

Modern Armenian question.

Russia began to interest herself in the Armenians when she acquired Georgia in 1801; but it was not until 1828–1829 that any appreciable number of them became her subjects. She found them necessary to the development of her new territories, and allowed them much freedom. They were permitted, within certain limits, to develop their national life; many became wealthy, and many rose to high positions in the military and civil service of the state. After the war of 1877–78 the Russian consuls in Turkey encouraged the formation of patriotic committees in Armenia, and a project was formed to create a separate state, under the supremacy of Russia, which was to include Russian, Persian and Turkish Armenia. The project was favoured by Loris-Melikov, then all-powerful in Russia, but in 1881 Alexander II. was assassinated, and shortly afterwards a strongly anti-Armenian policy was adopted. The schools were closed, the use of the Armenian language was discouraged, and attempts were made to Russify the Armenians and bring them within the pale of the Russian Church. All hope of practical self-government under Russian protection now ceased, and the Armenians of Tiflis turned their attention to Turkish Armenia. They had seen the success of the Slav committees in treating disturbances in the Balkans, and became the moving spirit in the attempts to produce similar troubles in Armenia. Russia made no real effort to check the action of her Armenian subjects, and after 1884 she steadily opposed any active interference by Great Britain in favour of the Turkish Armenians. When Echmiadzin passed to Russia, in 1828, the Catholicus began to claim spiritual jurisdiction over the whole Armenian Church, and the submission of the patriarch of Constantinople was obtained by Russia when she helped the sultan against Mehemet Ali. Subsequently Russia secured the submission of the independent catholicus of Sis, and thus acquired a power of interference in Armenian affairs in all parts of the world. During 1900 Russia showed renewed interest in Turkish Armenia by securing the right to construct all railways in it, and in the Armenians by pressing the Porte to restore order and introduce reforms.

Russian policy.

The Berlin treaty was a disappointment to the Gregorian Armenians, who had hoped that Armenia and Cilicia would have been formed into an autonomous province administered by Christians. But the formation of such a province was impossible. The Gregorians were scattered over the empire, and, except in a few small districts, were nowhere in a majority. Nor were they bound together by any community of thought or sentiment. The Turkish-speaking Armenians of the south could scarcely converse with the Armenian-speaking people of the north; and the ignorant mountaineers of the east had nothing in common, except religion, with the highly educated townsmen of Constantinople and Smyrna. After the change in Russian policy and the failure of the powers to secure reforms, the advanced party amongst the Armenians, some of whom had been educated in Europe and been deeply affected by the free thought and Nihilistic tendencies of the day, determined to secure their object by the production of disturbances such as those that had given birth to Bulgaria. Societies were formed at Tiflis and in several European capitals for the circulation of pamphlets and newspapers, and secret societies, such as the Huntchagist, were instituted for more revolutionary methods. An active propaganda was carried on in Turkish Armenia by emissaries, who tried to introduce arms and explosives, and represented the ordinary incidents of Turkish misrule to Europe as serious atrocities. The revolutionary movement was joined by some of the younger men, who formed local committees on the Nihilist plan, but it was strongly opposed by the Armenian clergy and the American missionaries, who saw the impossibility of success; and its irreligious tendency and the self-seeking ambition of its leaders made it unacceptable to the mass of the people. Exasperated at their failure, the emissaries organized attacks on individuals, wrote threatening letters, and at last posted revolutionary placards, 5th of January 1893, at Yuzgat, and on the walls of the American College at Marsivan. In the last case the object of the Huntchagists was to compromise the missionaries, and in this they succeeded. The Americans were accused of issuing the placards; two Armenian professors were imprisoned; and the girls' school was burned down. Outbreaks, easily suppressed, followed at Kaisarieh and other places.

Revolutionary movement.

One of the revolutionary dreams was to make the ancient Daron the centre of a new Armenia. But the movement met with no encouragement, either amongst the prosperous peasants on the rich plain of Mush or in the mountain villages of Sasun. In the summer of 1893, an emissary was captured near Mush, and the governor, hoping to secure others, ordered the Kurdish Irregular Horse to raid the mountain district. The Armenians drove off the Kurds,[1] and, when attacked in the spring of 1894, again held their own. The vali now called up regular troops from Erzingan; and the sultan issued a firman calling upon all loyal subjects to aid in suppressing the revolt. A massacre of a most brutal character, in which Turkish soldiers took part, followed; and aroused deep indignation in Europe. In November 1894 a Turkish commission of inquiry was sent to Armenia, and was accompanied by the consular delegates of Great Britain, France and Russia, who elicited the fact that there had been no attempt

[1] The Armenians and Kurds have lived together from the earliest times. The adoption of Islam by the latter, and by many Armenians, divided the people sharply into Christian and Moslem, and placed the Christian in a position of inferiority. But the relations between the two sects were not unfriendly previously to the Russian campaigns in Persia and Turkey. After 1829 the relations became less friendly; and later, when the Armenians attracted the sympathies of the European powers after the war of 1877-78, they became bitterly hostile.

at revolt to justify the action of the authorities. Throughout 1894 the state of the country bordered upon anarchy, and during the winter of 1894–1895 the British government, with lukewarm support from France and Russia, pressed for administrative reforms in the vilayets of Erzerum, Van, Bitlis, Sivas, Memuret-el-Aziz (Kharput) and Diarbekr. The Porte made counter-proposals, and officials concerned in the Sasun massacres were decorated and rewarded. On the 11th of May 1895 the three powers presented to the sultan a complicated scheme of reforms which was more calculated to increase than to lessen the difficulties connected with the government of Armenia; but it was the only one to which Russia would agree. The sultan delayed his answer. Great Britain was in favour of coercion, but Russia, when sounded, replied that she "would certainly not join in any coercive measures" and she was supported by France. At this moment, 21st of June 1895, Lord Rosebery's cabinet resigned, and when Lord Salisbury's government resumed the negotiations in August, the sultan appealed to France and Russia against England. During the negotiations the secret societies had not been inactive. Disturbances occurred at Tarsus; Armenians who did not espouse the "national" cause were murdered; the life of the patriarch was threatened; and a report was circulated that the British ambassador wished some Armenians killed to give him an excuse for bringing the fleet to Constantinople. On the 1st of October 1895 a number of Armenians, some armed, went in procession with a petition to the Porte and were ordered by the police to disperse. Shots were fired, and a riot occurred in which many Armenian and some Moslem lives were lost. The British ambassador now pressed the scheme of reforms upon the sultan, who accepted it on the 17th of October. Meanwhile there had been a massacre at Trebizond (October 8), in which armed men from Constantinople took part, and it had become evident that no united action on the part of the powers was to be feared. The sultan refused to publish the scheme of reforms, and massacre followed massacre in Armenia in quick succession until the 1st of January 1896. Nothing was done. Russia refused to agree to any measure of coercion, and declared (December 19) that she would take no action except such as was needed for the protection of foreigners. Great Britain was not prepared to act alone. In the summer of 1896 (June 14–22) there were massacres at Van, Egin, and Niksar; and on the 26th of August the Imperial Ottoman Bank at Constantinople was seized by revolutionists as a demonstration against the Christian powers who had left the Armenians to their fate. The project was known to the Porte, and the rabble, previously armed and instructed, were at once turned loose in the streets. Two days' massacre followed, during which from 6000 to 7000 Gregorian Armenians perished.

The massacres.

The massacres were apparently organized and carried out in accordance with a well-considered plan. They occurred, except in six places, in the vilayets to which the scheme of reforms was to apply. At Trebizond they took place just before the sultan accepted that scheme, and after his acceptance of it they spread rapidly. They were confined to Gregorian and Protestant Armenians. The Roman Catholics were protected by France, the Greek Christians by Russia. The massacre of Syrians, Jacobites and Chaldees at Urfa and elsewhere formed no part of the original plan. Orders were given to protect foreigners, and in some cases guards were placed over their houses. The damage to the American buildings at Kharput was due to direct disobedience of orders. The attacks on the bazars were made without warning, during business hours, when the men were in their shops and the women in their houses. Explicit promises were given, in some instances, that there would be no danger to those who opened their shops, but they were deliberately broken. Nearly all those who, from their wealth, education and influence, would have had a share in the government under the scheme of reforms, were killed and their families ruined by the destruction of their property. Where any attempt at defence was made the slaughter was greatest. The only successful resistance was at Zeitun, where the people received honourable terms after three months' fighting. In some towns the troops and police took an active part in the massacres. At Kharput artillery was used. In some the slaughter commenced and ended by bugle-call, and in a few instances the Armenians were disarmed beforehand. Wherever a superior official or army officer intervened the massacre at once ceased, and wherever a governor stood firm there was no disturbance. The actual perpetrators of the massacres were the local Moslems, aided by Lazis, Kurds and Circassians. A large majority of the Moslems disapproved of the massacres, and many Armenians were saved by Moslem friends. But the lower orders were excited by reports that the Armenians, supported by the European powers, were plotting the overthrow of the sultan; and their cupidity was aroused by the prospect of wiping out their heavy debts to Armenian pedlars and merchants. No one was punished for the massacres, and many of those implicated in them were rewarded. In some districts, especially in the Kharput vilayet, the cry of "Islam or death" was raised. Gregorian priests and Protestant pastors were tortured, but preferred death to apostasy. Men and women were killed in prison and in churches in cold blood. Churches, monasteries, schools and houses were plundered and destroyed. In some places there was evidence of the previous activity of secret societies, in others none. The number of those who perished, excluding Constantinople, was 20,000 to 25,000.[1] Many were forced to embrace Islam, and numbers were reduced to poverty. The destruction of property was enormous, the hardest-working and best tax-paying element in the country was destroyed, or impoverished, and where the breadwinners were killed the women and children were left destitute. Efforts by Great Britain and the United States to alleviate the distress were opposed by the authorities, but met with some success. After the massacres the number of students in the American schools and colleges increased, and many Gregorian Armenians became Roman Catholics in order to obtain the protection of France.

The Armenian revolutionary societies continued their propaganda down to the granting of the Turkish constitution in 1908; and meanwhile further massacres occurred here and there, notably at Mush (1904) and Van (1908).

See Abich, *Geologie d. armenischen Hochlandes* (Wien, 1882); Bishop, *Journeys in Persia and Kurdistan* (Lond., 1891); Bliss, *Turkey and the Armenian Atrocities* (Lond., 1896); Bryce, *Transcaucasia and Ararat* (4th ed., Lond., 1896); De Coursous, *La Rébellion arménienne* (Paris, 1895); Lepsius, *Armenia and Europe* (Lond., 1897); Murray, *Handbook for Asia Minor* (Lond., 1895); Parly. Papers, *Turkey*, I. (1895); *Turkey*, I., II. (1896); Supan, "Die Verbreitung d. Armenier in der asiatischen Turkei, u. in Transkaukasien," in Pet. *Mitt.* vol. xlii. (1896); Tozer, *Turkish Armenia and Eastern Asia Minor* (Lond., 1881); Cholet, *Arménie, Kurdistan, et Mésopotamie* (1892); Lynch, *Armenia* (2 vols., 1901).

(C. W. W.)

ARMENIAN CHURCH. No trustworthy account exists of the evangelization of Armenia, for the legend of King Abgar's correspondence with Christ, even if it contained any historical truth, only relates to Edessa and Syriac Christianity. That the Armenians appropriated from the Syrians this, as well as the stories of Bartholomew and Thaddeus (the Syriac *Addai*), was merely an avowal on their part that Edessa was the centre from which the faith radiated over their land. In the 4th century and later the liturgy was still read in Syriac in parts of Armenia, and the New Testament, the history of Eusebius, the homilies of Aphraates, the works of St Ephraem and many other early books were translated from Syriac, from which tongue most of their ecclesiological terms were derived. The earliest notice of an organized church in Armenia is in Eusebius, *H. E.* vi. 46, to the effect that Dionysius of Alexandria *c.* 250 sent a letter to Meruzanes, bishop of the brethren in Armenia. There were many Christians in Melitene at the time of the Decian persecution in A.D. 250, and two bishops from Great Armenia were present at the council of Nice in 325. King Tiridates (*c.* A.D. 238–314) had already been baptized some time after 261 by Gregory the Illuminator. The latter was ordained priest and appointed *catholicus* or exarch of the church of Great Armenia by Leontius, bishop of Caesarea in Cappadocia. This one fact is certain amidst the fables which soon obscured the history of this great missionary.

[1] According to some estimates the number killed was 50,000 or more.

Thus the church of Great Armenia began as a province of the Cappadocian see. But there was a tradition of a line of bishops earlier than Gregory in Siuniq, a region east of Ararat along the Araxes (Aras), which in early times claimed to be independent of the catholicus. The Adoptianist bishop Archelaus, who opposed the entry of Mani into Armenia under Probus *c.* 277, was also perhaps a Syriac-speaking bishop of Pers-Armenia. Almost the earliest document revealing anything of the inner organization and condition of the Armenian church in the Nicene age is the epistle of Macarius, bishop of Jerusalem, to the Armenian bishop Verthanes, written between 325 and 335 and preserved in Armenian. Its genuineness has been unreasonably suspected. It insists on the erection of fonts; on distinction of grades among the ordained clergy; on not postponing baptism too long; on bishops and priests alone, and not deacons, being allowed to baptize and lay hands on or confirm the baptized; on avoiding communion with Arians; on the use of unleavened bread in the Sacrament, &c. We learn from it that the bishop of Basen and Bagrevand was an Arian at that time. By the year 450 these two districts already had separate bishops of their own. The letter of Macarius, therefore, if a forgery, must be a very early one.[1] The Armenians must, like the Georgians a little later, have set store by the opinion of the bishop of Jerusalem, or they would not have sent to consult him. It was equally from Jerusalem that they subsequently adopted their lectionary and arrangement of the Christian year; and a 9th-century copy of this lectionary in the Paris library preserves to us precious details of the liturgical usages of Jerusalem in the 4th century. We can trace the presence of Armenian convents on the Mount of Olives as early as the 5th century.

Tradition represents the conversion of Great Armenia under Gregory and Tiridates as a sort of triumphant march, in which the temples of the demons and their records were destroyed wholesale, and their undefended sites instantly converted into Christian churches. The questions arise: how was the transition from old to new effected? and what was the type of teaching dominant in the new church? Armenian tradition, confirmed by nearly contemporary Greek sources, answers the first question. The old order went on, but under new names. The priestly families, we learn, hearing that the God preached by Gregory needed not sacrifice, sent to the king a deputation and asked how they were to live, if they became Christians; for until then the priests and their families had lived off the portions of the animal victims and other offerings reserved to them by pagan custom. Gregory replied that, if they would join the new religion, not only should the sacrifices continue, but they should have larger perquisites then ever. The priestly families then went over *en masse*. How far the older sacrificial rules resembled the levitical law we do not know, but in the canons of Sahak, *c.* 430, the priests already receive the levitical portions of the victims; and we find that animals are being sacrificed every Sunday, on the feast days which at first were few, in fulfilment of private vows, in expiation of the sins of the living, and still more of those of the dead. No one might kill his own meat and deprive the priest of his due; but this rule did not apply to the chase. The earliest Armenian rituals contain ample services for the conduct of an *agapē* (*q.v.*) or love feast held in the church off sacrificial meat. The victim was slaughtered by the priest in the church porch before the crucifix, after it had been ritually wreathed and given the holy salt, by licking which it appropriated a sacramental purity or efficacy previously conveyed into the salt by exorcisms and consecration. In the canons of Sahak the priest is represented as eating the sins of the people in these repasts.

[1] If a forgery, why should this letter have been assigned to Macarius, a comparatively obscure person whose name is not even found in the menaea of the Eastern church? But convincing proof of its authenticity lies in Macarius' reference to himself as merely archbishop of Jerusalem, and his avowal that he was unwilling to advise the Armenians, "being oppressed by the weakness of the authority conceded him by the weighty usages of the church." Jerusalem was only allowed to rank as a patriarchate in 451, and the seventh canon of Nice subordinated the see to that of Caesarea in Palestine. To this decree Macarius somewhat bitterly alludes.

It is easy to underrate the importance in religion of a change of names. The old sacrificial hymns were probably obscene and certainly nonsensical, and the substitution for them of the psalms, and of lections of the prophets and New Testament, was an enormous gain. We do not know precisely how the eucharistic rite was adjusted to these sacrificial meals; but, in the canons of Sahak, 1 Cor. xi. 17-34 is interpreted of these meals, which were known as the Dominical (suppers). The Eucharist was, therefore, long associated with the *matal* or animal victim, and only in the 8th century do we hear of an interval of time being left between the fleshly and the spiritual sacrifices, as the two rites were then called. The Basilian service of the Eucharist was used in the 5th century, but superseded later on by a Byzantine rite which will be found translated in F. E. Brightman's *Eastern Liturgies*. The Eucharist was no doubt the one important sacrifice in the minds of the clergy who had attended the schools of Constantinople and Alexandria; yet the heart of the people remained in their ancient blood-offerings, and as late as the 12th century they were prone to deny that the mass could expiate the sins of the dead unless accompanied by the sacrifice of an animal. Perhaps even to-day the worst fate that can befall a villager after death is to be deprived, not of commemoration in the mass, but of the victim slain for his sins. The keenest spiritual weapon of the Armenian priest was ever a threat not to offer the *matal* for a man when he died.

Another survival in the Armenian church was the hereditary priesthood. None but a scion of a priestly family could become a deacon, elder or bishop. Accordingly the primacy remained in the family of Gregory until about 374, when the king Pap or Bab murdered Nerses, who had been ordained by Eusebius of Caesarea (362–370) and was over-zealous in implanting in Armenia the canons about celibacy, marriage, fasting, hospices and monastic life which Basil had established in Cappadocia. It may be remarked that Gregory's own family was a cadet branch of the Arsacid kin which had occupied the thrones of Persia, Bactria, Armenia and Georgia. His primacy therefore was in itself a survival of an earlier age when king and priest were one. He was in fact a *rex sacrificulus*, and later on, when the Arsacid dynasty fell in Armenia *c.* A.D. 428, the Armenian catholicus became the symbol of national unity and the rallying-point of patriotism. The line of Gregory was restored in 390 in the person of Isaac or Sahak, son of Nerses, and his patriarchate was the golden age of Armenian literature. But by this time the autonomy of the Armenian church was thoroughly established. On the death of Nerses the right of saying grace at the royal meals, which was the essence of the catholicate, was transferred by the king, in despite of the Greeks, to the priestly family of Albianus, and thenceforth no Armenian catholicus went to Caesarea for ordination. The ties with Greek official Christendom were snapped for ever, and in subsequent ages the doctrinal preferences of the Armenians were usually determined more by antagonism to the Greeks than by reflection. If they accepted the council of Ephesus in 430 and joined in the condemnation of Nestorius, it was rather because the Sassanid kings of Persia, who thirsted for the reconquest of Armenia, favoured Nestorianism, a form of doctrine current in Persia and rejected in Byzantium. But later on, about 480, and throughout the following centuries, the Armenians rejected the decrees of Chalcedon and held that the assertion of two natures in Christ was a relapse into the heresy of Nestor. From the close of the 5th century the Armenians have remained monophysite, like the Copts and Abyssinians, and have only broken the record with occasional short interludes of orthodoxy, as when in 633 the emperor Heraclius forced reunion on them, under a catholicus named Esdras, at a council held in Erzerum. Even then all parties were careful not to mention Chalcedon. The march of Arab conquest kept the Armenians friendly to Byzantium for a few years; but in 718 the catholicus John of Odsun ascended the throne and at the council of Manazkert in 728 repeated and confirmed the anathemas against Chalcedon and the tome of Leo, that had been first pronounced by the catholicus Babken in 491 at a synod held in Valarshapat by the united Armenian, Georgian or Iberian, and Albanian churches.

The Armenians marked their complete disruption with the Greeks by starting an era of their own at the synod of Dvin. The era began on the 11th of July 552, and their year is vague, that is to say, it does not intercalate a day in February every fourth year, like the Julian calendar.

The two churches of Iberia and Albania at first depended on the Armenian for ordination of their primates or *catholici*, and in large part owed their first constitution to Armenian missionaries sent by Gregory the Illuminator. The Iberians still reverence as saints the Armenian doctors of the 5th century, but as early as 552 they began to resent the dictatorial methods of the Armenians, as well might a proud race of mountaineers who never wholly lost their political independence; and they broke off their allegiance to the Armenian see very soon afterwards, accepted Chalcedon and joined the Byzantine church. The Albanians of the Caucasus were also converted in the age of Gregory, early in the 4th century, and were loyal to the Armenians in the great struggle against Mazdaism in the 5th; but broke away for a time towards 600, and chose a patriarch without sending him to Armenia for ordination. Eventually this interesting church was engulfed by the rising tide of Mahommedan conquest, but not before one of their bishops, named Israel, had converted (677–703) the Huns who lay to the north of the Caspian and had translated the Bible and liturgies into their language. If the Albanian and Hunnish versions could be found, they would be of the greatest linguistic importance.

The mother church of Armenia was established by Gregory at Ashtishat in the province of Taron, on the site of the great temple of Wahagn, whose festival on the seventh of the month Sahmi was reconsecrated to John the Baptist and Athenogenes, an Armenian martyr and Greek hymn writer. The first of Navasard, the Armenian new year's day, was the feast of a god Vanatur or Wanadur (who answered to Ζεὺς ξένιος) in the holy pilgrim city of Bagawan. His day was reconsecrated to the Baptist, whose relics were brought to Bagawan. The feast of Anahite, the Armenian Venus and spouse of the chief god Aramazd, was in the same way rededicated to the Virgin Mary, who for long was not very clearly distinguished by the Armenians from the virgin mother church. The old cult of sacred stones and trees by an easy transition became cross-worship, but a cross was not sacred until the Christ had been, by priestly prayer and invocation, transferred into it.

What was the earliest doctrine of the churches of Armenia? If we could believe the fathers of the 5th and succeeding centuries Nicene orthodoxy prevailed in their country from the first; and in the 5th century they certainly chose for translation the works of orthodox fathers alone, such as Chrysostom, Basil, Gregory of Nyssa and Gregory Nazianzen, Cyril of Jerusalem and Cyril of Alexandria, Athanasius, Julius of Rome, Hippolytus, Irenaeus, avoiding Origen and other fathers who were becoming suspect. However, we do hear of versions of Nestorian writers like Diodore of Tarsus being in circulation, and the *Disputation* of Archelaus proves that the current orthodoxy of eastern Armenia was Adoptianist, if not Ebionite in tone. The Persian Armenians as late as the 6th century had not heard of the faith of Nicaea, and only then received it from the catholicus Babken. They sent a copy of their old creed to Babken, and it closely resembles the Adoptianist creed of Archelaus, the gist of which was that Jesus, until his thirtieth year, was a man mortal like other men; then, because he was righteous above all others, he was promoted to the honour and name of Son of God. He received the title by grace, but was not equal to God the Father. Because the Spirit worked with him, he was able to vanquish Satan and all desires, and because of his righteousness and good works he was made worthy of grace and became a Temple of God the Word, which came down from heaven in Jordan, dwelt in him and through him wrought miracles. From such a standpoint the baptism of Jesus was the moment of the divine incarnation. The man righteous above all others was then reborn of the Spirit, was illuminated, was spiritually anointed, became the Christ and Son of God. In effect the fathers of the Armenian church often fell back into such language, far removed as it is from orthodoxy; and they emphasized the importance of the baptismal feast of the Epiphany on the 6th of January by refusing to accept the feast of the physical birth of the 25th of December. As late as 1165 their patriarch Nerses defends the Armenian custom of keeping Christmas on the 6th of January on the express ground that as he was born after the flesh from the Virgin, *so he was born by way of baptism from the Jordan.* The custom from the first, he says, had been to feast on one and the same day the two births, much as they differed in sacramental import and in point of time. We see how deep the early Adoptianism had struck its roots, when a primate of the 12th century could still appeal to the baptismal regeneration of Jesus. The same Nerses held that the second Adam, Jesus Christ, received a new body and nature and the sevenfold grace of the Spirit *in the Jordan.* The Armenian doctors also taught that John by laying hands on Jesus and ordaining him at his baptism sacramentally transferred to him the three graces or *charismata* of kingship, prophecy and priesthood which had belonged to ancient Israel. After baptism, if not before, the flesh of Christ was incorruptible. It consisted of ethereal fire, and he was not subject to the ordinary phenomena of digestion, secretions and evacuations.

Monastic institutions were hardly introduced in Armenia before the 5th century, though Christian rest-houses had been erected along the high-roads long before and are mentioned in the *Disputation* of Archelaus. The Armenians called them *wanq*, and out of them grew the monasteries. The monks were, strictly speaking, penitents wearing the cowl, and not allowed to take a part in church government. This belonged to the elders. At first there was no separate episcopal ordination, and the one rite of elder or priest (Armen. *Qahanay*, Heb. *cohen*) sufficed. There were also deacons, half-deacons and readers. Besides these there was a class of *wardapets* or teachers, answering to the *didascalos* of the earliest church, whose province it was to guard the doctrine and for whom no rite of ordination is found in the older rituals.

A few other peculiarities of Armenian church usage or belief deserve notice. In baptism the rubric ordains that the baptized be plunged three times in the font in commemoration of the entombment during three days of the Lord. In the West trine immersion was generally held to be symbolic of the triune name of "Father, Son and Holy Ghost." This name the Armenians have used, at least since the year 700; before which date their fathers often speak of baptism into the death of Christ as the one essential. As late as about 1300 a traveller hostile to the Armenians reported to the pope that he had witnessed baptisms without any trinitarian invocation in as many as three hundred parish churches.

The paschal lamb is now eaten on Sunday, but until the 11th century, and even later, it was eaten with the Eucharist at a Lord's Supper celebrated on the evening of Maundy Thursday after the rite of *pedilavium* or washing of feet. On the morning of the same day the penitents were released from their fast.

The rite of extreme unction was introduced in the crusading epoch, although it was already usual to anoint the bodies of dead priests. The worship of images never seems to have taken root among Armenians; indeed they supplied the Greek world with iconoclast soldiers and emperors. The worship of crosses into which the Spirit or Christ had been inserted by the priest must have satisfied the religious needs of a people who, save in architecture, showed little artistic faculty. In their older rituals we find a rite for blessing a painted church, but no word of statues. Frescoes in their churches are rare, and mostly too high up for veneration to be paid to them.

On certain days the cross was washed, and the water in which it had been washed was a sovereign charm for curing sickness in men and animals and for bringing fertility to the land.

In the older rituals we find a rite of *exhomologesis*, for restoring those who had sinned after baptism. It was a medicine of sin that could only be used once and not a second time. In form it is a rehearsal of the first baptismal rite, but with omission of the water. It involved like the first rite open confession and repentance, and absolution by the church. In a later and less rigorous age this rite was abridged and adjusted to constant

repetition, in such wise that a sinner could be restored to grace not once only, but as often as the clergy chose to accept his repentance and confession. Thus the whole development of the penitentiary system is traceable in the MSS.

The confession of a dying man might be taken by any layman present, and written down in order to be shown to the priest when he arrived. It then was the duty of the latter to supplicate for his forgiveness, and administer to him the Eucharist.

The clergy of all grades were originally married. The parish priests, or white clergy, are so still, except some of the Latinizing ones. But since the 12th century, or even earlier, the higher clergy, *i.e.* patriarchs and bishops, have taken monkish vows and worn the cowl.

There were abortive attempts to unite the Armenian church with the Byzantine in the 9th century under the patriarch Photius, and again late in the 12th under the emperor Manuel Comnenus, when a joint council met at Romkla, near Tarsus, but ended in nothing (A.D. 1179). Neither could the Armenians keep on good terms even with the Syriac monophysites. From the age of the crusades on, the Armenians of Cilicia, whose patriarch sat at Sis, improved their acquaintance with Rome; and more than one of their patriarchs adopted the Roman faith, at least in words. Dominican missions went to Armenia, and in 1328 under their auspices was formed a regular order called the United Brethren, the forerunners of the Uniats of the present day, who have convents at Venice and Vienna, a college in Rome and a numerous following in Turkey. They retain their Armenian liturgies and rites, pruned to suit the Vatican standards of orthodoxy, and they recognize the pope as head of the church.

The patriarchs of Great Armenia first resided at Ashtishat, on the Araxes. From 478 to 931 they occupied Dvin in the same neighbourhood, then Aghthamar, an island in the Lake of Van, 931–967, the city of Ani, 992–1054, where are still visible the magnificent ruins of their churches and palaces. Since 1441 the chief catholicus has sat at Echmiadzin, the convent of Valarshapat, now part of Russian Armenia. A rival catholicus, with a small following, still has his cathedral and see at Sis. The catholicus of Valarshapat is nominally chosen by all Armenians. A synod of bishops, monks and doctors meets regularly to transact under his eye the business of the convent and the oecumenical affairs of the church; but its decisions are subject to the veto of a Russian procurator. There are Armenian patriarchs, subject to the spiritual jurisdiction of Echmiadzin, in Constantinople and Jerusalem. In the latter place the Armenians occupy a convent on Mount Sion, and keep up in the churches of the Sepulchre and of Bethlehem their own distinct rites and feasts, the only ones there which at all resemble those of the 4th century.

The following list of councils was compiled by John, catholicus about the year 728, and read at the council of Manazkert, when the dogmatic and disciplinary attitude of the Armenian church was defined once and for all:—

1. In twentieth year of catholicate of Gregory and thirty-seventh of Trdat, the king, on return of Aristaces from council of Nice, bringing the Nicene creed and canons.

2. Council held by St Nerses on his return from the council of the 150 fathers at Constantinople against Macedonius.

3. Held by St Sahak and Mesrop on receipt of letters from Proclus and Cyril after the council of Ephesus, when the "Glory in the Highest" was adopted. Held against Nestorianism.

4. Held by Joseph, disciple of Mashdotz (Mesrop) and St Sahak, in Shahapiwan in the sixth year of King Yazkert (*i.e.* Yazdegerd) of Persia, for the regulation of the church. Forty bishops present. (The Massalians were anathematized.)

5. Held by Babken, catholicus, in the City-plain (*i.e.* Dvin), in the 18th year of King Kavat (*i.e.* Kavadh), against the heresy of Acacius and Barsuma (Bar-sauma), the friends of Nestorius. The true (Nicene) faith was sent to the Armenians of the farther East (shortly afterwards a slightly different creed was adopted, identical with a pseudo-Athanasian symbol used by Evagrius of Pontus and given in Greek in Patr. Gr. xxvi. Col. 1232).

6. At the beginning of the Armenian era, held by Nerses in Dvin, in the fourth year of his catholicate, in the fourteenth of Chosroes' reign and in the fourteenth of Justinian Caesar. Held against Chalcedon, uniting the Baptism and Christmas feasts on the 6th of January (Epiphany), declaring for monophysitism, and adopting in the *Trisagion* the words "who wast crucified for us." This settlement lasted for about seventy-four years.

7. After the retaking of Jerusalem and recovery of the Cross from the Persians in the eighteenth year of his reign, Heraclius called a mixed council at Karin (Theodosiopolis) of Greeks and Armenians under Ezr (Esdras), catholicus, at which the preceding council of Dvin was cursed, its reforms repudiated and the confession of Chalcedon adopted. This remained the official attitude of the Armenian church until the catholicate of Elias (703–717). John, catholicus, denies to Ezr's meeting the name of council, and so makes his own the seventh.

8. Under John, catholicus, in Manazkert, in the one hundred and seventieth year of the Armenian era (=A.D. 728) under the presidency of Gregory Asharuni Chorepiscopos (Gregory Asheruni). All the Armenian bishops attended, as also the metropolitan of Urhha (Edessa), Jacobite bishops of Gartman, of Nfrkert, Amasia, by command of the archbishop of Antioch. Chalcedon was repudiated afresh, union with the Jacobites instituted, use of water and leaven in the Eucharist condemned, the five days' preliminary fast before Lent restored, Saturday as well as Sunday made a day of feasting and synaxis, any but the orthodox excluded from the Maundy Thursday Communion, the first communion of the new catechumens; union of the Baptismal and Christmas feasts was restored, and the faithful forbidden to fast on Fridays from Easter until Pentecost. In general these rules have been observed in the Armenian church ever since.

For list of authorities on the Armenian church see the works enumerated at the end of ARMENIAN LANGUAGE AND LITERATURE. For the relations of the Armenian church to the Persian kings see PERSIA: *Ancient History*, section viii. §§ 2 and 3. (F. C. C.)

ARMENIAN LANGUAGE AND LITERATURE. The Armenian language belongs to the group called Indo-European, of which the Iranic and Indic tongues formed one branch, and Greek, Albanian, Italian, Celtic, Germanic and Baltic-Slavonic dialects the other great branch. Unlike most of these, Armenian lost its genders long before the year A.D. 400, when the existing literature begins. Modern Persian similarly has lost gender; and in both cases the liberation must have been due to attrition of other tongues which had a different system of gender or none at all. So the Armenians were ever in contact on the north with the Iberians of the Caucasus who had none, and with the Semitic races on the south and east which had other ways of forming genders than the Indo-European tongues. *Language.*

From the original Armenian stock can be readily distinguished a mass of Old and Middle Persian loan-words. These are so numerous that for a time Armenian was classed as an Iranian tongue. For more than a thousand years, say until A.D. 640, Armenia was an appanage of the realm of the Persians and Parthians. Until A.D. 428 the Armenian throne was occupied by a younger branch of the Arsacid dynasty that ruled in Persia until the advent of the Sassanids (*c.* A.D. 226), and the internal polity and court administration of Armenia were modelled on the Persian or Parthian. Accordingly over 200 proper and personal names in Armenia were Old Persian, as well as 700 names of things. If we count in the derivative forms of these words we get at least 2000 Old Persian words. Often the same Persian word was borrowed twice over in an earlier and later form at an interval of centuries, just as in English we inherit a word direct or have taken it from Latin, and have also assimilated from French a later form of the same. The Persian influence in Armenian was already strong as early as 400 B.C., when Xenophon used a Persian interpreter to converse. In some of the Armenian villages they answered him in Persian. The Persian loan-words already present in Armenian as early as A.D. 400 mirror the earlier political and social life of Armenia. Thus many of their kings and nobles had Persian names; Persian also were most

words used in connexion with horses and the chase, with war and army, with dress, trade and coinage, calendar, weights and measures, with court and political institutions, with music, medicine, school, education, literature and the arts. Many everyday words were of the same origin, *e.g.* the words for village, desert, building and build, need, rich or liberal, arm (of body), rod or goad, face, opposite, wicked, unfriendly, discontented, difficult, daughter, eulogy, a youth, wary, enjoy, unhappy, volition, voluntary, unwilling, blind, cautious, blood-kin, coquet with, slumber, humble, mad, grace or favour, memory or attention, grandfather, old woman, prepared, duty, necessary, end, endless, superior, confident, mistake, warmth, heat, glory. The language of their old religion was mainly Persian, but in the 4th century they derived numerous ecclesiological words from the Syrians, from whom by way of Edessa and Nisibis Christianity penetrated eastern Armenia. The language of the garden and the names of plants were also Persian. They had their own numerals, but the words for one thousand and for ten thousand are Persian.

Yet more indicative of the extent of the Persian influence is the adoption of the adjectival ending *-akan* and *-zan*, added to purely Armenian words; also of the preposition *ham*, answering to *con* in " conjoin," " conspire," added to purely Armenian words, as in *hambarnam*, I take away, and *hamboir*, a kiss, a word which, strange to say, the Iberians in turn borrowed from the Armenians. From Persia also the Armenians took their names for surrounding races, *e.g. Tatshik* or *Tajik*, first for Arab and then for Turk, *Ariq* for Persians, *Kapkoh* for Caucasus, *Hrazdan*, *Vaspuragan*, &c. The Armenians call themselves *Hay*, plural *Hayq*; their country *Hayasdan*. The Iberians they called *Virq* or *Wirq* (where *q* marks the plural), the Medes *Marq*, the Cappadocians *Gamirq* (Cimmerians), the Greeks *Yûnes* or Ionians; Ararat they call *Masis*, the Euphrates the *Aradsan*, the Tigris *Teglath*, Erzerum is *Karin*, Edessa *Urhha*, Nisibis *Mdsbin*, Ctesiphon *Tizbon*, &c.

When the Persian and other loan-words are removed, a stock remains of native words and forms governed by other phonetic laws than those which govern the Aryan, *i.e.* Indian and Iranic, branch of the Indo-European tongues. Armenian appears to be a half-way dialect between the Aryan branch and Slavo-lettic. Much, however, in Armenian philology remains unexplained. For example the plural of nouns, pronouns and the first and second persons plural of verbs are all formed by adding a *q* or *k*, which has no parallel in any Indo-Germanic tongue. The genitive plural again is formed by adding a *tz* or *c*, and the same consonant characterizes the composite aorist and the conjunctive. In all three cases it is unexplained. In the verbs the termination *m* for the first singular at once explains itself, and the *n* of the third plural is the Indo-Germanic *nti*. But not so the second person singular ending in *s*, *e.g. berem*, I bear, *beres*, thou bearest. This has a superficial likeness to the I.-G. *esi* in *bheresi*, " thou bearest." Yet we should expect the *s* between vowels to vanish, and give us in Armenian *berê*. Perhaps, therefore, an old variant of *esi*, similar to the Greek ἐσσί, lies behind the Armenian *es*, thou art, and the *es* in *beres*, thou bearest. In any case it is clear that many of the oldest forms which Armenian shared with other Indo-Germanic dialects were lost and replaced by forms of which the origin is obscure. Perhaps a closer study of Mingrelian and Georgian will explain some of these peculiarities, for these and their cognate tongues must have had a wider range in the 7th and 8th centuries B.C. than they had later when clear history begins. The attempts made by S. Bugge to assimilate Old Armenian to Etruscan, and by P. Jensen to explain from it the Hittite inscriptions, appear to be fanciful. There is a large Semitic influence traceable in Armenian due to their early contact with the Syriac-speaking peoples to the south and east of them, and later to the Arab conquest. Much remains to be done in the way of collecting Armenian dialects, for which task there are written materials as far back as the 12th century over and above the work to be done by an intelligent traveller armed with a phonograph. Two main dialects of Armenian are distinguishable to-day, that of Ararat and Tiflis, and that of Stambul and the coast cities of Asia Minor. The latter is much overlaid with Tatar or Turkish words, and the Tatar order of words distinguishes the modern Armenian sentence from the ancient.

It remains to say that classical Armenian resembles rather the modern idiom of Van than of western Armenia. It was a plastic and noble language, capable of rendering faithfully, yet not servilely, the Greek Bible and Greek fathers. Often the Armenian translators, and especially after the 5th century, rendered word for word, preserving the order of the Greek. This literalness, though unpleasing from a literary standpoint, gives to many of their ancient versions the value almost of a Greek codex of the age in which the version was made. The same literalness also characterizes their translations from Syriac.

The Armenians had a temple literature of their own, which was destroyed in the 4th and 5th centuries by the Christian clergy, so thoroughly that barely twenty lines of it survive in the history of Moses of Khoren (Chorene). **Literature.**

Their Christian literature begins about 400 with the invention of the Armenian alphabet by Mesrop. This was probably an older alphabet to which Mesrop merely added vowels; but, in order to pacify the Greek ecclesiastics and the emperor Theodosius the Less, the Armenians concocted a story that it had been divinely revealed. Once their alphabet perfected, the catholicus Sahak formed a school of translators who were sent to Edessa, Athens, Constantinople, Alexandria, Antioch, Caesarea in Cappadocia, and elsewhere, to procure codices both in Syriac and Greek and translate them. From Syriac were made the first version of the New Testament, the version of Eusebius' History and his Life of Constantine (unless this be from the original Greek), the homilies of Aphraates, the Acts of Gurias and Samuna, the works of Ephrem Syrus (partly published in four volumes by the Mechitharists of Venice). They include the commentaries on the *Diatessaron* and the Paulines, Laboubna and History of Addai, the Syriac canons of the Apostles.

From the original Greek were rendered in the 5th century the following authors and works. An asterisk is prefixed to those which have been printed:—*Eusebius' *Chronicon*; *Philo's lost commentaries on Genesis and Exodus, and his lost treatises on Providence and Animals, as well as a great number of his works still preserved in Greek; *the entire Bible (the New Testament is a recension after Antiochene Greek texts of an older version made from the oldest Syriac text); *the Alexander romance of the pseudo-Callisthenes; **Epistles* and *Acts* of Ignatius of Antioch; *many homilies of Gregory Thaumaturgus; *Athanasius (a large number of works, many of them wrongly attributed); Irenaeus, *Adversus Haereses* and *Ad Marcianum* (recently found); *Hippolytus' commentaries on the Song of Songs and Daniel, and many fragments; *Timotheus' life of Athanasius; Theophilus of Alexandria, various homilies; *Eusebius of Gabala or Severianus, fifteen Homilies; *Cyril of Jerusalem, *Catecheses* and *Letter to Constantine*; **Wisdom of Ahikar*; *the *Apology* of Aristides; Gregory of Nazianzus, thirty-four Homilies; *Nonnus' work on Gregory (perhaps a version of 6th century); Basil of Caesarea, **Hexaëmeron*, fifteen Homilies on faith, epistle to Terentius, ascetic writings and canons, on the Holy Spirit, to Cledonius, &c. Helladius of Caesarea's life of Basil; Gregory of Nyssa's treatise on the Beatitudes, and many other homilies, Commentaries on Song of Songs, *On Human Nature (Nemesius), panegyrics on sundry Martyrs, and other works (but some of these versions belong to the beginning of the 8th century); Epiphanius of Salamis, Commentary on the Gospels, **On weights and measures*, **Physiologus*, canons and many homilies; Evagrius of Pontus, Homilies and Ascetic works, Letters to Melania, &c.; John Chrysostom, *Homilies and Prayers, in very beautiful language; *Proclus, patriarch of Constantinople, many homilies; *Nilus the Ascete, *On the Eight Spirits of Evil*; *Josephus, *On the Jewish War*; Dionysius of Alexandria, **Against Paul of Samosata* and other fragments: Acacius, bishop of Melitene, **Letters* to Sahak; Julius of Rome (fragments); Zenobius, Homilies (? from Syriac); the *History* of Julius Africanus was perhaps also translated in this century, but it is lost. To the 5th century belong the versions of the

Nicene canons, of which the Armenian text as preserved is barely intelligible, of the eucharistic rites called of *Basil, *Chrysostom, *Ignatius and others; also the *Hours or Breviary, the *Rites of Ordination, Baptism, of the making and release of Penitents, of Epiphany, and perhaps the many rites of animal sacrifice, for these are partly originals, partly versions of lost Greek texts. A mass of martyrs' acts were also rendered in this century, including parts of the lost collection made by Eusebius. Among these the **Acts and Apology* of Apollonius restore a lost 2nd-century text. The **Canons* of Sahak also purport to be translated from a Greek original about the year 330.

The Armenians were so busy in this century translating Greek and Syriac fathers that they have left little that is original. Still a number of historical works survive: *Faustus of Byzantium relates the events of the period A.D. 344–392 in a work instinct with life and racy of the soil. It was perhaps first composed in Greek, but it gives a faithful picture of the court of the petty sovereigns of Armenia, of the political organization, of the blood feuds of the clans, of the planting of Christianity. Procopius preserves some fragments of the Greek.

The **History of Taron*, by Zenobius of Glak, is a somewhat legendary account of Gregory the Illuminator, and may have been written in Syriac in the 5th, though it was only Armenized in a later century.

*Elisaeus Wardapet wrote a history of Wardan (Vardan), and of the war waged for their faith by the Armenians against the Sassanids. He was an eye-witness of this struggle, and gives a good account of the contemporary Mazdaism which the Persians tried to force on the Armenians. *Lazar of Pharp wrote a history embracing the events of the 5th century up to the year 485, as a continuation of the work of Faustus.

*A history of St Gregory and of the conversion of Armenia by Agathangelus is preserved in Greek, Armenian and Arabic. The Arabic edited by Professor Marr of St Petersburg seems to be the oldest form of text. The Greek is a rendering of the Armenian. It is a compilation, and the second part which contains the *Acts* of Gregory and of St Rhipsima seems wholly legendary. The Greek and Armenian texts were edited together by Lagarde.

*The *History of Armenia* by Moses of Khoren (Chorene) relates events up to about the year 450. It is a compilation, devoid of historical method, value or veracity, from all sorts of previous authors, mostly from those which already existed in an Armenian dress. Some critics put down the date of composition as low as about 700, and it was certainly retouched in the late 6th century.

*A long volume of rhetorical exercises, based on Aphthonius, is also ascribed to Moses of Khoren, and appears to be of the 5th century. The *geography which passes under his name may belong to the 7th century. Various homilies of Moses survive, as also of Elisaeus.

Gorium wrote in this century a **Life of Mesrop*, and Eznik a **Refutation of the Sects*, based largely on antecedent Greek works. The sects in question are Paganism, Mazdaism, Greek Philosophy and Manicheism. A volume of *homilies under the name of Gregory the Illuminator, but not his, also belongs to this century, and a series of ascetic discourses attributed to John Mandakuni, who was patriarch 478–500.

Of the 6th and 7th centuries few works survive except anonymous versions of the **Acts of Thomas* (perhaps from the Syriac), of the **Acts of Peter and Paul*, *of John (pseudo-Prochorus), *of Bartholomew, and of other apostles; also of *the Acts of Paul and Thekla, *of Titus, *of the Protevangel, *of the Testaments of the patriarchs, of the **Gospel of Nicodemus*, or *Acts of Pilate*, of the **Book of Adam*, of the **Deaths of the Prophets*, of the **History of Baruch*, of the *Apocalypses of Paul and of the Virgin Mary, of the *Acts of Sylvester, and of an enormous number of other similar apocryphs. Some of these may be of the 5th century. Two volumes of these apocryphs of the Old and New Testaments have recently been published at Venice. To these centuries belong also the versions of the Acts of the council of Ephesus, of Gangra, Laodicea and of other councils. To the late 7th century belong the *calendarial works of Ananiah of Shirak, who also has left a **chronicon* compiled from Eusebius, Andreas of Crete, Hippolytus and other sources. In the **Letter-book of the Patriarchs*, lately printed at Tiflis, are to be found a number of controversial monophysite tracts of these and the succeeding three centuries, important for church history. It includes a mass of documents relative to the churches of Iberia and Albania. The chief literary monument of the 7th century is the history of the wars of Heraclius and of the early Mahommedan conquests in Asia Minor, by the bishop Sebeos, who was an eye-witness. The *history of the Albanians of the Caucasus, by Moses Kalankatuatzi, also belongs to the end of this century. To the middle of the 7th century also belong the translations of Aristotle's treatises **On the Categories*, and **On Interpretation*, and of *Porphyry's *Isagogē*, as well as of voluminous Greek commentaries on these books; the version of the *Grammar of Dionysius Thrax and an incomplete Euclid. The translator was one David called the Invincible, who also wrote monophysite tracts. At the end of this 7th century one Philo of Tirak is supposed to have made the version of the *History of Socrates, unless indeed it was made earlier. To this century also seems to belong the Armenian version of a *history of the Iberians, by Djuansher, a work full of valuable information.

The early 8th century was a time of great literary activity. Gregory Asheruni wrote an important *commentary on the Jerusalem Lectionary, and his friend *John the catholicus (717–728) commentaries on the other liturgical works of his church; he also collected all existing canon law, Greek or Armenian, respected in his church, wrote *against the Paulicians and Docetae, and composed many beautiful hymns. *Leoncius the priest has left a history of the first caliphs, and Stephanus, bishop of Siunik, translated the *controversial works of Cyril of Alexandria (whose *Glaphyra* and commentaries, however, seem to have been translated at an earlier period). He also translated the works of Dionysius the Areopagite, commented on the Armenian breviary and wrote hymns.

In the 9th century Zachariah, catholicus, the correspondent of Photius, wrote many eloquent homilies for the various church feasts. Shapuh Bagratuni wrote a history of his age, now lost. Mashtotz, catholicus, collected in one volume the Armenian rituals.

In the 10th century (*c.* 925) the catholicus John VI. issued his *history of Armenia, and Thomas Artsruni a *history of his clan carried up to the year 936. Ananias of Mok (943–965) wrote a great work against the Paulicians, unfortunately lost. Chosroes wrote a *commentary on the eucharistic rites and breviary, *Mesrop a history of Nerses the Great; *Stephen of Asolik wrote a history of the world, and a commentary on Jeremiah; *Gregory of Narek his famous meditations and hymns; Samuel Kamrdjtsoretzi a commentary on the Lectionary based on Gregory Asheruni.

In the 11th century the catholicus Gregory translated many Acts of Martyrs, and John Kozerhn wrote a history, now lost, as well as a work on the Armenian calendar; Stephen Asolik a *history of Armenia up to the year 1004; *Aristaces of Lastiverd a valuable history of the conquest of Armenia by the Seljuk caliphs. We may also mention a *monophysite work against the Greek doctor Theopistus by Paul of Taron; *letters and poems of Gregory Magistros, who also was the translator of the **Laws*, *Timaeus* and other dialogues of Plato.

The 12th century saw many remarkable writers, mostly in Cilician Armenia, viz. Nerses the Graceful (d. 1165), author of an **Elegy* on the taking of Edessa, of *voluminous hymns, of long *Pastoral Letters and Synodal orations of value for the historian of eastern churches. *Samuel of Ani composed a chronicle up to 1179. Nerses of Lambron, archbishop of Tarsus, left a *Synodal oration, a *Commentary on the liturgy, &c., and his contemporary Gregory of Tlay an **Elegy* on the capture of Jerusalem, and various *dogmatic works. In this century the *history of Michael the Syrian was translated; Ignatius and Sargis composed *commentaries on Luke and *the catholic epistles, and *Matthew of Edessa a valuable history of the years 952–1136,

continued up to 1176 by Gregory the priest. Mechithar (Mekhitar) Kosh (d. 1207) wrote an elegant **Book of Fables*, and compiled a *corpus of civil and canon law (partly from Byzantine codes).

In the 13th century the following works or authors are to be noticed:—*history of Kiriakos of Ganzak, which contains much about the Mongols, Georgians and Albanians; *Malakia the monk's history of the Tatars up to 1272; *Chronicle of Mechithar of Ani (fragmentary); *Vahram's rhymed chronicle of the kings of Lesser Armenia; *history of the world, by Vartan, up to 1269. In this century mostly falls the redaction of a large fable literature, recently edited in three volumes by Professor Marr of St Petersburg.

14th century: *history of Siunik, by Stephen Orbelian, archbishop of that province 1287–1304; *Sempat's chronicle of Lesser Armenia (952–1274), carried on by a continuator to 1331; *Mechithar of Airivanq, a chronography; *Hethoum's account of the Tatars, and chronography of the years 1076–1307. John of Orotn (d. 1388) compiled commentaries on John's gospel and the Paulines, and wrote homilies and monophysite works; his disciple Gregory of Dathev (b. 1340) compiled a **Summa theologiae* called the *Book of Questions*, in the style of the *Summa* of Aquinas, which had been translated into Armenian *c.* 1330, as were a little later the **Summa* of Albertus and works of other schoolmen.

15th century: **History of Tamerlane*, by Thomas of Medsoph, carried up to 1447.

17th century, Araqel of Tabriz wrote a *history of the Persian invasions of Armenia in the years 1602–1661.

In the above list are not included a number of medical, astrological, calendarial and philological or lexicographic works, mostly written during or since the Cilician or crusading epoch. The hymns used in Armenian worship rarely go back to the 5th century; and they were still few in number and brief in length when Nerses the Graceful and his contemporaries more than doubled their number and bulk in the 12th century. Most Armenian poems embody acrostics, and their poets began to rhyme in the 8th century or thereabouts. Since the 15th century a certain number of profane poets have arisen, whose work is less jejune on the whole than that of the hymn and canticle writers of an earlier age. Gregory Magistros (d. 1058) abridged the whole of the Old and New Testaments in a *rhyming poem, and set a fashion to later writers. Such works as **Barlaam and Josaphat*, the **History of the Seven Sages*, the **Wisdom of Ahikar*, the **Tale of the City of Bronze*, were freely turned into verse in the 13th and following centuries.

It will be realized from the above enumeration of works written in each century that Armenian literature was purely monkish. There was no epic or romance literature; although this was not lacking in the contiguous country of Georgia, where there seem to have always been knights and ladies willing to read and keep alive a literature of poetry and narrative, not altogether suitable for monks, and more akin to Persian literature.

Other forms of faith than the orthodox had a hold in Armenia, particularly the Nestorian and the Manichean. Sundry works of Mani were translated in the year 588, but are lost. Perhaps certain works of Diodore of Tarsus survive, but the orthodox monks were so vigilant that there is little chance of finding any other monuments than those of the stereotyped orthodoxy.

The 16th century saw the first books printed in Armenian. A press was set up at Venice in 1565, and the psalms and breviary were printed. In 1584 the Roman propaganda began its issue of Armenian books with a Gregorian calendar. In the 17th century presses were working at Lembourg, Milan, Paris, Isfahan (where in 1640 a large folio of the *Lives of the Fathers of the Desert* appeared), in Leghorn, Amsterdam (where in 1664 the first edition of the Hymn-book, in 1666 the first Bible, and in 1667 the first Ritual were printed), Marseilles, Constantinople, Leipzig and Padua.

The press which has done most in printing Armenian authors is that of the Mechitharists of Venice. Here in 1836 was issued a magnificent thesaurus of the Armenian language, with the Latin and Greek equivalents of each word. At that time there was no dictionary of any language and literature to be compared with this for exhaustiveness and accuracy. There are now Armenian presses all over the world, reprinting old books or issuing new works, often translations of modern writers, English, French, Russian and German.

The chief collections of old Armenian MSS. are: at the convent of *Echmiadzin at Valarshapat; at Stambul in the library of the fathers of St Anthony; at Venice in the Mechitharist convent of San Lazaro; at the *Mechitharist convent in Vienna; in the *Royal library at Vienna; in the *Paris Bibliothèque Nationale; in the Vatican library; in the British Museum; in the *Bodleian; in the Rylands library; in the *Berlin and *Munich libraries; *in Tübingen; in St Petersburg, and in the *Lazarev institute at Moscow; at New Joulfa, the Armenian suburb of Isfahan. Private collections have been made by Mr Rendel Harris in Birmingham (presented to the university of Leiden); at Parham and elsewhere. A printed catalogue exists of those marked with an asterisk.

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ARMENTIÈRES, a town of northern France, in the department of Nord, on the Lys, 13 m. W.N.W. of Lille on the Northern railway from that city to Dunkirk. Pop. (1906) 25,408. The chief building is the hôtel de ville with a 17th-century belfry. There are communal colleges for girls and boys, a board of trade-arbitrators, a chamber of commerce and a national technical school. The town is an important centre for the spinning and weaving of flax and cotton; bleaching, dyeing and the manufacture of machinery are among the other industries. Its industrial prosperity dates from the middle ages, when, however, woollen, not cotton, goods were the staple product.

ARMET (diminutive of Fr. *arme*), a form of helmet, which was developed out of existing forms in the latter part of the 15th century. It was round in shape, and often had a narrow ridge or comb along the top. It had a pivoted or hinged vizor and nose-piece, and complete chin, neck and cheek protection, closely connected with the gorget. It is distinguished from the basinet by its roundness, and by the fact that it protects the neck and chin by strong plates, instead of a "camail" or loose collar of mail; from the salade and heaume by its close fit and skull-cap shape; and from the various forms of vizored burgonets by the absence of the projecting brim. It remained in use until the final abandonment of the complete closed head-piece.

ARMFELT, GUSTAF MAURITZ, COUNT (1757–1814), son of Charles II.'s general, Carl Gustaf Armfelt, was born in Finland on the 31st of March 1757. In 1774 he became an ensign in the guards, but his frivolity provoked the displeasure of Gustavus III. and he thought it prudent to go abroad. Subsequently, however, (1780) he met the king again at Spa and completely won the monarch's favour by his natural amiability, intelligence and brilliant social gifts. Henceforth his fortune was made. At first he was the *maître des plaisirs* of the Swedish court, but it was not long before more serious affairs were entrusted to him. He took part in the negotiations with Catherine II. (1783) and with the Danish government (1787), and during the Russian war of 1788–90 he was one of the king's most trusted and active counsellors. He also displayed great valour in the field. In 1788 when the Danes unexpectedly invaded Sweden and threatened Gothenburg, it was Armfelt who under the king's directions organized the Dalecarlian levies and led them to victory. He remained absolutely faithful to Gustavus when nearly the whole of the nobility fell away from him; brilliantly distinguished himself in the later phases of the Russian war; and was the Swedish plenipotentiary at the conclusion of the peace of Verelä. During the last years of Gustavus III. his influence was paramount, though he protested against his master's headstrong championship of the Bourbons. On his deathbed Gustavus III. (1792) committed the care of his infant son to Armfelt and appointed him a member of the council of regency; but the anti-Gustavian duke-regent Charles sent Armfelt as Swedish ambassador to Naples to get rid of him. From Naples Armfelt communicated with Catherine II., urging her to bring about by means of a military demonstration a change in the Swedish government in favour of the Gustavians. The plot was discovered by the regent's spies, and Armfelt only escaped from the man-of-war sent to Naples to seize him, with the assistance of Queen Caroline. He now fled to Russia, where he was interned at Kaluga, while at home he was condemned to confiscation and death as a traitor, and his unjustly accused mistress Magdalena Rudenschöld was publicly whipped to gratify an old grudge of the regent's. When Gustavus IV. attained his majority, Armfelt was completely rehabilitated and sent as Swedish ambassador to Vienna (1802), but was obliged to quit that post two years later for sharply attacking the Austrian government's attitude towards Bonaparte. From 1805 to 1807 he was commander-in-chief of the Swedish forces in Pomerania, where he displayed great ability and retarded the conquest of the duchy as long as it was humanly possible. On his return home, he was appointed commander-in-chief on the Norwegian frontier, but could do nothing owing to the *ordres, contre-ordres et désordres* of his lunatic master. He would have nothing to say to the revolutionaries who in 1809 deposed Gustavus IV. and his whole family. Armfelt was the most courageous of the supporters of the crown prince Gustavus, and when Bernadotte was elected resolved to retire to Finland. His departure was accelerated by a decree of expulsion as a conspirator (1811). Over the impressionable Alexander I. of Russia, Armfelt exercised almost as great an influence as Czartoryski, especially as regards Finnish affairs. He contributed more than any one else to the erection of the grand-duchy into an autonomous state, and was its first and best governor-general. The plan of the Russian defensive campaigns is, with great probability, also attributed to him, and he gained Alexander over to the plan of uniting Norway with Sweden. He died at Tsarskoe Selo on the 19th of August 1814.

See Robert Nisbet Bain, *Gustavus III.* vol. ii. (London, 1895); Elof Tegner, *Gustaf Mauritz Armfelt* (Stockholm, 1883–1887). (R. N. B.)

ARMIDALE, a town in Sandon county, New South Wales, Australia, 313 m. by rail N. of Sydney. Pop. (1901) 4249. It lies at an elevation of 3313 ft., in a picturesque mountainous district, for the most part pastoral and agricultural, though it contains some alluvial gold diggings. Antimony is found in large quantities near the town. Armidale is a cathedral town, being the seat of a Roman Catholic bishop and belonging to the joint Anglican diocese of Grafton; Armidale St Peter's, the Anglican cathedral, and St Mary's, the Roman Catholic, are both fine buildings. The town is the centre of great educational activity, its schools including the New England girls' school, St Patrick's college, the high school, the Ursuline convent and state schools. Armidale became a municipality in 1863.

ARMILLA, ARMIL or **ARMILLARY SPHERE** (from the Lat. *armilla*, a bracelet), an instrument used in astronomy. In its simplest form, consisting of a ring fixed in the plane of the equator, the *armilla* is one of the most ancient of astronomical instruments. Slightly developed, it was crossed by another ring fixed in the plane of the meridian. The first was an equinoctial, the second a solstitial armilla. Shadows were used as indices of the sun's position, in combination with angular divisions. When several rings or circles were combined representing the great circles of the heavens, the instrument became an armillary sphere. Armillae are said to have been in early use in China. Eratosthenes (276–196 B.C.) used most probably a solstitial armilla for measuring the obliquity of the ecliptic. Hipparchus (160–125 B.C.) probably used an armillary sphere of four rings. Ptolemy (*c.* A.D. 107–161) describes his instrument in the *Syntaxis* (book v. chap. i.), and it is of great interest as an example of the armillary sphere passing into the spherical astrolabe. It consisted of a graduated circle inside which another could slide, carrying two small tubes diametrically opposite, the instrument being kept vertical by a plumb-line.

From M. Blundeville's *Treatise of the first principles of Cosmography and specially of the Sphere.*

Armillary Sphere. A.D. 1636.

No material advance was made on Ptolemy's instrument until Tycho Brahe, whose elaborate armillary spheres passing into astrolabes are figured in his *Astronomiae Instauratae Mechanica.*

The armillary sphere survives as useful for teaching, and may be described as a skeleton celestial globe, the series of rings representing the great circles of the heavens, and revolving on an axis within a horizon. With the earth as centre such a sphere is known as Ptolemaic; with the sun as centre, as Copernican.

The designer of the instrument shown no doubt thought that the north pole might suitably have the same ornament as was used to mark N. on the compass card, and so surmounted it with the *fleur-de-lys*, traditionally chosen for that purpose on the compass by Flavio Gioja in honour of Charles of Anjou, king of Sicily and Naples.

Armillary spheres occur in many old sculptures, paintings and engravings; and from these sources we know that they were made for suspension, for resting on the ground or on a table, for holding by a short handle, or either for holding or for resting on a stand.

AUTHORITIES.—Tycho Brahe, *Astronomiae Instauratae Mechanica*; *M. Blundeville, his Exercises*; N. Bion, *Traité des instrumens de mathématique*; also *L'Usage des globes célestes*; Sédillot, *Mémoire sur les instrumens*; J. B. Delambre, *Histoire de l'astronomie ancienne*; R. Grant, *History of Physical Astronomy*. (M. L. H.)

ARMINIUS, the Latinized form of the name of HERMANN, or more probably ARMĪN (17 B.C.–A.D. 21), the German national hero. He was a son of a certain Segimer, a prince of the tribe of the Cherusci, and in early life served with distinction as an officer in the Roman armies. Returning to his own people he found them chafing under the yoke of the Roman governor, Quintilius Varus; he entertained for them hopes of freedom, and cautiously inducing neighbouring tribes to join his standard he led the rebellion which broke out in the autumn of A.D. 9. Heavily laden with baggage the troops of Varus were decoyed into the fastnesses of the Teutoburger Wald, and there attacked, the completeness of the barbarian victory being attested by the virtual annihilation of three legions, by the voluntary death of Varus, and by the terror which reigned in Rome when the news of the defeat became known, a terror which found utterance in the emperor's despairing cry: "Varus, give me back my legions!" Then in A.D. 15 Germanicus Caesar led the Romans against Arminius, and captured his wife, Thusnelda. An indecisive battle was fought in the Teutoburger Wald, where Germanicus narrowly escaped the fate of Varus, and in the following year Arminius was defeated. The hero's later years were spent in fighting against Marbod, prince of the Marcomanni, and in disputes with his own people occasioned probably by his desire to found a powerful kingdom. He was murdered in A.D. 21.

In 1875 a great monument to Arminius was completed. This stands on the Grotenburg mountain near Detmold. Klopstock and other poets have used his exploits as material for dramas.

Much discussion has taken place with regard to the exact spot in the Teutoburger Wald where the great battle between Arminius and Varus was fought. There is an immense literature on this subject, and the following may be consulted:—T. Mommsen, *Die Ortlichkeit der Varusschlacht* (1885); E. Meyer, *Untersuchungen über die Schlacht im Teutoburger Walde* (1893); A. Wilms, *Die Schlacht im Teutoburger Walde* (1899); F. Knoke, *Das Schlachtfeld im Teutoburger Walde* (1899); E. Dünzelmann, *Der Schauplatz der Varusschlacht* (1889); and P. Höfer, *Die Varusschlacht* (1888). For more general accounts of Arminius see: Tacitus, *Annals*, edited by H. Furneaux (1884–1891); O. Kemmer, *Arminius* (1893); F. W. Fischer, *Armin und die Römer* (1893); W. Uhl, *Das Portrait des Arminius* (1898); and F. Knoke, *Die Kriegszüge des Germanicus in Deutschland* (1887).

ARMINIUS, JACOBUS (1560–1609), Dutch theologian, author of the modified reformed theology that receives its name of Arminian from him, was born at Oudewater, South Holland, on the 10th of October 1560. Arminius is a Latinized form of his patronymic Hermanns or Hermansen. His father, Hermann Jakobs, a cutler, died while he was an infant, leaving a widow and three children. Theodorus Aemilius, a priest, who had turned Protestant, adopting Jakob, sent him to school at Utrecht, but died when his charge was in his fifteenth year. Rudolf Snellius (Snel van Roijen, 1546–1613), the mathematician, a native of Oudewater, then a professor at Marburg, happening at the time to visit his early home, met the boy, saw promise in him and undertook his maintenance and education. But hardly was he settled at Marburg when the news came that the Spaniards had besieged and taken Oudewater, and murdered its inhabitants almost without exception. Arminius hurried home, but only to find all his relatives slain. In February the same year (1575), the university of Leiden had been founded, and thither, by the kindness of friends, Arminius was sent to study theology. The six years he remained at Leiden (1576–1582) were years of active and innovating thought in Holland. The War of Independence had started conflicting tendencies in men's minds. To some it seemed to illustrate the necessity of the state tolerating only one religion, but to others the necessity of the state tolerating all. Dirck Coornhert argued, in private conferences and public disputations, that it was wrong to punish heretics, and his great opponents were, as a rule, the ministers, who maintained that there was no room for more than one religion in a state. Caspar Koolhaes, the heroic minister of Leiden—its first lecturer, too, in divinity—pleaded against a too rigid uniformity, for such an agreement on "fundamentals" as had allowed Reformed, Lutherans and Anabaptists to unite. Leiden had been happy, too, in its first professors. There taught in theology Guillaume Feuguières or Feuguereius (d. 1613), a mild divine, who had written a treatise on persuasion in religion, urging that as to it "men could be led, not driven"; Lambert Danaeus, who deserves remembrance as the first to discuss Christian ethics scientifically, apart from dogmatics; Johannes Drusius, the Orientalist, one of the most enlightened and advanced scholars of his day, settled later at Franeker; Johann Kolmann the younger, best known by his saying that high Calvinism made God "both a tyrant and an executioner." Snellius, Arminius's old patron, now removed to Leiden, expounded the Ramist philosophy, and did his best to start his students on the search after truth, unimpeded by the authority of Aristotle. Under these men and influences, Arminius studied with signal success; and the promise he gave induced the merchants' gild of Amsterdam to bear the further expenses of his education. In 1582 he went to Geneva, studied there awhile under Theodore Beza, but had soon, owing to his active advocacy of the Ramist philosophy, to remove to Basel. After a short but brilliant career there he turned to Geneva, studied for three years, travelled, in 1586, in Italy, heard Giacomo Zarabella (1533–1589) lecture on philosophy in Padua, visited Rome, and, open-minded enough to see its good as well as its evil, was suspected by the stern Dutch Calvinists of "popish" leanings. Next year he was called to Amsterdam, and there, in 1588, was ordained. He soon acquired the reputation of being a good preacher and faithful pastor. He was commissioned to organize the educational system of the city, and is said to have done it well. He greatly distinguished himself by fidelity to duty during a plague that devastated Amsterdam in 1602. In 1603 he was called, in succession to Franz Junius, to a theological professorship at Leiden, which he held till his death on the 19th of October 1609.

Arminius is best known as the founder of the anti-Calvinistic school in Reformed theology, which created the Remonstrant Church in Holland (see REMONSTRANTS), and contributed to form the Arminian tendency or party in England. He was a man of mild and liberal spirit, broadened by varied culture, constitutionally averse from narrow views and enforced uniformity. He lived in a period of severe systematizing. The Reformed strengthened itself against the Roman Catholic theology by working itself, on the one hand, into vigorous logical consistency, and supporting itself, on the other, on the supreme authority of the Scriptures. Calvin's first principle, the absolute sovereignty of God, had been so applied as to make the divine decree determine alike the acts and the destinies of men; and his formal principle had been so construed as to invest his system with the authority of the source whence it professed to have been drawn. Calvinism had become, towards the close of the 16th century, supreme in Holland, but the very rigour of the uniformity it exacted provoked a reaction. Coornhert could not plead for the toleration of heretics without assailing the dominant Calvinism, and so he opposed a conditional to its unconditional predestination. The two ministers of Delft, who had debated the point with him, had, the better to turn his arguments, descended from the

supralapsarian to the infralapsarian position, *i.e.* made the divine decree, instead of precede and determine, succeed the Fall. This seemed to the high Calvinists of Holland a grave heresy. Arminius, fresh from Geneva, familiar with the dialectics of Beza, appeared to many the man able to speak the needed word, and so, in 1589, he was simultaneously invited by the ecclesiastical court of Amsterdam to refute Coornhert, and by Martin Lydius, professor at Franeker, to combat the two infralapsarian ministers of Delft. Thus led to confront the questions of necessity and free will, his own views became unsettled, and the further he pursued his inquiries the more he was inclined to assert the freedom of man and limit the range of the unconditional decrees of God. This change became gradually more apparent in his preaching and in his conferences with his clerical associates, and occasioned much controversy in the ecclesiastical courts where, however, he successfully defended his position. The controversy was embittered and the differences sharpened by his appointment to the professorship at Leiden. He had as colleague Franz Gomarus, a strong supralapsarian, perfervid, irrepressible; and their collisions, personal, official, political, tended to develop and define their respective positions.

Arminius died, worn out by uncongenial controversy and ecclesiastical persecution, before his system had been elaborated into the logical consistency it attained in the hands of his celebrated successor, Simon Episcopius; but though inchoate in detail, it was in its principles clear and coherent enough. These may be thus stated:

1. The decree of God is, when it concerns His own actions, absolute, but when it concerns man's, conditional, *i.e.* the decree relative to the Saviour to be appointed and the salvation to be provided is absolute, but the decree relative to the persons saved or condemned is made to depend on the acts—belief and repentance in the one case, unbelief and impenitence in the other—of the persons themselves.

2. The providence or government of God, while sovereign, is exercised in harmony with the nature of the creatures governed, *i.e.* the sovereignty of God is so exercised as to be compatible with the freedom of man.

3. Man is by original nature, through the assistance of divine grace, free, able to will and perform the right; but is in his fallen state, of and by himself, unable to do so; he needs to be regenerated in all his powers before he can do what is good and pleasing to God.

4. Divine grace originates, maintains and perfects all the good in man, so much so that he cannot, though regenerate, conceive, will or do any good thing without it.

5. The saints possess, by the grace of the Holy Spirit, sufficient strength to persevere to the end in spite of sin and the flesh, but may so decline from sound doctrine as to cause divine grace to be ineffectual.

6. Every believer may be assured of his own salvation.

7. It is possible for a regenerate man to live without sin.

Arminius's works are mostly occasional treatises drawn from him by controversial emergencies, but they everywhere exhibit a calm, well-furnished, undogmatic and progressive mind. He was essentially an amiable man, who hated the zeal for an impossible orthodoxy that constrained "the church to institute a search after crimes which have not betrayed an existence, yea, and to drag into open contentions those who are meditating no evil." His friend Peter Bertius, who pronounced his funeral oration, closed it with these words: "There lived a man whom it was not possible for those who knew him sufficiently to esteem; those who entertained no esteem for him are such as never knew him well enough to appreciate his merits."

The works of Arminius (in Latin) were published in a single quarto volume at Leiden in 1629, at Frankfort in 1631 and 1635. Two volumes of an English translation, with copious notes, by James Nichols, were published at London, 1825–1828; three volumes (complete) at Buffalo, 1853. A life was written by Caspar Brandt, son of Gerard Brandt, the historian of the Dutch reformation, and published in 1724; republished and annotated by J. L. Mosheim in 1725; and translated into English by the Rev. John Guthrie, 1854. James Nichols also wrote a life (London, 1843).

ARMISTICE (from Lat. *arma*, arms, and *sistere*, to stop), a suspension of hostilities by mutual agreement between two nations at war, or their respective forces. An armistice may be either general or particular; in the first case there is a complete cessation of hostile operations in every part of the dominions of the belligerent powers; in the second there is merely a temporary truce between two contending armies, or between a besieged fortress and the force besieging it. Such a temporary truce, when for a very limited period and for a special purpose, *e.g.* the collection of the wounded and the burial of the dead, is termed a *suspension of arms*. A general armistice cannot be concluded by the commanders-in-chief unless special authority has been previously delegated to them by their respective governments; otherwise any arrangement entered into by them requires subsequent ratification by the supreme powers of the states. A partial truce may be concluded by the officers of the respective powers, without any special authority from their governments, wherever, from the nature and extent of the commands they exercise, their duties could not be efficiently discharged without their possession of such a power. The conduct of belligerent parties during an armistice is usually regulated in modern warfare by express agreement between the parties, but where this is not the case the following general conditions may be laid down. (1) Each party may do, within the limits prescribed by the truce, whatever he could have done in time of peace. For example, he can raise troops, collect stores, receive reinforcements and fortify places that are not actually in a state of siege. (2) Neither party can take advantage of the armistice to do what he could not have done had military operations continued. Thus he cannot throw provisions or reinforcements into a besieged town, and neither besiegers nor besieged are at liberty to repair their fortifications or erect new works. (3) All things contained in places the possession of which was contested, must remain in the state in which they were before the armistice began. Any infringement by either party of the conditions of the truce entitles the other to recommence hostile operations without previous intimation.

ARMOIRE, the French name (cf. Almery) given to a tall movable cupboard, or "wardrobe," with one or more doors. It has varied considerably in shape and size, and the decoration of its doors and sides has faithfully represented mutations of fashion and modifications of use. It was originally exceedingly massive and found its chief decoration in elaborate hinges and locks of beaten iron. The finer ecclesiastical armoires or aumbries which have come down to us—used in churches for the safe custody of vestments, eucharistic vessels, reliquaries and other precious objects—are usually painted, sometimes even upon the interior, with sacred subjects or with incidents from the lives of the saints. The cathedrals of Bayeux and Noyon contain famous examples; the most typical English one is in York minster. By the end of the 14th century, when the carpenter and the wood-carver had acquired a better mastery of their material, the taste for painted surfaces appears to have given place to the vogue of carving, and the simple rectangular panels gradually became sculptured with a simple motive, such as the linen-fold or parchment patterns. In the treasury of St Germain l'Auxerrois the ends of the 15th-century armoires are treated in this way. In that and the two following centuries the keys and the escutcheons of the locks became highly ornamental; usually in forged iron, they were occasionally made of more precious metals. By slow degrees the shape of this receptacle changed—from breadth was evolved height, and the tall form of armoire became characteristic. The Renaissance exercised a notable effect upon this, as upon so many other varieties of furniture. It became less obviously and aggressively a thing of utility; its proportions shrank from the massive to the elegant; its artistic effectiveness was vastly enhanced by its division into an upper and a lower part. Enriched with columns and pilasters, its panels carved with mythology, its canopied niches filled with sculptured statuettes, and terminating with a rich cornice and perhaps a broken pediment, it was widely removed in appearance, if not in purpose, from the uncompromising iron-mounted receptacle of earlier

generations. During the 16th century, when the surging impulses of the Renaissance had died away, the armoire relapsed into plainness, its proportions increased, and it was again constructed in one piece. Ere long, however, it grew more sumptuous than ever. Boulle encrusted it with marqueterie from designs by Bérain; it glowed with *amorini*, with the torches and arrows of Cupid, with the garlands which he weaves for his captives, and when allusiveness left a corner vacant, it was filled with arabesques in ebony or ivory, in brass or white metal. While the royal palaces and the hôtels of the great nobility were filled with those costly splendours, the ordinary cabinetmaker continued to construct his modest pieces, and by the middle of the 18th century the armoire was found in every French house, ample in width and high in proportion to the lofty rooms of the period. It is not to be supposed that so useful a piece of furniture was confined to France. It was used, more or less, throughout a considerable part of Europe, but it was distinctively Gallic nevertheless, and never became thoroughly acclimatized elsewhere until about the beginning of the 19th century, when it developed into the glass-fronted wardrobe which is now an essential detail in the plenishing of the bed-chamber, not merely in France and England, but in many other countries. The *armoire à glace* was known and occasionally made in France as far back as the middle of the 18th century, and almost the earliest mention of it connects it with the scandalous relations of the Maréchal de Richelieu and the beautiful *fermière générale*, Mme de la Popelinière, who had one made to mask a secret door. In the conventional and not very attractive wardrobe of commerce it is difficult to descry the gracious characteristics of the armoire of the Renaissance or the 17th century, and it is not altogether surprising that Théodore de Banville should have condemned one of the most solidly useful of household necessaries as a "hideous monster."

ARMORICA (Aremorica), the Roman name, derived from two Celtic words meaning the "seaside" (*ar*, on, and *mor*, sea), for the land of the Armorici, roughly the peninsula of Brittany. At the time of the Roman advance on Gaul there were five principal tribes in Armorica, the Namneti, the Veneti, the Osismii, the Curiosolitae and the Redones. It was subdued by Caesar, who entirely destroyed the seafaring tribe of its south coast, the Veneti. Under the Empire it formed part of the province of Gallia Lugudunensis (Lugdunensis). It contained hardly any towns, though many large country houses, and was perhaps less Romanized than the rest of Gaul. In and after the later part of the 5th century it received many Celtic immigrants from the British Isles, fleeing (it is said) from the Saxons; and the Celtic dialect which the Bretons still speak is thought to owe its origin to these immigrants. (See further Brittany.)

ARMOUR, PHILIP DANFORTH (1832–1901), American merchant and philanthropist, was born in Stockbridge, New York, on the 16th of May 1832. He was educated at Cazenovia Academy, Cazenovia, N.Y., worked for several years on his father's farm, and in 1852 with a small party went overland to California, a large part of the journey being made on foot. Here during the next four years he laid the foundations of his fortune. In 1856 he became associated with his friend, Frederick S. Miles, in a wholesale grocery and commission business at Milwaukee, In 1863 he became the head of the firm of Armour, Plankington & Co., pork packers, whose headquarters were at Milwaukee. He also obtained a large interest in the firm H. O. Armour & Co., which was founded by his brother, Herman Ossian Armour (1837–1901), and which, starting as a grain commission business, in 1868 established also a large pork-packing plant. Of this firm, the name of which was changed to Armour & Co. in 1870, he became the head in 1875, and thereafter the business made such rapid progress that in 1901 as many as 11,000 hands were employed. Besides contributing to many charitable enterprises, Armour founded the Armour Institute of Technology at Chicago in 1892 and the Armour Flats in Chicago, built for the purpose of supplying at a low rental good homes for working men and their families. He also contributed liberally to the Armour Mission in Chicago, which was founded in 1881 by his brother, Joseph Armour. At the time of his death, on the 6th of January 1901, Philip D. Armour's private fortune was supposed to exceed $50,000,000.

ARMOUR PLATES. The earliest recorded proposal to employ armour for ships of war (for body armour, &c., see Arms and Armour) appears to have been made in England by Sir William Congreve in 1805. In *The Times* of the 20th of February of that year reference is made to Congreve's designs for an armoured floating mortar battery which the inventor considered would be proof against artillery fire. Among Congreve's unpublished papers there is also a suggestion for armour-plating the embrasures of casemates. Nothing, however, seems to have come of these proposals, and a similar lack of appreciation befell the next advocate of armour, John Stevens of New Jersey, U.S.A., who submitted the plans of an armoured vessel to Congress in 1812. The Stevens family, however, continued to work at the subject, and by 1841 had determined by actual experiment the thickness of wrought-iron armour which was proof against the projectiles then in use. The necessity for armouring ships as a protection against shell fire was again pointed out by General Paixhans in 1841, and in 1845 Dupuy de Lôme had prepared the designs of an armoured frigate for the French government. During the period between 1827 and 1854, experiments in connexion with the proposed application of armour to both ships and forts were carried out in England, the United States and France, but the question did not get beyond the experimental stage until the latter year, when armoured floating batteries were laid down in all three countries, probably as the immediate outcome of the destruction of the Turkish fleet by shell fire at Sinope on the 30th of November 1853.

Defence for ships.

History.

Three of the French floating batteries were in action at the bombardment of Kinburn in 1855, where they achieved a conspicuous success, silencing the Russian forts after a four hours' engagement, during which they themselves, although frequently struck, were practically uninjured, their loss in personnel being but trifling. To quote Very: "This comparatively insignificant action, which had little if any effect upon the course of the Crimean War, changed the whole condition of armour for naval use from one of speculation to one of actual and constant necessity." The military application of armour for the protection of guns mounted in permanent fortifications followed. Its development, however, took rather a different course, and the question of armour generally is of less importance for the military engineer than for the naval constructor. For the employment of armour in ship construction and in permanent works on land, see the articles Shipbuilding; Fortification and Siegecraft; the present article is concerned solely with the actual armour itself.

The earliest armour, both for ships and forts, was made of wrought iron, and was disposed either in a single thickness or in successive layers sandwiched with wood or concrete. Such armour is now wholly obsolete, though examples of it may still be found in a few forts of early date. The chief application of armour in modern land defences is in the form of shields for the protection of guns mounted *en barbette*. Examples of such shields are shown in figs. 1 and 2. Fig. 1 shows a 4·5-in. steel shield for the U.S.A. government, face-hardened by the Harvey process, to which reference is made below. It was attacked by 5-in. and 6-in. armour-piercing shot, and proved capable of keeping out the 5-in. up to a striking velocity of nearly 1800 ft. per second, but was defeated by a 6-in. capped A.P. shot with a striking velocity of 1842 ft. per second. The mounting was not seriously damaged by the firing, but could be operated after the impact of one 3·2-in., five 5-in. and three 6-in. projectiles. Fig. 2 shows a gun-shield, manufactured by Messrs Hadfield of Sheffield, after attack by 4·1-in., 4·7-in. and 6-in. armour-piercing and other projectiles. The limit of the shield's resistance was just reached by an uncapped 4·7-in. A.P. shell with a striking velocity of 2128 ft. per second. The shield (the average maximum thickness of which was 5·8 in.) showed great toughness, and although subjected to a

Construction and testing.

severe battering, and occasionally outmatched by the attacking projectiles, developed no visible crack. It is chiefly remarkable for the fact that it was cast and not forged. As is evident from the fringing around the hole made by the 6-in. A.P. shell, the shield was not face-hardened. A more highly developed form of the gun-shield is to be found in the armoured cupola, which has been employed to a very considerable extent in permanent fortifications, and whose use is still strongly advocated by continental European military engineers. The majority of the cupolas to be found in continental forts are not, however, of very recent date, those erected in 1894 at Molsheim near Strassburg being comparatively modern instances. Any cupolas constructed nowadays would be of steel, either forged or cast, and would probably be face-hardened, but a large number of those extant are of compound or even of iron armour. Many of those on sea-fronts are made of chilled cast iron. Such armour, which was introduced by Gruson of Magdeburg in 1868, is extremely hard, and cannot be perforated, but must be destroyed by fracture. It is thus the antithesis of wrought iron, which, when of good quality, does not break up under the impact of the shot but yields by perforation. Armour of the Gruson type is well adapted for curved surfaces such as cupolas, which on account of their shape are scarcely liable to receive a direct hit, except at distant ranges, and its extreme hardness would greatly assist it to throw off shot striking obliquely, which have naturally a tendency to glance. Chilled iron, on account of its liability to break up when subjected to a continuous bombardment by the armour-piercing steel projectiles of guns of even medium calibre, was usually considered unsuitable for employment in inland forts, where wrought iron, mild steel or compound armour was preferred. On the other hand, as pointed out by the late Captain C. Orde Browne, R.A., it was admirably adapted to resist the few rounds that the heavy guns of battleships might be expected to deliver during an attack of comparatively limited duration.

Chilled iron was never employed for naval purposes, and warship armour continued to be made exclusively of wrought iron until 1876 when steel was introduced by Schneider. In an important trial at Spezzia in that year the superiority in resisting power of steel to wrought iron was conclusively proved, but, on the other hand, steel showed a great tendency to through-cracking, a defect which led Messrs Cammell of Sheffield in 1877 to introduce compound armour consisting of a steel surface in intimate union with a wrought-iron foundation plate. In Cammell plates, which were made by the Wilson process, the steel face was formed by running molten steel on to a white-hot foundation plate of iron, while in the compound plates, made by Messrs John Brown & Co. according to the patent of J. D. Ellis, a thin steel surface plate was cemented on to the wrought-iron foundation by running in molten steel between. Compound armour possessed the advantages of a harder face than was then possible in a homogeneous steel plate, while, on the other hand, the back was softer and less liable to crack. Its weak point was the liability of the surface plate to crack through under fire and become detached from its iron backing. The manufacture of steel, however, continued to improve, so that in 1890 we find steel plates being made which were comparatively free from liability to through-cracking, while their power to resist perforation was somewhat greater than that of the best compound. The difference, however, was at no time very marked, and between 1880 and 1890 the resistance to perforation of either steel or compound as compared with wrought iron may be taken as about 1·3 to 1.

Compound armour required to be well backed to bring out its best qualities, and there is a case on record in 1883 when a 12-in. Cammell plate weighing 10½ tons, backed by granite, stopped a 16-in. Palliser shot with a striking energy of nearly 30,000 foot tons and a calculated perforation of 25 inches of wrought iron. As steel improved, efforts were made to impart an even greater hardness to the actual surface or skin of compound armour, and, with this object in view, Captain T. J. Tresidder, C.M.G., patented in 1887 a method of chilling the heated surface of a plate by means of jets of water under pressure. By this method it was found possible to obtain a degree of hardness which was prevented in ordinary plunging by the formation of a layer of steam between the water and the heated surface of the plate. Compound plates face-hardened on this system gave excellent results, and forged-steel armour-piercing projectiles were in some cases broken up on their surfaces as if they had been merely chilled iron. Attempts were also made to increase the toughness of the back by the substitution of mild nickel steel for wrought iron. The inherent defect of compound armour, however—its want of homogeneity,—remained, and in the year 1891 H. A. Harvey of Newark, N.J., introduced a process whereby an all steel plate could be face-hardened in such a way that the advantages of the compound principle were obtained in a homogeneous plate. The process in question consisted in carburizing or cementing the surface of a steel plate by keeping it for a fortnight or so at a high temperature in contact with finely divided charcoal, so that the heated surface absorbed a certain amount of carbon, which penetrated to a considerable depth, thus causing a difference in chemical composition between the front and back of the plate. After it had been left a sufficient time in the cementation furnace, the plate was withdrawn and allowed to cool slowly until it reached a dull red heat, when it was suddenly chilled by the application of water, but by a less perfect method than that employed by Tresidder. Steel plates treated by the Harvey and Tresidder processes, which shortly became combined, possessed about twice the resisting power of wrought iron. The figure of merit, or resistance to penetration as compared with wrought iron, varied with the thickness of the plate, being rather more than 2 with plates from 6 to 8 in. thick and rather less for the thicker plates. In 1889 Schneider introduced the use of nickel in steel for armour plates, and in 1891 or 1892 the St Chamond works employed a nickel steel to which was added a small percentage of chromium.

All modern armour contains nickel in percentages varying from 3 to 5, and from 1·0 to 2·0% of chromium is also employed as a general rule. Nickel in the above quantities adds greatly to the toughness as well as to the hardness of steel, while chromium enables it to absorb carbon to a greater depth during cementation, and increases its susceptibility to tempering, besides conducing to a tough fibrous condition in the body of a plate. Alloy steels of this nature appear to be very susceptible to thermal treatment, by suitable variation of which, with or without oil quenching, the physical condition of the same steel may be made to vary to an extraordinary extent, a peculiarity which is turned to good account in the manufacture of the modern armour plate.

The principal modern process is that introduced by Krupp in 1893. Although it is stated that a few firms both in Great Britain and in other countries use special processes of their own, it is probable that they differ only in detail from the Krupp process, which has been adopted by the great majority of makers. Krupp plates are made of nickel-chrome steel and undergo a special heat treatment during manufacture which is briefly described below. They can either be cemented or, as was usual in England until about 1902 in the case of the thinner plates (4 in. and under) and those used for curved structures such as casemates, non-cemented. They are in either case face-hardened by chilling. Messrs Krupp have, however, cemented plates of 3 in. and upward since 1895. Although the full process is now applied to plates of as little as 2 in. in thickness, there is some difference of opinion between manufacturers as to the value of cementing these very thin plates. The simple Harvey process is still employed to some extent in the case of plates between 5 and 3 in. in thickness, and excellent results are also stated to have been obtained with plates from 2 to 4 in. in thickness, manufactured from a special steel by the process patented by M. Charpy of the St Jacques steel works at Montluçon. A Krupp cemented (K.C.) plate is not perhaps harder as regards surface than a good Harveyed plate, but the depth of hard face is greater, and the plate is very much tougher in the back, a quality which is of particular importance in the thicker plates. The figure of merit varies, as in Harveyed plates, with the thickness of the armour, being about 2·7 in the case of good 6-in. plates,

while for the thicker plates the value gradually falls off to about 2·3 in the case of 12-in. armour. This figure of merit is as against uncapped armour-piercing shot of approximately the same calibre as the thickness of the plate. The resisting power of the non-cemented Krupp plates is usually regarded as being considerably less than that of the cemented plates, and may be taken on an average to be 2·25 times that of wrought iron.

Figs. 3, 4 and 5 are illustrations of good cemented plates of the Krupp type. Fig. 3 shows an 11·8-in. plate, tried by Messrs Krupp in 1895, after attack by three 12-in. steel armour-piercing projectiles of from 712·7 to 716·1 lb in weight. In the third round the striking velocity of the projectile was 1993 ft. per second, the calculated perforation of wrought iron by Tresidder's formula being 25·9 in. The attack was successfully resisted, all the projectiles being broken up without effecting perforation, while there were no serious cracks. The figure of merit of the plate was thus well in excess of 2·2. The great toughness of the plate is perhaps even more remarkable than its hardness; its width was only 6·28 ft., so that each shot head formed a wedge of approximately one-sixth of its width. The excellence of the metal which is capable of withstanding such a strain is apparent.

Fig. 4 is of a 9-in. K.C. plate, made by Messrs Armstrong, Whitworth & Co. for the Japanese government, after undergoing an unusually severe official test. The fourth round was capable of perforating 22 in. of wrought iron, so that the figure of merit of the plate must have been considerably in excess of 2·45, as there were no through-cracks, and the limit of resistance was far from being reached.

Fig. 5 shows the front of an excellent 6-in. cemented plate of Messrs Beardmore's manufacture, tried at Eskmeals on the 11th of October 1901. It withstood the attack of four armour-piercing 6-in. shot of 100 lb weight, with striking velocities varying from 1996 to 2177 ft. per second. Its limit of resistance was just passed by the fifth round in which the striking velocity was no less than 2261 ft. per second. The projectile, which broke up in passing through the plate, did not get through the skin plate behind the wood backing, and evidently had no surplus energy left. The figure of merit of this plate was between 2·6 and 2·8, but was evidently much closer to the latter than to the former figure. A sixth round fired with a Johnson capped shot weighing 105·9 lb easily perforated both plate and backing with a striking velocity of 1945 ft. per second, thus reducing the figure of merit of the plate to below 2·2 and illustrating very clearly the advantage given by capping the point of an armour-piercing projectile. There were no through-cracks in the plate after this severe trial, the back being evidently as tough as the face was hard.

Fig. 6 shows a 3-in. K.N.C. plate of Messrs Vickers, Sons & Maxim's manufacture, tested privately by the firm in November 1905. It proved to be of unusual excellence, its limit of resistance being just reached by a 12½-lb armour-piercing shell of 3 in. calibre with a striking velocity of 2558 ft. per second, a result which, even if the projectiles used were not relatively of the same perforating power as those used in the proof of 6-in. and thicker plates, shows that its resisting power was very great. At a low estimate its figure of merit against 3-in. A.P. *shot* may be taken as about 2·6, which is exceptionally high for a non-cemented, or indeed for any but the best K.C. plates.

The plate also withstood the attack of a 4·7-in. service pattern steel armour-piercing shell of 45 lb weight striking the unbacked portion with a velocity of 1599 ft. per second, and was only just beaten by a similar shell with a velocity of 1630 ft. per second. The effect of all the above-mentioned rounds is shown in the photograph. The same plate subsequently kept out two 6-in. common shell filled up to weight with salt and plugged, with striking velocities of 1412 and 1739 ft. per second respectively, the former being against the unbacked and the latter against the backed half of the plate,—the only effect on the plate being that round 6 caused a fragment of the right-hand top corner of the plate to break off, and round 7 started a few surface cracks between the points of impact of rounds 1, 2 and 3.

Within the limitations referred to below, the resisting power of all hard-faced plates is very much reduced when the armour-piercing projectiles used in the attack are capped, the average figure of merit of Krupp cemented plates not being more than 2 against capped shot as compared with about 2·5 against uncapped. So long ago as 1878 it was suggested by Lt.-Col. (then Captain) T. English, R.E., that armour-piercing projectiles would be assisted in attacking compound plates if caps of wrought iron could be fitted to their points. Experiments at Shoeburyness, however, did not show that any advantage was gained by this device, and nothing further was heard of the cap until 1894, when experiments carried out in Russia with so-called "magnetic" shot against plates of Harveyed steel showed that the perforating power of an armour-piercing projectile was considerably augmented where hard-faced plates were concerned, if its point were protected by a cap of wrought iron or mild steel. The conditions of the Russian results (and of subsequent trials in various parts of the world which have confirmed them) differed considerably from the earlier English ones. The material of both projectiles and plates differed, as did also the velocities employed—the low velocities in the earlier trials probably contributing in large measure to the non-success of the cap. The cap, as now used, consists of a thimble of comparatively soft steel of from 3 to 5 % of the weight of the projectile, attached to the point of the latter either by solder or by being pressed hydraulically or otherwise into grooves or indentations in the head. Its function appears to be to support the point on impact, and so to enable it to get unbroken through the hard face layers of the plate. Once through the cemented portion with its point intact, a projectile which is strong enough to remain undeformed, will usually perforate the plate by a true boring action if its striking velocity be high enough. In the case of the uncapped projectile, on the other hand, the point is almost invariably crushed against the hard face and driven back as a wedge into the body of the projectile, which is thus set up so that, instead of boring, it acts as a punch and dislodges or tends to dislodge a coned plug or disk of metal, the greatest diameter of which may be as much as four times the calibre of the projectile. The disproportion between the maximum diameter of the disk and that of the projectile is particularly marked when the calibre of the latter is much in excess of the thickness of the plate. When plate and projectile are equally matched, *e.g.* 6″ versus 6″, the plug of metal dislodged may be roughly cylindrical in shape, and its diameter not greatly in excess of that of the projectile. In all cases the greatest width of the plug or disk is at the back of the plate.

A stout and rigid backing evidently assists a plate very much more against this class of attack than against the perforating attack of a capped shot. Fig. 7 shows the back of a 6-in. plate attacked in 1898, and affords an excellent illustration of the difference in action of capped and uncapped projectiles. In round 7 the star-shaped opening made by the point of a capped shot boring its way through is seen, while rounds 2, 3, 4 and 5 show disks of plate partially dislodged by uncapped projectiles. The perforating action of capped armour-piercing projectiles is even better shown in fig. 8, which shows a 250-mm. (9·8 in.) Krupp plate after attack by 150-mm. (5·9 in.) capped A.P. shot. In rounds 5 and 6 the projectiles, with striking velocities of 2302 and 2281 ft. per second, perforated. Round 7, with a striking velocity of 2244 ft. per second, just got its point through and rebounded, while round 8, with a striking velocity of 2232, lodged in the plate. In many cases a capped projectile punches out a plug, usually more or less cylindrical in shape and of about the same diameter as the projectile, from a plate, and does not defeat it by a true boring action. In such cases it will probably be found that the projectile has been broken up, and that only the head, set up and in a more or less crushed condition, has got through the plate. This peculiarity of action can best be accounted for by attributing either abnormal excellence to the plate or to that portion of it concerned—for plates sometimes vary considerably and are not of uniform hardness throughout, —or comparative inferiority to the projectile. Whichever way it may be, what has happened appears to be that after the cap has given the point sufficient support to get it through the very hard

FIG. 1.—HARVEYIZED SHIELD, 4·5 INCHES THICK, ON 6-INCH PEDESTAL MOUNT, AFTER ATTACK BY 5-INCH AND 6-INCH CAPPED ARMOUR-PIERCING SHOT.

FIG. 2.—GUN SHIELD, 6 INCHES THICK, AFTER ATTACK. (HADFIELD.)

FIG. 3.—KRUPP-CEMENTED PLATE, 11·8 INCHES THICK, AFTER ATTACK. (KRUPP, MEPPEN.)

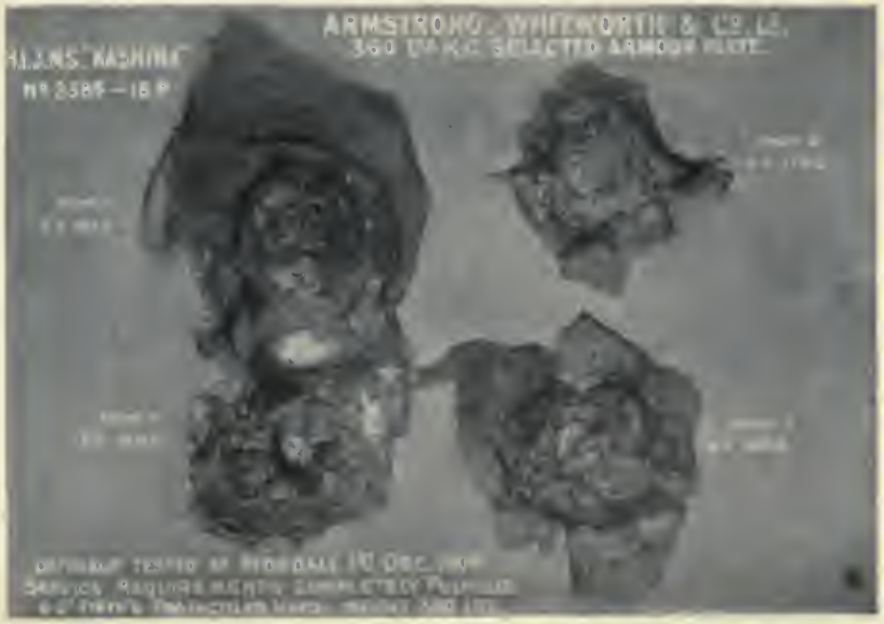


FIG. 4.—KRUPP-CEMENTED PLATE, 9 INCHES THICK, AFTER ATTACK. (ARMSTRONG, WHITWORTH & CO.)

FIG. 5.—BEARDMORE CEMENTED PLATE, 6 INCHES THICK, AFTER ATTACK BY 6-INCH SHOT.
(From Brassey's Naval Annual, 1902, by permission.)

FIG. 6.—KRUPP-CEMENTED PLATE, 3 INCHES THICK, AFTER ATTACK.
(VICKERS, SONS & MAXIM.)

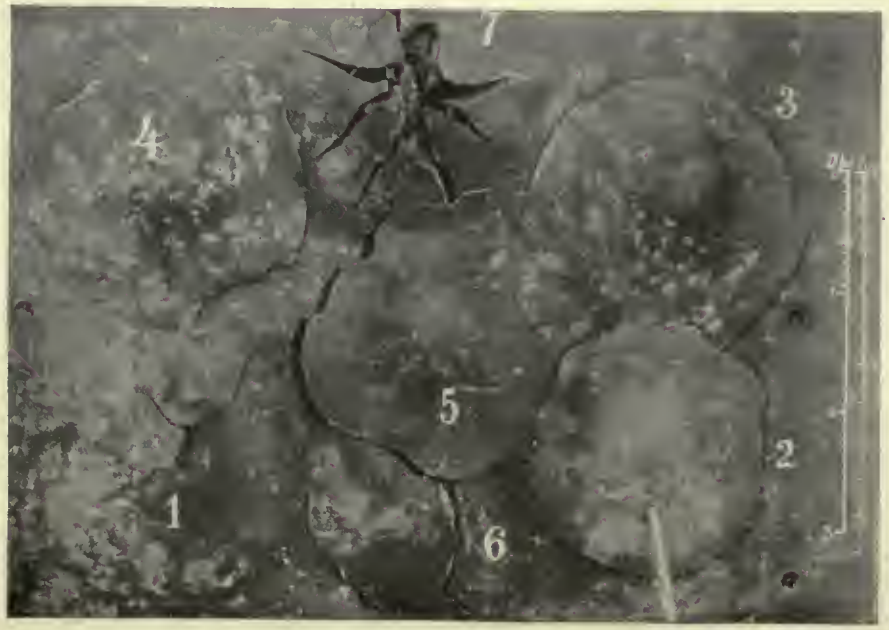


FIG. 7.—BACK OF A 6-INCH PLATE, SHOWING ACTION OF CAPPED AND UNCAPPED PROJECTILES.

FIG. 8.—BACK OF KRUPP PLATE 9·8 INCHES THICK, AFTER ATTACK, WITH CAPPED PROJECTILE. (KRUPP, MEPPEN.)
(From Brassey's Naval Annual, by permission.)

surface layers, the point has been flattened in the region of extreme hardness and toughness combined, which exists immediately behind the deeply carburized surface. The action from this point becomes a punching one, and the extra strain tends to break up the projectile, so that the latter gets through wholly or partially, in a broken condition, driving a plug of plate in front of it. At low striking velocities, probably in the neighbourhood of 1700 ft. per second, the cap fails to act, and no advantage is given by it to the shot. This is probably because the velocity is sufficiently low to give the cap time to expand and so fail to grip the point as the latter is forced into it. The cap also fails as a rule to benefit the projectile when the angle of incidence is more than 30° to the normal.

Laws of resistance.

The laws governing the resistance of armour to perforation have been the subject of investigation for many years, and a considerable number of formulae have been put forward by means of which the thickness of armour perforable by any given projectile at any given striking velocity may be calculated. Although in some cases based on very different theoretical considerations, there is a general agreement among them as far as perforation proper is concerned, and Tresidder's formula for the perforation of wrought iron, $t^2 = wv^3/d\text{A}$, may be taken as typical. Here t represents the thickness perforable in inches, w the weight of the projectile in pounds, v its velocity in foot seconds, d its diameter in inches and A the constant given by $\log \text{A} = 8{\cdot}8410$.

For the perforation of Harveyed or Krupp cemented armour by capped armour-piercing shot, this formula may be employed in conjunction with a suitable constant according to the nature of armour attacked. In the case of K. C. armour the formula becomes $t^2 = wv^3/4d\text{A}$. A useful rough rule is $t/d = v/1900$.

Hard armour, such as chilled cast iron, cannot be perforated but must be destroyed by fracture, and its destruction is apparently dependent solely upon the striking energy of the projectile and independent of its diameter. The punching of hard-faced armour by uncapped projectiles is intermediate in character between perforation and cracking, but approaches the former more nearly than the latter. The formula most used in England in this case is Krupp's formula for K.C., viz. $t^2 = wv^2/d\text{A}^1$, where t, w, v and d are the same as before, and $\log \text{A}^1 = 6{\cdot}3532$. This, if we assume the sectional density (w/d^3) of projectiles to be constant and equal to 0·46, reduces to the very handy rule of thumb $t/d = v/2200$, which, within the limits of striking velocity obtainable under service conditions, is sufficiently accurate for practical purposes. For oblique attack up to an angle of 30° to the normal, the same formula may be employed, $t \sec\theta$ being substituted for t, where θ is the angle of incidence and t the normal thickness of the plate attacked. More exact results would be obtained, however, by the use of Tresidder's W.I. formula, given above, in conjunction with a suitable figure of merit, according to the nature and thickness of the plate. It should be remembered in this connexion that the figure of merit of a plate against a punching attack falls off very much when the thickness of the plate is considerably less than the calibre of the attacking projectile. For example, the F.M. of a 6-in. plate may be 2·6 against 6-in. uncapped A.P. projectiles, but only 2·2 against 9·2-in. projectiles of the same character. In the case of the perforating action of capped projectiles, on the other hand, the ratio of d and t does not appear to affect the F.M. to any great extent, though according to Tresidder, the latter is inclined to fall when d is considerably less than t, which is the exact opposite of what happens with punching.

Another method of measuring the quality of armour, which is largely employed upon the continent of Europe, is by the ratio, r, between the velocity requisite to perforate any given plate and that needed to pierce a plate of mild steel of the same thickness, according to the formula of Commandant Jacob de Marre, viz. $v = \text{A}e^{0{\cdot}7}a^{0{\cdot}75}/p^{0{\cdot}5}$ where $e =$ the thickness of the plate in centimetres, $a =$ the calibre of the projectile in centimetres, $p =$ the weight of the projectile in kilogrammes, $v =$ the striking velocity of the projectile in metres per second, and $\log \text{A} = 1{\cdot}7347$. Converted into the usual English units and notation, this formula becomes $v = \text{A}^1 t^{0{\cdot}7} d^{0{\cdot}75}/w^{0{\cdot}5}$, in which $\log \text{A}^1 = 3{\cdot}0094$; in this form it constitutes the basis of the ballistic tests for the acceptance of armour plates for the U.S. navy.

Common shell, which are not strong enough to remain undeformed on impact, derive little benefit from the cap and usually defeat a plate by punching rather than by perforation. Their punching power may be taken roughly as about ⅔ that of an uncapped armour-piercing shot. Shells filled with high explosives, unless special arrangements are made to deaden the bursting charge and so obviate detonation upon impact, are only effective against the thinnest armour.

Manufacture.

With regard to manufacture, a brief account of the Krupp process as applied in one of the great English armour plate works (omitting confidential details of temperature, &c.) will illustrate the great complexity of treatment which the modern armour plate has to undergo before its remarkable qualities of combined hardness and toughness can be developed. The composition of the steel probably differs slightly with the manufacturer, and also with the thickness of the armour, but it will usually contain from 3 to 4 % of nickel, from 1·0 to 2·0 % of chromium and about 0·25 to 0·35 % of carbon, together with from 0·3 to 0·7 % of manganese. After being cast, the ingot is first heated to a uniform degree of temperature throughout its mass and then generally forged under the hydraulic forging press. It is then reheated and passed through the rolls. After rolling, the plate is allowed to cool, and is then subjected to a thermal treatment preparatory to surfacing and cutting. Its surface is then freed from scale and planed. After planing, the plate is passed into the cementation furnace, where its face remains for some weeks in contact with specially prepared carbon, the temperature being gradually raised to that required for cementation and as gradually lowered after that is effected. After cementation the plate is heated to a certain temperature and is then plunged into an oil bath in order to toughen it. After withdrawal from the oil bath, the plate is cooled, reheated to a lower temperature, quenched again in water, reheated and passed to the bending press, where it is bent to shape while hot, proper allowance being made for the slight change of curve which takes place on the final chilling. After bending it is again heated and then allowed to get cold, when the final machining, drilling and cutting are carried out. The plate is now placed in a furnace and differentially heated so that the face is raised to a higher temperature than the back. After being thus heated for a certain period the plate is withdrawn, and both back and face are douched simultaneously with jets of cold water under pressure, the result being that the face is left glass-hard while the back is in the toughest condition possible for such hard steel.

The cast-steel armour made by Hadfield has already been alluded to. That made by Krupp (the only other maker at present of this class of armour) is of face-hardened nickel steel. A 5·9-in. plate of this material tried in 1902 had a figure of merit of more than 2·2 against uncapped 5·9-in. armour-piercing projectiles of 112 lb in weight. The main advantage of cast armour is that it is well adapted to armoured structures of complicated design and of varying thickness, which it would be difficult or impossible to forge in one piece. It should also be cheaper than forged armour, and, should time be a consideration, could probably be turned out more quickly; on the other hand, it is improbable that heavy castings such as would be required could be as regular in quality and as free from flaws as is possible when forged material is used, and it is unlikely that the average resistance to attack of cast-steel armour will ever be equal to that of the best forged steel.

Defence against small-arms.

Of recent years there has been a considerable demand for thin steel plating proof against small-arm bullets at close ranges. This class of steel is used for field-gun shields and for sap shields, to afford cover for men in field-works, for armoured trains, motor-cars and ambulances, and also very largely for armouring shallow-draught river-gunboats. Holtzer made chrome steel breastplates in 1890, 0·158 in. of which was proof against the 0·43-in. hard lead bullet of the Gras rifle at 10 metres range, while 0·236 in. was proof

against the 0·32-in. 231-grain Lebel bullet at the same distance, the striking velocities being approximately 1490 and 2070 ft. per second respectively. The bullet-proof steel made by Messrs Cammell, Laird & Co. in Great Britain may be taken as typical of that produced by the best modern manufacturers. It is proof against the 215-grain Lee-Enfield bullet of 0·303 in. calibre striking directly, as under:

Range.	Thickness of Plate.	Striking Velocity.
10 yards	0·187 inch	2050 f.s.
100 ,,	0·167 ,,	1865 ,,
560 ,,	0·080 ,,	1080 ,,

The weight of the 0·08-in. plating is only 3·2 lb per sq. ft. The material is stated to be readily adaptable to the ordinary operation of bending, machining, drilling, &c., and is thus very suitable for the purposes indicated above. (W. E. E.)

ARMS AND ARMOUR (Lat. *arma*, from the Aryan root *ar*, to join or fit; cf. Gr. ἁρμός, joint; the form *armour*, from Lat. *armatura*, should strictly be *armure*). Under this heading are included weapons of offence (arms) and defensive equipment (armour). The history of the development of arms and armour begins with that of the human race; indeed, combined with domestic implements, the most primitive weapons which have been found constitute the most important, if not the only, tangible evidence on which the history of primitive man is based. It is largely from the materials and characteristics of the weapons and utensils found in caves, tombs and various strata of the earth's crust, coupled with geological considerations, that the ethnological and chronological classifications of prehistoric man have been deduced. For a detailed account of this classification and the evidence see ARCHAEOLOGY; BRONZE AGE; FLINT IMPLEMENTS, &c., and articles on special weapons.

Offensive weapons may be classified roughly, according to their shape (*i.e.* the kind of blow or wound which they are intended to inflict), and the way in which they are used, as follows:—(1) Arms which are wielded by hand at close quarters. These are subdivided into (*a*) *cleaving* weapons, *e.g.* axes; (*b*) *crushing*, *e.g.* clubs, maces and all hammer-like arms; (*c*) *thrusting*, *e.g.* pointed swords and daggers; (*d*) *cutting*, *e.g.* sabres (such weapons frequently combine both the cut and the thrust, *e.g.* swords with both edge and point); (*e*) those weapons represented by the spear, lance, pike, &c., which deal a thrusting blow but are distinguished from (*c*) by their greater length. (2) Purely missile weapons, *e.g.* darts, javelins and spears. Frequently these weapons are used also at close quarters as thrusting weapons; the typical example of these is the medium-length spear of not more than about 6 ft. in length. (3) Arms which discharge missiles, *e.g.* bows, catapults and fire-arms generally. (See ARCHERY and section *Fire-arms* below.) The weapons in (2) and (3) are designed to avoid hand-to-hand fighting.

Classification.

Weapons are also classified in a variety of other ways. Thus we have *small-arms*, *i.e.* all weapons in classes (1) and (2) with those in (3) which do not require carriages. *Side-arms* are those which, when not in use, are worn at the side, *e.g.* daggers, swords, bayonets. *Armes blanches* is a term used for offensive weapons of iron and steel which are used at close quarters.

Defensive armour consists of body armour, protections for the head and the limbs, and various types of shield.

1. *Stone Age.*—One of the chief problems which have perplexed archaeologists is that of finding a criterion which will enable them to distinguish the most primitive products of human skill from similar objects whose form is due to the forces of nature. It is often impossible to say precisely whether a rough piece of flint is to be regarded as a weapon (except so far as it could be used as a missile) or merely as a fragment of rock. Passing over these doubtful cases, we come first to indubitable examples of weapons deliberately fashioned in stone for offensive purposes. The use of stone weapons appears to have been universally characteristic of the earliest races of mankind, as it is still distinctive of those savage races which are most nearly allied to primitive man. These weapons were naturally simple in form and structure. The earliest examples (Palaeolithic) found in river-drift gravel in various parts of Europe are merely chipped flints, celts, &c. Later on we find polished implements (Neolithic) progressively more elaborate in design and workmanship, such as socketed stones with wooden handles and knives or daggers of flaked flint with handles. Besides flint the commonest materials are diorite, greenstone, serpentine and indurated clay-slate; there are also weapons of horn and bone (daggers and spear-heads). Spear-heads and arrow-points (leaf-shaped, lozenge-shaped, tanged and triangular) were chipped in flint with such skill as to be little inferior to their metal successors. They have accurately flaked barbs and tangs, and in some cases their edges are minutely chipped. The heads appear to have been fastened to the shafts by vegetable fibre and bitumen. Knife-daggers of flint, though practically of one single type, exhibit much variety of form. They vary in size also, but seldom exceed 12 in. in length. They are sometimes obtuse-edged like a scraping-tool, sometimes delicately chipped to a straight edge, while the flakes are so regularly removed from the convex part of the blade as to give a wavy surface, and the corners of the handle are delicately crimped. The daggers attain their highest perfection in the short, leaf-shaped form,—the precursor of the leaf-shaped sword which is peculiarly characteristic of the Bronze Age,—and the curved knives found especially in Great Britain and Russia, and also in Egypt. The precise object of the sharpening of both convex and concave edges in the curved variety is not clear. There have also been found sling-stones, and, in Scotland and Ireland, balls of stone with their "surfaces divided into a number of more or less projecting circles with channels between them." These latter, Sir John Evans suggests, were attached to a thong which passed through the surface channels, and used like the *bolas* of South America. The weapon could thus deal a blow at close quarters, or could be thrown so as to entangle the limbs of an enemy. Of defensive armour of stone there is none. The only approximation is to be found in the small rectangular plates of slate, &c., perforated with holes at the corners, which are supposed to have been bound on to the arm to protect it from the recoil of the bow-string. Similar wristlets or bracers are in use among the Eskimos (of bone) and in India (of ivory). These plates measure generally about 4 in. by 1½ in.

History.

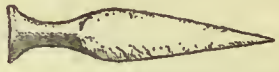


FIG. 1.—Leaf-shaped Flint Dagger.

2. *Bronze Age.*—It is impossible to assign any date as the beginning of the Bronze Age; indeed, archaeology has shown that the adoption of metal for weapons was very gradual. The stone weapon perseveres alongside the bronze, and there exist stone axes which, by their shape, suggest that they have been copied from metal axes. In the earliest interments in which the weapons deposited with the dead are of other materials than stone, a peculiar form of bronze dagger occurs. It consists of a well-finished, thin, knife-like blade, usually about 6 in. in length, broad at the hilt and tapering to the point, and attached to the handle by massive rivets of bronze. It has been found associated with stone celts, both of the roughly chipped and the highly polished kind, showing that these had not been entirely disused when bronze became available. A later type of bronze dagger is a broad, heavy, curved weapon, usually from 9 to 15 in. in length, with massive rivets for attachment to an equally massive handle. The leaf-shaped sword, however, is the characteristic weapon of the Bronze Age. It is found all over Europe, from Lapland to the Mediterranean. No warlike weapon of any period is more graceful in form or more beautifully finished. The finish seems to have been given in the mould without the aid of hammer or file, the edge being formed by suddenly reducing the thickness of the metal, so as to produce a narrow border of extreme thinness along

FIG. 2.—Leaf-shaped Bronze Sword.

both sides of the blade from hilt to point. The handle-plate and blade were cast in one piece, and the handle itself was formed by side plates of bone, horn or wood, riveted through the handle-plates. There was no guard, and the weapon, though short, was well balanced, but more fitted for stabbing and thrusting than for cutting with the edge. The Scandinavian variety is not so decidedly leaf-shaped, and is longer and heavier than the common British form; and instead of a handle-plate, it was furnished with a tang on which a round, flat-topped handle was fastened, like that of the modern Highland dirk, sometimes surmounted by a crescent-like ornament of bronze. A narrow, rapier-shaped variety, tapering from hilt to point, was made without a handle-plate, and attached to the hilt by rivets like the bronze daggers already mentioned. This form is more common in the British Isles than in Scandinavia, and is most abundant in Ireland. The spear-heads of the Bronze Age present a considerable variety of form, though the leaf-shaped predominates, and barbed examples are extremely rare. Some British weapons of this form occasionally reach a length of 27 in. The larger varieties are often beautifully designed, having segmental openings on both sides of the central ridge of the blade, and elaborately ornamented with

FIG. 3.—Bronze Spear-Head, length 19 inches.

chevron patterns of chased or inlaid work both on the socket and blade. Arrow-points are much rarer in bronze than in flint. In all probability the flint arrow-point (which was equally effective and much more easily replaced when lost) continued to be used throughout the Bronze Age. Shields of bronze, circular, with hammered-up bosses, concentric ridges and rows of studs, were held in the hand by a central handle underneath the boss. The transition period between the Bronze and Iron Ages in central Europe is well defined by the occurrence of iron swords, which are simple copies of the leaf-shaped weapon, sometimes with flat handle-plate of bronze. These have been found associated with articles assigned to the 3rd or 4th century B.C.

Hallstatt weapons.

An important distinction between the characteristic bronze swords peculiar to southern peoples and the swords both of iron and of bronze found together in the Hallstatt cemeteries (in the Salzkammergut, Austria, ancient Noricum) is that whereas the former invariably have short handles (2¼ to 2½ in.), the latter are provided with handles from 3 to 3½ in. long, terminating in a round or oval pommel; the grip of one of the bronze swords even reaches a length of 4 in. The hilts are decorated with ivory, amber, wood, bronze, horn, and the decoration of blade and scabbard is often elaborate. The length of these swords is sometimes as much as 30 to 33 in. Again at La Tène on Lake Neuchâtel iron swords have been found to the number of one hundred, with handles of 4 to 7½ in. long and a total length varying from 30 to 38 in. Similar remains have been found in France at Bibracte and Alesia, and even in Ireland (cf. Munro, *The Lake-dwellings of Europe*, pp. 282, 383).

The occurrence at Hallstatt of bronze swords together with iron, having the characteristic long handle, has led to the hypothesis that the graves are those of an immigrant (probably Celtic) people of northern extraction which had conquered and overlaid a smaller-framed Bronze Age people, and had introduced the use of iron while continuing to use the bronze of their predecessors with the necessary modifications. This theory derived from tangible remains is corroborated by literary evidence. Thus Polybius (ii. 33, iii. 114) describes the Celtic peoples as fighting with a long pointless iron sword, which easily bent and was in any case too large to be used easily in a mêlée.

The graves at Hallstatt yielded in addition to these important swords a much larger number of spears. Of these two only were of bronze, the head of the larger being 7½ in. long. The much more numerous iron heads range up to as much as 2 ft. in length, and are all fastened to the shaft by rivets. All the arrow-heads found are of bronze, while of the axes the great majority are of iron; a few have iron edges fitted in a bed of bronze.

These examples are sufficient to show that the transition from bronze to iron was very slow. The fact that they were found in a district which is known to have been directly in the line of march pursued by invaders from the north tends to confirm the theory that the introduction of iron was the work of such invaders.

See Sir John Evans, *Ancient Stone Implements* (2nd. ed., 1897), *Bronze Implements*; W. Ridgeway, *Early Age of Greece*; and works quoted under ARCHAEOLOGY.

3. *Early Greek Weapons.*—The character of the weapons used by the early peoples of the Aegean in the periods known as Minoan, Mycenaean and Homeric is a problem which has given rise of recent years to much discussion. The controversy is an important part of the Homeric question as a whole, and the various theories of the weapons used in the Trojan War hinge on wider theories as to the date and authorship of the Homeric poems. One widely accepted hypothesis, based on the important monograph by Dr Wolfgang Reichel, *Über homerische Waffen. Archäologische Untersuchungen* (Vienna, 1894), is that the Homeric heroes, like those who created the civilization known as Mycenaean, had no defensive armour except the Mycenaean shield, and used weapons of bronze. This view is derived to a great extent from the Homeric poems themselves, in which the metal most frequently mentioned is χαλκός (bronze), and involves the assumption that all passages which describe the use of corslets, breastplates, small shields and greaves are later interpolations. It is maintained on the other hand (*e.g.* by Prof. W. Ridgeway, *Early Age of Greece*, i. chap. 3), that the Homeric Achaeans (whom he regards as the descendants of the central European peoples, the makers of the Hallstatt iron swords) were far advanced into the Iron Age, and that the use of bronze weapons is merely another instance of the fact that the introduction of a new element does not necessarily banish the older. This theory would separate the Homeric from the Mycenaean altogether, and is part of a much more comprehensive ethnological hypothesis. According to another hypothesis, the Homeric poems are true descriptions of a single age, or, in other words, the weapons of the Homeric age were far more diverse and elaborate than is supposed by Reichel.

Mycenaean and Homeric.

Very few traces of iron have been found in the Mycenaean settlements, nor have any examples of body armour been found except the ceremonial gold breastplates at Mycenae. The Mycenaean soldiers carried apparently a bronze spear, a bronze sword and a bow and arrows. The arrow-heads are first of obsidian and later of bronze. It would appear that only the chief warriors used spear and shield, while the majority fought with bows. The swords found at Mycenae are two-edged, of rigid bronze, and as long as 3 ft. or even more; from representations of battles it would seem that they were perhaps used for thrusting mainly. They are highly ornamented and some have hilts of wood, bone or ivory, or even gold mounting. Later swords became shorter and of a type like that of early iron swords found in Greece. Moreover in a few cases there have been found in pre-Mycenaean (late Minoan III.) tombs a few examples of short iron swords together with bronze remains. All Mycenaean spears are of bronze and, apparently, their shafts, unlike the Homeric, had no butt-piece. In the absence of any metal helmets in the tombs we may perhaps assume that the Mycenaean helmet was a leather cap, possibly strengthened with tusks, such as appears in Homer (*Iliad*, x.) also. The Mycenaean shield (generally, perhaps, made of leather) has given rise to much controversy, which hinges largely on the interpretation of the evidence provided by the representation on the Warrior Vase and the Painted Stele from Mycenae and pottery found at Tiryns. Professor Ridgeway regards these as describing post-Mycenaean conditions, and maintains that the true Mycenaean shield was always long (from neck to feet), and that it was either in the form of a figure-of-eight targe, or rectangular and sometimes incurved like the section of a cylinder; whereas the Homeric shield was round (*e.g.* κυκλότερος, εὔκυκλος, &c.). Dr Reichel's followers believe that the Homeric shield was long ("like a tower") and

incurved in the centre like the Mycenaean, that Homer knew nothing of the small round shield, and that the epithets implying roundness used in the poems are to be explained as meaning "well-balanced" or as late interpolations. On the whole we must conclude that the Mycenaean age is by no means a single homogeneous whole (see AEGEAN CIVILIZATION), and that the weapons are not exclusively of bronze, nor of any single type.

The Homeric warrior in full armour, according to the Homeric poems, wore: (1) shield (*ἀσπίς*, *σάκος*), (2) greaves (*κνημῖδες*), (3) band (*ζῶμα*), (4) belt (*ζωστήρ*)and *mitrē*, (5) tunic (*χιτών*), (6) helmet (*κορύς*), (7) breastplate (*θώρηξ*), (8) sword (*ξίφος*). The *λαισήϊον* was a protection worn by the archers in place of a shield. According to the usual view, the Homeric shield was, as we have seen, bent in about half way up each side (in the form of a figure-of-eight) to give freedom to the arms, and large enough to protect the whole body. The two curves were held rigid by two wooden (probably) staves inside. It was composed of layers of ox-hide overlaid with bronze, forming a boss in the centre, and sometimes had studs upon it. Reichel's view is that it was the weight of these huge shields which led to the use of the chariot as a means of going rapidly from one part of the field to another (though Professor Ridgeway and others contest this, and Helbig mentions more than one case of long journeys on foot under shield), and further that the round shield is entirely unknown to Homer. This large shield was clearly the natural protection against showers of missiles, rather than against enemies fighting with the sword.

The greaves were, no doubt, generally of hide, protected the leg all round, and were fastened at the knee with cords. On the other hand Mycenaean bronze greaves have been found at Enkomi (Cyprus) and at Glassinatz (Glasinac), and therefore it is not necessary, following Reichel, to cut out Homer's references to the "bronze-greaved" Achaeans (*Iliad*, vii. 41), a phrase which has been taken as evidence for regarding the passage as spurious. The tin greaves of Achilles are obviously exceptional.

The *thorex* again is the subject of controversy. Reichel, arguing that the great shield rendered any breastplate unnecessary, regarded the word as a general term for body clothing, but Ridgeway strongly maintains the older theory that it was a bronze breastplate, and Andrew Lang points out that, on Reichel's theory, a word which originally meant the "breast" was transferred to mean "loin-cloth" (which, to judge from the artistic representations, was all that the Mycenaean warrior wore), and subsequently in historic times returned to its natural use for the breastplate—a most unlikely evolution. The passages in Homer which describe it as a breastplate are regarded by Reichel's school as later interpolations. Gilbert Murray thinks that the Homeric poems must be regarded as belonging to different periods of development, and therefore attributes the more elaborate armour to the "surface" (late Ionian) stratum. The *zoma* was probably a loin-cloth, and the *mitrē* a metal band about a foot wide in front and narrow behind to protect the lower part of the body. As a matter of fact, however, the big shield does not exclude the use of body armour, and it is quite likely that the Homeric warrior wore a bronze corslet, *i.e.* a somewhat improved form of the *λινοθώρηξ*, or stiffened shirt. On the other hand, it is probable, as we gather from the poems, that this corslet was not strong enough to do more than stop a spent spear. The *chiton* was worn over the *mitrē*, and reached the knees; it was held to the body by the *zostēr*, a metal-plated belt. Helmets were both of metal on leather, and of leather throughout; the crests were of horsehair (not of metal like the later Greek helmets) and there were no cheek-pieces.

The sword has already been mentioned. Ridgeway, in spite of the almost invariable mention of bronze as the material of the Homeric weapons, believes that it was generally of iron, but, while the presence of iron in the Homeric age is admitted in the case of implements, it is generally held that weapons were all of bronze. Except for one arrow-head (*Iliad*, iv. 123), and the mace of Areithoüs, mentioned as a unique example by Nestor (*Iliad*, vii. 141), no reference to an iron weapon proper occurs in the Homeric poems. But the sword was used only when the favourite spear or javelin had failed to decide the contest.

It must be admitted that the problem of pre-Homeric armour and Homeric armour must always be largely a matter of inference, based on a comparative study of the evidence literary and archaeological. Unless we are prepared to adopt the theory that the Homeric poems consist of a mosaic of interpolation informed by an archaizing editor, we must assume that they describe a single period of transition intermediate between the Mycenaean prime and the dawn of history proper. In this case we shall believe that the Homeric warrior has so far adapted to changing conditions the simple appliances of the Mycenaean that he has evolved a feeble corslet with minor pieces of body armour, while retaining the big double-bellied shield as a protection against the arrows which are still the chief weapon of the rank and file and are even used on occasion by the chiefs. If we further believe that the iron at his disposal was similar to that used by the Celts of Polybius, it is natural to believe also that he preferred the harder bronze for his weapons, though iron was common for domestic and other implements.

On early Greek arms in general see, besides Reichel and Ridgeway *op. cit.*: A. Lang, *Homer and his Age* (London, 1906; and criticisms in *Classical Review*, February 1907); G. G. A. Murray, *The Rise of the Greek Epic* (Oxford, 1907), chap. vi.; R. M. Burrows, *Discoveries in Crete* (2nd ed., London, 1907); Leaf and Bayfield, *Iliad*, i.–xii. Appendix A (follows Reichel); W. Helbig, *Homerische Epos* (1884 and 1899), and *La Question mycénienne* (1896); C. Robert, *Studien zur Ilias* (Berlin, 1901); Chr. Tsountas and J. I. Manatt, *The Mycenaean Age* (1897); V. Bérard, *Les Phéniciens et l'Odyssée* (Paris, 1902); Cauer, *Grundfrager d. Homerkritik* (Leipzig, 1895); much valuable discussion will be found in articles in *Journ. Hell. Stud.*, *Classical Rev.* and *Journ. of Anthropol. Instit.*; see also editions of *Iliad* and *Odyssey* (espec. D. B. Monro), and works quoted under AEGEAN CIVILIZATION; HOMER; MYCENAE.

4. *Greek, Historical.*—The equipment does not differ generically from that described in the Homeric poems, except when we come to the reforms of the Macedonians. The hoplites, who formed the main army, wore helmet, body armour, greaves and shield, and fought with pike and sword. The helmets were (1) the Corinthian, which covered the face to the chin, with slits for the eyes, and often had no plume or crest; (2) the Athenian, which did not cover the face (though sometimes it had cheek-plates which could be turned up if necessary), had crests, sometimes triple, with plumes of feathers, horsehair or leather; (3) a steel cap (*πῖλος*) without crest, plumes or cheek-plates. The last seems to have been most common in the Spartan army. The body armour consisted of breast and back plates fastened together by thongs or straps and buckles; sometimes poverty compelled a man to be content with a leather jerkin (*σπολάς*) partly strengthened by metal plates, or even a quilted linen or stuffed shirt. Greaves were of pliant bronze fastened at the back above the ankle and below the knee. Shields were of the small round or oval type, adapted to the new conditions in which the bow and arrow had given place to hand-to-hand fighting. They were held by means of two handles (*ὄχανα*), the left hand being thrust through the first and grasping the second. In the 5th and 4th centuries the shield bore a device or initial representing the state and also the individual's own crest. The hoplite's pike, about 8 ft. long, unlike the Homeric weapon, was hardly ever thrown. In the Macedonian phalanx a pike (*σάρισσα*), certainly 18 ft., and perhaps later in the 3rd and 2nd centuries even 24 ft. long, was introduced. The sword was straight, sharp-pointed, short, sometimes less than 20 in., and rarely more than 2 ft. long. It was double-edged and used for both cut and thrust. A less common type was the *μάχαιρα* or curved sabre used by the Spartans, with one sharp edge. The hoplite had no other offensive weapons.

The cavalry were heavy-armed like the hoplites except that they carried a smaller shield, or, more usually, none at all. They were armed with a lance which they wielded freely (*i.e.* not "in rest") and occasionally threw. The Macedonian cavalry had a *σάρισσα*. The light-armed (*γυμνῆτες*, *ψιλοί*) were (1) *ἀκοντισταί*, armed with a javelin (3 to 5 ft. long) and a small shield; (2) *τοξόται*, archers; and (3) *σφενδονῆται*, slingers, whose missiles

were balls of lead, stones and hardened clay pellets. Between the heavy and the light armed were the peltasts. The *pelta*, from which they took the name, was a light shield or target, made of skin or leather on a wooden or wickerwork frame. The Athenian Iphicrates armed them with linen corslet and a larger spear and sword than those of the hoplites; he also invented a new footgear (called after him *iphicratides*) to replace the older greaves.

5. *Roman.*—The equipment of the Roman soldier, like the organization of the army (see ROMAN ARMY), passed through a great number of changes, and it is quite impossible to summarize it as a single subject. In the period of the kings the legion was the old Greek phalanx with Greek armour; the front ranks wore the Greek panoply and fought with long spears and the circular Argolic shield. The early Roman sword, like that of the Greeks, Egyptians and Etruscans, was of bronze. We have no direct statement as to its form, but in all probability it was of the ordinary leaf-shape. We gather from the monuments that, in the 1st century B.C., the Roman sword was short, worn on the right side (except by officers, who carried no shield), suspended from a shoulder-belt (*balteus*) or a waist-belt (*cingulum*), and reaching from the hollow of the back to the middle of the thigh, thus representing a length of from 22 in. to 2 ft. The blade was straight, double-edged, obtusely-pointed. On the Trajan column (A.D. 114) it is considerably longer, and under the Flavian emperors the long, single-edged *spatha* appears frequently along with the short sword.

The second period ending with the Punic wars witnessed a change. The *hastati* and the *principes* are both heavily armed, but the round shield has given way to the oblong (*scutum*), except for one-third of the *hastati* who bore only the spear and the light javelin (*gaesa*). The third period—that described by Polybius—is characterized by greater complexity of armour, due no doubt in part to the experience gained in conflicts with a wider range of peoples, and in part to the assimilation of the methods peculiar to the new Italian allies. Thus we find the skirmishers (*velites*) armed with a light javelin 3 ft. long and ¾ in. thick, with an iron point 9 in. long; this point was so fragile that it was rendered useless by the first cast. For defence they wore a hide-covered headpiece and a round buckler 3 ft. in diameter. The heavy-armed carried a *scutum* formed of two boards glued together, covered with canvas and skin, and incurved into the shape of a half-cylinder; its upper and lower edges were strengthened with iron rims and its centre with a boss (*umbo*). A greave was worn on the right leg, and the helmet was of bronze with a crest of three feathers. The wealthier soldiers wore the full cuirass of chain armour (*lorica*), the poorer a brass plate 9 in. square. For offence they carried a sword and two javelins. The former was the Spanish weapon, straight, double-edged and pointed, for both thrust and cut, in place of the old Greek sword.

The characteristic weapon, however, was the *pilum* (Gr. ὐσσός). The form of this weapon and the mode of using it have been minutely described by Polybius (vi. 23), but his description has been much misunderstood in consequence of the rarity of representations or remains of the *pilum*. It is shown on a monument of St Rémy, in Provence, assigned to the age of the first emperors, and in a bas-relief at Mainz, on the grave-stone of Quintus Petilius Secundus, a soldier of the 15th legion. A specimen of the actual weapon is in the museum at Wiesbaden. It is a javelin with a stout iron head (7 in.), carried on an iron rod, about 20 in. in length, which terminates in a tang for insertion in the wooden shaft. As represented on the monuments, the iron part of the weapon is about one-third of its entire length (6¾ ft.). It was used primarily as a missile. When the point pierced the shield the weight of the stave pulled the shield downwards and rendered it useless. At close quarters it answered all the purposes, offensive and defensive, of the modern bayonet when "fixed." Vegetius, in his *Rei militaris instituta*, describes it in a modified form as used in the armies of the lower empire, and in a still more modified form it reappears as the "argon" of the Franks. This equipment was characteristic of *hastati*, *principes* and *triarii* (save that the latter used the *hasta* instead of the *pilum*). We thus see how great is the change from the time when the *hastati* were the light-armed (from *hasta*) of the Greek phalanx.

The cavalry, which had originally been protected only by a light ox-hide shield and the most fragile spears, adopted, about Polybius's time, the full Greek equipment of buckler, strong spear and breastplate.

In the last period of the republic the *pilum* became the universal weapon of the heavy-armed, while the auxiliaries (all foreigners, the *velites* having disappeared) used the *hasta* and the long single-edged sword (*spatha*). Under the empire the heavy-armed, according to Josephus, had helmet, cuirass, a long sword worn on the left side, and a dagger on the right, *pilum* and *scutum*. The special detachment detailed to attend the commander had a round shield (*clipeus*) and a long spear. The cavalry wore armour like that of the infantry, with a broadsword, a buckler slung from the horse's side, a long pole for thrusting, and several javelins, almost as large as spears, in a sheath or quiver. Arrian, writing of a period some fifty years later, gives further particulars from which we gather that of the cavalry some were bowmen, some polemen, while others wielded lances and axes.

For the arms and armour of other peoples of antiquity see *e.g.* PERSIA: *History, Ancient*, section v. "The Persian Empire of the Achaemenids"; BRITAIN, *Anglo-Saxon*, section v. "Warfare"; ETRURIA; EGYPT, &c. (J. M. M.)

6. *English from the Norman Conquest.*—It is unnecessary here to trace in detail the history of European armour in the middle ages and after, but its use and fashion in England may illustrate the broad lines of the gradual perfection and the hurried abandonment of the ancient war-harness. Each country gave its armour something of the national character, the Spanish harness being touched with the Moorish taste, the Italian with the classical note borrowed from the monuments of old time, and the German with the Teutonic feeling for the grotesque.

To understand the development of English arms and armour it is well for us to consider carefully the fashion of these things at the time of that landmark of history, the Norman Conquest. Poets, chroniclers and law-makers give us material for their description, and in the great embroidery of Bayeux, with its more than six hundred lively figures, we have pictured all the circumstances of war. We find that weapons and war gear have advanced little or nothing beyond the age which saw the Dacian warrior armed from crown to foot. A knight is reckoned fully armed if he have helmet, hawberk and shield; his weapons are sword and lance, although he sometimes carries axe or mace and, more rarely, a bow. The coat of fence, which the Norman called *hawberk* and the English *byrnie*, hangs from neck to knee, the sleeves loose and covering the elbow only, the skirt slit before and behind for ease in the saddle. The Bayeux artists (see fig. 4) commonly show these skirts as though they were short breeches, the hawberk taking the fashion at first sight of a man's swimming dress, but other authorities set us right, and towards the end of the tapestry we see men stripping hawberks from the slain by pulling them over the head. Back and front are so much alike that he who armed Duke William for the fight slipped on the armour hind side before, an omen that he should change his state of a duke for that of a king. The hawberk might be mail of woven rings, of rings sewn upon leather or cotton, of overlapping scales of leather, horn or iron, of that jazerant work which was formed of little plates sewn to canvas or linen, or of thick cotton and old linen padded and quilted in lozenges, squares or lines. There are indications that the

11th-century Bayeux tapestry.

FIG. 4.—From the Bayeux Tapestry.

hawberk was sometimes reinforced at the breast probably by a small oblong plate fastened underneath. Its weight is shown in the scene where William's men carry arms to the ships, each hawberk being borne between two men upon a pole thrust through the sleeves.

The helmet is a brimless and pointed cap, either all of metal or of leather or even wood framed and strengthened with metal. Its characteristic piece is the guard which protects the nose and brow from swinging cuts, so disguising the knight that William must needs take off his helmet to show his men that he had not fallen. Such a nasal appears in a 10th-century illumination; at the time of the Conquest it was all but universal. It grows rare and all but disappears in the 13th century, although examples are found to the end of the middle ages. The helmet is laced under the chin, and under it the knight often wore a hood of mail or quilting which covered the top of the head, the ears and neck, but left the chin free—in two or three cases he has this hood without the helmet. A close coif was probably worn beneath it when it was of ringed mail, to spare the fretting of the metal on the head.

The knights' legs are shown in most cases as unprotected save by stout hose or leg-bands: only in two or three instances does the tapestry picture a warrior with armed legs, and it is perhaps significant of the rarity of this defence that the duke is so armed. The feet are covered only by the leather boot, the heels having prick spurs.

Broad-bladed swords with cross-hilts of straight or drooping quills are fastened with a strap and buckle girdle to the left side. They have a short grip, and the blade would seem to be from 2½ to 3 ft. in length. The chieftain unarmed in his house is often seen with unbuckled and sheathed sword sceptre-wise in his hands, carrying it as an Indian raja will nurse his sheathed tulwar. The ash spears brandished or couched by the knights as they charge seem from 7 to 8 or 9 ft. in length. In a few cases a three-forked pennon flutters at the end. The axe, a weapon which the Normans, in spite of their Norse ancestry, do not carry in the battle, is of the type called the Danish axe, long-shafted, the large blade boldly curved out. Maces, such as that with which the bishop of Bayeux rallies his young men, seem knotted clubs of simple form. Short and strong bows are drawn to the breast by the Norman archers.

Of the shields in the fight, four or five borne by the English are of the old English form—large, round bucklers of linden-wood, bossed and ribbed with iron. For the rest the horsemen bear the Norman shield, kite-shaped, with tapering foot, and long enough to carry a dead warrior from the field. On the inner side are straps for the hand to grip and a long strap allowed the knight to hang the shield from his neck. Let us note that although wyvern-like monsters, crosses, roundels and other devices appear on these shields, none of them has any indication of true armory, whose origins must be placed in the next century.

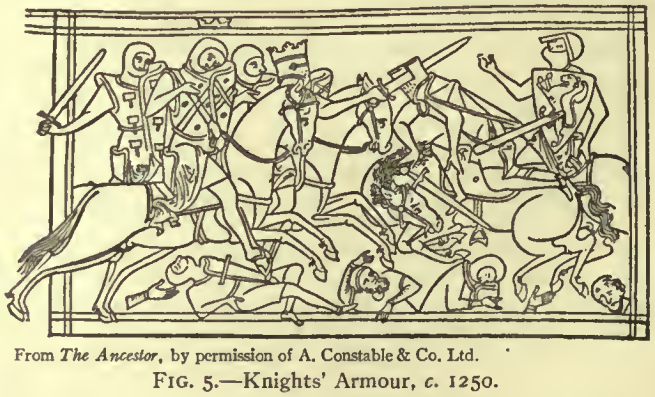
The 12th century, although an age of riding and warring, affects but little the fashion of armour. The picture of a king on his seal may well stand for the full-armed knight of his age, but Henry Beauclerc, Stephen and Henry II. are shown in harness not much unlike that of the Bayeux needlework. But the sleeve of the hawberk goes to the wrist, and the kite shield grows less, Stephen's shield being 30 in. long at the most. On Stephen's second seal the mail hood is drawn over the point of the chin, and Henry II.'s seals show the chin covered to the lips. At least one seal of this king has the legs and feet armed with hose of ringed mail, probably secured by lacing at the back of the leg as a modern boot is laced. The first seal of Richard Lionheart marks an important movement. His hawberk, hood and hose clothe him, like his father, from crown to toe, and to this equipment he adds gloves of mail. Under the hawberk flows out to the heels the skirt of a long gown slit in front. But helm and shield are the most remarkable points. The shield has become flatter at the top, and at last the shield of an English king bears those armorial devices whose beginnings are seen elsewhere a generation before. The earlier seal has the shield with a rampant lion ramping to the sinister side and closely resembling that on the shield of Philip of Alsace, long believed to be the earliest example of true armory. But the shield in the second seal bears the three leopards which have been ever since the arms of the kings of England, and from this time to the end of the middle ages armorial devices become the common decorations of the knight's shield, coat, saddle and horse-trapper. The helmet of the first seal is a high thimble-topped cap, without a nasal guard, but the second has the king's head covered with the great helm, barrel-shaped and reinforced in front with a flat ventaile pierced in slits for the sight. This helm is crested with a semicircular ridge from which spring two wings, or rows of feathers fan-wise. On its side the ridge bears a single leopard, the forerunner of the coming crests.

12th century.

For 13th-century arms, although but poor scraps remain of original material, we have authority in plenty—pictures, seals and carving, and, above all, the effigies in stone or brass which give us each visible link, strap and ornament. All these have for a commentary chronicles, poems and account books, so that the history of armour may be followed in detail.

13th century.

The long, sleeveless surcoat seen over King John's mail on his broad seal goes through the century and is often embroidered with arms. The shield becomes flat-topped the better to receive armorial charges. The great helm is common, although many knights on the day of battle like better the freedom of the mail hood with a steel cap worn over or under its crown, keeping for the tourney-yard the great helm which towards the century-end begins to carry its towering crest. Great variety is seen in the forms of the flat or round-topped helm, some being in one piece, pierced for sight and air, others having hinged or movable ventailes. At the end of the century a sugar-loaf type is the established form. The knight's hawberk is worn over a gambeson of linen, quilted linen or cotton, which lesser men wear with a steel cap for all defence. Breast and back plates also are sometimes borne under the hawberk, and the first plates in sight at last appear in those knee-cops which protect the joining of the upper and lower hose, and in a few examples of bainbergs or greaves of metal or leather. At the end of Henry III.'s reign we have the admirable illustrations of a manuscript of Matthew Paris's *Lives of the Offas*, with many pictures of knights. (See fig 5.) Here we see knights with knee-cop and greave and a plenty of curious headpieces, the plain mail hood and mail hoods with a plate ventaile to cover the face, barrel-helms and round-topped helms and even round-topped helmets with the Norman nose-guard.



From *The Ancestor*, by permission of A. Constable & Co. Ltd.

FIG. 5.—Knights' Armour, *c.* 1250.

In the last half of the 13th century appears the curious defence known as *alettes*. This name is given to a pair of leather plates generally oblong in form and tagged to the back of the shoulder. As a rule they are borne to display the wearer's arms, but being sometimes plain they may have had some slight defensive value, covering a weak spot at the armpit and turning a sweeping sword-cut at the neck. They disappear in the earlier years of Edward III.

Surcoat, shield and trapper have the arms of their owner. The rowel-spur makes a rare appearance. Weapons change little,

although the sword is often longer and heavier. Richard I. had favoured the cross-bow, in spite of papal denunciations of that weapon hateful to God, and its use is common through all the 13th century, after which it makes way for the national weapon of the long-bow.

14th century.

In the 14th century, the high-day of chivalry, the age of Crecy and Poitiers, of the Black Prince and Chandos, the age which saw enrolled the noble company of the Garter, the art of the armourer and weapon-smith strides forward. At its beginning we see many knights still clad in chain mail with no visible plate. At its end the knight is often locked in plates from head to foot, no chainwork showing save the camail edge under the helm and the fringe of the mail skirt or hawberk.

Before the first quarter of the 14th century is past many of these plates are in common use. Sir John de Creke's brass, about 1325–1330, is a fair example (fig. 6). His helmet is a basinet, pointed at the top, probably worn over a complete hood of mail flowing to the mid-breast. This hood was soon to lose its crown, the later basinets having the camail, a defence of mail covering neck, cheeks and chin and secured to the basinet with eyelet holes and loops through which a lace was passed. A rerebrace of plate defends the outer side of the upper arm, plain elbow-cops the elbow, and round bosses in the form of leopard heads guard the shoulder and the crook of the elbow. The fore-arm is covered with the plates of a vambrace which appears from under the hawberk sleeve. Large and decorated knee-cops cover the knees, ridged greaves the shins, and the upper part of the foot from pointed toe to ankle is fenced with those articulated and overlapping plates the perfection of which in the next century enabled the full-harnessed knight to move his body as freely as might an unarmed man. Under the plates the mail hose show themselves and the heels have rowelled spurs. He has a hawberk of mail whose front skirt ends in a point between the knees, the loose sleeves between wrist and elbow. Under this is a haketon of some soft material whose folds fall to a line above the height of the knee. Over the hawberk is a garment, perhaps of leather with a dagged skirt-edge, and over this again is a sleeveless gambeson or pourpoint of leather or quilted work, studded and enriched. Over all is the sleeveless surcoat, the skirt before cut squarely off at the height of the fork of the leg, the skirt behind falling to below the knee. The loose folds of this surcoat are gathered at the waist by a narrow belt, the sword hanging from a broader belt carried across the hip. Before 1350 the long surcoat of the 13th century was still further shortened, the tails being cut off squarely with the front. The fate of Sir John Chandos, who in 1369 stumbled on a slippery road, his long coat "armed with his arms" becoming tangled with his legs, points to the fact that an old soldier might cling to an old fashion.

FIG. 6.—Brass of Sir John de Creke. From Waller's *Monumental Brasses.*

The desire for a better defence than a steel cap and camail and a less cumbrous one than the great helm, in which the knight rode half stifled and half blind, brought in as a fighting headpiece the basinet with a movable viser. This is found throughout this century, disappearing in the next when the salet and its varieties displaced it. But there were many knights who still fought with the great helm covering basinet and camail, a fact which speaks eloquently of the mighty blows given in this warlike age. The many monumental brasses of the last half of the 14th century show us for the most part knights in basinet and camail with the face exposed, but their heads are commonly pillowed on the great helm and in any case the viser would hinder the artist's desire to show the knight's features.

The fully-armed man of the latter half of the 14th century seems to have worn a rounded breastplate and a back-plate over his chain hawberk. Chaucer's Sir Thopas must always be cited for the defences of this age, the hero wearing the quilted haketon next his shirt, and over that the habergeon, a lesser hawberk of chain mail. His last defence is a fine hawberk "full strong of plate" showing that "hawberk" sometimes served as a word for the body plates. Over all this is the "cote-armure" or surcoat. Many passages from the chroniclers show that the three coats of fence one over the other were in common use in the field, and Froissart tells a tale of a knight struck by a dart in such wise that the head pierced through his plates, his coat of mail and his haketon stuffed with twisted silk. The surcoat in the age of Edward III. became a scanty garment sitting tightly to the body, laced up the back or sides, the close skirts ending at the fork of the leg with a dagged or slittered edge. The waistbelt is rarely in sight, but the broad belt across the hips, on which the dagger comes to hang as a balance to the sword, grows richer and heavier, the best work of the goldsmith or silversmith being spent upon it. Arms and legs and feet become cased in plate of steel or studded leather, and before the mid-century the shoulder-plates, like the steel shoes, are of overlapping pieces and the elbow also moves easily under the same defence. (See fig. 7.)

FIG. 7.—Brass of Sir John de Foxley. From Waller's *Monumental Brasses.*

Such harness, ever growing more beautiful in its rich details, serves our champions until the beginning of the 15th century, when the fashion begins to turn. The scanty surcoat tends to disappear. It may be that during the bitter feuds and fierce slaughters of the Wars of the Roses men were unwilling to display on their breasts the bearings by which their mortal foe might know them afar. The horseman's shield went with the surcoat, its disuse hastened by the perfection of armour, and the banners of leaders remained as the only armorial signs commonly seen in war. But at jousts and tourneys, where personal distinction was eagerly sought, the loose tabard, which, after the middle of the century, bore the arms of the wearer on back, front and both sleeves, was still to be seen, with the crest of parchment or leather towering above a helm whose mantle, from the ribbon-like strip of the early 13th century, had grown into a fluttering cloak with wildly slittered edge streaming out behind the charging knight.

15th century.

FIG. 8.—Brass of Sir John Lisle at Thruxton.

When a score of years of this 15th century had run we find the knight closed in with plates, no edge of chain mail remaining in sight. The surcoat being gone we see him armed in breast and back plate, his loins covered by a skirt of "tonlets," as the defence of overlapping horizontal bands comes to be named (fig. 8). The chain camail has gone out of fashion, the basinet continuing itself with a chin and cheek plate which joins a gorget of plate covering the collar-bone, a movable viser shutting in the whole head with steel. The gussets of chain mail sewn into the leathern or fustian doublet worn below the body armour are unseen even at the gap at the hollow of the arm where the plates must be allowed to move freely, for a little plate, round, oval or oblong, is tagged to each side to fence the weak point. These plates often differ in size and shape one from the other, the sword-arm side carrying the smaller one.

Soon after this the six or eight "tonlets" grow fewer, being continued on the lower edge by the so-called tuilles, small plates strapped to the tonlets and swinging with the movement of the legs. A fine suit of armour is shown in the monument of Count Otto IV. of Henneberg (fig. 9). Knightly armour takes perhaps

FIG. 9.—Gothic Style of Armour. Monument of Count Otto IV. of Henneberg.

its last expression of perfection in such a noble harness as that worn by Richard Beauchamp, earl of Warwick, whose armed effigy was wrought between 1451 and 1454 (fig. 10). In this we see the characteristic feature of the great elbow-cops, whose channelled and fluted edges overlapping vambrace and rerebrace become monstrous fan-like shapes in the brass of Richard Quartremayns, graven about 1460. At this time the harness of the left shoulder is often notably reinforced, as compared with that of the sword-arm shoulder. Towards the latter part of the century chain mail reappears as a skirt or breech of mail, showing itself under the diminished tonlets, and, when helm and gorget are removed, as a high-standing collar. The articulation by overlapping plates extends even to the breastplate, whose front is thus in two or more pieces. Very long-necked rowel-spurs are often found, and the toes of the sabbatons or steel shoes are sharply pointed. The characteristic helmet of the latter half of the century is the salet or salade, a large steel cap, whose edge is carried out from the brows and still more boldly at the back of the neck.

Knights abandon the great helm in war, but it is perfected for use in the tilt-yard, taking for that purpose an enormous size, to enable two good inches of stuffing to come between head or face and the steel plate. Such a helm sits well down on the shoulders, to which it is locked before and behind by strong buckles or rivets. The note of the 15th century in armour is that of fantastically elaborate forms boldly outlined and a splendour of colour which gained much from the custom of wearing over the full harness short cloaks or rich coats turned up with furs, or from another fashion of covering the body plates or brigandines with rich velvets studded with gold. The details of the harness take a thousand curious shapes, and even amongst the simpler jacks and steel caps of the archers the same glorious variety is seen.

If the note of the 15th century be variety of form, that of the 16th century, the last important chapter in the history of armour, is surface decoration, the harness of great folk atoning in some measure for loss of the beautiful medieval sense of line by elaborate enrichment. Plain engraving, niello, russet work, golden inlay and beaten ornament are common methods of enrichment. The great plume of ostrich feathers flows from the helmet crown of leaders in war. As in the reign of Edward III., costume's fashion affects the forms of armour, the broad toe of the Henry VIII. shoe being imitated in steel, as the wide fluted skirts of the so-called Maximilian armour imitate the German fashion in civil dress which the Imperial host popularized through northern Europe (fig. 11). These skirts have been called "lamboys" by modern writers on military antiquities, but the

16th century.

FIG. 10.—Brass of Richard Beauchamp, earl of Warwick.
From Stothard's *Monumental Effigies.*

From Hewitt's *Arms and Armour.*
FIG. 11.—Meeting of Henry VIII. and Maximilian.

word seems an antiquarianism of no value, apparently a misreading of the word "jambeis" in some early document. So many notable examples of the armour of this 16th century are accessible in European collections, other illustrations occurring in great plenty, that its details call for little discussion; a fine and characteristic suit is that by the famous English armourer, Jacob Topf (fig. 12), which belonged to Sir Christopher Hatton. Into this century the arquebusier marches, demanding a chief place in the line of battle, although it is a common error that the improvement in fire-arms drove out the fully armed warrior, whose plates gave him no protection. Until the rifle came to the soldier's hands, plate armour could easily be made shot-proof.

It was driven from the field by the new strategy which asked for long marches and rapid movements of armies. This century's armour for the tilt-yard gives such protection to the champion, with its many reinforcing pieces, that unless the caged helm were used—the same which cost Henry II. of France his life—the risks of the tilt-yard must have fallen much below those of the polo-field. The horse with crinet, chafron and bards of steel was as well covered from harm.

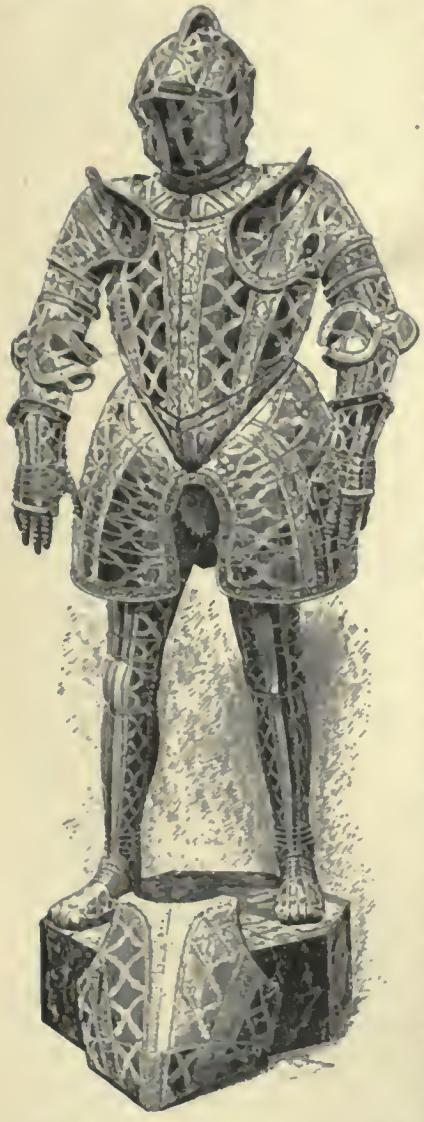


FIG. 12.—Suit by Jacob Topf, nearly complete; the gorget does not belong to it. Below is the placcate.

Before the end of the 16th century the full suit of war harness is an antique survival. Long boots take the place of greaves and steel shoes, and early in the 16th century the military pedants are heard to bewail the common laying aside of other pieces. The mounted cavalier—cuirassier or pistolier—might take the field, even as late as the Great Rebellion, armed at all points save the backs of the thighs and the legs below the knee; but a combed and brimmed cap, breast and back plate and tassets equipped the pikeman, and the musketeer would march without any metal on him save his headpiece, for it was soon found that heavily armed musketeers, after a long trudge through summer dust or winter mud, were readier to rest than to shoot. Everywhere there was revolt against the burden of plates, and as early as 1593 Sir Richard Hawkins found that his adventurers would not use even the light corslets provided by him, "esteeming a pot of wine a better defence." Gervase Markham, in his *Souldier's Accidence* of 1645, asks that at least the captain of cuirassiers should be armed "at all peeces, cap a pee," but he would have found few such captains, and Markham is a great praiser of noble old custom. The famous figure of a pikeman of 1668 (fig. 13) in Elton's *Art Military* has steel cap, corslet and tassets, but he stands for a fashion dead or dying. The last noteworthy helmet was what is now termed the lobster-tail helmet, a headpiece with round top, flat brim before, a broad articulated brim behind, cheek-pieces hanging by straps and a grate of upright bars to cover the face, some having in place of the grate a movable nose-guard to be raised or lowered at will. The close resemblance of this helmet to that worn by the Japanese, with whom the Dutch were then trading, is worth remark, although each of the two pieces seems to have had its separate origin. Thus, save for a steel cap here and a corslet there, especially to be found amongst the guards of sovereigns who must cling to something of antique tradition, armour departs out of the civilized world.

When in the reign of Queen Victoria her mounted guardsmen were given back their breast and back plates, the last piece of body armour had been the tiny gilt crescent worn at the throat by officers of foot, which crescent was the shrunken symbol of that great gorget of plate that came in with the 15th century. The shining plates of the Guards are parade pieces only, but a curious revival of an old defence was carried by English cavalry in the field at the end of the 19th century, when small gussets of chain mail were attached to the shoulders of certain cavalrymen as a defence against sword cuts. Through all the age of modern warfare inventors have pressed the claims of various bullet-proof breastplates, but where they have been effective against rifle fire their weight has made them too heavy an addition to the soldier's burden. (See, however, ARMOUR PLATES, *ad fin.*) Last of all we may reckon those secret coats of mail which are said to be worn on occasion by modern rulers in dread of the assassin. The London detective department has such coats of fence in its armoury; and on the other side it may be remembered that the Kelly gang of bushrangers, driven to bay, were found to have forged suits of plate for themselves out of sheets of boiler-iron.

Survival of armour.

FIG. 13.—Pikeman. From *The Compleat Body of the Art Military*, by Lieut.-Col. Elton (1668).

Ancient arms and armour are now eagerly sought by European and American collectors, and high prices are paid down for every noteworthy piece. The supply is assisted by the efforts of many forgers of false pieces, the most cunning of whom bring all archaeological skill to their aid, and few great national or private collections are free from some example of this industry. For the genuine pieces competition runs high. Suits of plate of the earliest period may be sought in vain, and the greatest collectors may hardly hope for such a panoply of the late Gothic period as that which is the ornament of the Wallace collection. Even this famous harness is not wholly free from suspicion of restoration. Armour of the latter half of the 16th century, however, often appears in the sale-rooms and is found in many private collections, although the "ancestral armour" which decorates so many ancient halls in England is generally the plates and pots which served the pikemen of the 17th-century militia.

Collections.

It is not hard to understand this scarcity of ancient pieces. In the first place it must be remembered that the fully armed man was always a rare figure in war, and only the rich could engage in the costly follies of the later tournaments. The novelists have done much to encourage the belief that most men of gentle rank rode to the wars lance in hand, locked up in full harness of plate; but the country gentleman, serving as light horseman or mounted archer, would hold himself well armed had he a quilted jack or brigandine and a basinet or salet. Men armed *cap a pee* crowd the illuminations of chronicle books, the artists having the same tastes as the boy who decorates his Latin grammar with battles which are hand-to-hand conflicts of epauletted generals. Monuments and brasses also show these fully armed men, but here again we must recognize the tendency which made the last of the cheap miniaturists endow their clients lavishly with heavy watch-chains and rings. As late as the 18th century the portrait painters drew their military or naval sitters in the breastplates and pauldrons, vambraces and rerebraces of an earlier age. Ancient wills and inventories, save those of great folk or military adventurers, have scanty reference to complete harnesses. Ringed hawberks, in a damp northern climate, will not survive

long neglect, and many of them must have been cut in pieces for burnishers or for the mail skirts and gussets attached to the later arming doublets. As the fashion of plate armour changed, the smith might adapt an old harness to the new taste, but more often it would be cast aside. Men to whom the sight of a steel coat called up the business of their daily life wasted no sentimentality over an obsolete piece. The early antiquaries might have saved us many priceless things, but it was not until a few *virtuosi* of the 18th century were taken with the Gothic fancy that popular archaeology dealt with aught but Greek statuary and Roman inscriptions. The 19th century was well advanced before an interest in medieval antiquities became common amongst educated men, and for most contemporaries of Dr Johnson a medieval helm was a barbarous curiosity exciting the same measure of mild interest as does the Zulu knobkerry seen by us as we pass a pawnbroker's window. (O. Ba.)

7. *Fire-arms.* (For the development of cannon, see Artillery and Ordnance.)—Hand-cannons appear almost simultaneously with the larger *bombards*. They were made by the Flemings in the 14th century. An early instance of the use of hand fire-arms in England is the siege of Huntercombe Manor in 1375. These were simply small cannon, provided with a stock of wood, and fired by the application of a match to the touch-hole. During the 15th century the hand-gun was steadily improved, and its use became more general. Edward IV., landing in England in 1471 to reconquer his throne, brought with him a force of Burgundian hand-gun men (mercenaries), and in 1476 the Swiss at Morat had no less than 6000 of their men thus armed. The prototype of the modern military weapon is the *arquebus* (*q.v.*), a form of which was afterwards called in England the *caliver*. Various dates are given for the introduction of the arquebus, which owed many of its details to the perfected cross-bow which it superseded. The Spanish army in the Italian wars at the beginning of the 16th century was the first to make full and effective use of the new weapon, and thus to make the fire action of infantry a serious factor in the decision of battles. The Spaniards also took the next step in advance. The *musket* (*q.v.*) was heavier and more powerful than the arquebus, and, in the hands of the duke of Alva's army in the Netherlands, so conclusively proved its superiority that it at once replaced its rival in the armies of Europe. Both the arquebus and the musket had a touch-hole on the right side of the barrel, with a pan for the priming, with which a lighted quick match was brought in contact by pressing a trigger. The musket, on account of its weight, was provided with a long rest, forked in the upper part and furnished with a spike to stick in the ground. The *matchlock* (long-barrelled matchlocks are still used by various uncivilized peoples, notably in India) was the typical weapon of the soldier for two centuries. The class of hand fire-arms provided with an arrangement for striking a spark to ignite the powder charge begins with the *wheel-lock*. This lock was invented at Nuremberg in 1515, but was seldom applied to the arquebus and musket on account of the costliness of its mechanism and the uncertainty of its action. The early forms of flint-lock (*snaphance*) were open to the same objections, and the *fire-lock* (as the flint-lock was usually called) remained for many years after its introduction the armament of special troops only, till about the beginning of the 18th century it finally superseded the old matchlock. Thenceforward the fire-lock (called familiarly in England "Brown Bess") formed with the bayonet (*q.v.*) the armament of all infantry, and the fire-arms carried by other troops were constructed on the same principle. Flint-lock muskets were supplanted about 1830–1840 by the percussion musket, in which a fulminate cap was used. A Scottish clergyman, Alexander Forsyth, invented this method of ignition in 1807, but it was not till 1820 that it began to come into general use. (See Gun.) The system of firing the charge by a fulminate was followed by the invention of the needle-gun (*q.v.*). The muzzle-loading rifle, employed by special troops since about 1800, came into general use in the armies of Europe about 1854–1860. It was superseded, as a result of the success of the needle-gun in the war of 1866, by the breech-loading rifle, this in its turn giving way to the magazine rifle about 1886–1890. (See Rifle.) Neither breech-loaders nor revolvers, however, are inventions of modern date. Both were known in Germany as early as the close of the 15th century. There are in the Musée d'Artillerie at Paris wheel-lock arquebuses of the 16th century which are breech-loaders; and there is, in the Tower armoury, a revolver with the old matchlock, the date of which is about 1550. A German arquebus of the 16th century, in the museum of Sigmaringen, is a revolver of seven barrels. Nor is rifling a new thing in fire-arms, for there was a rifled arquebus of the 15th century, in which the balls were driven home by a mallet, and a patent was taken out in England for rifling in 1635. All these systems were thus known at an early period in the history of fire-arms, but for want of the minutely accurate workmanship required and, above all, of a satisfactory firing arrangement, they were left in an undeveloped state until modern times. The earliest pistols were merely shorter hand-guns, modified for mounted men, and provided with a straight stock which was held against the breastplate (poitrinal or petronel). The long-barrelled pistol was the typical weapon of the cavalry of the 16th century. (See Cavalry.) With the revival of shock tactics initiated by Gustavus Adolphus the length of the pistol barrel became less and less, and its stock was then shaped for the hand alone. (See Pistol.) (C. F. A.)

ARMSTEAD, HENRY HUGH (1828–1905), English sculptor, was first trained as a silversmith, and achieved the highest excellence with the "St George's Vase" and the "Outram Shield." He rose to the front rank among contemporary sculptors, his chief works being the external sculptural decorations of the colonial office in Whitehall, the sculptures on the southern and eastern sides of the podium of the Albert Memorial, the large fountain at King's College, Cambridge, and numerous effigies, such as "Bishop Wilberforce" at Winchester, and "Lord John Thynne" at Westminster, with smaller portraiture and much ideal work. His sense of style and nobility was remarkable; and he was besides gifted with a fine power of design and draughtsmanship, which he put to good use in his early years for book illustration. He was elected associate of the Royal Academy in 1875 and a full member in 1880.

ARMSTRONG, ARCHIBALD (d. 1672), court jester, called "Archy," was a native of Scotland or of Cumberland, and according to tradition first distinguished himself as a sheep-stealer; afterwards he entered the service of James VI., with whom he became a favourite. When the king succeeded to the English throne, Archy was appointed court jester. In 1611 he was granted a pension of two shillings a day, and in 1617 he accompanied James on his visit to Scotland. His influence was considerable and he was greatly courted and flattered, but his success appears to have turned his head. He became presumptuous, insolent and mischievous, excited foolish jealousies between the king and Henry, prince of Wales, and was much disliked by the members of the court. In 1623 he accompanied Prince Charles and Buckingham in their adventure into Spain, where he was much caressed and favoured by the Spanish court and, according to his own account, was granted a pension. His conduct here became more intolerable than ever. He rallied the infanta on the defeat of the Armada and censured the conduct of the expedition to Buckingham's face. Buckingham declared he would have him hanged, to which the jester replied that "dukes had often been hanged for insolence but never fools for talking." On his return he gained some complimentary allusions from Ben Jonson by his attacks upon the Spanish marriage. He retained his post on the accession of Charles I., and accumulated a considerable fortune, including the grant by the king of 1000 acres in Ireland. After the death of Buckingham in 1628, whom he declared "the greatest enemy of three kings," the principal object of his dislike and rude jests was Laud, whom he openly vilified and ridiculed. He pronounced the following grace at Whitehall in Laud's presence: "Great praise be given to God and little *laud* to the devil," and after the news of the rebellion in Scotland in 1637 he greeted Laud on his way to the council chamber at Whitehall with: "Who's fool now? Does not your

Grace hear the news from Stirling about the liturgy?" On Laud's complaint to the council, Archy was sentenced the same day "to have his coat pulled over his head and be discharged the king's service and banished the king's court." He settled in London as a money-lender, and many complaints were made to the privy council and House of Lords of his sharp practices. In 1641 on the occasion of Laud's arrest, he enjoyed a mean revenge by publishing *Archy's Dream; sometimes Jester to his Majestie, but exiled the Court by Canterburie's malice.* Subsequently he resided at Arthuret in Cumberland, according to some accounts his birthplace, where he possessed an estate, and where he died in 1672, his burial taking place on the 1st of April. He was twice married, his second wife being Sybilla Bell. There is no record of any legal offspring, but the baptism of a "base son" of Archibald Armstrong is entered in the parish register of the 17th of December 1643. *A Banquet of Jests: A change of Cheare*, published about 1630, a collection chiefly of dull, stale jokes, is attributed to him, and with still less reason probably *A choice Banquet of Witty Jests . . . Being an addition to Archee's Jests, taken out of his Closet but never published in his Lifetime* (1660).

ARMSTRONG, JOHN (1709–1779), British physician and writer, was born about 1709 at Castletown, Roxburghshire, where his father was parish minister. He graduated M.D. (1732) at Edinburgh University, and soon afterwards settled in London, where he paid more attention to literature than to medicine. He was, in 1746, appointed one of the physicians to the military hospital behind Buckingham House; and, in 1760, physician to the army in Germany, an appointment which he held till the peace of 1763, when he retired on half-pay. For many years he was closely associated with John Wilkes, but quarrelled with him in 1763. He died on the 7th of September 1779. Armstrong's first publication, an anonymous one, entitled *An Essay for Abridging the Study of Physic* (1735), was a satire on the ignorance of the apothecaries and medical men of his day. This was followed two years after by the *Economy of Love*, a poem the indecency of which damaged his professional practice. In 1744 appeared his *Art of Preserving Health*, a very successful didactic poem, and the one production on which his literary reputation rests. His *Miscellanies* (1770) contains some shorter poems displaying considerable humour.

ARMSTRONG, JOHN (1758–1843), American soldier, diplomatist and political leader, born at Carlisle, Pennsylvania, on the 25th of November 1758. His father, also named John Armstrong (1725–1795), a native of the north of Ireland, who had emigrated to the Pennsylvania frontier between 1745 and 1748, served successively as a brigadier-general in the Continental army (1776), as brigadier-general and then major-general of the Pennsylvania militia (1777–81), during the War of Independence, and was a member of the Continental Congress in 1779–1780 and again in 1787–1788. The son studied for a time at the College of New Jersey (now Princeton University), and served as a major in the War of Independence. In March 1783, while the Continental army was stationed at Newburgh (*q.v.*), New York, he wrote and issued, anonymously, the famous "Newburgh Addresses." In 1784 he led a force of Pennsylvania militia against the Connecticut settlers in Wyoming Valley, and treated them in such a high-handed manner as to incur the disapproval even of the Pennsylvania legislature. In 1789 he married the sister of Chancellor Robert R. Livingston of New York, and removed to New York city, where his own ability and his family connexion gave him great political influence. In 1801–1802 and again in 1804 he was a member of the United States Senate. From 1804 to 1810 he was the United States minister to France, and in March 1806 he was joined with James Bowdoin as a special minister to treat through France with Spain concerning the acquisition of Florida, Spanish spoliations of American commerce, and the "Louisiana" boundary. During the War of 1812, he was a brigadier-general in the United States army from July 1812 until January 1813, and from then until August 1814 secretary of war in the cabinet of President Madison, when his unpopularity forced him to resign. "In spite of Armstrong's services, abilities and experience," says Henry Adams, "something in his character always created distrust. He had every advantage of education, social and political connexion, ability and self-confidence; . . . but he suffered from the reputation of indolence and intrigue." Nevertheless, he "introduced into the army an energy wholly new," an energy the results of which were apparent "for half a century." After his resignation he lived in retirement at Red Hook, New York, where he died on the 1st of April 1843. He published *Notices of the War of 1812* (2 vols., 1836; new ed., 1840), the value of which is greatly impaired by its obvious partiality.

The best account of Armstrong's career as minister to France and as secretary of war may be found in Henry Adams's *History of the United States, 1801–1817* (9 vols., New York, 1889–1890).

ARMSTRONG, SAMUEL CHAPMAN (1839–1893), American soldier, philanthropist and educator, was born on Maui, one of the Hawaiian Islands, on the 30th of January 1839, his parents, Richard and Clarissa Armstrong, being American missionaries. He was educated at the Punahou school at Punahou, at Oahu College, into which the Punahou school developed in 1853, and at Williams College, Williamstown, Massachusetts, where he graduated in 1862. He served in the Civil War, on the Union side, from 1862 to 1865, rising in the volunteer service to the regular rank of colonel and the brevet rank of brigadier-general, and, after December 1863, acted as one of the officers of the coloured troops commanded by General William Birney. In November 1865 he was honourably mustered out of the volunteer service. His experience as commander of negro troops had added to his interest, always strong, in the negroes of the south, and in March 1866 he became superintendent of the Ninth District of Virginia, under the Freedman's Bureau, with headquarters near Fort Monroe. While in this position he became convinced that the only permanent solution of the manifold difficulties which the freedmen encountered lay in their moral and industrial education. He remained in the educational department of the Bureau until this work came to an end in 1872; though five years earlier, at Hampton, Virginia, near Fort Monroe, he had founded, with the aid principally of the American Missionary Association, an industrial school for negroes, Hampton Institute, which was formally opened in 1868, and at the head of which he remained until his death, there, on the 11th of May 1893. After 1878 Indians were also admitted to the Institute, and during the last fifteen years of his life Armstrong took a deep interest in the "Indian question." Much of his time after 1868 was spent in the Northern and Eastern states, whither he went to raise funds for the Institute. See *Samuel Chapman Armstrong, a Biographical Study* (New York, 1904), by his daughter, Edith Armstrong Talbot.

His brother, WILLIAM N. ARMSTRONG, was attorney-general in the cabinet of the Hawaiian king Kalakaua I. He accompanied that monarch on a prolonged foreign tour in 1881, visiting Japan, China, Siam, India, Europe and the United States, and in 1904 published an amusing account of the journey, called *Round the World with a King.*

ARMSTRONG, WILLIAM GEORGE ARMSTRONG, BARON (1810–1900), British inventor, founder of the Elswick manufacturing works, was born on the 26th of November 1810, at Newcastle-on-Tyne, and was educated at a school in Bishop Auckland. The profession which he adopted was that of a solicitor, and from 1833 to 1847 he was engaged in active practice in Newcastle as a member of the firm of Donkin, Stable & Armstrong. His sympathies, however, were always with mechanical and scientific pursuits, and several of his inventions date from a time anterior to his final abandonment of the law. In 1841–1843 he published several papers on the electricity of effluent steam. This subject he was led to study by the experience of a colliery engineman, who noticed that he received a sharp shock on exposing one hand to a jet of steam issuing from a boiler with which his other hand was in contact, and the inquiry was followed by the invention of the "hydro-electric" machine, a powerful generator of electricity, which was thought worthy of careful investigation by Faraday. The question of the utilization of water-power

had engaged his attention even earlier, and in 1839 he invented an improved rotary water motor. Soon afterwards he designed a hydraulic crane, which contained the germ of all the hydraulic machinery for which he and Elswick were subsequently to become famous. This machine depended simply on the pressure of water acting directly in a cylinder on a piston, which was connected with suitable multiplying gear. In the first example, which was erected on the quay at Newcastle in 1846, the necessary pressure was obtained from the ordinary water mains of the town; but the merits and advantages of the device soon became widely appreciated, and a demand arose for the erection of cranes in positions where the pressure afforded by the mains was insufficient. Of course pressure could always be obtained by the aid of special reservoirs, but to build these was not always desirable, or even practicable. Hence, when in 1850 a hydraulic installation was required for a new ferry station at New Holland, on the Humber estuary, the absence of water mains of any kind, coupled with the prohibitive cost of a special reservoir owing to the character of the soil, impelled him to invent a fresh piece of apparatus, the "accumulator," which consists of a large cylinder containing a piston that can be loaded to give any desired pressure, the water being pumped in below it by a steam-engine or other prime mover. This simple device may be looked upon as the crown of the hydraulic system, since by its various modifications the installation of hydraulic power became possible in almost any situation. In particular, it was rendered practicable on board ship, and its application to the manipulation of heavy naval guns and other purposes on warships was not the least important of Armstrong's achievements.

The Elswick works were originally founded for the manufacture of this hydraulic machinery, but it was not long before they became the birthplace of a revolution in gunmaking; indeed, could nothing more be placed to Armstrong's credit than their establishment, his name would still be worthy of remembrance. Modern artillery dates from about 1855, when Armstrong's first gun made its appearance. This weapon embodied all the essential features which distinguish the ordnance of to-day from the cannon of the middle ages—it was built up of rings of metal shrunk upon an inner steel barrel; it was loaded at the breech; it was rifled; and it threw, not a round ball, but an elongated projectile with ogival head. The guns constructed on this principle yielded such excellent results, both in range and accuracy, that they were adopted by the British government in 1859, Armstrong himself being appointed engineer of rifled ordnance and receiving the honour of knighthood. At the same time the Elswick Ordnance Company was formed to manufacture the guns under the supervision of Armstrong, who, however, had no financial interest in the concern; it was merged in the Elswick Engineering Works four years later. Great Britain thus originated a principle of gun construction which has since been universally followed, and obtained an armament superior to that possessed by any other country at that time. But while there was no doubt as to the shooting capacities of these guns, defects in the breech mechanism soon became equally patent, and in a few years caused a reversion to muzzle-loading. Armstrong resigned his position in 1863, and for seventeen years the government adhered to the older method of loading, in spite of the improvements which experiment and research at Elswick and elsewhere had during that period produced in the mechanism and performance of heavy guns. But at last Armstrong's results could no longer be ignored; and wire-wound breech-loading guns were received back into the service in 1880. The use of steel wire for the construction of guns was one of Armstrong's early ideas. He perceived that to coil many turns of thin wire round an inner barrel was a logical extension of the large hooped method already mentioned, and in conjunction with I. K. Brunel, was preparing to put the plan to practical test when the discovery that it had already been patented caused him to abandon his intention, until about 1877. This incident well illustrates the ground of his objection to the British system of patent law, which he looked upon as calculated to strifle invention and impede progress; the patentees in this case did not manage to make a practical success of their invention themselves, but the existence of prior patents was sufficient to turn him aside from a path which conducted him to valuable results when afterwards, owing to the expiry of those patents, he was free to pursue it as he pleased.

Lord Armstrong, who was raised to the peerage in 1887, was the author of *A Visit to Egypt* (1873), and *Electric Movement in Air and Water* (1897), besides many professional papers. He died on the 27th of December 1900, at Rothbury, Northumberland. His title became extinct, but his grand-nephew and heir, W. H. A. F. Watson-Armstrong (b. 1863), was in 1903 created Baron Armstrong of Bamburgh and Cragside.

ARMY (from Fr. *armée*, Lat. *armata*), a considerable body of men armed and organized for the purpose of warfare on land (Ger. *Armee*), or the whole armed force at the disposal of a state or person for the same purpose (Ger. *Heer* = host). The application of the term is sometimes restricted to the permanent, active or regular forces of a state. The history of the development of the army systems of the world is dealt with in this article in sections 1 to 38, being followed by sections 39 to 59 on the characteristics of present-day armies. The remainder of the article is devoted to sections on the history of the principal armies of Europe, and that of the United States. For the Japanese Army see JAPAN, and for the existing condition of the army in each country see under the country heading.

GENERAL HISTORY

1. *Early Armies.*—It is only with the evolution of the specially military function in a tribe or nation, expressed by the separation of a warrior-class, that the history of armies (as now understood) commences. Numerous savage tribes of the present day possess military organizations based on this system, but it first appears in the history of civilization amongst the Egyptians. By the earliest laws of Egypt, provision was made for the support of the warriors. The exploits of her armies under the legendary Sesostris cannot be regarded as historical, but it appears certain that the country possessed an army, capable of waging war in a regular fashion, and divided thus early into separate arms, these being chariots, infantry and archers. The systems of the Assyrians and Babylonians present no particular features of interest, save that horsemen, as distinct from charioteers, appear on the scene. The first historical instance of a military organization resembling those of modern times is that of the Persian empire.

2. *Persia.*—Drawn from a hardy and nomadic race, the armies of Persia at first consisted mainly of cavalry, and owed much of their success to the consequent ease and rapidity of their movements. The warlike Persians constantly extended their power by fresh conquests, and for some time remained a distinctly conquering and military race, attaining their highest power under Cyrus and Cambyses. Cyrus seems to have been the founder of a comprehensive military organization, of which we gather details from Xenophon and other writers. To each province was allotted a certain number of soldiers as standing army. These troops, formed originally of native Persians only, were called the king's troops. They comprised two classes, the one devoted exclusively to garrisoning towns and castles, the other distributed throughout the country. To each province was appointed a military commander, responsible for the number and efficiency of the troops in his district, while the civil governor was answerable for their subsistence and pay. Annual musters were held, either by the king in person or by generals deputed for the purpose and invested with full powers. This organization seems to have fully answered its original purpose, that of holding a vast empire acquired by conquest and promptly repelling inroads or putting down insurrections. But when a great foreign war was contemplated, the standing army was augmented by a levy throughout the empire. The extent of the empire made such a levy a matter of time, and the heterogeneous and unorganized mass of men of all nations so brought together was a source of weakness rather than strength. Indeed, the vast hosts over which the Greeks gained their victories comprised

but a small proportion of the true Persians. The cavalry alone seems to have retained its national character, and with it something of its high reputation, even to the days of Alexander.

3. *Greece.*—The Homeric armies were tribal levies of foot, armed with spear, sword, bow, &c., and commanded by the chiefs in their war-chariots. In historic times all this is changed. Greece becomes a congeries of city-states, each with its own citizen-militia. Federal armies and permanent troops are rare, the former owing to the centrifugal tendency of Greek politics, the latter because the "tyrannies," which must have relied very largely on standing armies to maintain themselves, had ultimately given way to democratic institutions. But the citizen-militia of Athens or Sparta resembled rather a modern "nation in arms" than an auxiliary force. Service was compulsory in almost all states, and as the young men began their career as soldiers with a continuous training of two or three years, Hellenic armies, like those of modern Europe, consisted of men who had undergone a thorough initial training and were subsequently called up as required. Cavalry, as always in the broken country of the Peloponnesus, was not of great importance, and it is only when the theatre of Greek history is extended to the plains of Thessaly that the mounted men become numerous. In the 4th century the mainstay of Greek armies was the *hoplite* (ὁπλίτης), the heavy-armed infantryman who fought in the *corps de bataille*; the light troops were men who could not provide the full equipment of the hoplite, rather than soldiers trained for certain special duties such as skirmishing. The fighting formation was that of the *phalanx*, a solid corps of hoplites armed with long spears. The armies were recruited for each war by calling up one or more classes of men in reserve according to age. It was the duty and privilege of the free citizen to bear arms; the slaves were rarely trusted with weapons.

4. *Sparta.*—So much is common to the various states. In Sparta the idea of the nation in arms was more thoroughly carried out than in any other state in the history of civilization. In other states the individual citizen often lived the life of a soldier, here the nation lived the life of a regiment. Private homes resembled the "married quarters" of a modern army; the unmarried men lived entirely in barracks. Military exercises were only interrupted by actual service in the field, and the whole life of a man of military age was devoted to them. Under these circumstances, the Spartans maintained a practically unchallenged supremacy over the armies of other Greek states; sometimes their superiority was so great that, like the Spanish regulars in the early part of the Dutch War of Independence, they destroyed their enemies with insignificant loss to themselves. The surrender of a Spartan detachment, hopelessly cut off from all assistance, and the victory of a body of well-trained and handy light infantry over a closed battalion of Spartiates were events so unusual as seriously to affect the course of Greek history.

5. *Greek Mercenaries.*—The military system of the 4th century was not called upon to provide armies for continuous service on distant expeditions. When, after the earlier campaigns of the Peloponnesian War, the necessity for such expeditions arose, the system was often strained almost to breaking point, (*e.g.* in the case of the Athenian expedition to Syracuse), and ultimately the states of Greece were driven to choose between unprofitable expenditure of the lives of citizens and recruiting from other sources. Mercenaries serving as light troops, and particularly as *peltasts* (a new form of disciplined "light infantry") soon appeared. The *corps de bataille* remained for long the old phalanx of citizen hoplites. But the heavy losses of many years told severely on the resources of every state, and ultimately non-national recruits—adventurers and soldiers of fortune, broken men who had lost their possessions in the wars, political refugees, runaway slaves, &c.—found their way even into the ranks of the hoplites, and Athens at one great crisis (407) enlisted slaves, with the promise of citizenship as their reward. The Arcadians, like the Scots and the Swiss in modern history, furnished the most numerous contingent to the new professional armies. A truly national army was indeed to appear once more in the history of the Peloponnesus, but in the meantime the professional soldier held the field. The old bond of strict citizenship once broken, the career of the soldier of fortune was open to the adventurous Greek. Taenarum and Corinth became regular *entrepôts* for mercenaries. The younger Cyrus raised his army for the invasion of Persia precisely as the emperors Maximilian and Charles V. raised regiments of *Landsknechte*—by the issue of recruiting commissions to captains of reputation. This army became the famous Ten Thousand. It was a marching city-state, its members not desperate adventurers, but men with the calm self-respect of Greek civilization. On the fall of its generals, it chose the best officers of the army to command, and obeyed implicitly. Cheirisophus the Spartan and Xenophon the Athenian, whom they chose, were not plausible demagogues; they were line officers, who, suddenly promoted to the chief command under circumstances of almost overwhelming difficulty, proved capable of achieving the impossible. The merit of choosing such leaders is not the least title to fame of the Ten Thousand mercenary Greek hoplites. About the same time Iphicrates with a body of mercenary *peltasts* destroyed a *mora* or corps of Spartan hoplites (391 B.C.).

6. *Epaminondas.*—Not many years after this, Spartan oppression roused the Theban revolt, and the Theban revolt became the Theban hegemony. The army which achieved this under the leadership of Epaminondas, one of the great captains of history, had already given proofs of its valour against Xenophon and the Cyreian veterans. Still earlier it had won the great victory of Delium (424 B.C.).

It was organized, as were the professional armies, on the accepted model of the old armies, viz. the phalangite order, but the addition of peltasts now made a Theban army, unlike the Spartans, capable of operating in broken country as well as in the plain. The new tactics of the phalanx, introduced by Epaminondas, embodied, for the first time in the history of war, the modern principle of local superiority of force, and suggested to Frederick the Great the famous "oblique order of battle." Further, the cavalry was more numerous and better led than that of Peloponnesian states. The professional armies had well understood the management of cavalry; Xenophon's handbook of the subject is not without value in the 20th century. In Greek armies the dearth of horses and the consequent numerical weakness of the cavalry prevented the bold use of the arm on the battlefield (see CAVALRY). But Thebes had always to deal with nations which possessed numerous horsemen. Jason of Pherae, for instance, put into the field against Thebes many thousands of Thessalian horse; and thus at the battle of Tegyra in 375 the Theban cavalry under Pelopidas, aided by the *corps d'élite* of infantry called the Sacred Band, carried all before them. At Leuctra Epaminondas won a glorious victory by the use of his "oblique order" tactics; the same methods achieved the second great victory of Mantineia (362 B.C.) at which Epaminondas fell. Pelopidas had already been slain in a battle against the Thessalians, and there was no leader to carry on their work. But the new Greek system was yet to gain its greatest triumphs under Alexander the Great.

7. *Alexander.*—The reforms of Alexander's father, Philip of Macedon, may most justly be compared to those of Frederick William I. in Prussia. Philip had lived at Thebes as a hostage, and had known Iphicrates, Epaminondas and Pelopidas. He grafted the Theban system of tactics on to the Macedonian system of organization. That the latter—a complete territorial system—was efficient was shown by the fact that Philip's blow was always struck before his enemies were ready to meet it. That the new Greek tactics, properly used, were superior to the old was once more demonstrated at Chaeronea (338 B.C.), where the Macedonian infantry militia fought in phalanx, and the cavalry, led by the young Alexander, delivered the last crushing blow. On his accession, like Frederick the Great, Alexander inherited a well-trained and numerous army, and was not slow to use it. The invasion of Asia was carried out by an army of the Greek pattern, formed both of Hellenes and of

non-Hellenes on an exceedingly strong Macedonian nucleus. Alexander's own guard was composed of picked horse and foot. The infantry of the line comprised Macedonian and Greek hoplites, the Macedonians being subdivided into heavy and medium troops. These fought in a grand phalanx, which was subdivided into units corresponding to the modern divisions, brigades and regiments, the fighting formation being normally a line of battalion masses. The arm of the infantry was the 18-foot pike (*sarissa*). The peltasts, Macedonian and Greek, were numerous and well trained, and there was the usual mass of irregular light troops, bowmen, slingers, &c. The cavalry included the Guard (ἄγημα), a body of heavy cavalry composed of chosen Macedonians, the line cavalry of Macedonia (ἑταῖροι) and Thessaly, the numerous small contingents of the Greek states, mercenary corps and light lancers for outpost work. The final blow and the gathering of the fruits of victory were now for the first time the work of the mounted arm. The solid phalanx was almost unbreakable in the earlier stages of the battle, but after a long infantry fight the horsemen had their chance. In former wars they were too few and too poorly mounted to avail themselves of it, and decisive victories were in consequence rarely achieved in battles of Greek versus Greek. Under Epaminondas, and still more under Philip and Alexander, the cavalry was strong enough for its new work. Battles are now ended by the shock action of mounted men, and in Alexander's time it is noted as a novelty that the cavalry carried out the pursuit of a beaten army. There were further, in Alexander's army, artillerymen with a battering train, engineers and departmental troops, and also a medical service, an improvement attributed to Jason of Pherae. The victories of this army, in close order and in open, over every kind of enemy and on every sort of terrain, produced the Hellenistic world, and in that achievement the history of Greek armies closes, for after the return of the greater part of the Europeans to their homes the armies of Alexander and his successors, while preserving much of the old form, become more and more orientalized.

The decisive step was taken in 323, when a picked contingent of Persians, armed mainly with missile weapons, was drafted into the phalanx, in which henceforward they formed the middle ranks of each file of sixteen men. But, like the third rank of Prussian infantry up to 1888, they normally fought as skirmishers in advance, falling into their place behind the pikes of the Macedonian file-leaders only if required for the decisive assault. The new method, of course, depended for success on the steadiness of the thin three-deep line of Macedonians thus left as the line of battle. Alexander's veterans were indeed to be trusted, but as time went on, and little by little the war-trained Greeks left the service, it became less and less safe to array the Hellenistic army in this shallow and articulated order of battle. The purely formal organization of the phalanx sixteen deep became thus the actual tactical formation, and around this solid mass of 16,384 men gathered the heterogeneous levies of a typical oriental army. Pyrrhus, king of Epirus, retained far more of the tradition of Alexander's system than his contemporaries farther east, yet his phalanx, comparatively light and mobile as it was, achieved victories over the Roman legion only at the cost of self-destruction. Even elephants quickly became a necessary adjunct to Hellenistic armies.

8. *Carthage.*—The military systems of the Jews present few features of unusual interest. The expedient of calling out successive contingents from the different tribes, in order to ensure continuity in military operations, should, however, be noticed. David and Solomon possessed numerous permanent troops which served as guards and garrisons; in principle this organization was identical with that of the Persians, and that of Europe in the 16th and 17th centuries. Particular interest attaches to the Carthaginian military forces of the 3rd century B.C. Rarely has any army achieved such renown in the short space of sixty years (264–202 B.C.). Carthage produced a series of great generals, culminating in Hannibal, who is marked out, even by the little that is known of him, as the equal of Napoleon. But Napoleon was supported by a national army, Hannibal and his predecessors were condemned to work with armies of mercenaries. For the first time in the world's history war is a matter with which the civil population has no concern. The merchants of Carthage fought only in the last extremity; the wars in which their markets were extended were conducted by non-national forces and directed by the few Carthaginian citizens who possessed military aptitudes. The civil authorities displayed towards their instruments a spirit of hatred for which it is difficult to find a parallel. Unsuccessful leaders were crucified, the mercenary soldiers were cheated of their pay, and broke out into a mutiny which shook the empire of Carthage to its foundations. But the magnetism of a leader's personality infused a corporate military spirit into these heterogeneous Punic armies, and history has never witnessed so complete an illustration of the power of pure and unaided *esprit de corps* as in the case of Hannibal's army in Italy, which, composed as it was of Spaniards, Africans, Gauls, Numidians, Italians and soldiers of fortune of every country, was yet welded by him into thorough efficiency. The army of Italy was as great in its last fight at Zama as the army of Spain at Rocroi; its victories of the Trebia, Trasimene and Cannae were so appalling that, two hundred years later, the leader to whom these soldiers devoted their lives was still, to a Roman, the " dire " Hannibal.

In their formal organization the Carthaginian armies resembled the new Greek model, and indeed they were created in the first instance by Xanthippus, a Spartan soldier in the service of Carthage, who was called upon to raise and train an army when the Romans were actually at the gates of Carthage, and justified his methods in the brilliant victory of Tunis (255 B.C.). For the solid Macedonian phalanx of 16,000 spears Xanthippus substituted a line of heavy battalions equal in its aggregate power of resistance to the older form, and far more flexible. The triumphs of the cavalry arm in Hannibal's battles far excelled those of Alexander's horesemen. Hannibal chose his fighting ground whenever possible with a view to using their full power, first to defeat the hostile cavalry, then to ride down the shaken infantry masses, and finally to pursue *au fond*. At Cannae, the greatest disaster ever suffered by the Romans, the decisive blow and the slaughter were the work of Hannibal's line cavalry, the relentless pursuit that of his light horse. But a professional long-service army has always the greatest difficulty in making good its losses, and in the present case it was wholly unable to do so. Even Hannibal failed at last before the sustained efforts of the citizen army of Rome.

9. *Roman Army under the Republic.*—The earliest organization of the Roman army is attributed to Romulus, who formed it on the tribal principle, each of the three tribes contributing its contingent of horse and foot. But it was to Servius Tullius that Rome owed, traditionally, the complete classification of her citizen-soldiers. For the details of the Roman military system, see ROMAN ARMY. During the earlier period of Roman history the army was drawn entirely from the first classes of the population, who served without pay and provided their own arms and armour. The wealthiest men (*equites*) furnished the cavalry, the remainder the infantry, while the poorer classes either fought as light troops or escaped altogether the privilege and burden of military service. Each " legion " of 3000 heavy foot was at first formed in a solid phalanx. The introduction of the elastic and handy three-line formation with intervals (similar in many respects to Alexander's) was brought about by the Gallic wars, and is attributed to M. Furius Camillus, who also, during the siege of Veii, introduced the practice of paying the soldiers, and thus removed the chief obstacle to the employment of the poorer classes. The new order of battle was fully developed in the Pyrrhic Wars, and the typical army of the Republic may be taken as dating from the latter part of the 3rd century B.C. The legionary was still possessed of a property qualification, but it had become relatively small. An annual levy was made at Rome to provide for the campaign of the year. Discipline was severe, and the rewards appealed as much to the soldier's honour as to his desire of gain. A legion now consisted of three lines (*Hastati, Principes, Triarii*), each line composed of men of

similar age and experience, and was further subdivided into thirty "maniples," each of two "centuries." The normal establishment of 300 cavalry, 3000 heavy and 1200 light infantry was still maintained, though in practice these figures were often exceeded. In place of the old light-armed and somewhat inferior *rorarii*, the new *velites* performed light infantry duties (211 B.C.), at the same time retaining their place in the maniples, of which they formed the last ranks (compare the Macedonian phalanx as reorganized in 323, § 7 above). The 300 cavalry of the legion were trained for shock action. But the strength of the Roman army lay in the heavy legionary infantry of citizens. The thirty maniples of each legion stood in three lines of battle, but the most notable point of their formation was that each maniple stood by itself on its own small manœuvre-area, free to take ground to front or flank. To the Roman legion was added a legion of allies, somewhat differently organized and possessing more cavalry, and the whole force was called a "double legion" or briefly a "legion." A consul's army consisted nominally of two double legions, but in the Punic wars military exigencies rather than custom dictated the numbers of the army, and the two consuls at Cannae (216 B.C.) commanded two double consular armies, or eight double legions.

10. *Characteristics of the Roman Army.*—Such in outline was the Roman military organization at the time when it was put to the severe test of the Second Punic War. Its elements were good, its military skill superior to that of any other army of ancient history, while its organization was on the whole far better than any that had gone before. The handy formation of maniples at open order was unique in the ancient world, and it did not reappear in history up to the advent of Gustavus Adolphus. In this formation, in which everything was entrusted to the skill of subordinates and the individual courage of the rank and file, the Romans met and withstood with success every type of impact, from the ponderous shock of the Macedonian phalanx and the dangerous rush of Celtic savages to the charge of elephants. Yet it was no particular virtue in the actual form employed that carried the Roman arms to so many victories. There would have been positive danger in thus articulating the legion had it been composed of any but the most trustworthy soldiers. To swiftness and precision of manœuvre they added a dogged obstinacy over which nothing but overwhelming disaster prevailed. It is, therefore, not unnatural to ask wherein the system which produced these soldiers failed, as it did within a century after the battle of Zama. The greatest defect was the want of a single military command. The civil magistrates of Rome were *ex officio* leaders of her armies, and though no Roman officer lacked military training, the views of a consul or praetor were almost invariably influenced by the programme of his political party. When, as sometimes happened, the men under their command sided in the political differences of their leaders, all real control came to an end. The soldiers of the Republic hardly ever forgot that they were citizens with voting powers; they served as a rule only during a campaign; and, while there could be little question as to their patriotism and stubbornness, they lacked almost entirely that *esprit de corps* which is found only amongst the members of a body having a permanent corporate existence. Thus they had the vices as well as the virtues of a nation in arms, and they fell still further short of the ideal because of the dubious and precarious tenure of their generals' commands. The great officers were usually sent home at the end of a campaign, to be replaced by their elected successors, and they showed all the hesitation and fear of responsibility usually found in a temporary commander. Above all, when two armies, each under its own consul or praetor, acted together, the command was either divided or exercised on alternate days.

11. *Roman Empire.*—The essential weaknesses of militia forces and the accidental circumstances of that under consideration led, even in earlier times, to the adoption of various expedients which for a time obviated the evils to which allusion has been made. But a change of far greater importance followed the final exploits of the armies of the old system. The increasing dominions of the Republic, the spread of wealth and luxury, the gradual decadence of the old Roman ideas, all tended to produce an army more suited to the needs of the newer time than the citizen militia of the 3rd century. Permanent troops were a necessity; the rich, in their newly acquired dislike of personal effort, ceased to bear their share in the routine life of the army, and thus the proletariat began to join the legions with the express intention of taking to a military career. The actual change from the old *régime* to the new was in the main the work of Gaius Marius. The urgent demand for men at the time of the Teutonic invasions caused the service to be thrown open to all Roman citizens irrespective of *census*. The new territories furnished cavalry, better and more numerous than the old *equites*, and light troops of various kinds to replace the *velites*. Only the heavy foot remained a purely Italian force, and the spread of the Roman citizenship gradually abolished the distinction between a Roman and an allied legion. The higher classes had repeatedly shown themselves unwilling to serve under plebeians (*e.g.* Varro and Flaminius); Marius preferred to have as soldiers men who did not despise him as an inferior. Under all these influences for good or for evil, the standing army was developed in the first half of the 1st century B.C. The tactical changes in the legion indicate its altered character. The small maniples gave way to heavy "cohorts," ten cohorts forming the legion; as in the Napoleonic wars, light and handy formations became denser and more rigid with the progressive decadence in *moral* of the rank and file. It is more significant still that in the days of Marius the annual oath of allegiance taken by the soldier came to be replaced by a personal vow, taken once and for all, of loyalty to the general. *Ubi bene, ibi patria* was an expression of the new spirit of the army, and Caesar had but to address his men as *quirites* (civilians) to quell a mutiny. *Hastati*, *principes* and *triarii* were now merely expressions in drill and tactics. But perhaps the most important of all these changes was the growth of regimental spirit and tradition. The legions were now numbered throughout the army, and the Tenth Legion has remained a classic instance of a "crack" corps. The *moral* of the Roman army was founded no longer on patriotism, but on professional pride and *esprit de corps*.

With this military system Rome passed through the era of the Civil Wars, at the end of which Augustus found himself with forty-five legions on his hands. As soon as possible he carried through a great reorganization, by which, after ruthlessly rejecting inferior elements, he obtained a smaller picked force of twenty-five legions, with numerous auxiliary forces. These were permanently stationed in the frontier provinces of the Empire, while Italy was garrisoned by the Praetorian cohorts, and thus was formed a regular long-service army, the strength of which has been estimated at 300,000 men. But these measures, temporarily successful, produced in the end an army which not only was perpetually at variance with the civil populations it was supposed to protect, but frequently murdered the emperors to whom it had sworn allegiance when it raised them to the throne. The evil fame of the Italian cohorts has survived in the phrase "praetorianism" used to imply a venal military despotism. The citizens gradually ceased to bear arms, and the practice of self-mutilation became common. The inevitable *dénouement* was delayed from time to time by the work of an energetic prince. But the ever-increasing inefficiency and factiousness of the legions, and the evanescence of all military spirit in the civil population, made it easy for the barbarians, when once the frontier was broken through, to overrun the decadent Empire. The end came when the Gothic heavy horse annihilated the legions of Valens at Adrianople (A.D. 387).

There was now no resource but to take the barbarians into Roman pay. Under the name of *foederati*, the Gothic mercenary cavalry played the most conspicuous part in the succeeding wars of the Empire, and began the reign of the heavy cavalry arm, which lasted for almost a thousand years. Even so soon as within six years of the death of Valens twenty thousand Gothic horse decided a great battle in the emperor's favour. These men, however, became turbulent and factious, and it was not until the emperor Leo I. had regenerated the native Roman soldier

that the balance was maintained between the national and the hired warrior. The work of this emperor and of his successors found eventual expression in the victories of Belisarius and Narses, in which the Romans, in the new rôle of horse-archers, so well combined their efforts with those of the *foederati* that neither the heavy cavalry of the Goths nor the phalanx of Frankish infantry proved to be capable of resisting the imperial forces. At the battle of Casilinum (553) Roman foot-archers and infantry bore no small part of the work. It was thus in the Eastern Empire that the Roman military spirit revived, and the Byzantine army, as evolved from the system of Justinian, became eventually the sole example of a fully organized service to be found in medieval history.

12. *The "Dark Ages."*—In western Europe all traces of Roman military institutions quickly died out, and the conquerors of the new kingdoms developed fresh systems from the simple tribal levy. The men of the plains were horsemen, those of marsh and moor were foot, and the four greater peoples retained these original characteristics long after the conquest had been completed. In organization the Lombards and Franks, Visigoths and English scarcely differed. The whole military population formed the mass of the army, the chiefs and their personal retainers the *élite*. The Lombards and the Visigoths were naturally cavalry; the Franks and the English were, equally naturally, infantry, and the armies of the Merovingian kings differed but little from the English *fyrd* with which Offa and Penda fought their battles. But in these nations the use of horses and armour, at first confined to kings and great chiefs, gradually spread downwards to the ever-growing classes of *thegns*, *comites*, &c. Finally, under Charlemagne were developed the general lines of the military organization which eventually became feudalism. For his distant wars he required an efficient and mobile army. Hence successive "capitularies" were issued dealing with matters of recruiting, organization, discipline and field service work. Very noticeable are his system of forts (*burgi*) with garrisons, his military train of artillery and supplies, and the reappearance of the ancient principle that three or four men should equip and maintain one of themselves as a warrior. These and other measures taken by him tended to produce a strong veteran army, very different in efficiency from the tumultuary levy, to which recourse was had only in the last resort. While war (as a whole) was not yet an art, fighting (from the individual's point of view) had certainly become a special function; after Charlemagne's time the typical feudal army, composed of well-equipped cavalry and ill-armed peasantry serving on foot, rapidly developed. Enemies such as Danes and Magyars could only be dealt with by mounted men who could ride round them, compel them to fight, and annihilate them by the shock of the charge; consequently the practice of leaving the infantry in rear, and even at home, grew up almost as a part of the feudal system of warfare. England, however, sought a different remedy, and thus diverged from the continental methods. This remedy was the creation of a fleet, and, the later Danish wars being there carried out, not by bands of mounted raiders, but by large armies of military settlers, infantry retained its premier position in England up to the day of Hastings. Even the *thegns*, who there, as abroad, were the mainstay of the army, were heavy-armed infantry. The only contribution made by Canute to the military organization of England was the retention of a picked force of *hus carles* (household troops) when the rest of the army with which he had conquered his realm was sent back to Scandinavia. At Hastings, the forces of Harold consisted wholly of infantry. The English array was composed of the king and his personal friends, the *hus carles*, and the contingents of the *fyrd* under the local *thegns*; though better armed, they were organized after the manner of their forefathers. On that field there perished the best infantry in Europe, and henceforward for three centuries there was no serious rival to challenge the predominance of the heavy cavalry.

13. *The Byzantines* (cf. article Roman Empire, Later).—While the west of Europe was evolving feudalism, the Byzantine empire was acquiring an army and military system scarcely surpassed by any of those of antiquity and not often equalled up to the most modern times. The *foederati* disappeared after the time of Justinian, and by A.D. 600 the army had become at once professional and national. For generations, regiments had had a corporate existence. Now brigades and divisions also appeared in war, and, somewhat later, in peace likewise. With the disappearance of the barbarians, the army became one homogeneous service, minutely systematized, and generally resembling an army in the modern sense of the word. The militia of the frontier districts performed efficiently the service of surveillance, and the field forces of disciplined regulars were moved and employed in accordance with well-reasoned principles of war; their maintenance was provided for by a scutage, levied, in lieu of service, on the central provinces of the empire. Later, a complete territorial system of recruiting and command was introduced. Each "theme" (military district) had its own regular garrison, and furnished a field division of some 5000 picked troopers for a campaign in any theatre of war. Provision having been made in peace for a depot system, all weakly men and horses could be left behind, and local duties handed over to second line troops; thus the field forces were practically always on a war footing. Beside the "themes" under their generals, there were certain districts on the frontiers, called "clissuras," placed under chosen officers, and specially organized for emergency service. The corps of officers in the Byzantine army was recruited from the highest classes, and there were many families (*e.g.* that from which came the celebrated Nicephorus Phocas) in which soldiering was the traditional career. The rank and file were either military settlers or men of the yeoman class, and in either case had a personal interest in the safety of the theme which prevented friction between soldiers and civilians. The principal arm was, of course, cavalry, and infantry was employed only in special duties. Engineer, train and medical services were maintained in each theme. Of the *ensemble* of the Byzantine army it has been said that "the art of war as it was understood at Constantinople . . . was the only system of real merit existing. No western nation could have afforded such a training to its officers till the 16th or . . . 17th century." The vitality of such an army remained intact long after the rest of the empire had begun to decay, and though the old army practically ceased to exist after the great disaster of Manzikert (1071), the barbarians and other mercenaries who formed the new service were organized, drilled and trained to the same pitch of military efficiency. Indeed the greatest tactical triumph of the Byzantine system (Calavryta, 1079) was won by an army already largely composed of foreigners. But mercenaries in the end developed practorianism, as usual, and at last they actually mutinied, in the presence of the enemy, for higher pay (Constantinople, 1204).

14. *Feudalism.*—From the military point of view the change under feudalism was very remarkable. For the first time in the history of western Europe there appears, in however rough a form, a systematized obligation to serve in arms, regulated on a territorial basis. That army organization in the modern sense—organization for tactics and command—did not develop in any degree commensurate with the development of military administration, was due to the peculiar characteristics of the feudal system, and the virtues and weaknesses of medieval armies were its natural outcome. Personal bravery, the primary virtue of the soldier, could not be wanting in the members of a military class, the *métier* of which was war and manly exercises. Pride of caste, ambition and knightly emulation, all helped to raise to a high standard the individual efficiency of the feudal cavalier. But the gravest faults of the system, considered as an army organization, were directly due to this personal element. Indiscipline, impatience of superior control, and dangerous knight-errantry, together with the absence of any chain of command, prevented the feudal cavalry from achieving results at all proportionate to the effort expended and the potentialities of a force with so many soldierly qualities. If such defects were habitually found in the best elements of the army—the feudal tenants and subtenants who formed the heavy cavalry arm—

little could be expected of the despised and ill-armed foot-soldiery of the levy. The swift raids of the Danes and others (see above) had created a precedent which in French and German wars was almost invariably followed. The feudal levy rarely appeared at all on the battlefield, and when it was thus employed it was ridden down by the hostile knights, and even by those of its own party, without offering more than the feeblest resistance. Above all, one disadvantage, common to all classes of feudal soldiers, made an army so composed quite untrustworthy. The service which a king was able to exact from his feudatories was so slight (varying from one month to three in the year) that no military operation which was at all likely to be prolonged could be undertaken with any hope of success.

15. *Medieval Mercenaries.*—It was natural, therefore, that a sovereign who contemplated a great war should employ mercenaries. These were usually foreigners, as practically all national forces served on feudal terms. While the greater lords rode with him on all his expeditions, the bulk of his army consisted of professional soldiers, paid by the levy of *scutage* imposed upon the feudal tenantry. There had always been soldiers of fortune. William's host at Hastings contained many such men; later, the Flemings who invaded England in the days of Henry I. sang to each other—

"Hop, hop, Willeken, hop! England is mine and thine,"—

and from all the evidence it is clear that in earlier days the hired soldiers were adventurers seeking lands and homes. But these men usually proved to be most undesirable subjects, and sovereigns soon began to pay a money wage for the services of mercenaries properly so called. Such were the troops which figured in English history under Stephen. Such troops, moreover, formed the main part of the armies of the early Plantagenets. They were, as a matter of course, armed and armoured like the knights, with whom they formed the men-at-arms (*gendarmes*) of the army. Indeed, in the 11th and 12th centuries, the typical army of France or the Empire contains a relatively small percentage of "knights," evidence of which fact may be found even in so fanciful a romance as *Aucassin and Nicolete*. It must be noted, however, that not all the mercenaries were heavy cavalry; the Brabançon pikeman and the Italian crossbowman (the value of whose weapon was universally recognized) often formed part of a feudal army.

16. *Infantry in Feudal Times.*—These mercenary foot soldiers came as a rule from districts in which the infantry arm had maintained its ancient predominance in unbroken continuity. The cities of Flanders and Brabant, and those of the Lombard plain, had escaped feudal interference with their methods of fighting, and their burgher militia had developed into solid bodies of heavy-armed pikemen. These were very different from those of the feudal levy, and individual knightly bravery usually failed to make the slightest impression on a band of infantry held together by the stringent corporate feeling of a trade-gild. The more adventurous of the young men, like those of the Greek cities, took service abroad and fought with credit in their customary manner. The reign of the "Brabançon" as a mercenary was indeed short, but he continued, in his own country, to fight in the old way, and his successor in the profession of arms, the Genoese crossbowman, was always highly valued. In England, moreover, the infantry of the old *fyrd* was not suffered to decay into a rabble of half-armed countrymen, and in France a burgher infantry was established by Louis VI. under the name of the *milice des communes*, with the idea of creating a counterpoise to the power of the feudatories. Feudalism, therefore, as a military system, was short-lived. Its limitations had always necessitated the employment of mercenaries, and in several places a solid infantry was coming into existence, which was drawn from the sturdy and self-respecting middle classes, and in a few generations was to prove itself a worthy opponent not only to the knight, but to the professional man-at-arms.

17. *The Crusades.*—It is an undoubted fact that the long wars of the Crusades produced, directly, but slight improvement in the feudal armies of Europe. In the East large bodies of men were successfully kept under arms for a considerable period, but the application of crusading methods to European war was altogether impracticable. In the first place, much of the permanent force of these armies was contributed by the military orders, which had no place in European political activities. Secondly, enthusiasm mitigated much of the evil of individualism. In the third place, there was no custom to limit the period of service, since the Crusaders had undertaken a definite task and would merely have stultified their own purpose in leaving the work only half done. There were, therefore, sharp contrasts between crusading and European armies. In the latter, systematization was confined to details of recruiting; in the armies of the Cross, men were from time to time obtained by the accident of religious fervour, while at the same time continuous service produced a relatively high system of tactical organization. Different conditions, therefore, produced different methods, and crusading unity and discipline could not have been imposed on an ordinary army, which indeed with its paid auxiliaries was fairly adequate for the somewhat desultory European wars of that time. The statement that the Crusaders had a direct influence on the revival of infantry is hardly susceptible of convincing demonstration, but it is at any rate beyond question that the social and economic results of the Crusades materially contributed to the downfall of the feudal knight, and in consequence to a rise in the relative importance of the middle classes. Further, not only were the Crusading knights compelled by their own want of numbers to rely on the good qualities of the foot, but the foot themselves were the "survivors of the fittest," for the weakly men died before they reached the Holy Land, and with them there were always knights who had lost their horses and could not obtain remounts. Moreover, when "simple" and "gentle" both took the Cross there could be no question of treating Crusaders as if they were the mere feudal levy. But the little direct influence of the whole of these wars upon military progress in Europe is shown clearly enough by the fact that at the very close of the Crusades a great battle was lost through knight-errantry of the true feudal type (Mansurah).

18. *The Period of Transition* (1290–1490).—Besides the infantry already mentioned, that of Scotland and that of the German cities fought with credit on many fields. Their arm was the pike, and they were always formed in solid masses (called in Scotland, *schiltrons*). The basis of the medieval commune being the suppression of the individual in the social unit, it was natural that the burgher infantry should fight "in serried ranks and in better order" than a line of individual knights, who, moreover, were almost powerless before walled cities. But these forces lacked offensive power, and it was left for the English archers, whose importance dates from the latter years of the 13th century, to show afresh, at Creçy, Poitiers and Agincourt, the value of missile action. When properly supported by other arms, they proved themselves capable of meeting both the man-at-arms and the pikeman. The greatest importance attaches to the evolution of this idea of mutual support and combination. Once it was realized, war became an art, and armies became specially organized bodies of troops of different arms. It cannot be admitted, indeed, as has been claimed, that the 14th century had a scientific system of tactics, or that the campaign of Poitiers was arranged by the French "general staff." Nevertheless, during this century armies were steadily coming to consist of expert soldiers, to the exclusion of national levies and casual mercenaries. It is true that, by his system of "indents," Edward III. of England raised national armies of a professional type, but the English soldier thus enrolled, when discharged by his own sovereign, naturally sought similar employment elsewhere. This system produced, moreover, a class of unemployed soldiers, and these, with others who became adventurers from choice or necessity, and even with foreign troops, formed the armies which fought in the Wars of the Roses —armies which differed but slightly from others of the time. The natural result of these wars was to implant a hatred of soldiery in the heart of a nation which had formerly produced the best fighting men in Europe, a hatred which left a deep imprint on the constitutional and social life of the people. In

France, where Joan of Arc passed like a meteor across the military firmament, the idea of a national regular army took a practical form in the middle of the 15th century. Still, the forces thus brought into existence were not numerous, and the soldier of fortune, in spite of such experiences of his methods as those of the Wars of the Roses, was yet to attain the zenith of his career.

19. *The Condottieri.*— The immediate result of this confused period of destruction and reconstruction was the *condottiere*, who becomes important about 1300. In Italy, where the *condottieri* chiefly flourished, they were in demand owing to the want of feudal cavalry, and the inability of burgher infantry to undertake wars of aggression. The "free companies" (who served in great numbers in France and Spain as well as in Italy) were "military societies very much like trade-gilds," which (so to speak) were hawked from place to place by their managing directors, and hired temporarily by princes who needed their services. Unlike the older hirelings, they were permanently organized, and thus, with their experience and discipline, became the best troops in existence. But the carrying on of war "in the spirit of a handicraft" led to bloodless battles, indecisive campaigns, and other unsatisfactory results, and the reign of the *condottieri* proper was over by 1400, subsequent free companies being raised on a more strictly national basis. With all their defects, however, they were the pioneers of modern organization. In the inextricable tangle of old and new methods which constitutes the military system of the 15th century, it is possible to discern three marked tendencies. One is the result of a purely military conception of the now special art of war, and its exposition as an art by men who devote their whole career to it. The second is the idea of a national army, resulting from many social, economical and political causes. The third is the tendency towards minuter organization and subdivision within the army. Whereas the individual feudatories had disliked the close supervision of a minor commander, and their army had in consequence remained always a loosely-knit unit, the men who made war into an art belonged to small bands or corps, and naturally began their organization from the lower units. Herein, therefore, was the germ of the regimental system of the present day.

20. *The Swiss.*—The best description of a typical European army at the opening of the new period of development is that of the French army in Italy in 1494, written by Paolo Giovio. He notes with surprise that the various corps of infantry and cavalry are distinct, the usual practice of the time being to combine one lancer, one archer, one groom, &c., into a small unit furnished and commanded by the lancer. There were Swiss and German infantry, armed with pike and halbert, with a few "shot," who marched in good order to music. There were the heavy men-at-arms (*gendarmes*), accompanied as of old by mounted archers, who, however, now fought independently. There were, further, Gascon slingers and crossbowmen, who had probably acquired, from contact with Spain, some of the lightness and dash of their neighbours. The artillery train was composed of 140 heavy pieces and a great number of lighter guns; these were then and for many generations thereafter a special arm outside the military establishments (see ARTILLERY). In all this the only relic of the days of Creçy is the administrative combination of the men-at-arms and the horse archers, and even this is no longer practised in action. The most important element in the army is the heavy infantry of Swiss and Germans. The Swiss had for a century past gradually developed into the most formidable troops of the day. The wars of Žižka (*q.v.*) in Bohemia (1420) materially assisted in the downfall of the heavy cavalry; and the victories of the Swiss, beginning with Sempach (1382), had by 1480 proved that their solid battalions, armed with the long pike and the halberd, were practically invulnerable to all but missile and shock action combined. By fortune of war, they never met the English, who had shown the way to deal with the *schiltron* as early as Falkirk. So great was their confidence against ordinary troops, that on one occasion (1444) they detached 1600 men to engage 50,000. It was natural that a series of victories such as Granson, Morat and Nancy should place them in the forefront of the military nations of Europe. The whole people devoted itself thereupon to professional soldiering, particularly in the French service, and though their monopoly of mercenary employment lasted a short time only, they continued to furnish regiments to the armies of France, Spain and the Pope up to the most modern times. But their efficiency was thoroughly sapped by the growth of a mutinous and insubordinate spirit, the memory of which has survived in the proverb *Point d'argent, point de Suisse*, and inspired Machiavelli with the hatred of mercenaries which marks every page of his work on the art of war. One of their devices for extorting money was to appear at the muster with many more soldiers than had been contracted for by their employers, who were forced to submit to this form of blackmail. At last the French, tired of these caprices, inflicted on the Swiss the crushing defeat of Marignan (*q.v.*), and their tactical system received its death-blow from the Spaniards at Pavia (1525).

21. *The Landsknechts.*—The modern army owes far more of its organization and administrative methods to the Landsknechts ("men of the country," as distinct from foreigners) than to the Swiss. As the latter were traditionally the friends of France, so these Swabians were the mainstay of the Imperial armies, though both were mercenaries. The emperor Maximilian exerted himself to improve the new force, which soon became the model for military Europe. A corps of Landsknechts was usually raised by a system resembling that of "indents," commissions being issued by the sovereign to leaders of repute to enlist men. A "colour" (*Fähnlein*) numbered usually about 400 men, a corps consisted of a varying number of colours, some corps having 12,000 men. From these troops, with their intense pride, *esprit de corps* and comradeship, there has come down to modern times much of present-day etiquette, interior economy and "regimental customs"— in other words, nearly all that is comprised in the "regimental" system. Amongst the most notable features of their system were the functions of the provost, who combined the modern offices of provost-marshal, transport and supply officer, and canteen manager; the disciplinary code, which admitted the right of the rank and file to judge offences touching the honour of the regiment; and the women who, lawfully or unlawfully attached to the soldiers, marched with the regiment and had a definite place in its corporate life. The conception of the regiment as the home of the soldier was thus realized in fact.

22. *The Spanish Army.*— The tendencies towards professional soldiering and towards subdivision had now pronounced themselves. At the same time, while national armies, as dreamed of by Machiavelli, were not yet in existence, two at least of the powers were beginning to work towards an ideal. This ideal was an army which was entirely at the disposal of its own sovereign, trained to the due professional standard, and organized in the best way found by experience to be applicable to military needs. On these bases was formed the old Spanish army which, from Pavia (1525) to Rocroi (1643), was held by common consent to be the finest service in existence. Almost immediately after emerging from the period of internal development, Spain found herself obliged to maintain an army for the Italian wars. In the first instance this was raised from amongst veterans of the war of Granada, who enlisted for an indefinite time. Probably the oldest line regiments in Europe are those descended from the famous *tercios*, whose formation marks the beginning of military establishments, just as the Landsknechts were the founders of military manners and customs. The great captains who led the new army soon assimilated the best points of the Swiss system, and it was the Spanish army which evolved the typical combination of pike and musket which flourished up to 1700. Outside the domain the tactics, it must be credited with an important contribution to the science of army organization, in the depot system, whereby the *tercios* in the field were continually "fed" and kept up to strength. The social position of the soldier was that of a gentleman, and the young nobles (who soon came to prefer the *tercios* to the cavalry service) thought it no shame,

when their commands were reduced, to "take a pike" in another regiment. The provost and his gallows were as much in evidence in a Spanish camp as in one of Landsknechts, but the comradeship and *esprit de corps* of a *tercio* were the admiration of all contemporary soldiers. With all its good qualities, however, this army was not truly national; men soon came from all the various nations ruled by the Habsburgs, and the soldier of fortune found employment in a *tercio* as readily as elsewhere. But it was a great gain that corps, as such, were fully recognized as belonging to the government, however shifting the *personnel* might be. Permanence of regimental existence had now been attained, though the universal acceptance and thorough application of the principle were still far distant. During the 16th century, the French regular army (originating in the *compagnies d'ordonnance* of 1445), which was always in existence, even when the Swiss and *gendarmes* were the best part of the field forces, underwent a considerable development, producing amongst other things the military terminology of the present day. But the wars of religion effectually checked all progress in the latter part of the century, and the European reputation of the French army dates only from the latter part of the Thirty Years' War.

23. *The Sixteenth Century.*—The battle of St Quentin (1557) is usually taken as the date from which the last type of a purely mercenary *arm* (as distinct from *corps*) comes into prominence. "Brabançon" or "Swiss" implied pikemen without further qualification, the new term "Reiter" similarly implied mercenary cavalry fighting with the pistol. Heavy cavalry could disperse arquebusiers and musketeers, but it was helpless against solid masses of pikemen; the Reiters solved the difficulty by the use of the pistol. They were well armoured and had little to fear from musket-balls. Arrayed in deep squadrons, therefore, they rode up to the pikes with impunity, and fired methodically *dans le tas*, each rank when it had discharged its pistols filing to the rear to reload. These Reiters were organized in squadrons of variable strength, and recruited in the same manner as were the Landsknechts. They were much inferior, however, to the latter in their discipline and general conduct, for cavalry had many more individual opportunities of plunder than the foot, and the rapacity and selfishness of the Reiters were consequently in marked contrast to the good order and mutual helpfulness in the field and in quarters which characterized the regimental system of the Landsknechts.

24. *Dutch System.*—The most interesting feature of the Dutch system, which was gradually evolved by the patriots in the long War of Independence, was its minute attention to detail. In the first years of the war, William the Silent had to depend, for field operations, on mutinous and inefficient mercenaries and on raw countrymen who had nothing but devotion to oppose to the discipline and skill of the best regular army in the world. Such troops were, from the point of view of soldiers like Alva, mere *canaille*, and the ludicrous ease with which their armies were destroyed (as at Jemmingen and Mookerheyde), at the cost of the lives of perhaps a dozen Spanish veterans, went far to justify this view. But, fortunately for the Dutch, their fortified towns were exceedingly numerous, and the individual bravery of citizen-militia, who were fighting for the lives of every soul within their walls, baffled time after time all the efforts of Alva's men. In the open, Spanish officers took incredible liberties with the enemy; once, at any rate, they marched for hours together along submerged embankments with hostile vessels firing into them from either side. Behind walls the Dutch were practically a match for the most furious valour of the assailants.

The insurgents' first important victory in the open field, that of Rymenant near Malines (1577), was won by the skill of "Bras de Fer," de la Noue, a veteran French general, and the stubbornness of the English contingent of the Dutch army—for England, from 1572 onwards, sent out an ever-increasing number of volunteers. This battle was soon followed by the great defeat of Gembloux (1578), and William the Silent was not destined to see the rise of the Dutch army. Maurice of Nassau was the real organizer of victory. In the wreck of all feudal and burgher military institutions, he turned to the old models of Xenophon, Polybius, Aelian and the rest. Drill, as rigid and as complicated as that of the Macedonian phalanx, came into vogue, the infantry was organized more strictly into companies and regiments, the cavalry into troops or cornets. The *Reiter* tactics of the pistol were followed by the latter, the former consisted of pikes, halberts and "shot." This form was generally followed in central Europe, as usual, without the spirit, but in Holland it was the greater trustworthiness of the rank and file that allowed of more flexible formations, and here we no longer see the foot of an army drawn up, as at Jemmingen, in one solid and immovable "square." In their own country and with the system best suited thereto, the Dutch, who moreover acquired greater skill and steadiness day by day, maintained their ground against all the efforts of a Parma and a Spinola. Indeed, it is the best tribute to the vitality of the Spanish system that the inevitable *débâcle* was so long delayed. The campaigns of Spinola in Germany demonstrated that the "Dutch" system, as a system for general use, was at any rate no better than the system over which it had locally asserted its superiority, and the spirit, and not the form, of Maurice's practice achieved the ultimate victory of the Netherlanders. In the Thirty Years' War, the unsuccessful armies of Mansfeld and many others were modelled on the Dutch system,—the forces of Spinola, of Tilly and of Wallenstein, on the Spanish. In other words, these systems as such meant little; the discipline and spirit behind them, everything. Yet the contribution made by the Dutch system to the armies of to-day was not small; to Maurice and his comrades we owe, first the introduction of careful and accurate drill, and secondly the beginnings of an acknowledged science of war, the groundwork of both being the theory and practice of antiquity. The present method of "forming fours" in the British infantry is ultimately derived from Aelian, just as the first beats of the drums in a march represent the regimental calls of the Landsknechts, and the depots and the drafts for the service battalions date from the Italian wars of Spain.

25. *The Thirty Years' War.*—Hitherto all armies had been raised or reduced according to the military and political situation of the moment. Spain had indeed maintained a relatively high effective in peace, but elsewhere a few personal guards, small garrisons, and sometimes a small regular army to serve as a nucleus, constituted the only permanent forces kept under arms by sovereigns, though, in this era of perpetual wars, armies were almost always on a war footing. The expense of maintenance at that time practically forbade any other system than this, called in German *Werbe-system*, a term for which in English there is no nearer equivalent than "enlistment" or "levy" system. It is worth noticing that this very system is identical in principle with that of the United States at the present day, viz., a small permanent force, inflated to any required size at the moment of need. The exceptional conditions of the Dutch army, indeed, secured for its regiments a long life; yet when danger was finally over, a large portion of the army was at once reduced. The history of the British army from about 1740 to 1820 is a most striking, if belated, example of the *Werbe-system* in practice. But the Thirty Years' War naturally produced an unusual continuity of service in corps raised about 1620–1630, and fifty years later the principle of the standing army was universally accepted. It is thus that the senior regiments of the Prussian and Austrian armies date from about 1630. At this time an event took place which was destined to have a profound influence on the military art. Gustavus Adolphus of Sweden landed in Germany with an army better organized, trained and equipped than any which had preceded it. This army, by its great victory of Breitenfeld (1631), inaugurated the era of "modern" warfare, and it is to the system of Gustavus that the student must turn for the initial point of the progressive development which has produced the armies of to-day. Spanish and Dutch methods at once became as obsolete as those of the Landsknechts.

26. *The Swedish Army.*—The Swedish army was raised by a carefully regulated system of conscription, which was "preached in every pulpit in Sweden." There were indeed enlisted regiments of the usual type, and it would seem that Gustavus

obtained the best even of the soldiers of fortune. But the national regiments were raised on the *Indelta* system. Each officer and man, under this scheme, received a land grant within the territorial district of his corps, and each of these districts supplied recruits in numbers proportionate to its population. This curious mixture of feudal and modern methods produced the best elements of an army, which, aided by the tactical and technical improvements introduced by Gustavus, proved itself incomparably superior to its rivals. Of course the long and bloody campaigns of 1630–34 led to the admission of great numbers of mercenaries even into the Swedish corps; and German, Scottish and other regiments figured largely, not only in the armies of Duke Bernhard and his successors, but in the army of Gustavus' own lifetime. As early as 1632 one brigade of the army was distinguished by the title "Swedish," as alone containing no foreigners. Yet the framework was much the same as it had been in 1630. The battle-organization of two lines and two wings, which was typical of the later "linear" tactics, began to supplant the system of the *tercios*. How cumbrous the latter had become by 1630 may be judged from any battle-plan of the period, and notably from that of Lützen. Gustavus' cavalry fought four or three deep only, and depended as little as possible on the pistol. The work of riding down the pikes was indeed rendered easier by the improved tactical handiness of the musketeers, but it was fiery leading which alone compelled victory, for there were relatively few Swedish horse and many squadrons of Germans and others, who in themselves were far less likely to charge boldly than the "Pappenheimers" and other crack corps of the enemy. The infantry was of the highest class, and only on that condition could loose and supple lines be trusted to oppose the solid *tercios* of Tilly and Wallenstein. Cumbrous indeed these were, but by long practice they had acquired no small manœuvring power, of which Breitenfeld affords a striking example. The Swedes, however, completely surpassed them. The progress thus made may be gauged from the fact that under Gustavus the largest closed body of infantry was less than 300 strong. Briefly, the genius of a great commander, the ardour of a born cavalry leader, better arms and better organization, carried the Swedes to the end of their career of victory, but how personal was the *vis viva* which inspired the army was quickly noticeable after the death of Gustavus. Even a Bernhard could, in the end, evoke no more heroism from a Swedish army than from any other, and the real Swedish troops fought their last battle at Nördlingen (1634). After this, little distinguished the "Swedish" forces from the general mass of the armies of the time, save their system, to which, and to its influence on the training of such leaders as Banér, Torstensson and Wrangel, all their later victories were due. So much of Gustavus' work survived even the carnage of Nördlingen, and his system always obtained better results, even with the heterogeneous troops of this later period, than any other of the time.

27. *The English Civil War* (see GREAT REBELLION).—The armies on either side which, about the same time, were fighting out the constitutional quarrel in England were essentially different from all those of the continent, though their formal organization was similar to that of the Swedes. The military expression of a national conscience had appeared rarely indeed in the Thirty Years' War, which was a means of livelihood for, rather than an assertion of principle by, those who engaged in it. In England, on the other hand, there were no mercenaries, and the whole character of the operations was settled by the burning desire of a true "nation in arms" to decide at once, by the arbitrament of battle, the vital points at issue. A German critic (Fritz Hoenig) has indicated Worcester as the prototype of Sedan; at any rate, battles of this kind invariably resulted in failure when entrusted to a "standing" army of the 18th century. But the national armies disappeared at the end of the struggle; after the Restoration, English political aims became, so far as military activity was concerned, similar in scope and execution to those of the continent; and the example of Cromwell and the "New Model," which might have revolutionized military Europe, passed away without having any marked influence on the armies of other nations.

28. *Standing Armies.*—Nine years after Nördlingen, the old Spanish army fought its last and most honourable battle at Rocroi. Its conquerors were the new French troops, whose victory created as great a sensation as Pavia and Creçy had done. Infusing a new military spirit into the formal organization of Gustavus' system, the French army was now to "set the fashion" for a century. France had been the first power to revive regular forces, and the famous "Picardie" regiment disputed for precedence even with the old *tercios*. The country had emerged from the confusion of the past century with the foreign and domestic strength of a practically absolute central power. The Fronde continued the military history of the army from the end of the Thirty Years' War; and when the period of consolidation was finally closed, all was prepared for the introduction of a "standing army," practically always at war strength, and entirely at the disposal of the sovereign. The reorganization of the military establishments by Louvois may be taken as the formal date at which standing armies came into prominence (see historical sketch of the French army below). Other powers rapidly followed the lead of France, for the defects of enlisted troops had become very clear, and the possession of an army always ready for war was an obvious advantage in dynastic politics. The French proprietary system of regiments, and the general scheme of army administration which replaced it, may be taken as typical of the armies of other great powers in the time of Louis XIV.

29. *Character of the Standing Armies.*—A peculiar character was from the first imparted to the new organizations by the results of the Thirty Years' War. A well-founded horror of military barbarity had the effect of separating the soldier from the civilian by an impassable gulf. The drain of thirty years on the population, resources and finances of almost every country in middle Europe, everywhere limited the size of the new armies; and the decision in 1648 of all questions save those of dynastic interest dictated the nature of their employment. The best soldiers of the time pronounced in favour of small field armies, for in the then state of communications and agriculture large forces proved in practice too cumbrous for good work. In every country, therefore, the army took the form of a professional body, nearly though not quite independent of extra recruits for war, set apart entirely from all contact with civil life, rigidly restricted as to conduct in peace and war, and employed mostly in the "maintenance" of their superiors' private quarrels. Iron discipline produced splendid tenacity in action, and wholesale desertion at all times. In the Seven Years' War, for instance, the Austrians stated one-fifth of their total loss as due to desertion, and Thackeray's *Barry Lyndon* gives no untrue picture of the life of a soldier under the old régime. Further, since men were costly, rigid economy of their lives in action, and minute care for their feeding and shelter on the march, occupied a disproportionate amount of the attention of their generals. Armies necessarily moved slowly and remained concentrated to facilitate supply and to check desertion, and thus, when a commander had every unit of his troops within a short ride of his headquarters, there was little need for intermediate general officers, and still less for a highly trained staff.

30. *Organization in the 18th Century.*—All armies were now almost equal in fighting value, and war was consequently reduced to a set of rules (not principles), since superiority was only to be gained by methods, not by men. Soldiers such as Marlborough, who were superior to these jejune prescriptions, met indeed with uniform success. But the methods of the 18th century failed to receive full illustration, save by the accident of a great captain's direction, even amidst the circumstances for which they were designed. It is hardly to be wondered at, therefore, that they failed, when forced by a new phase of development to cope with events completely beyond their element. The inner organization was not markedly altered. Artillery was still outside the normal organization of the line of battle, though in the period 1660–1740 much was done in all countries to improve

the material, and above all to turn the *personnel* into disciplined soldiers. Cavalry was organized in regiments and squadrons, and armed with sabre and pistol. Infantry had by 1703 begun to assume its three-deep line formation and the typical weapons of the arm, musket and bayonet. Regiments and battalions were the units of combat as well as organization. In the fight the company was entirely merged in the higher unit, but as an administrative body it still remained. As for the higher organization, an army consisted simply of a greater or less number of battalions and squadrons, without, as a rule, intermediate commands and groupings. The army was arrayed as a whole in two lines of battle, with the infantry in the centre and the cavalry on the flanks, and an advanced guard; the so-called reserve consisting merely of troops not assigned to the regular commands. It was divided, for command in action, into right and left wings, both of cavalry and infantry, of each line. This was the famous "linear" organization, which in theory produced the maximum effort in the minimum time, but in practice, handled by officers whose chief care was to avoid the expenditure of effort, achieved only negative results. To see its defects one need only suppose a battalion of the first line hard pressed by the enemy. A battalion of the second line was directly behind it, but there was no authority, less than that of the wing commander, which could order it up to support the first. All the conditions of the time were opposed to tactical subdivision, as the term is now understood. That the 18th century did not revive *schiltrons* was due to the new fire tactics, to which everything but control was sacrificed. This "control," as has been said, implied not so much command as police supervision. But far beyond any faults of organization and recruiting, the inherent vice of these armies was, as Machiavelli had pointed out two centuries previously, and as Prussia was to learn to her cost in 1806, that once they were thoroughly defeated, the only thing left to be done was to make peace at once, since there was no other armed force capable of retrieving a failure.

31. *Frederick the Great.*—The military career of Frederick the Great is very different from those of his predecessors. With an army organized on the customary system, and trained and equipped, better indeed, but still on the same lines as those of his rivals, the king of Prussia achieved results out of all proportion to those imagined by contemporary soldiers. It is to his campaigns, therefore, that the student must refer for the real, if usually latent, possibilities of the army of the 18th century. The prime secret of his success lay in the fact that he was his own master, and responsible to no superior for the uses to which he put his men. This position had never, since the introduction of standing armies, been attained by any one, even Eugene and Leopold of Dessau being subject to the common restriction; and with this extraordinary advantage over his opponents, Frederick had further the firmness and ruthless energy of a great commander. Prussia, moreover, was more strictly organized than other countries, and there was relatively little of that opposition of local authorities to the movement of troops which was conspicuous in Austria. The military successes of Prussia, therefore, up to 1757, were not primarily due to the system and the formal tactics, but were the logical outcome of greater energy in the leading, and less friction in the administration, of her armies. But the conditions were totally different in 1758–1762, when the full force of the alliance against Prussia developed itself in four theatres of war. Frederick was driven back to the old methods of making war, and his men were no longer the soldiers of Leuthen and Hohenfriedberg. If discipline was severe before, it was merciless then; the king obtained men by force and fraud from every part of Germany, and had both to repress and to train them in the face of the enemy. That under such conditions, and with such men, the weaker party finally emerged triumphant, was indeed a startling phenomenon. Yet its result for soldiers was not the production of the national army, though the dynastic forces had once more shown themselves incapable of compassing decisive victories, nor yet the removal of the barrier between army and people, for the operations of Frederick's recruiting agents made a lasting impression, and, further, large numbers of men who had thought to make a profession of arms were turned adrift at the end of the war. On the contrary, all that the great and prolonged *tour de force* of these years produced was a tendency, quite in the spirit of the age, to make a formal science out of the art of war. Better working and better methods were less sought after than systematization of the special practices of the most successful commanders. Thus Frederick's methods, since 1758 essentially the same as those of others, were taken as the basis of the science now for the first time called "strategy," the fact that his opponents had also practised it without success being strangely ignored. Along with this came a mania for imitation. Prussian drill, uniforms and hair-powder were slavishly copied by every state, and for the next twenty years, and especially when the war-trained officers and men had left active service, the purest pedantry reigned in all the armies of Europe, including that of Prussia. One of the ablest of Frederick's subordinates wrote a book in which he urged that the cadence of the infantry step should be increased by one pace per minute. The only exceptions to the universal prevalence of this spirit were in the Austrian army, which was saved from atrophy by its Turkish wars, and in a few British and French troops who served in the American War of Independence. The British regiments were sent to die of fever in the West Indies; when the storm of the French Revolution broke over Europe, the Austrian army was the only stable element of resistance.

32. *The French Revolution.*—Very different were the armies of the Revolution. Europe, after being given over to professional soldiers for five hundred years, at last produced the modern system of the "nation in arms." The French volunteers of 1792 were a force by which the routine generals of the enemy, working with instruments and by rules designed for other conditions, were completely puzzled, and France gained a short respite. The year 1793 witnessed the most remarkable event that is recorded in the history of armies. Raw enthusiasm was replaced, after the disasters and defections which marked the beginning of the campaign, by a systematic and unsparing conscription, and the masses of men thus enrolled, inspired by ardent patriotism and directed by the ferocious energy of the Committee of Public Safety, met the disciplined formalists with an opposition before which the attack completely collapsed. It was less marvellous in fact than in appearance that this should be so. Not to mention the influence of pedantry and senility on the course of the operations, it may be admitted that Frederick and his army at their best would have been unable to accomplish the downfall of the now thoroughly roused French. Tactically, the fire of the regulars' line caused the Revolutionary levies to melt away by thousands, but men were ready to fill the gaps. No complicated supply system bound the French to magazines and fortresses, for Europe could once more feed an army without convoys, and roads were now good and numerous. No fear of desertion kept them concentrated under canvas, for each man was personally concerned with the issue. If the allies tried to oppose them on an equal front, they were weak at all points, and the old organization had no provision for the working of a scattered army. While ten victorious campaigns had not carried Marlborough nearer to Paris than some marches beyond the Sambre, two campaigns now carried a French army to within a few miles of Vienna. It was obvious that, before such forces and such mobility, the old system was doomed, and with each successive failure the old armies became more discouraged. Napoleon's victories finally closed this chapter of military development, and by 1808 the only army left to represent it was the British. Even to this the Peninsular War opened a line of progress, which, if different in many essentials from continental practice, was in any case much more than a copy of an obsolete model.

33. *The Conscription.*—In 1793, at a moment when the danger to France was so great as to produce the rigorous emergency methods of the Reign of Terror, the combined enemies of the Republic had less than 300,000 men in the field between Basel and Dunkirk. On the other hand, the call of the "country in

danger" produced more than four times this number of men for the French armies within a few months. Louis XIV., even when all France had been awakened to warlike enthusiasm by a similar threat (1709), had not been able to put in the field more than one-fifth of this force. The methods of the great war minister Carnot were enforced by the ruthless committee, and when men's lives were safer before the bayonets of the allies than before the civil tribunals at home, there was no difficulty in enlisting the whole military spirit of France. There is therefore not much to be said as to the earliest application of the conscription, at least as regards its formal working, since any system possessing elasticity would equally have served the purpose. In the meanwhile, the older plans of organization had proved inadequate for dealing with such imposing masses of men. Even with disciplined soldiers they had long been known as applicable only to small armies, and the deficiencies of the French, with their consequences in tactics and strategy, soon produced the first illustrations of modern methods. Unable to meet the allies in the plain, they fought in broken ground and on the widest possible front. This of course produced decentralization and subdivision; and it became absolutely necessary that each detachment on a front of battle 30 m. long (*e.g.* Stokach) should be properly commanded and self-sufficing. The army was therefore constituted in a number of *divisions*, each of two or more brigades with cavalry and artillery sufficient for its own needs. It was even more important that each divisional general, with his own staff, should be a real commander, and not merely the supervisor of a section of the line of battle, for he was almost in the position that a commander-in-chief had formerly held. The need of generals was easily supplied when there was so wide a field of selection. For the allies the mere adoption of new forms was without result, since it was contrary both to tradition and to existing organization. The attempts which were made in this direction did not tend to mitigate the evils of inferior numbers and *moral*. The French soon followed up the divisional system with the further organization of groups of divisions under specially selected general officers; this again quickly developed into the modern army corps.

34. *Napoleon.*—Revolutionary government, however, gave way in a few years to more ordinary institutions, and the spirit of French politics had become that of aggrandizement in the name of liberty. The ruthless application of the new principle of masses had been terribly costly, and the disasters of 1799 reawakened in the mass of the people the old dislike of war and service. Even before this it had been found necessary to frame a new act, the famous law proposed by General Jourdan (1798). With this the conscription for general service began. The legal term of five years was so far exceeded that the service came to be looked upon as a career, or servitude, for life; it was therefore both unavoidable and profitable to admit substitutes. Even in 1806 one quarter of Napoleon's conscripts failed to come up for duty. The *Grande Armée* thus from its inception contained elements of doubtful value, and only the tradition of victory and the 50% of veterans still serving aided the genius of Napoleon to win the brilliant victories of 1805 and 1806. But these veterans were gradually eliminated by bloodshed and service exposure, and when, after the peace of Tilsit, "French" armies began to be recruited from all sorts of nations, decay had set in. As early as 1806 the emperor had had to "anticipate" the conscription, that is, call up the conscripts before their time, and by 1810 the percentage of absentees in France had grown to about 80, the remainder being largely those who lacked courage to oppose the authorities. Finally, the armies of Napoleon became masses of men of all nations fighting even more unwillingly than the armies of the old régime. Little success attended the emperor's attempt to convert a "nation in arms" into a great dynastic army. Considered as such, it had even fewer elements of solidity than the standing armies of the 18th century, for it lacked the discipline which had made the regiments of Frederick invincible. After 1812 it was attacked by huge armies of patriots which possessed advantages of organization and skilful direction that the *levée en masse* of 1793 had lacked. Only the now fully developed genius and magnificent tenacity of Napoleon staved off for a time the *débâcle* which was as inevitable as had been that of the old régime.

35. *The Grande Armée.*—In 1805–1806, when the older spirit of the Revolution was already represented by one-half only of French soldiers, the actual steadiness and manœuvring power of the *Grande Armée* had attained its highest level. The army at this time was organized into brigades, divisions and corps, the last-named unit being as a rule a marshal's command, and always completed as a small army with all the necessary arms and services. Several such corps (usually of unequal strength) formed the army. The greatest weakness of the organization, which was in other respects most pliant and adaptable, was the want of good staff-officers. The emperor had so far cowed his marshals that few of them could take the slightest individual responsibility, and the combatant staff-officers remained, as they had been in the 18th century, either confidential clerks or merely gallopers. No one but a Napoleon could have managed huge armies upon these terms; in fact the marshals, from Berthier downwards, generally failed when in independent commands. Of the three arms, infantry and cavalry regiments were organized in much the same way as in Frederick's day, though tactical methods were very different, and discipline far inferior. The greatest advance had taken place in the artillery service. Field and horse batteries, as organized and disciplined units, had come into general use during the Revolutionary wars, and the division, corps and army commanders had always batteries assigned to their several commands as a permanent and integral part of the fighting troops. Napoleon himself, and his brilliant artillery officers Sénarmont and Drouot, brought the arm to such a pitch of efficiency that it enabled him to win splendid victories almost by its own action. As a typical organization we may take the III. corps of Marshal Davout in 1806. This was formed of the following troops:—

Cavalry brigade—General Vialannes—three regiments, 1538 men. Corps artillery, 12 guns.
1st Division—General Morand—five infantry regiments in three brigades, 12 guns, 10,820 men.
2nd Division—General Friant—five regiments in three brigades, 8 guns, 8758 men.
3rd Division—General Gudin—four regiments in three brigades, 12 guns, 9077 men.

A comparison of this *ordre de bataille* with that of a modern army corps will show that the general idea of corps organization has undergone but slight modification since the days of Napoleon. More troops allotted to departmental duties, and additional engineers for the working of modern scientific aids, are the only new features in the formal organization of a corps in the 20th century. Yet the spirit of 1806 and that of 1906 were essentially different, and the story of the development of this difference through the 19th century closes for the present the history of progress in tactical organization.

36. *The Wars of Liberation.*—The Prussian defeat at Jena was followed by a national surrender so abject as to prove conclusively the eternal truth, that a divorce of armies from national interests is completely fatal to national well-being. But the oppression of the victors soon began to produce a spirit of ardent patriotism which, carefully directed by a small band of able soldiers, led in the end to a national uprising of a steadier and more lasting kind than that of the French Revolution. Prussia was compelled, by the rigorous treaty of peace, to keep a small force only under arms, and circumstances thus drove her into the path of military development which she subsequently followed. The stipulation of the treaty was evaded by the *Krümper* system, by which men were passed through the ranks as hastily as possible and dismissed to the reserve, their places being taken by recruits. The regimental establishments were therefore mere *cadres*, and the *personnel*, recruited by universal service with few exemptions, ever-changing. This system depended on the willingness of the reserves to come up when called upon, and the arrogance of

the French was quite sufficient to ensure this. The *dénouement* of the Napoleonic wars came too swiftly for the full development of the armed strength of Prussia on these lines; and at the outbreak of the Wars of Liberation a newly formed *Landwehr* and numerous volunteer corps took the field with no more training than the French had had in 1793. Still, the principles of universal service (*allgemeine Wehrpflicht*) and of the army reserve were, for the first time in modern history, systematically put into action, and modern military development has concerned itself more with the consolidation of the *Krümper* system than with the creation of another. The début of the new Prussian army was most unsuccessful, for Napoleon had now attained the highest point of soldierly skill, and managed to inflict heavy defeats on the allies. But the Prussians were not discouraged; like the French in 1793 they took to broken ground, and managed to win combats against all leaders opposed to them except Napoleon himself. The Russian army formed a solid background for the Prussians, and in the end Austria joined the coalition. Reconstituted on modern lines, the Austrian army in 1813, except in the higher leading, was probably the best-organized on the continent. After three desperate campaigns the Napoleonic régime came to an end, and men felt that there would be no such struggle again in their lifetime. Military Europe settled down into grooves along which it ran until 1866. France, exhausted of its manhood, sought a field for military activities in colonial wars waged by long-service troops. The conscription was still in force, but the citizens served most unwillingly, and substitution produced a professional army, which as usual became a dynastic tool. Austria, always menaced with foreign war and internal disorder, maintained the best army in Europe. The British army, though employed far differently, retained substantially the Peninsular system.

37. *European Armies 1815–1870.*—The events of the period 1815–1859 showed afresh that such long-service armies were incomparably the best form of military machine for the purpose of giving expression to a hostile "view" (not "feeling"). Austrian armies triumphed in Italy, French armies in Spain, Belgium, Algeria, Italy and Russia, British in innumerable and exacting colonial wars. Only the Prussian forces retained the characteristics of the levies of 1813, and the enthusiasm which had carried these through Leipzig and the other great battles was hardly to be expected of their sons, ranged on the side of despotism in the troubled times of 1848–1850. But the principle was not permitted to die out. The Bronnzell-Olmütz incident of 1850 (see SEVEN WEEKS' WAR) showed that the organization of 1813 was defective, and this was altered in spite of the fiercest opposition of all classes. Soon afterwards, and before the new Prussian army proved itself on a great battlefield, the American Civil War, a fiercer struggle than any of those which followed it in Europe, illustrated the capabilities and the weaknesses of voluntary-service troops. Here the hostile "view" was replaced by a hostile "feeling," and the battles of the disciplined enthusiasts on either side were of a very different kind from those of contemporary Europe. But, if the experiences of 1861–1865 proved that armies voluntarily enlisted "for the war" were capable of unexcelled feats of endurance, they proved further that such armies, whose discipline and training in peace were relatively little, or indeed wholly absent, were incapable of forcing a swift decision. The European "nation in arms," whatever its other failings, certainly achieved its task, or failed decisively to do so, in the shortest possible time. Only the special characteristics of the American theatre of war gave the Union and Confederate volunteers the space and time necessary for the creation of armies, and so the great struggle in North America passed without affecting seriously the war ideas and preparations of Europe. The weakness of the staff work with which both sides were credited helped further to confirm the belief of the Prussians in their system, and in this instance they were justified by the immense superiority of their own general staff to that of any army in existence. It was in this particular that a corps of 1870 differed so essentially from a corps of Napoleon's time. The formal organization had not been altered save as the varying relative importance of the separate arms had dictated. The almost intangible spirit which animates the members of a general staff, causes them not merely to "think" —that was always in the quartermaster-general's department—but to "think alike," so that a few simple orders called "directives" sufficed to set armies in motion with a definite purpose before them, whereas formerly elaborate and detailed plans of battle had to be devised and distributed in order to achieve the object in view. A comparison of the number of orders and letters written by a marshal and by his chief of staff in Napoleon's time with similar documents in 1870 indicates clearly the changed position of the staff. In the *Grande Armée* and in the French army of 1870 the officers of the general staff were often absent entirely from the scene of action. In Prussia the new staff system produced a far different result—indeed, the staff, rather than the Prussian military system, was the actual victor of 1870. Still, the system would probably have conquered in the end in any case, and other nations, convinced by events that their departure from the ideal of 1813, however convenient formerly, was no longer justified, promptly copied Prussia as exactly, and, as a matter of fact, as slavishly, as they had done after the Seven Years' War.

38. *Modern Developments.*—Since 1870, then, with the single exception of Great Britain, all the major European powers have adopted the principle of compulsory short service with reserves. Along with this has come the fullest development of the territorial system (see below). The natural consequence therefore of the heavy work falling upon the shoulders of the Prussian officer, who had to instruct his men, was, in the first place, a general staff of the highest class, and in the second, a system of distributing the troops over the whole country in such a way that the regiments were permanently stationed in the district in which they recruited and from which they drew their reserves. Prussia realized that if the reservists were to be obtained when required the unit must be strictly localized; France, on the contrary, lost much time and spent much trouble, in the mobilization of 1870, in forwarding the reservists to a regiment distant, perhaps, 300 m. The Prussian system did not work satisfactorily at first, for until all the district staff-officers were trained in the same way there was great inequality in the efficiency of the various army corps, and central control, before the modern development of railways, was relatively slight. Further, the mobilization must be completed, or nearly so, before concentration begins, and thus an active professional army, always at war strength, might annihilate the frontier corps before those in the interior were ready to move. But the advantages far outweighed the defects of the system, and, such professional armies having after 1870 disappeared, there was little to fear. Everywhere, therefore, save in Great Britain (for at that time the United States was hardly counted as a great military power, in spite of its two million war-trained veterans in civil life), the German model was followed, and is now followed, with but slight divergence. The period of reforms after the Prussian model (about 1873–1890) practically established the military systems which are treated below as those of the present day. The last quarter of the century witnessed a very great development of military forces, without important organic changes. The chief interest to the student of this period lies in the severe competition between the great military powers for predominance in numbers, expressed usually in the reduction of the period of service with the colours to a minimum. The final results of this cannot well be predicted: it is enough to say that it is the *Leitmotiv* in the present stage in the development of armies. Below will be found short historical sketches of various armies of the present day which are of interest in respect of their historical development. Details of existing forces are given in articles dealing with the several states to which they belong. Historical accounts of the armies of Japan and of Egypt will be found in the articles on those states. The Japanese wars of 1894–95 and 1904–5 contributed little to the history of military organization as a pure science. The

true lessons of this war were the demonstration of the wide applicability of the German methods, upon which exclusively the Japanese army had formed itself, and still more the first illustration of the new moral force of nationalities as the decisive factor. The form of armies remained unaltered. Neither the events of the Boer War of 1899–1902 nor the Manchurian operations were held by European soldiers to warrant any serious modifications in organization. It is to the moral force alluded to above, rather than to mere technical improvements, that the best soldiers of Europe, and notably those of the French general staff (see the works of General H. Bonnal), have of late years devoted their most earnest attention.

Present-Day Armies

39. The main principles of all military organization as developed in history would seem to be national recruiting and allegiance, distinctive methods of training and administration, continuity of service and general homogeneity of form. The method of raising men is of course different in different states. In this regard armies may conveniently be classed as voluntarily enlisted, levied or conscript, and militia, represented respectively by the forces of Great Britain, Germany and Switzerland. It must not be forgotten, however, that voluntary troops may be and are maintained even in states in which the bulk of the army is levied by compulsion, and the simple militia obligation of defending the country is universally recognized.

40. *Compulsory Service.*—Universal liability to service (*allgemeine Wehrpflicht*) draws into the active army all, or nearly all, the men of military age for a continuous period of short service, after which they pass successively to the reserve, the second and the third line troops (*Landwehr*, *Landsturm*, &c.). In this way the greatest number of soldiers is obtained at the cheapest rate and the number of trained men in reserve available to keep the army up to strength is in theory that of the able-bodied manhood of the country. In practice the annual levy is, however, not exhaustive, and increased numerical strength is obtained by reducing the term of colour-service to a minimum. This may be less in a hard-worked conscript army than in one which depends upon the attractions of the service to induce recruits to join. In conscript armies, training for war is carried out with undeviating rigour. In these circumstances the recruits are too numerous and the time available is too limited for the work of training to be committed to a few selected instructors, and every officer has therefore to instruct his own men. The result is usually a corps of officers whose capacity is beyond question, while the general staff is composed of men whose ability is above a high general average. As to the rank and file, the men taken for service are in many respects the best of the nation, and this superiority is progressively enhanced, since increase of population is not often accompanied by a corresponding increase in the military establishments. In Germany in 1905, it is stated, nearly half the contingent was excused from serving in peace time, over and above the usual numbers exempted or medically rejected. The financial aspect of compulsory service may be summed up in a few words. The state does not offer a wage, the pay of the soldier is a mere trifle, and, for a given expenditure, at least three times as many men may be kept under arms as under any known "voluntary" system. Above all, the state has at its disposal for war an almost inexhaustible supply of trained soldiers. This aspect of compulsory service has indeed led its admirers sometimes to sacrifice quality to quantity; but, provided always that the regular training is adequate, it may be admitted that there is no limit to the numbers which are susceptible of useful employment. There are, however, many grave defects inherent in all armies raised by compulsory levy (see Conscription, for a discussion of the chief economical and social questions involved). Most of the advantages of universal service result, not from the compulsory enlistment, but from the principle of short service and reserves. But the cost of maintaining huge armies of the modern European type on the voluntary system would be entirely prohibitive, and those nations which have adopted the *allgemeine Wehrpflicht* have done so with full cognizance of the evil as well as of the good points of the system.

The chief of these evils is the doubtful element which exists in all such armies. Under the merciless discipline of the old régime the most unwilling men feared their officers more than the enemy. Modern short service, however, demands the good-will of all ranks and may fail altogether to make recalcitrants into good soldiers, and it may be taken for granted that every conscript army contains many men who cannot be induced to fight. Herein lies the justification of the principle of "masses," and of reduced colour-service; by drawing into the ranks the maximum number of men, the government has an eventual residuum of the bravest men in the nation left in the ranks. What has been said of the officers of these armies cannot be applied to the non-commissioned officers. Their promotion is necessarily rapid, and the field of selection is restricted to those men who are willing to re-engage, *i.e.* to serve beyond their compulsory term of two or three years. Many men do so to avoid the struggles of civil life, and such "fugitive and cloistered virtue" scarcely fosters the moral strength required for command. As the best men return to civil life, there is no choice but to promote inferior men, and the latter, when invested with authority, not infrequently abuse it. Indeed in some armies the soldier regards his officer chiefly as his protector from the rapacity or cruelty of his sergeant or corporal. A true short-service army is almost incapable of being employed on peace service abroad; quite apart from other considerations, the cost of conveying to and from home annually one-third or one-half of the troops would be prohibitive. If, as must be the case, a professional force is maintained for oversea service many men would join it who would otherwise be serving as non-commissioned officers at home and the prevailing difficulty would thus be enhanced. When colonial defence calls for relatively large numbers of men, *i.e.* an army, home resources are severely strained.

41. *Conscription* in the proper sense, *i.e.* selection by lot of a proportion of the able-bodied manhood of a country, is now rarely practised. The obvious unfairness of selection by lot has always had the result of admitting substitutes procured by those on whom the lot has fallen; hence the poorer classes are unduly burdened with the defence of the country, while the rich escape with a money payment. In practice, conscription invariably produces a professional long-service army in which each soldier is paid to discharge the obligations of several successive conscripts. Such an army is therefore a voluntary long-service army in the main, *plus* a proportion of the unwilling men found in every forced levy. The gravest disadvantage is, however, the fact that the bulk of the nation has not been through the regular army at all; it is almost impossible to maintain a large and costly standing army and at the same time to give a full training to auxiliary forces. The difference between a "national guard" such as that of the siege of Paris in 1870–71 and a *Landwehr* produced under the German system, was very wide. Regarded as a compromise between universal and voluntary service, conscription still maintains a precarious existence in Europe. As the cardinal principle of recruiting armies, it is completely obsolete.

42. *Voluntary Service.*—Existing voluntary armies have usually developed from armies of the old régime, and seem to owe their continued existence either to the fact that only comparatively small armaments are maintained in peace, other and larger armies being specially recruited during a war (a modification of the "enlistment system"), or to the necessities of garrisoning colonial empires. The military advantages and disadvantages of voluntary service are naturally the faults and merits of the opposite system. The voluntary army is available for general service. It includes few unwilling soldiers, and its resultant advantage over an army of the ordinary type has been stated to be as high as 30%. At all events, we need only examine military history to find that with conscript armies wholesale shirking is far from unknown. That loss from this cause does not paralyse operations as it paralysed those of the 18th century.

is due to the fact that such fugitives do not desert to the enemy, but reappear in the ranks of their own side; it must not therefore be assumed that men have become braver because the "missing" are not so numerous. In colonial and savage warfare the superior personal qualities of the voluntary soldier often count for more than skill on the part of the officers. These would be diminished by shortening the time of service, and this fact, with the expense of transport, entails that a reasonably long period must be spent with the colours. On the other hand, the provision of the large armies of modern warfare requires the maintenance of a reserve, and no reserve is possible if the whole period for which men will enlist is spent with the colours. The demand for long service in the individual, and for trained men in the aggregate, thus produces a compromise. The principle of long service, *i.e.* ten years or more with the colours, is not applicable to the needs of the modern *grande guerre*; it gives neither great initial strength nor great reserves. The force thus produced is costly and not lightly to be risked; it affords relatively little opportunity for the training of officers, and tends to become a class apart from the rest of the population. On the other hand, such a force is the best possible army for foreign and colonial service. A state therefore which relies on voluntary enlistment for its forces at home and abroad, must either keep an army which is adaptable to both functions or maintain a separate service for each.

In a state where relatively small armaments are maintained in peace, voluntary armies are infinitely superior to any that could be obtained under any system of compulsion. The state can afford to give a good wage, and can therefore choose its recruits carefully. It can thus have either a few incomparable veteran soldiers (long-service), or a fairly large number of men of superior physique and intelligence, who have received an adequate short-service training. Even the youngest of such men are capable of good service, while the veterans are probably better soldiers than any to be found in conscript armies. This is, however, a special case. The raw material of any but a small voluntary army usually tends to be drawn from inferior sources; the cost of a larger force, paid the full wages of skilled labourers, would be very great, and numbers commensurate with those of an army of the other model could only be obtained at an exorbitant price. The short-service principle is therefore accepted. Here, however, as recruiting depends upon the good-will of the people, it is impossible to work the soldiers with any degree of rigour. Hence the voluntary soldier must serve longer than a conscript in order to attain the same proficiency. The reserve is thus weakened, and the total trained regular force diminished. Moreover, as fewer recruits are required annually, there is less work for the officers to do. In the particular case of Great Britain it is practically certain that in future, reliance will be placed upon the auxiliary forces and the civil population for the provision of the enormous reserves required in a great war; this course is, however, only feasible in the case of an insular nation which has time to collect its strength for the final and decisive blow overseas. The application of the same principle to a continental military power depends on the capacity for stern and unflagging resistance displayed by the *corps de couverture* charged with the duty of gaining the time necessary for the development and concentration of the national masses. In Great Britain (except in the case of a surprise invasion) the place of this corps would be taken by "command of the sea." Abroad, the spirit of the exposed regiments themselves furnishes the only guarantee, and this can hardly be calculated with sufficient certainty, under modern conditions, to justify the adoption of this new "enlistment system." Voluntary service, therefore, with all its intrinsic merits, is only applicable to the conditions of a great war when the war reserve can be trained *ad hoc*.

43. The militia idea (see MILITIA) has been applied most completely in Switzerland, which has no regular army, but trains almost the whole nation as a militia. The system, with many serious disadvantages, has the great merit that the maximum number of men receives a certain amount of training at a minimum cost both to the state and to the individual. Mention should also be made of the system of augmenting the national forces by recruiting "foreign legions." This is, of course, a relic of the *Werbe-system;* it was practised habitually by the British governments of the 18th and early 19th centuries. "Hessians" figured conspicuously in the British armies in the American War of Independence, and the "King's German Legion" was only the best and most famous of many foreign corps in the service of George III. during the Revolutionary and Napoleonic wars. A new German Legion was raised during the Crimean War, but the almost universal adoption of the *Krümper* system has naturally put an end to the old method, for all the best recruits are now accounted for in the service of their own countries.

ARMY ORGANIZATION

44. *Arms of the Service.*—Organization into "arms" is produced by the multiplicity of the weapons used, their functions and their limitations. The "three arms"—a term universally applied to infantry (*q.v.*), cavalry (*q.v.*) and artillery (*q.v.*)—coexist owing to the fact that each can undertake functions which the others cannot properly fulfil. Thus cavalry can close with an enemy at the quickest pace, infantry can work in difficult ground, and artillery is effective at great ranges. Infantry indeed, having the power of engaging both at close quarters and at a distance, constitutes the chief part of a fighting force. Other "arms," such as mounted infantry, cyclists, engineers, &c., are again differentiated from the three chief arms by their proper functions. In deciding upon the establishment in peace, or the composition of a force for war, it is therefore necessary to settle beforehand the relative importance of these functions in carrying out the work in hand. Thus an army operating in Essex would be unusually strong in infantry, one on Salisbury Plain would possess a great number of guns, and an army operating on the South African veldt would consist very largely of mounted men. The normal European war has, however, naturally been taken as the basis upon which the relative proportions of the three arms are calculated. At the battle of Kolin (1757) the cavalry was more than half as strong as the infantry engaged. At Borodino (1812) there were 39 cavalry to 100 of other arms, and 5 guns per 1000 men. In 1870 the Germans had at the outset 7 cavalrymen to every 100 men of other arms, the French 10. As for guns, the German artillery had 3, the French 3½ per 1000 men. In more modern times the proportions have undergone some alteration, the artillery having been increased, and the cavalry brought nearer to the Napoleonic standard. Thus the relative proportions, in peace time, now stand at 5 or 6 guns per 1000 men, and 16 cavalry soldiers to 100 men of other arms. It must be borne in mind that cavalry and artillery are maintained in peace at a higher effective than infantry, the strength of the latter being much inflated in war, while cavalry and artillery are not easily extemporized. Thus in the Manchurian campaign these proportions were very different. The Russian army on the eve of the battle of Mukden (20th of February 1905) consisted of 370 battalions, 142 squadrons and 153 field batteries (1200 guns), with, in addition, over 200 heavy guns. The strength of this force, which was organized in three armies, was about 300,000 infantry and 18,000 cavalry and Cossacks, with 3½ guns per 1000 men of other arms. The Japanese armies consisted of 300,000 infantry, 11,000 cavalry, 900 field and 170 heavy guns, the proportion of field artillery being 2½ guns per 1000 men.

It is perhaps not superfluous to mention that all the smaller units in a modern army consist of one arm only. Formerly several dissimilar weapons were combined in the same unit. The knight with his four or five variously armed retainers constituted an example of this method of organization, which slowly died out as weapons became more uniform and their functions better defined.

45. *Command.*—The first essential of a good organization is to ensure that each member of the organized body, in his own sphere of action, should contribute his share to the achievement of the common object. Further, it is entirely beyond the power

of one man, or of a few, to control every action and provide for every want of a great number of individuals. The modern system of command, therefore, provides for a system of grades, in which, theoretically, officers of each grade control a group of the next lower units. A lieutenant-colonel, for instance, may be in charge of a group of eight companies, each of which is under a captain. In practice, all armies are permanently organized on these lines, up to the colonel's or lieutenant-colonel's command, and most of them are permanently divided into various higher units under general officers, the brigade, division and army corps. The almost invariable practice is to organize *infantry* into companies, battalions and regiments. *Cavalry* is divided into troops, squadrons and regiments. *Artillery* is organized in batteries, these being usually grouped in various ways. The other arms and departments are subdivided in the same general way. The commands of general officers are the *brigade* of infantry, cavalry, and in some cases artillery, the *division* of two or more infantry brigades and a force of artillery and mounted troops, or of cavalry and horse artillery, and the *army corps* of two or more divisions and " corps troops." *Armies* of several corps, and *groups of armies* are also formed.

46. A *brigade* is the command of a brigadier or major-general, or of a colonel. It consists almost invariably of one arm only. In armies of the old régime it was not usual to assign troops of all arms to the subordinate generals. Hence the brigade is a much older form of organization than the division of all arms, and in fact dates from the 16th century. The infantry brigade consists, in the British service, of the brigadier and his staff, four battalions of infantry, and adminstrative and medical units, the combatant strength being about 4000 men. In Germany and France the brigade is composed of the staff, and two regiments (6 battalions) with a total of over 6000 combatants at war strength. The cavalry brigade is sometimes formed of three, sometimes of two regiments; the number of squadrons to a regiment on service is usually four, exceptionally three, and rarely five and six. The " brigade " of artillery in Great Britain is a lieutenant-colonel's command, and the term here corresponds to the *Abtheilung* of the German, and the *groupe* of the French armies (see ARTILLERY). In Germany and France, however, an artillery brigade consists of two or more regiments, or twelve batteries at least, under the command of an artillery general officer.

47. A *division* is an organization containing troops of all arms. Since the virtual abolition of the " corps artillery " (see ARTILLERY), the force of field artillery forming part of an infantry division is sometimes as high as 72 guns (Germany); in Great Britain the augmented division of 1906 has 54 field guns, 12 field howitzers, and 4 heavy guns, a total of 70. The term " infantry " division is, in strictness, no longer applicable, since such a unit is a miniature army corps of infantry, artillery and cavalry, with the necessary services for the supply of ammunition, food and forage, and for the care of the sick and wounded. A more exact title would be " army " division. In general it is composed, so far as combatants are concerned, of the divisional commander and his staff, two or more infantry brigades, a number of batteries of field artillery forming a regiment, brigade or group, a small force, varying from a squadron to a regiment, of cavalry (divisional cavalry), with some engineers. The force of the old British division (1905) may be taken, on an average, as 10,000 men, increased in the 1906 reorganization to about 15,000 combatants. In other armies the fighting force of the division amounts to rather more than 14,000. The *cavalry division* (see CAVALRY) is composed of the staff, two or three cavalry brigades, horse artillery, with perhaps mounted infantry, cyclists, or even light infantry in addition. In many, if not most, armies cavalry divisions are formed only in war. In the field the cavalry division is usually an independent unit with its own commander and staff. " Cavalry corps " of several divisions have very rarely been formed in the past, a division having been regarded as the largest unit capable of being led by one man. There is, however, a growing tendency in favour of the corps organization, at any rate in war.

48. *Army Corps.*—The " corps " of the 18th century was simply a large detachment, more or less complete in itself, organized for some particular purpose (*e.g.* to cover a siege), and placed for the time being under some general officer other than the chief commander. The modern army corps is a development from the division of all arms, which originated in the French Revolutionary wars. It is a unit of considerable strength, furnished with the due proportion of troops of all arms and of the auxiliary and medical services, and permanently placed under the command of one general. The corps organization (though a *corps d'armée* was often spoken of as an *armée*) was used in Napoleon's army in all the campaigns of the Empire. It may be mentioned, as a curious feature of Napoleon's methods, that he invariably constituted each *corps d'armée* of a different strength, so that the enemy would not be able to estimate his force by the simple process of counting the corps flags which marked the marshals' headquarters. Thus in 1812 he constituted one corps of 72,000 men, while another had but 18,000. After the fall of Napoleon a further advance was made. The adoption of universal service amongst the great military nations brought in its train the territorial organization, and the corps, representing a large district, soon became a unit of peace formation. For the smooth working of the new military system it was essential that the framework of the war army should exist in peace. The Prussians were the first to bring the system to perfection; long before 1866 Prussia was permanently divided into army corps districts, all the troops of the III. army corps being Brandenburgers, all those of the VI. Silesians, and so on, though political reasons required, and to some extent still require, modifications of this principle in dealing with annexed territory (*e.g.* Hanover and Alsace-Lorraine). The events of 1866 and of 1870–71 caused the almost universal adoption of the army corps regional system. In the case of the British army, operating as it usually did in minor wars, and rarely having more than sixty or seventy thousand men on one theatre even in continental wars, there was less need of so large a unit as the corps. Not only was a British army small in numbers, but it preserved high traditions of discipline, and was sufficiently well trained to be susceptible as a unit to the impulse given by one man. Even where the term " corps " does appear in Peninsular annals, the implication is of a corps in the old sense of a grand detachment. Neither cavalry nor artillery was assigned to any of the British " corps " at Waterloo.

49. *Constitution of the Army Corps.*—In 1870–71 the III. German army corps (with which compare Marshal Davout's *ordre de bataille* above) consisted of the following combatant units: (*a*) staff; (*b*) two infantry divisions (4 brigades, 8 regiments or 24 battalions), with, in each division, a cavalry regiment, 4 batteries of artillery or 24 guns, and engineers; (*c*) corps troops, artillery (6 field batteries), pioneer battalion (engineers), train battalion (supply and transport). A rifle battalion was attached to one of the divisions.

This *ordre de bataille* was followed more or less generally by all countries up to the most modern times, but between 1890 and 1902 came a very considerable change in the point of view from which the corps was regarded as a fighting unit. This change was expressed in the abolition of the corps artillery. Formerly the corps commander controlled the greater part of the field artillery, as well as troops of other arms; at the present time he has a mere handful of troops. Unless battalions are taken from the divisions to form a corps reserve, the direct influence of the corps organization on the battle is due almost solely to the fact that the commander has at his disposal the special natures of artillery and also some horse artillery. Thus the (augmented) division is regarded by many as the fighting unit of the 20th, as the corps was that of the 19th century. In Europe there is even a tendency to substitute the ancient phrase " reserve artillery " for " corps artillery," showing that the rôle to be played by the corps batteries is subordinated to the operations of the masses of divisional artillery, the whole being subject, of course, to the technical supervision of the artillery general officer who accompanies the corps headquarters. Thus limited, the army corps has now

come to consist of the staff, two or more divisions, the corps or reserve artillery (of special batteries), a small force of "corps" cavalry, and various technical and departmental troops. The cavalry is never very numerous, owing to the demands of the independent cavalry divisions on the one hand and those of the divisional cavalry on the other. The engineers of an army corps include telegraph, balloon and pontoon units. Attached to the corps are reserves of munitions and supplies in ammunition columns, field parks, supply parks, &c. The term and the organization were discontinued in England in 1906, on the augmentation of the divisions and the assignment of certain former "corps troops" to the direct control of the army commanders. It should be noticed that the Japanese, who had no corps organization during the war of 1904–5, afterwards increased the strength of their divisions from 15,000 to 20,000; the augmented "division," with the above *peace* strength, becomes to all intents and purposes a corps, and the generals commanding divisions were in 1906 given the title of generals-in-chief.

50. *Army.*—The term "army" is applied, in war time, to any command of several army corps, or even of several divisions, operating under the orders of one commander-in-chief. The army in this sense (distinguished by a number or by a special title) varies, therefore, with circumstances. In the American Civil War, the Army of the Ohio consisted in 1864 only of the army staff and the XXIII. corps. At the other extreme we find that the German II. Army in 1870 consisted of seven army corps and two cavalry divisions, and the III. Army of six army corps and two cavalry divisions. The term "army" in this sense is therefore very elastic in its application, but it is generally held that large groups of corps operating in one theatre of war should be subdivided into armies, and that the strength of an army should not exceed about 150,000 men, if indeed this figure is reached at all. This again depends upon circumstances. It might be advisable to divide a force of five corps into two armies, or on the other hand it might be impossible to find suitable leaders for more than two armies when half a million men were present for duty. In France, organization has been carried a step further. The bulk of the national forces is, in case of war, organized into a "group of armies" under a commander, usually, though incorrectly, called the *generalissimo*. This office, of course, does not exist in peace, but the insignia, the distinctive marks of the headquarters flag, &c., are stated in official publications, and the names of the generalissimo and of his chief of staff are known. Under the generalissimo would be four or five army commanders, each with three or four army corps under him. Independent of this "group of armies" there would be other and minor "armies" where required.

51. *Chief Command.*—The leading of the "group of armies" referred to above does not, in France, imply the supreme command, which would be exercised by the minister of war in Paris. The German system, on the other hand, is based upon the leadership of the national forces by the sovereign in person, and even though the headquarters of the "supreme war lord" (*Oberste Kriegsherr*) are actually in the field in one theatre of operations, he directs the movements of the German armies in all quarters. Similarly, in 1864, General Grant accompanied and controlled as a "group" the Armies of the Potomac and the James, supervising at the same time the operations of other groups and armies. In the same campaign a subordinate general, Sherman, commanded a "group" consisting of the Armies of the Tennessee, the Cumberland and the Ohio. The question as to whether the supreme command and the command of the principal group of armies should be in the same hands is very difficult of solution. In practice, the method adopted in each case usually grows out of the military and political conditions. The advantage of the German method is that the supreme commander is in actual contact with the troops, and can therefore form an accurate judgment of their powers. Under these conditions the risk of having cabinet strategy forced upon the generals is at its minimum, and more especially so if the supreme commander is the head of the state. On the other hand, his judgment is very liable to be influenced unduly by facts, coming under his own notice, which may in reality have no more than a local significance. Further, the supreme commander is at the mercy of distant subordinates to a far greater degree than he would be if free to go from one army to another. Thus, in 1870 the king of Prussia's headquarters before Paris were subjected to such pressure from subordinate army commanders that on several occasions selected staff-officers had to be sent to examine, for the king's private information, the real state of things at the front. The conduct of operations by one group commander in the campaign of 1864 seemed, at a distance, so eccentric and dangerous that General Grant actually left his own group of armies and went in person to take over command at the threatened point. Balanced judgment is thus often impossible unless the supreme command is independent of, and in a position to exercise general supervision over, each and every group or army. At the other end of the scale is the system of command employed by the Turks in 1877, in which four armies, three of them being actually on the same theatre of war, were directed from Constantinople. This system may be condemned unreservedly. It is recognized that, once the armies on either side have become seriously engaged, a commander-in-chief on the spot must direct them. Thus in 1904, while the Japanese and Russian armies were under the supreme command of their respective sovereigns, General Kuropatkin and Marshal Oyama personally commanded the chief groups of armies in the field. This is substantially the same as the system of the French army. It is therefore permissible to regard the system pursued by the Germans in 1870, and by the Union government in 1864, more as suited to special circumstances than as a general rule. As has been said above, the special feature of the German system of command is the personal leadership of the German emperor, and this brings the student at once to the consideration of another important part of the "superior leading."

52. The *Chief of the General Staff* is, as his title implies, the chief staff officer of the service, and as such, he has duties of the highest possible importance, both in peace and war. For the general subject of staff duties see STAFF. Here we are concerned only with the peculiar position of the chief of staff under a system in which the sovereign is the actual commander-in-chief. It is obvious in the first place that the sovereign may not be a great soldier, fitted by mental gifts, training and character to be placed at the head of an army of, perhaps, a million men. Allowing that it is imperative that, whatever he may be in himself, the sovereign should *ex officio* command the armies, it is easy to see that the ablest general in these armies must be selected to act as his adviser, irrespective of rank and seniority. This officer must therefore be assigned to a station beyond that of his army rank, and his orders are in fact those of the sovereign himself. Nor is it sufficient that he should occupy an unofficial position as adviser, or *ad latus*. If he were no more than this, the sovereign could act without his adviser being even aware of the action taken. As the staff is the machinery for the transmission of orders and despatches, all orders of the commander-in-chief are signed by the chief of staff as a matter of course, and this position is therefore that in which the adviser has the necessary influence. The relations between the sovereign and his chief military adviser are thus of the first importance to the smooth working of the great military machine, and never have the possibilities of this apparently strange system been more fully exploited than by King William and his chief of staff von Moltke in 1866 and in 1870–71. It is not true to say that the king was the mere figurehead of the German armies, or that Moltke was the real commander-in-chief. Those who have said this forget that the sole responsibility for the consequences of every order lay with the king, and that it is precisely the fear of this responsibilty that has made so many brilliant subordinates fail when in chief command. The characters of the two men supplemented each other, as also in the case of Blücher and Gneisenau and that of Radetzky and Hess. Under these circumstances, the German system of command works, on the whole, smoothly. Matters would, however, be different if either of the two officers failed to realize their mutual interdependence, and the system is in any

case only required when the self-sufficing great soldier is not available for the chief executive command.

53. *First and Second Lines.*—The organization into arms and units is of course maintained in peace as well as for war. Military forces are further organized, in peace, into active and reserve troops, first and second lines, &c., according to the power possessed by the executive over the men. Broadly speaking, the latter fall into three classes, regulars, auxiliary forces and irregular troops. The regulars or active troops are usually liable to serve at all times and in any country to which they may be sent. Auxiliary forces may be defined as all troops which undergo actual military training without being constantly under arms, and in Great Britain these were until 1908 represented by the Militia, the Yeomanry and the Volunteers, and now by the Territorial Force and the Special Reserve. In a country in which recruiting is by voluntary enlistment the classification is, of course, very different from that prevailing in a conscript army. The various "lines" are usually composed of separate organizations; the men are recruited upon different engagements, and receive a varying amount of training. Of the men not permanently embodied, only the reserve of the active army has actually served a continuous term with the colours. Other troops, called by various appellations, of which "militia" may be taken as generic, go through their military training at intervals. The general lines of army organization in the case of a country recruiting by universal service are as follows:—The male population is divided into classes, by ages, and the total period of liability to service is usually about 25 years. Thus at any given time, assuming two years' colour-service, the men of 20 and 21 years of age would constitute the active army serving with the colours, those of, say, 22 and 23, the reserve. The *Landwehr* or second line army would consist of all men who had been through the active army and were now aged 24 to 36. The third line would similarly consist of men whose ages were between 36 and 44. Assuming the same annual levy, the active army would consist of 200,000 men, its reserve 200,000, the second line of 1,300,000, and the third of 800,000. Thus of 2,500,000 men liable to, and trained for, military service, 200,000 only would be under arms at any given time. The simple system here outlined is of course modified and complicated in practice owing to re-engagements by non-commissioned officers, the speedy dismissal to the reserve of intelligent and educated men, &c.

54. *War Reserves.*—In war, the reserves increase the field armies to 400,000 men, the whole or part of the second line is called up and formed into auxiliary regiments, brigades and divisions, and in case of necessity the third line is also called upon, though usually this is only in the last resort and for home defence only. The proportion of reservists to men with the colours varies of course with the length of service. Thus in France or Germany, with two years' service in force, half of the rank and file of a unit in war would be men recalled from civil life. The true military value of reservists is often questioned, and under certain circumstances it is probable that units would take the field at peace strength without waiting for their reservists. The frontier guards of the continental military powers, which are expected to move at the earliest possible moment after hostilities have begun, are maintained at a higher effective than other units, and do not depend to any great extent on receiving reservists. The peace footing of cavalry and artillery units is similarly maintained at an artificial level. An operation of the nature of a *coup de main* would in any case be carried out by the troops available at the moment, however large might be the force required—twenty weak battalions would, in fact, be employed instead of ten strong ones. There is another class of troops, which may be called depot troops. These consist of officers and men left behind when the active corps completed with reserves takes the field, and they have (*a*) to furnish drafts for the front—and (*b*) to form a nucleus upon which all later formations are built up. The troops of the second line undertake minor work, such as guarding railways, and also furnish drafts for the field army. Later, when they have been for some time under arms, the second line troops are often employed by themselves in first line. A year's training under war conditions should bring such troops to the highest efficiency. As for irregulars, they have real military value only when the various permanent establishments do not take up the whole fighting strength of the nation, and thus states having universal service armies do not, as a rule, contemplate the employment of combatants other than those shown on the peace rolls. The status of irregulars is ill defined, but it is practically agreed that combatants, over whose conduct the military authorities have no disciplinary power, should be denied the privileges of recognized soldiers, and put to death if captured. So drastic a procedure is naturally open to abuse and is not always expedient. Still, it is perfectly right that the same man shall not be allowed, for example, to shoot a sentry at one moment, and to claim the privileges of a harmless civilian at the next. The division into first, second and third lines follows generally from the above. The first line troops, in a conscript army, are the "active army" or regulars, permanently under arms in peace time, and its reserves, which are used on the outbreak of war to complete the existing units to full strength. The German terms *Landwehr* and *Landsturm* are often applied to armies of the second and the third lines.

55. The military characteristics of the various types of regular troops have been dealt with in considering the advantages and disadvantages of the several forms of recruiting. It only remains to give some indication of the advantages which such forces (irrespective of their time of service) possess over troops which only come up for training at intervals. Physically, the men with the colours are always superior to the rest, owing to their constant exercise and the regularity and order under which they live; as soldiers, they are more under the control of their officers, who are their leaders in daily life, in closer touch with army methods and discipline, and, as regards their formal training, they possess infinitely greater power of strategic and tactical manœuvre. Their steadiness under fire is of course more to be relied upon than that of other troops. Wellington, speaking of the contrast between old and young soldiers (regulars), was of opinion that the chief difference lay in the greater hardiness, power of endurance, and general campaigning qualities given by experience. This is of course more than ever true in respect of regular and auxiliary troops, as was strikingly demonstrated in the Spanish-American War. On the whole, it is true to say that only a regular army can endure defeat without dissolution, and that volunteers, reservists or militiamen fresh from civil life may win a victory but cannot make the fullest use of it when won. At the same time, when they have been through one or two arduous campaigns, raw troops become to all intents and purposes equal to any regulars. On the other hand, the greatest military virtue of auxiliary forces is their enthusiasm. With this quality were won the great victories of 1792–94 in France, those of 1813 in Germany, and the beginnings of Italian unity at Calatafimi and Palermo. The earlier days of the American Civil War witnessed desperate fighting, of which Shiloh is the best example, between armies which had had but the slightest military training. In the same war the first battle of Bull Run illustrated what has been said above as to the weaknesses of unprofessional armies. Both sides, raw and untrained, fought for a long time with the greatest determination, after which the defeated army was completely dissolved in rout and the victors quite unable to pursue. So far it is the relative military value of the professional soldier and the citizen-soldier that has been reviewed. A continental army of the French or German stamp is differently constituted. It is, first of all, clear that the drilled citizen-soldier combines the qualities of training and enthusiasm. From this it follows that a hostile "feeling" as well as a hostile "view" must animate such an army if it is to do good service. If a modern "nation in arms" is engaged in a purely dynastic quarrel against a professional army of inferior strength, the result will probably be victory for the latter. But the active army of France or Germany constitutes but a small part of the "nation in arms," and the army for war is

composed in addition of men who have at some period in the past gone through a regular training. Herein lies the difference between continental and British auxiliary forces. In the French army, an ex-soldier during his ten years of reserve service was by the law of 1905 only liable for two months' training, and for the rest of his military career for two weeks' service only. The further reduction of this liability was proposed in 1907 and led to much controversy. The question of the value of auxiliary forces, then, as between the continous work of, say, English territorials, and the permanent though dwindling influence of an original period of active soldiering, is one of considerable importance. It is largely decided in any given case by the average age of the men in the ranks.

56. The transfer of troops from the state of peace to that of war is called *mobilization*. This is, of course, a matter which primarily depends on good administration, and its minutest details are in all states laid down beforehand. Reservists have to be summoned, and, on arrival, to be clothed and equipped out of stores maintained in peace. Officers and men of the regular army on leave have to be recalled, the whole medically examined for physical fitness to serve, and a thousand details have to be worked out before the unit is ready to move to its concentration station. The concentration and the strategic deployment are, of course, dependent upon the circumstances of each war, and the peace organization ceases to be applicable. But throughout a war the depots at home, the recruiting districts of second-line troops, and above all the various arsenals, manufactories and offices controlled by the war department are continually at work in maintaining the troops in the field at proper strength and effectiveness.

57. *Territorial System.*—The feudal system was of course a territorial system in principle. Indeed, as has been shown above, a feudal army was chiefly at fault owing to the dislocation of the various levies. Concentration was equally the characteristic of the professional armies which succeeded those of feudalism, and only such militia forces as remained in existence preserved a local character. The origin of territorial recruiting for first-line troops is to be found in the "cantonal" system, said to have been introduced by Louis XIV., but brought to the greatest perfection in Prussia under Frederick William I. But long service and the absence of a reserve vitiated the system in practice, since losses had to be made good by general recruiting, and even the French Revolution may hardly be said to have produced the territorial system as we understand it to-day. It was only in the deliberate preparation of the Prussian army on short-service lines that we find the beginning of the "territorial system of dislocation and command." This is so intimately connected with the general system of organization that it cannot be considered merely as a method of recruiting by districts. It may be defined as a system whereby, for purposes of command in peace, recruiting, and of organization generally, the country is divided into districts, which are again divided and subdivided as may be required. In a country in which universal service prevails, an army corps district is divided into divisional districts, these being made up of brigade and of regimental districts. Each of these units recruits, and is in peace usually stationed, in its own area; the artillery, cavalry and special arms are recruited for the corps throughout the whole allotted area, and stationed at various points within the same. Thus in the German army the III. army corps is composed entirely of Brandenburgers. The infantry of the corps is stationed in ten towns, the cavalry in four and the artillery in five. In countries which adhere to voluntary recruiting, the system, depending as it does on the calculable certainty of recruiting, is not so fully developed, but in Great Britain the auxiliary forces have been reorganized in divisions of all arms on a strictly territorial basis. The advantage of the system as carried into effect in Germany is obvious. Training is carried out with a minimum of friction and expense, as each unit has an ample area for training. Whilst the brigadiers can exercise general control over the colonels, and the divisional generals over the brigadiers, there is little undue interference of superior authority in the work of each grade, and the men, if soldiers by compulsion, at any rate are serving close to their own homes. Most of the reservists required on mobilization reside within a few miles of their barracks. Living in the midst of the civil population, the troops do not tend to become a class apart. Small garrisons are not, as formerly, allowed to stagnate, since modern communications make supervision easy. Further, it must be borne in mind that the essence of the system is the organization and training for war of the whole military population. Now so great a mass of men could not be administered except through this decentralization of authority, and the corollary of short service universally applied is the full territorial system, in which the whole enrolled strength of the district is subjected to the authority of the district commander. Practice, however, falls short of theory, and the dangers of drawing whole units from disaffected or unmilitary districts are often foreseen and discounted by distributing the recruits, non-regionally, amongst more or less distant regiments.

58. *Army Administration.*—The existing systems of command and organization, being usually based upon purely military considerations, have thus much, indeed almost all, in common. *Administration* differs from them in one important respect. While the methods of command and organization are the result of the accumulated experience of many armies through many hundred years, the central administration in each case is the product of the historical evolution of the particular country, and is dependent upon forms of government, constitutions and political parties. Thus France, after 1870, remodelled the organization of her forces in accordance with the methods which were presumed to have given Germany the victory, but the head-quarters staff at Paris is very different in all branches from that of Berlin. Great Britain adopted German tactics, and to some extent even uniform, but the Army Council has no counterpart in the administration of the German emperor's forces.

The first point for consideration, therefore, is, what is the ultimate, and what is the proximate, authority supervising the administration? The former is, in most countries, the people or its representatives in parliament, for it is in their power to stop supplies, and without money the whole military fabric must crumble. The constitutional chief of the army is the sovereign, or, in republics, the president, but in most countries the direct control of army matters by the representatives of the people extends over all affairs into which the well-being of the civil population, the expenditure of money, alleged miscarriages of military justice, &c., enter, and it is not unusual to find grand strategy, and even the technical deficiencies of a field-gun or rifle, the subject of interpellation and debate. The peculiar influence of the sovereign is in what may be termed patronage (that is, the selection of officers to fill important positions and the general supervision of the officer-corps), and in the fact that loyalty is the foundation of the discipline and soldierly honour which it is the task of the officers to inculate into their men. In all cases the head of the state is *ipso facto* the head of the army. The difference between various systems may then be held to depend on the degree of power allowed to or held by him. This reacts upon the central administration of the army, and is the cause of the differences of system alluded to. For the civil chief of the executive is not necessarily a soldier, much less an expert and capable soldier; he must, therefore, be provided with technical advisers. The chief of the general staff is often the principal of these, though in some cases a special commander-in-chief, or the minister for war, or, as in France and England, a committee or council, has the duty of advising the executive on technical matters.

59. *Branches of Administration.*—In these circumstances the only general principle of army administration common to all systems is the division of the labour between two great branches. Military administration, in respect of the troops and material which it has to control, is divided between the departments of the *War Office* and the *General Staff*. In the staff work of subordinate units, *e.g.* army corps and divisions, the same classification of duties is adopted, "general staff" duties being performed by one set of officers, "routine staff" duties by another.

The work of a *General Staff* may be taken as consisting in preparation for war, and this again, both in Great Britain and abroad, consists of military policy in all its branches, staff duties in war, the collection of intelligence, mobilization, plans of operations and concentration, training, military history and geography, and the preparation of war regulations. These subjects are usually subdivided into four or five groups, each of which is dealt with by a separate section of the general staff, the actual division of the work, of course, varying in different countries. Thus, the second section of the French staff deals with "the organization and tactics of foreign armies, study of foreign theatres of war, and military missions abroad." A *War Office* is concerned with peace administration and with the provision of men and material in war. Under the former category fall such matters as "routine" administration, finance, justice, recruiting, promotion of officers (though not always), barracks and buildings generally, armament, equipment and clothing, &c., in fact all matters not directly relevant to the training of the troops for and the employment of the troops in war. In war, some of the functions of a war office are suspended, but on the other hand the work necessary for the provision of men and material to augment the army and to make good its losses is vastly increased. In 1870 the minister of war, von Roon, accompanied the headquarters in the field, but this arrangement did not work well, and will not be employed again. The chief duties other than those of the general staff fall into two classes, the "routine staff," administration or adjutant-general's branch, which deals with all matters affecting *personnel*, and the quartermaster-general's branch, which supervises the provision and issue of supplies, stores and *matériel* of all kinds. Over and above these, provision has to be made for control of all the technical parts of administration, such as artillery and engineer services (in Great Britain, this, with a portion of the quartermaster-general's department, is under the master-general of the ordnance), and for military legislation, preparation of estimates, &c. These are, of course, special subjects, not directly belonging to the general administrative system. It is only requisite that the latter should be sufficiently elastic to admit of these departments being formed as required. However these subordinate offices may be multiplied, the main work of the war office is in the two departments of the adjutant-general (*personnel*) and the quartermaster-general (*matériel*). Beyond and wholly distinct from these is the general staff, the creation of which is perhaps the most important contribution of the past century to the pure science of military organization.

British Army

60. Prior to the Norman Conquest the armed force of England was essentially a national militia. Every freeman was bound to bear arms for the defence of the country, or for the maintenance of order. To give some organization and training to the levy, the several sheriffs had authority to call out the contingents of their shires for exercise. The "fyrd," as the levy was named, was available for home service only, and could not be moved even from its county except in the case of emergency; and it

Comparative Strength of Various Armies

(*a*) *Compulsory Service* (1906).

	France.	Germany.	Russia.	Austria-Hungary.	Italy.
Annual Contingent for the Colours	230,000	222,000	254,000	128,000	83,000
Medically unfit and exempt	90,000	127,000	120,000	57,000	110,000
Excused from Service in Peace, able-bodied	..	291,000	606,000	285,000	122,000
Total of Men becoming liable for Service in 1907	320,000	540,000	980,000	470,000	315,000
Total Permanent Armed Force in Peace	610,000 (not including colonial troops)	610,000	1,226,000	356,000	269,000
First-Line Troops, war-strength (estimated)	1,350,000	1,675,000	2,187,000	950,000	800,000
Second-Line Troops, war-strength (estimated)	3,000,000	2,275,000	1,429,000	1,450,000	1,150,000
Numbers available in excess of these (estimated)	450,000	3,950,000	9,384,000	5,000,000	1,200,000
Total War Resources of all kinds	4,800,000	7,900,000	13,000,000	7,400,000	3,150,000
Annual Military Expenditure—total	£27,720,000	£32,228,000	£36,080,000	£15,840,000	£11,280,000
Annual Military Expenditure—per head of population (approximate)	13s. 9d.	10s. 9d.	5s. 3d.	6s. 8d.	6s. 5d.

(*b*) *Authorized Establishments and Approximate Military Resources of the British Empire* (1906–1907).

	British Regular Army.	Reserves for Regular Army.	Auxiliary Forces.	Native Troops (Regular, Reserve, &c.).	Colonial Forces (various).	Total.
Great Britain	117,000	120,000	500,000	..	..	737,000
Channel Islands, Malta, Bermuda, Colonies and Dependencies	65,000	..	6,000	..	30,000	101,000
India	75,000	..	30,000	202,000	..	307,000
Canadian Forces	..	..	46,000	..	59,000 (reserves)	105,000
Australian Forces (including New Zealand)	..	..	70,000 (appr.)	..	..	70,000
South African Forces	..	..	20,000 (appr.)	..	..	20,000
Totals	257,000	120,000	672,000	202,000	89,000	1,340,000

Note.—Ex-soldiers of regular and auxiliary forces, still fit for service, and estimated *levées en masse*, are not counted. Enlistment chiefly voluntary.

(*c*) The Regular Army of the United States has a maximum authorized establishment (1906) of 60,000 enlisted men; the Organized Militia was at the same date 110,000 strong. Voluntary enlistment throughout. (See United States.) In 1906–1907 the total numbers available for a *levée en masse* were estimated at 13,000,000.

was principally to repel oversea invasions that its services were required. Yet even in those days the necessity of some more permanent force was felt, and bodies of paid troops were maintained by the kings at their own cost. Thus Canute and his successors, and even some of the great earls kept up a household force (*huscarles*). The English army at Hastings consisted of the *fyrd* and the corps of *huscarles*.

The English had fought on foot; but the mailed horseman had now become the chief factor in war, and the Conqueror introduced into England the system of tenure by knight-service familiar in Normandy. This was based on the unit of the feudal host, the *constabularia* of ten knights, the Conqueror granting lands in return for finding one or more of these units (in the case of great barons) or some fraction of them (in the case of lesser tenants). The obligation was to provide knights to serve, with horse and arms, for forty days in each year at their own charges. This obligation could be handed on by sub-enfeoffment through a whole series of under-tenants. The system being based, not on the duty of personal service, but on the obligation to supply one or more knights (or it might be only the fraction of a knight), it was early found convenient to commute this for a money payment known as "scutage" (see KNIGHT SERVICE and SCUTAGE). This money enabled the king to hire mercenaries, or pay such of the feudal troops as were willing to serve beyond the usual time. From time to time proclamations and statutes were issued reminding the holders of knights' fees of their duties; but the immediate object was generally to raise money rather than to enforce personal service, which became more and more rare. The feudal system had not, however, abrogated the old Saxon levies, and from these arose two national institutions—the *posse comitatus*, liable to be called out by the sheriff to maintain the king's peace, and later the *militia* (*q.v.*). The *posse comitatus*, or power of the county, included all males able to bear arms, peers and spiritual men excepted; and though primarily a police force it was also bound to assist in the defence of the country. This levy was organized by the Assize of Arms under Henry II. (1181), and subsequently under Edward I. (1285) by the so-called "Statute of Winchester," which determined the numbers and description of weapons to be kept by each man according to his property, and also provided for their periodical inspection. The early Plantagenets made free use of mercenaries. But the weakness of the feudal system in England was preparing, through the 12th and 13th centuries, a nation in arms absolutely unique in the middle ages. The Scottish and Welsh wars were, of course, fought by the feudal levy, but this levy was far from being the mob of unwilling peasants usual abroad, and from the *fyrd* came the English archers, whose fame was established by Edward I.'s wars, and carried to the continent by Edward III. Edward III. realized that there was better material to be had in his own country than abroad, and the army with which he invaded France was an army of national mercenaries, or, more simply, of English soldiers. The army at Creçy was composed exclusively of English, Welsh and Irish. From the pay list of the army at the siege of Calais (1346) it appears that all ranks, from the prince of Wales downward, were paid, no attempt being made to force even the feudal nobles to serve abroad at their own expense. These armies were raised mainly by contracts entered into "with some knight or gentleman expert in war, and of great revenue and livelihood in the country, to serve the king in war with a number of men." Copies of the indentures executed when Henry V. raised his army for the invasion of France in 1415 are in existence. Under these the contracting party agreed to serve the king abroad for one year, with a given number of men equipped according to agreement, and at a stipulated rate of pay. A certain sum was usually paid in advance, and in many cases the crown jewels and plate were given in pledge for the rest. The profession of arms seems to have been profitable. The pay of the soldier was high as compared with that of the ordinary labourer, and he had the prospect of a share of plunder in addition, so that it was not difficult to raise men where the commander had a good military reputation. Edward III. is said to have declined the services of numbers of foreign mercenaries who wished to enrol under him in his wars against France.

The funds for the payment of these armies were provided partly from the royal revenues, partly from the fines paid in lieu of military service, and other fines arbitrarily imposed, and partly by grants from parliament. As the soldier's contract usually ended with the war, and the king had seldom funds to renew it even if he so wished, the armies disbanded of themselves at the close of each war. To secure the services of the soldier during his contract, acts were passed (18 Henry VI. c. 19; and 7 Henry VII. c. 1) inflicting penalties for desertion; and in Edward VI.'s reign an act "touching the true service of captains and soldiers" was passed, somewhat of the nature of a Mutiny Act.

61. It is difficult to summarize the history of the army between the Hundred Years' War and 1642. The final failure of the English arms in France was soon followed by the Wars of the Roses, and in the long period of civil strife the only national force remaining to England was the Calais garrison. Henry VIII. was a soldier-king, but he shared the public feeling for the old bow and bill, and English armies which served abroad did not, it seems, win the respect of the advanced professional soldiers of the continent. In 1519 the Venetian ambassador described the English forces as consisting of 150,000 men whose peculiar, though not exclusive, weapon was the long bow (Fortescue i. 117). The national levy made in 1588 to resist the Armada and the threat of invasion produced about 750 lancers (heavy-armed cavalry), 2000 light horse and 56,000 foot, beside 20,000 men employed in watching the coasts. The small proportion of mounted men is very remarkable in a country in which Cromwell was before long to illustrate the full power of cavalry on the battlefield. It is indeed not unfair to regard this army as a miscellaneous levy of inferior quality.

It was in cavalry that England was weakest, and by three different acts it was sought to improve the breed of horses, though the light horse of the northern counties had a good reputation, and even won the admiration of the emperor Charles V. Perhaps the best organized force in England at this time was the London volunteer association which ultimately became the Honourable Artillery Company. At Flodden the spirit of the old English yeomanry triumphed over the outward form of continental battalions which the Scots had adopted, and doubtless the great victory did much to retard military progress in England. The chief service of Henry VIII. to the British army was the formation of an artillery train, in which he took a special interest. Before he died the forces came to consist of a few permanent troops (the bodyguard and the fortress artillery service), the militia or general levy, which was for home, and indeed for county, service only, and the paid armies which were collected for a foreign war and disbanded at the conclusion of peace, and were recruited on the same principle of indents which had served in the Hundred Years' War. In the reign of Mary, the old Statute of Winchester was revised (1553), and the new act provided for a readjustment of the county contingents and in some degree for the rearmament of the militia. But, from the fall of Calais and the expedition to Havre up to the battle of the Dunes a century later, the intervention of British forces in foreign wars was always futile and generally disastrous. During this time, however, the numerous British regiments in the service of Holland learned, in the long war of Dutch independence, the art of war as it had developed on the continent since 1450, and assimilated the regimental system and the drill and armament of the best models. Thus it was that in 1642 there were many hundreds of trained and war-experienced officers and sergeants available for the armies of the king and the parliament. By this time bows and bills had long disappeared even from the militia, and the Thirty Years' War, which, even more than the Low Countries, offered a career for the adventurous man, contributed yet more trained officers and soldiers to the English and Scottish forces. So closely indeed was war now studied by Englishmen that the respective adherents of the Dutch and the Swedish systems quarrelled on the eve of the battle of Edgehill. Francis

and Horace Vere, Sir John Norris, and other Englishmen had become generals of European reputation. Skippon, Astley, Goring, Rupert, and many others soon to be famous were distinguished as company and regimental officers in the battles and sieges of Germany and the Low Countries.

The home forces of England had, as has been said, little or nothing to revive their ancient renown. Instead, they had come to be regarded as a menace to the constitution. In Queen Elizabeth's time the demands of the Irish wars had led to frequent forced levies, and the occasional billeting of the troops in England also gave rise to murmurs, but the brilliancy and energy of her reign covered a great deal, and the peaceful policy of her successor removed all immediate cause of complaint. But after the accession of Charles I. we find the army a constant and principal source of dispute between the king and parliament, until under William III. it is finally established on a constitutional footing. Charles, wishing to support the Elector Palatine in the Thirty Years' War, raised an army of 10,000 men. He was already encumbered with debts, and the parliament refused all grants, on which he had recourse to forced loans. The army was sent to Spain, but returned without effecting anything, and was not disbanded, as usual, but billeted on the inhabitants. The billeting was the more deeply resented as it appeared that the troops were purposely billeted on those who had resisted the loan. Forced loans, billeting and martial law—all directly connected with the maintenance of the army— formed the main substance of the grievances set forth in the Petition of Right. In accepting this petition, Charles gave up the right to maintain an army without consent of parliament; and when in 1639 he wished to raise one to act against the rebellious Scots, parliament was called together, and its sanction obtained, on the plea that the army was necessary for the defence of England. This army again became the source of dispute between the king and parliament, and finally both sides appealed to arms.

62. The first years of the Great Rebellion (*q.v.*) showed primarily the abundance of good officers produced by the wars on the continent, and in the second place the absolute inadequacy of the military system of the country; the commissions of array, militia ordinances, &c., had at last to give way to regular methods of enlistment and a central army administration. It was clear, at the same time, that when the struggle was one of principles and not of dynastic politics, excellent recruits, far different from the wretched levies who had been gathered together for the Spanish war, were to be had in any reasonable number. These causes combined to produce the "New Model" which, originating in Cromwell's own cavalry and the London trained bands of foot, formed of picked men and officers, severely disciplined, and organized and administered in the right way, quickly proved its superiority over all other armies in the field, and in a few years raised its general to supreme civil power. The 15th of February 1645 was the birthday of the British standing army, and from its first concentration at Windsor Park dates the scarlet uniform. The men were for the most part voluntarily enlisted from existing corps, though deficiencies had immediately to be made good by impressment.

Four months later the New Model decided the quarrel of king and parliament at Naseby. When Cromwell, the first lieutenant-general and the second captain-general of the army, sent his veterans to take part in the wars of the continent they proved themselves a match for the best soldiers in Europe. On the restoration of the monarchy in 1660 the army, now some 80,000 strong, was disbanded. It had enforced the execution of Charles I., it had dissolved parliament, and England had been for years governed under a military régime. Thus the most popular measure of the Restoration was the dissolution of the army. Only Monk's regiment of foot (now the Coldstream Guards) survived to represent the New Model in the army of to-day. At the same time the troops (now regiments) of household cavalry, and the regiment of foot which afterwards became the Grenadier Guards, were formed, chiefly from Royalists, though the disbanded New Model contributed many experienced recruits. The permanent forces of the crown came to consist once more of the "garrisons and guards," maintained by the king from the revenue allotted to him for carrying on the government of the country. The "garrisons" were commissioned to special fortresses—the Tower of London, Portsmouth, &c. The "guards" comprised the sovereign's bodyguards ("the yeomen of the guard" and "gentlemen-at-arms," who had existed since the times of Henry VII. and VIII.), and the regiments mentioned above. Even this small force, at first not exceeding 3000 men, was looked on with jealousy by parliament, and every attempt to increase it was opposed. The acquisition of Tangier and Bombay, as part of the dower of the infanta of Portugal, led to the formation of a troop of horse (now the 1st Royal Dragoons) and a regiment of infantry (the 2nd, now Queen's R.W. Surrey, regiment) for the protection of the former; and a regiment of infantry (afterwards transferred to the East India Company) to hold the latter (1661). These troops, not being stationed in the kingdom, created no distrust; but whenever, as on several occasions during Charles's reign, considerable armies were raised, they were mostly disbanded when the occasion ceased. Several regiments, however, were added to the permanent force, including Dumbarton's regiment (the 1st or Royal Scots, nicknamed Pontius Pilate's Bodyguard)—which had a long record of service in the armies of the continent, and represented the Scots brigade of Gustavus Adolphus's army—and the 3rd Buffs, representing the English regiments of the Dutch army and through them the volunteers of 1572, and on Charles's death in 1685 the total force of "guards and garrisons" had risen to 16,500, of whom about one-half formed what we should now call the standing army.

63. James II., an experienced soldier and sailor, was more obstinate than his predecessor in his efforts to increase the army, and Monmouth's rebellion afforded him the opportunity. A force of about 20,000 men was maintained in England, and a large camp formed at Hounslow. Eight cavalry and twelve infantry regiments (the senior of which was the 7th "Royal" Fusiliers, formed on a new French model) were raised, and given the numbers which, with few exceptions, they still bear. James even proposed to disband the militia, which had not distinguished itself in the late rebellion, and further augment the standing army; and although the proposal was instantly rejected, he continued to add to the army till the Revolution deprived him of his throne. The army which he had raised was to a great extent disbanded, the Irish soldiers especially, whom he had introduced in large numbers on account of their religion, being all sent home.

The condition of the army immediately engaged the attention of parliament. The Bill of Rights had definitely established that "the raising or keeping of a standing army within the kingdom, unless it be by the consent of parliament, is against the law," and past experience made them very jealous of such a force. But civil war was imminent, foreign war certain; and William had only a few Dutch troops, and the remains of James's army, with which to meet the storm. Parliament therefore sanctioned a standing army, trusting to the checks established by the Bill of Rights and Act of Settlement, and by placing the pay of the army under the control of the Commons. An event soon showed the altered position of the army. A regiment mutinied and declared for James. It was surrounded and compelled to lay down its arms; but William found himself without legal power to deal with the mutineers. He therefore applied to parliament, and in 1689 was passed the first Mutiny Act, which, after repeating the provisions regarding the army inserted in the Bill of Rights, and declaring the illegality of martial law, gave power to the crown to deal with the offences of mutiny and desertion by courts-martial. From this event is often dated the history of the standing army as a constitutional force (but see Fortescue, *British Army*, i. 335).

64. Under William the army was considerably augmented. The old regiments of James's army were reorganized, retaining, however, their original numbers, and three of cavalry and eleven of infantry (numbered to the 28th) were added. In 1690 parliament sanctioned a force of 62,000 men, further increased to

65,000 in 1691; but on peace being made in 1697 the Commons immediately passed resolutions to the effect that the land forces be reduced to 7000 men in England and 12,000 in Ireland. The War of the Spanish Succession quickly obliged Great Britain again to raise a large army, at one time exceeding 200,000 men; but of these the greater number were foreign troops engaged for the continental war. Fortescue (*op. cit.* i. 555) estimates the British forces at home and abroad as 70,000 men at the highest figure. After the peace of Utrecht the force was again reduced to 8000 men in Great Britain and 11,000 in the plantations (*i.e.* colonies) and abroad. From that time to the present the strength of the army has been determined by the annual votes of parliament, and though frequently the subject of warm debates in both houses, it has ceased to be a matter of dispute between the crown and parliament. The following table shows the fluctuations from that time onward—the peace years showing the average peace strength, the war years the maximum to which the forces were raised:—

Peace.		War.	
Year.	Number.	Year.	Number.
1750	18,857	1745	74,187
1793	17,013	1761	67,776
1822	71,790	1777	90,734
1845	100,011	1812	245,996
1857	156,995	1856	275,079
1866	203,404	1858	222,874

Note.—Prior to 1856 the British forces serving in India are not included.

During William's reign the small English army bore an honourable part in the wars against Louis XIV., and especially distinguished itself under the king at Steinkirk, Neerwinden and Namur. Twenty English regiments took part in the campaign of 1694. In the great wars of Queen Anne's reign the British army under Marlborough acquired a European reputation. The cavalry, which had called forth the admiration of Prince Eugene when passed in review before him after its long march across Germany (1704), especially distinguished itself in the battle of Blenheim, and Ramillies, Oudenarde and Malplaquet were added to the list of English victories. But the army as usual was reduced at once, and even the cadres of old regiments were disbanded, though the alarm of Jacobite insurrections soon brought about the re-creation of many of these. During the reign of the first and second Georges an artillery corps was organized, and the army further increased by five regiments of cavalry and thirty-five of infantry. Fresh laurels were won at Dettingen (1743), in which battle twenty English regiments took part; and though Fontenoy (*q.v.*) was a day of disaster for the English arms, it did not lower their reputation, but rather added to it. Six regiments of infantry won the chief glory of Prince Ferdinand's victory of Minden (*q.v.*) in 1759, and throughout the latter part of the Seven Years' War the British contingent of Ferdinand's army served with almost unvarying distinction in numerous actions. About this time the first English regiments were sent to India, and the 39th shared in Clive's victory at Plassey. During the first half of George III.'s reign the army was principally occupied in America; and though the conquest of Canada may be counted with pride among its exploits, this page in its history is certainly the darkest. English armies capitulated at Saratoga and at Yorktown, and the war ended by the evacuation of the revolted states of America and the acknowledgment of their independence.

65. Before passing to the great French Revolutionary wars, from which a fresh period in the history of the army may be dated, it will be well to review the general condition of the army in the preceding century, injured as it was by the distrust of parliament and departmental weakness and corruption which went far to neutralize the good work of the duke of Cumberland as commander-in-chief and of Pitt as war administrator. Regiments were raised almost as in the days of the Edwards. The crown contracted with a distinguished soldier, or gentleman of high position, who undertook to raise the men, receiving a certain sum as bounty-money for each recruit. In some cases, in lieu of money, the contractor received the nomination of all or some of the officers, and recouped himself by selling the commissions. This system—termed "raising men for rank"—was retained for many years, and originally helped to create the "purchase system" of promotion. For the maintenance of the regiment the colonel received an annual sum sufficient to cover the pay of the men, and the expenses of clothing and of recruiting. The colonel was given a "beating order," without which no enlistment was legal, and was responsible for maintaining his regiment at full strength. "Muster masters" were appointed to muster the regiments, and to see that the men for whom pay was drawn were really effective. Sometimes, when casualties were numerous, the allowance was insufficient to meet the cost of recruiting, and special grants were made. In war time the ranks were also filled by released debtors, pardoned criminals, and impressed paupers and vagrants. Where the men were raised by voluntary enlistment, the period of service was a matter of contract between the colonel and the soldier, and the engagement was usually for life; but exceptional levies were enlisted for the duration of war, or for periods of three or five years. As for the officers, the low rate of pay and the purchase system combined to exclude all but men of independent incomes. Appointments (except when in the gift of the colonel) were made by the king at home, and by the commander-in-chief abroad; even in Ireland the power of appointment rested with the local commander of the forces until the Union. The soldier was clothed by his colonel, the charge being defrayed from the "stock fund." The army lived in barracks, camps or billets. The barrack accommodation in Great Britain at the beginning of the 18th century only sufficed for five thousand men; and though it had gradually risen to twenty thousand in 1792, a large part of the army was constantly in camps and billets—the latter causing endless complaints and difficulties.

66. The first efforts of the army in the long war with France did not tend to raise its reputation amongst the armies of Europe. The campaigns of allied armies under the duke of York in the Netherlands, in which British contingents figured largely, were uniformly unsuccessful (1793–94 and 1799), though in this respect they resembled those of almost all soldiers who commanded against the "New French" army. The policy of the younger Pitt sent thousands of the best soldiers to unprofitable employment, and indeed to death, in the West Indies. At home the administration was corrupt and ineffective, and the people generally shared the contemptuous feeling towards the regular army which was then prevalent in Europe. But a better era began with the appointment of Frederick Augustus, duke of York, as commander-in-chief of the army. He did much to improve its organization, discipline and training, and was ably seconded by commanders of distinguished ability. Under Abercromby in Egypt, under Stuart at Maida, and under Lake, Wellesley and others in India, the British armies again attached victory to their standards, and made themselves feared and respected. Later, Napoleon's threat of invading England excited her martial spirit to the highest pitch to which it had ever attained. Finally, her military glory was raised by the series of successful campaigns in the Peninsula, until it culminated in the great victory of Waterloo; and the army emerged from the war with the most solidly founded reputation of any in Europe.

The events of this period belong to the history of Europe, and fall outside the province of an article dealing only with the army. The great augmentations required during the war were effected partly by raising additional regiments, but principally by increasing the number of battalions, some regiments being given as many as four. On the conclusion of peace these battalions were reduced, but the regiments were retained, and the army was permanently increased from about twenty thousand, the usual peace establishment before the war, to an average of eighty thousand. The duke of York, on first appointment to the command, had introduced a uniform drill throughout the army, which was further modified according to Sir David Dundas's system in 1800; and, under the direction of Sir John Moore and others, a high perfection of drill was attained. At

the beginning of the war, the infantry, like that of the continental powers, was formed in three ranks; but a two-rank formation had been introduced in America and in India and gradually became general, and in 1809 was finally approved. In the Peninsula the army was permanently organized in divisions, usually consisting of two brigades of three or four battalions each, and one or two batteries of artillery. The duke of Wellington had also brought the commissariat and the army transport to a high pitch of perfection, but in the long peace which followed these establishments were reduced or broken up.

67. The period which elapsed between Waterloo and the Crimean War is marked by a number of Indian and colonial wars, but by no organic changes in the army, with perhaps the single exception of the Limited Service Act of 1847, by which enlistment for ten or twelve years, with power to re-engage to complete twenty-one, was substituted for the life enlistments hitherto in force. The army went to sleep on the laurels and recollections of the Peninsula. The duke of Wellington, for many years commander-in-chief, was too anxious to hide it away in the colonies in order to save it from further reductions or utter extinction, to attempt any great administrative reforms. The force which was sent to the Crimea in 1854 was an agglomeration of battalions, individually of the finest quality, but unused to work together, without trained staff, administrative departments or army organization of any kind. The lesson of the winter before Sevastopol was dearly bought, but was not thrown away. From that time successive war ministers and commanders-in-chief have laboured perseveringly at the difficult task of army organization and administration. Foremost in the work was Sidney Herbert (Lord Herbert of Lea), the soldier's friend, who fell a sacrifice to his labours (1861), but not before he had done much for the army. The whole system of administration was revised. In 1854 it was inconceivably complicated and cumbersome. The "secretary of state for war and colonies," sitting at the Colonial Office, had a general but vague control, practically limited to times of war. The "secretary at war" was the parliamentary representative of the army, and exercised a certain financial control, not extending, however, to the ordnance corps. The commander-in-chief was responsible to the sovereign alone in all matters connected with the discipline, command or patronage of the army, but to the secretary at war in financial matters. The master-general and board of ordnance were responsible for the supply of material on requisition, but were otherwise independent, and had the artillery and engineers under them. The commissariat department had its headquarters at the treasury, and until 1852 the militia were under the home secretary. A number of minor subdepartments, more or less independent, also existed, causing endless confusion, correspondence and frequent collision. In 1854 the business of the colonies was separated from that of war, and the then secretary of state, the duke of Newcastle, assumed control over all the other administrative officers. In the following year the secretary of state was appointed secretary at war also, and the duties of the two offices amalgamated. The same year the commissariat office was transferred to the war department, and the Board of Ordnance abolished, its functions being divided between the commander-in-chief and the secretary of state. The minor departments were gradually absorbed, and the whole administration divided under two great chiefs, sitting at the war office and Horse Guards respectively. In 1870 these two were welded into one, and the war office now existing was constituted.

Corresponding improvements were effected in every branch. The system of clothing the soldiers was altered, the contracts being taken from the colonels of regiments, who received a money allowance instead, and the clothing supplied from government manufactories. The pay, food and general condition of the soldier were improved; reading and recreation rooms, libraries, gymnasia and facilities for games of all kinds being provided. Barracks (*q.v.*) were built on improved principles, and a large permanent camp was formed at Aldershot, where considerable forces were collected and manœuvred together. Various educational establishments were opened, a staff college was established for the instruction of officers wishing to qualify for the staff, and regimental schools were improved.

68. The Indian Mutiny of 1857, followed by the transference of the government of India, led to important changes. The East India Company's white troops were amalgamated with the Queen's army, and the whole reorganized (see *Indian Army* below).

The fact that such difficulties as those of 1854 and 1857, not to speak of the disorders of 1848, had been surmounted by the weak army which remained over from the reductions of forty years, coupled with the instantaneous and effective rejoinder to the threats of the French colonels in 1859—the creation of the Volunteer Force—certainly lulled the nation and its representatives into a false sense of security. Thus the two obvious lessons of the German successes of 1866 and 1870—the power of a national army for offensive invasion, and the rapidity with which such an army when thoroughly organized could be moved—created the greatest sensation in England. The year 1870 is, therefore, of prime importance in the history of the regular forces of the crown. The strength of the home forces at different times between 1815 and 1870 is given as follows (Biddulph, *Lord Cardwell at the War Office*):—

	Regulars.	Auxiliaries.	Field Guns.
1820	64,426	60,740	22
1830	50,876	34,614	30
1840	53,379	20,791	30
1850	68,538	29,868	70
1860	100,701	229,501	180
1870	89,051 (later 109,000)	281,692	180

69. The period of reform commences therefore with 1870, and is connected indissolubly with the name of Edward, Lord Cardwell, secretary of state for war 1869–1874. In the matter of organization the result of his labours was seen in the perfectly arranged expedition to Ashanti (1874); as for recruiting, the introduction of short service and reserve enlistment together with many rearrangements of pay, &c., proved so far popular that the number of men annually enlisted was more than trebled (11,742 in 1869; 39,971 in 1885; 40,729 in 1898), and so far efficient that "Lord Cardwell's . . . system, with but small modification, gave us during the Boer War 80,000 reservists, of whom 96 or 97 % were found efficient, and has enabled us to keep an army of 150,000 regulars in the field for 15 months" (Rt. Hon. St John Brodrick, House of Commons, 8th of March 1901). The localization of the army, subsequently completed by the territorial system of 1882, was commenced under Cardwell's régime, and a measure which encountered much powerful opposition at the time, the abolition of the purchase of commissions, was also effected by him (1871). The machinery of administration was improved, and autumn manœuvres were practised on a scale hitherto unknown in England. In 1871 certain powers over the militia, formerly held by lords-lieutenant, were transferred to the crown, and the auxiliary forces were placed directly under the generals commanding districts. In 1881 came an important change in the infantry of the line, which was entirely remodelled in two-battalion regiments bearing territorial titles. This measure (the "linked battalion" system) aroused great opposition; it was dictated chiefly by the necessity of maintaining the Indian and colonial garrisons at full strength, and was begun during Lord Cardwell's tenure of office, the principle being that each regiment should have one battalion at home and one abroad, the latter being fed by the former, which in its turn drew upon the reserve to complete it for war. The working of the system is to be considered as belonging to present practice rather than to history, and the reader is therefore referred to the article UNITED KINGDOM. On these general lines the army progressed up to 1899, when the Boer War called into the field on a distant theatre of war all the resources of the regular army, and in addition drew largely upon the existing auxiliary forces, and even upon wholly untrained civilians, for the numbers required to make war in an area which

comprised nearly all Africa south of the Zambezi. As the result of this war (see TRANSVAAL) successive schemes of reform were undertaken by the various war ministers, leading up to Mr Haldane's "territorial" scheme (1908), which put the organization of the forces in the United Kingdom (*q.v.*) on a new basis.

Innovations had not been unknown in the period immediately preceding the war; as a single example we may take the development of the mounted infantry (*q.v.*) It was natural that the war itself, and especially a war of so peculiar a character, should intensify the spirit of innovation. The corresponding period in the German army lasted from 1871 to 1888, and such a period of unsettlement is indeed the common, practically the universal, result of a war on a large scale. Much that was of value in the Prussian methods, faithfully and even slavishly copied by Great Britain as by others after 1870, was temporarily forgotten, but the pendulum swung back again, and the Russo-Japanese War led to the disappearance, so far as Europe was concerned, of many products of the period of doubt and controversy which followed the struggle in South Africa. Side by side with continuous discussions of the greater questions of military policy, amongst these being many well-reasoned proposals for universal service, the technical and administrative efficiency of the service has undergone great improvement, and this appears to be of more real and permanent value than the greater part of the solutions given for the larger problems. The changes in the organization of the artillery afford the best evidence of this spirit of practical and technical reform. In the first place the old "royal regiment" was divided into two branches. The officers for the field and horse artillery stand now on one seniority list for promotion, the garrison, heavy and mountain batteries on another. In each branch important changes of organization have been also made. In the field branch, both for Royal Field and Royal Horse Artillery, the battery is no longer the one unit for all purposes. A lieutenant-colonel's command, the "brigade," has been created. It consists of a group, in the horse artillery of two, in the field artillery of three batteries. For the practical training of the horse and field artillery a large area of ground on the wild open country of Dartmoor, near Okehampton, has for some years been utilized. A similar school has been started at Glen Imaal in Ireland, and a new training ground has been opened on Salisbury Plain. Similarly, with the Royal Garrison Artillery a more perfect system has been devised for the regulation and practice of the fire of each fortress, in accordance with the varying circumstances of its position, &c. A practice school for the garrison artillery has been established at Lydd, but the various coast fortresses themselves carry out irregular practice with service ammunition.

INDIAN ARMY

70. Historically, the Indian army grew up in three distinct divisions, the Bengal, Madras and Bombay armies. This separation was the natural result of the original foundation of separate settlements and factories in India; and each retains to the present day much of its old identity.

Bengal.—The English traders in Bengal were long restricted by the native princes to a military establishment of an ensign and 30 men; and this force may be taken as the germ of the Indian army. In 1681 Bengal received the first reinforcement from Madras, and two years later a company was sent from Madras, raising the little Bengal army to a strength of 250 Europeans. In 1695 native soldiers were first enlisted. In 1701–1702 the garrison of Calcutta consisted of 120 soldiers and seamen gunners. In 1756 occurred the defence of Calcutta against Suraj-ud-Dowlah, and the terrible tragedy of the Black Hole. The work of reconquest and punishment was carried out by an expedition from Madras, and in the little force with which Clive gained the great victory of Plassey the Bengal army was represented by a few hundred men only (the British 39th, now Dorsetshire regiment, which was also present, was the first King's regiment sent to India, and bears the motto *Primus in Indis*); but from this date the military power of the Company rapidly increased. A company of artillery had been organized in 1748; and in 1757, shortly before Plassey, the 1st regiment of Bengal native infantry was raised. Next, in 1759 the native infantry was augmented, in 1760 dragoons were raised, and in 1763 the total forces amounted to 1500 Europeans and 12 battalions of native infantry (11,500 men). In 1765 the European infantry was divided into 3 regiments, and the whole force was organized in 3 brigades, each consisting of 1 company of artillery, 1 regiment European infantry, 1 troop of native cavalry, and 7 battalions of sepoys. In 1766, on the reduction of some money allowances, a number of officers of the Bengal army agreed to resign their commissions simultaneously. This dangerous combination was promptly put down by Clive, to whom the Bengal army may be said to owe its existence.

The constant wars and extensions of dominion of the next thirty years led to further augmentations; the number of brigades and of European regiments was increased to 6; and in 1794 the Bengal army numbered about 3500 Europeans and 24,000 natives.

71. *Madras.*—The first armed force in the Madras presidency was the little garrison of Armegon on the Coromandel coast, consisting of 28 soldiers. In 1644 Fort St George was built and garrisoned, and in 1653 Madras became a presidency. In 1745 the garrison of Fort St George consisted of 200 Europeans, while a similar number, with the addition of 200 "Topasses" (descendants of the Portuguese), garrisoned Fort St David. In 1748 the various independent companies on the Coromandel coast and other places were consolidated into the Madras European regiment. From this time the military history of the Madras army was full of incident, and it bore the principal part in Clive's victories of Arcot, Kavaripak and Plassey. In 1754 the 39th regiment of the Royal army was sent to Madras. In 1758 three others followed. In 1772 the Madras army numbered 3000 European infantry and 16,000 natives, and in 1784 the number of native troops had risen to 34,000.

72. *Bombay.*—The island of Bombay formed part of the marriage portion received by Charles II. with the infanta of Portugal, and in 1662 the Bombay regiment of Europeans was raised to defend it. In 1668 the island was granted to the Company, and the regiment at the same time transferred to them. In 1708 Bombay became a presidency, but it did not play so important a part as the others in the early extension of British power, and its forces were not so rapidly developed. It is said, however, to have been the first to discipline native troops, and Bombay sepoys were sent to Madras in 1747, and took part in the battle of Plassey in 1757. In 1772 the Bombay army consisted of 2500 Europeans and 3500 sepoys, but in 1794, in consequence of the struggles with the Mahratta power, the native troops had been increased to 24,000.

73. *Consolidation of the Army.*—In 1796 a general reorganization took place. Hitherto the officers in each presidency had been borne on general "lists," according to branches of the service. These lists were now broken up and cadres of regiments formed. The colonels and lieutenant-colonels remained on separate lists, and an establishment of general officers was created, while the divisional commands were distributed between the royal and Company's officers. Further augmentations took place, consequent on the great extension of British supremacy. In 1798 the native infantry in India numbered 122 battalions. In 1808 the total force in India amounted to 24,500 Europeans and 154,500 natives.

The first half of the 19th century was filled with wars and annexations, and the army was steadily increased. Horse artillery was formed, and the artillery in general greatly augmented. "Irregular cavalry" was raised in Bengal and Bombay, and recruited from a better class of troopers, who received high pay and found their own horses and equipment. "Local forces" were raised in various parts from time to time, the most important being the Punjab irregular force (raised after the annexation of the Punjab in 1849), consisting of 3 field batteries, 5 regiments of cavalry, and 5 of infantry, and the Nagpur and Oudh irregular forces. Another kind of force, which had been gradually formed, was that called "contingents"—troops raised by the protected native states. The strongest of these was that of Hyderabad, originally known as the nizam's army. Changes were also made in the organization of the army. Sanitary improvements were effected, manufacturing establishments instituted or increased, and the administration generally improved.

74. *The Army before the Mutiny.*—The officering and recruiting of the three armies were in all essentials similar. The officers were mainly supplied by the Company's military college at Addiscombe in Surrey (established in 1809), and by direct appointments. The Bengal army was recruited from Hindustan, the infantry being mostly drawn from Oudh and the great Gangetic plains. The soldiers were chiefly high-caste Hindus, a sixth being Mahommedans. The cavalry was composed mainly of Mahommedans, recruited from Rohilkhand and the Gangetic Doab. The only other elements in the army were four Gurkha regiments, enlisted from Nepal, and the local Punjab irregular force. The Madras army was chiefly recruited from that presidency, or the native states connected with it, and consisted of Mahommedans, Brahmans, and of the Mahratta, Tamil and Telugu peoples. The Bombay army was recruited from its own presidency, with some Hindustanis, but chiefly formed of Mahrattas and Mahommedans; the Bombay light cavalry mainly from Hindustan proper.

Including the local and irregular troops (about 100,000 strong), the total strength amounted to 38,000 Europeans of all arms, with 276 field guns, and 348,000 native troops, with 248 field guns,—truly a magnificent establishment, and, outwardly, worthy of the great empire which England had created for herself in the East, but inwardly unsound, and on the very verge of the great mutiny of 1857.

In 1856 the establishment in the several presidencies was as follows:—

	Bengal.	Madras.	Bombay.	Total.
British Cavalry Regiments .	2	1	1	4
British Infantry Battalions .	15	3	4	22
Company's European Battalions	3	3	3	9
European and Native Artillery Battalions	12	7	5	24
Native Infantry Battalions . .	74	52	29	155
Native Cavalry Regiments .	28	8	3	39

An account of the events of 1857–58 will be found under INDIAN MUTINY. After the catastrophe the reorganization of the military forces on different lines was of course unavoidable. Fortunately, the armies of Madras and Bombay had been almost wholly untouched by the spirit of disaffection, and in the darkest days the Sikhs, though formerly enemies of the British, had not only remained faithful to them, but had rendered them powerful assistance.

75. *The Reorganization.*—By the autumn of 1858 the mutiny was virtually crushed, and the task of reorganization commenced. On the 1st of September 1858 the East India Company ceased to rule, and Her Majesty's government took up the reins of power. On the important question of the army, the opinions and advice of the most distinguished soldiers and civilians were invited. Masses of reports and evidence were collected in India, and by a royal commission in England. On the report of this commission the new system was based. The local European army was abolished, and its *personnel* amalgamated with the royal army. The artillery became wholly British, with the exception of a few native mountain batteries. The total strength of the British troops, all of the royal army, was largely increased, while that of the native troops was largely diminished. Three distinct native armies—those of Bengal, Madras and Bombay—were still maintained. The reduced Indian armies consisted of cavalry and infantry only, with a very few artillery, distributed as follows:—

	Battalions Infantry.	Regiments Cavalry.
Bengal	49	19
Madras	40	4
Bombay	30	7
Punjab Force . . .	12	6
Total . . .	131	36

There were also three sapper battalions, one to each army.

The Punjab force, which had 5 batteries of native artillery attached to it, continued under the Punjab government. In addition, the Hyderabad contingent of 4 cavalry, 6 infantry regiments and 4 batteries, and a local force in central India of 2 regiments cavalry and 6 infantry, were retained under the government of India. After all the arrangements had been completed the army of India consisted of 62,000 British and 125,000 native troops.

76. *The Modern Army.*—The college at Addiscombe was closed in 1860, and the direct appointment of British officers to the Indian local forces ceased in 1861. In that year a staff corps was formed by royal warrant in each presidency "to supply a body of officers for service in India, by whom various offices and appointments hitherto held by officers borne on the strength of the several corps in the Indian forces shall in future be held." Special rules were laid down. The corps was at first recruited partly from officers of the Company's service and partly from the royal army, holding staff appointments (the new regimental employment being considered as staff duty) and all kinds of political and civil posts; for the system established later see INDIA: *Army*. The native artillery and sappers and miners were to be officered from the Royal Artillery and Royal Engineers. The only English warrant and non-commissioned officers now to be employed in the native army were to be those of the Royal Engineers with the sappers and miners.

A radical change in the regimental organization of all the native armies was effected in 1863. The Punjab Frontier Force was from the first organized on the irregular system, which was there seen at its best, as also were the new regiments raised during the Mutiny. This system was now applied to the whole army, each regiment and battalion having seven British officers attached to it for command and administrative duties, the immediate command of troops and companies being left to the native officers. Thus was the system reverted to, which was initiated by Clive, of a few British officers only being attached to each corps for the higher regimental duties of command and control. Time had shown that this was more effective than the regular system instituted in 1796 of British officers commanding troops and companies.

A new spirit was breathed into the army. The supremacy of the commandant was the main principle. He was less hampered by the unbending regulations enjoined upon the old regular regiments, had greater powers of reward and punishment, was in a position to assume larger responsibility and greater freedom of action, and was supported in the full exercise of his authority. The system made the officers.

Up to 1881 the native army underwent little change, but in that year 18 regiments of infantry and 4 of cavalry were broken up, almost the same total number of men being maintained in fewer and stronger regiments. The only reduction made in the British troops was in the Royal Artillery, which was diminished by 11 batteries. The events of 1885, however, on the Russo-Afghan frontier, led to augmentations. The 11 batteries Royal Artillery were brought back from England; each of the 9 British cavalry regiments in India received a fourth squadron; each of the British infantry battalions was increased by 100 men, and 3 battalions were added. The native cavalry had a fourth squadron added to each regiment; three of the four regiments broken up in 1881 were re-raised, while the native infantry was increased in regimental strength, and 9 new battalions raised composed of Gurkhas, Sikhs and Punjabis. The addition in all amounted to 10,600 British and 21,200 native troops. In 1890 the strength of the army of India was 73,000 British and, including irregulars, 147,500 native troops. For the Indian volunteers, see VOLUNTEERS.

Many important changes took place between 1885 and 1904. Seven Madras infantry regiments were converted into regiments for service in Burma, composed of Gurkhas and hardy races from northern India; six Bengal and Bombay regiments were similarly converted into regiments of Punjabis, Pathans and Gurkhas; the native mountain batteries have been increased to ten; a system of linked battalions has been introduced with the formation of regimental centres for mobilization; and reserves for infantry and mountain artillery have been formed. The number of British officers with each regiment has been increased to nine, and the two wing commands in battalions have been converted into 4 double-company commands of 250 men each, under a British commander, who is responsible to the commandant for their training and efficiency, the command of the companies being left to the native officers. This system, which is analogous to the squadron command in the cavalry, admits of closer individual attention to training, and distributes among the senior British regimental officers effective responsibility of a personal kind.

An addition (at the imperial expense) of five battalions of Sikhs, Punjabi Mahommedans, Jats and hillmen in northern India was made in 1900, as the result of India being called upon to furnish garrisons for Mauritius and other stations overseas.

The unification of the triplicate army departments in the different presidential armies was completed in 1891, all being brought directly under the supreme government; and the three separate staff corps of Bengal, Madras and Bombay were fused into one in 1891 as the Indian Staff Corps. The term "Indian Staff Corps" was in turn replaced by that of "Indian Army" in 1903. These measures prepared the way for the new system of army organization which, by authority of parliament, abolished divided control and placed the whole army of India under the governor-general and the commander-in-chief in India.

CANADIAN FORCES

77. In the earliest European settlements in Canada, the necessity of protection against Indians caused the formation of a militia, and in 1665 companies were raised in every parish. The military history of the Canadian forces under French rule is full of incident, and they served not only against Indian raiders but also against the troops of Great Britain and of her North American colonies. Six militia battalions took part in the defence of Quebec in 1759, and even the transfer of Canada from the French to the British crown did not cause the disbandment of the existing forces. The French Canadians distinguished themselves not less than the British settlers in the War of American Independence, and in particular in the defence of Quebec against Montgomery and Arnold. In 1787 an ordinance was made whereby three battalions of the militia were permanently embodied, each contingent serving for two years, at the end of which time a fresh contingent relieved it, and after this a succession of laws and regulations were made with a view to complete organization of the force. The brunt of the fighting on the American frontier in the war of 1812 was borne very largely by the permanent force of three battalions and the fresh units called out, all these being militia corps. Up to 1828 a distinction had been made between the British and the French regiments: this was then abolished. The militia was again employed on active service during the disturbances of 1837, and the "Active Militia" in 1863 had grown to a strength of 25,000 men. The Fenian troubles of 1864 and 1866 caused the embodiment of the Canadian forces once more. In 1867 took place the unification of Canada, after which the whole force was completely organized on the basis of a militia act (1868). A department of Militia and Defence with a responsible minister was established, and the strength of the active militia of all arms was fixed at 40,000 rank and file. Two years later the militia furnished 6000 men to deal with the Fenian Raid of 1870, and took part in Colonel (Lord) Wolseley's Red River expedition. In 1871 a permanent force, serving the double purpose of a regular nucleus and an instructional cadre, was organized in two troops of cavalry, two batteries of artillery and one regiment of infantry, and in 1876 the Royal Military College of Canada was founded at Kingston. In 1885 the Riel rebellion was dealt with, and the important action of Batoche won, by the militia, without assistance from regular

troops. In the same year Canada contributed a force of *voyageurs* to the Nile expedition of Lord Wolseley; the experience of these men was admittedly of great assistance in navigating the Rapids. The militia sent contingents of all arms to serve in the South African War, 1899–1902, including "Strathcona's Horse," a special corps, recruited almost entirely from the Active Militia and the North-west Mounted Police. The latter, a permanent constabulary of mounted riflemen, was formed in 1873.

After the South African War an extensive scheme of reorganization was taken in hand, the command being exercised for two years (1902–1904) by Major-General Lord Dundonald, and subsequently by a militia council (Militia Act 1904), similar in constitution to the home Army Council. For details of the present military strength of Canada, see the article CANADA.

AUSTRIAN ARMY

78. The *Landsknecht* infantry constituted the mainstay of the imperial armies in the 16th century. Maximilian I. and Charles V. are recorded to have marched and carried the "long pike" in their ranks. Maximilian also formed a corps of *Kyrisser*, who were the origin of the modern cuirassiers. It was not, however, until much later that the Austrian army came into existence as a permanent force. Rudolph II. formed a small standing force about 1600, but relied upon the "enlistment" system, like other sovereigns of the time, for the bulk of his armies. The Thirty Years' War produced the permanence of service which led in all the states of Europe to the rise of standing armies. In the Empire it was Wallenstein who first raised a distinctly imperial army of soldiers owing no duty but to the sovereign; and it was the suspicion that he intended to use this army, which was raised largely at his own expense, to further his own ends, that led to his assassination. From that time the regiments belonged no longer to their colonels, but to the emperor; and the oldest regiments in the present Austrian army date from the Thirty Years' War, at the close of which Austria had 19 infantry, 6 cuirassier and 1 dragoon regiments. The almost continuous wars of Austria against France and the Turks (from 1495 to 1895 Austrian troops took part in 7000 actions of all sorts) led to a continuous increase in her establishments. The wars of the time of Montecucculi and of Eugene were followed by that of the Polish Succession, the two Turkish wars, and the three great struggles against Frederick the Great. Thus in 1763 the army had been almost continuously on active service for more than 100 years, in the course of which its organization had been modified in accordance with the lessons of each war. This, in conjunction with the fact that Austria took part in other Turkish campaigns subsequently, rendered this army the most formidable opponent of the forces of the French Revolution (1792). But the superior leading, organization and numbers of the emperor's forces were totally inadequate to the magnitude of the task of suppressing the Revolutionary forces, and though such victories as Neerwinden were sufficient proof of the efficiency and valour of the Austrians, they made no headway. In later campaigns, in which the enemy had acquired war experience, and the best of their officers had come to the front, the tide turned against the Imperialists even on the field of battle. The archduke Charles's victories of 1796 were more than counterbalanced by Bonaparte's Italian campaign, and the temporary success of 1799 ended at Marengo and Hohenlinden.

79. The Austrians, during the short peace which preceded the war of 1805, suffered, in consequence of all this, from a feeling of distrust, not merely in their leaders, but also in the whole system upon which the army was raised, organized and trained. This was substantially the same as that of the Seven Years' War time. Enlistment being voluntary and for long service, the numbers necessary to cope with the output of the French conscription could not be raised, and the inner history of the Austrian headquarters in the Ulm campaign shows that the dissensions and mutual distrust of the general officers had gone far towards the disintegration of an army which at that time had the most *esprit de corps* and the highest military qualities of any army in Europe. But the disasters of 1805 swept away good and bad alike in the abolition of the old system. Already the archduke Charles had designed a "nation in arms" after the French model, and on this basis the reconstruction was begun. The conscription was put in force and the necessary numbers thus obtained; the administration was at the same time reformed and the organization and supply services brought into line with modern requirements. The war of 1809 surprised Austria in the midst of her reorganization, yet the new army fought with the greatest spirit. The invasion of Bavaria was by no means so leisurely as it had been in 1805, and the archduke Charles obtained one signal victory over Napoleon in person. Aspern and Wagram were most desperately contested, and though the archduke ceased to take part in the administration after 1809 the work went on steadily until, in 1813, the Austrian armies worthily represented the combination of discipline with the "nation in arms" principle. Their intervention in the War of Liberation was decisive, and Austria, in spite of her territorial losses of the past years, put into the field well-drilled armies far exceeding in numbers those which had appeared in the wars of the Revolution. After the fall of Napoleon, Austria's hold on Italy necessitated the maintenance of a large army of occupation. This army, and in particular its cavalry, was admittedly the best in Europe, and, having to be ready to march at a few days' notice, it was saved from the deadening influence of undisturbed peace which affected every other service in Europe from 1815 to 1850.

80. The Austrian system has conserved much of the peculiar tone of the army of 1848, of which English readers may obtain a good idea from George Meredith's *Vittoria*. It was, however, a natural result of this that the army lost to some considerable extent the spirit of the "nation in arms" of 1809 and 1813. It was employed in dynastic wars, and the conscription was of course modified by substitution; thus, when the war of 1859 resulted unfavourably to the Austrians, the army began to lose confidence, precisely as had been the case in 1805. Once more, in 1866, an army animated by the purely professional spirit, which was itself weakened by distrust, met a "nation in arms," and in this case a nation well trained in peace and armed with a breechloader. Bad staff work, and tactics which can only be described as those of pique, precipitated the disaster, and in seven weeks the victorious Prussians were almost at the gates of Vienna.

The result of the war, and of the constitutional changes about this time, was the re-adoption of the principles of 1806–1813, the abolition of conscription and long service in favour of universal service for a short term, and a thorough reform in the methods of command and staff work. It has been said of the Prussian army that "discipline is—the officers." This is more true of the "K.K." army[1] than of any other in Europe; the great bond of union between the heterogeneous levies of recruits of many races is the spirit of the corps of officers, which retains the personal and professional characteristics of the old army of Italy.

FRENCH ARMY

81. The French army (see for further details FRANCE: *Law and Institutions*) dates from the middle of the 15th century, at which time Charles VII. formed, from mercenaries who had served him in the Hundred Years' War, the *compagnies d'ordonnance*, and thus laid the foundation of a national standing army. But the armies that followed the kings in their wars still consisted mainly of mercenaries, hired for the occasion; and the work of Charles and his successors was completely undone in the confusion of the religious wars. Louvois, was minister of Louis XIV., was the true creator of the French royal army. The organization of the first standing army is here given in some detail, as it served as a model for all armies for more than a century, and is also followed to some extent in our own times. Before the advent of Louvois, the forces were royal only in name. The army was a fortuitous concourse of regiments of horse and foot, each of which was the property of its colonel. The companies similarly

[1] The phrase "K. und K." (*Kaiserlich und Königlich*) is applied to all services common to the Austrian and Hungarian armies. "K.-K." (*Kaiserlich-Königlich*) refers strictly only to the troops of Austria, the Hungarian army being known as the "K.Ung." (Royal Hungarian) service.

belonged to their captains, and, the state being then in no condition to buy out these vested interests, superior control was almost illusory. Indeed, all the well-known devices for eluding such control, for instance, showing imaginary men on the pay lists, can be traced to the French army of the 16th century. A further difficulty lay in the existence of the offices called Colonel-General, Marshal-General and Grand Master of Artillery, between whom no common administration was possible. The grand master survived until 1743, but Louvois managed to suppress the other offices, and even to put one of his own subordinates into the office of grand master. Thus was assured direct royal control, exercised through the war minister. Louvois was unable indeed to overthrow the proprietary system, but he made stringent regulations against abuses, and confined it to the colonels (*mestre de camp* in the cavalry) and the captains. Henceforward the colonel was a wealthy noble, with few duties beyond that of spending money freely and of exercising his court influence on behalf of his regiment. The real work of the service was done by the lieutenant-colonels and lieutenants, and the king and the minister recognized this on all occasions. Thus Vauban was given, as a reward for good service, a company in the "Picardie" regiment without purchase. Promotions from the ranks were very rare but not unknown, and all promotions were awarded according to merit except those to captain or colonel. One of the captains in a regiment was styled major, and acted as adjutant. This post was of course filled by selection and not by purchase. The grades of general officers were newly fixed by Louvois—the *brigadier*, *maréchal de camp*, lieutenant-general and marshal of France. The general principle was to give command, but not promotion, according to merit. The rank and file were recruited by voluntary enlistment for four years' service. The infantry company was maintained in peace at an effective of 60, except in the guards and the numerous foreign corps, in which the company was always at the war strength of 100 to 200 men. This arm was composed, in 1678, of the *Gardes françaises*, the Swiss guards, the old (*vieux* and *petits vieux*) regiments of the line, of which the senior, "Picardie," claimed to be the oldest regiment in Europe, and the regiments raised under the new system. The *régiment du roi*, which was deliberately made the model of all others and was commanded by the celebrated Martinet, was the senior of these latter. The whole infantry arm in 1678 numbered 320,000 field and garrison troops. The cavalry consisted of the *Maison du Roi* (which Louvois converted from a "show" corps to one of the highest discipline and valour), divided into the *Gardes du Corps* and the *Mousquetaires*, the *Gendarmerie* (descended from the old feudal cavalry and the *ordonnance* companies) and the line cavalry, the whole being about 55,000 strong. There were also 10,000 dragoons. In addition to the regular army, the king could call out, in case of need, the ancient *arrière-ban* or levy, as was in fact done in 1674. On that occasion, however, it behaved badly, and it was not again employed. In 1688 Louvois organized a militia raised by ballot. This numbered 25,000 men and proved to be better, at any rate, than the *arrière-ban*. Many infantry regiments of the line were, as has been said, foreign, and in 1678 the foreigners numbered 30,000, the greater part of these being Swiss.

82. The artillery had been an industrial concern rather than an arm of the service. In sieges a sum of money was paid for each piece put in battery, and the grand master was not subordinated to the war office. A nominee of Louvois, as has been said, filled the post at this time, and eventually Louvois formed companies of artillerymen, and finally the regiment of "Fusiliers" which Vauban described as the "finest regiment in the world." The engineer service, as organized by Vauban, was composed of engineers "in ordinary," and of line officers especially employed in war. Louvois further introduced the system of magazines. To ensure the regular working of supply and transport, he instituted direct control by the central executive, and stored great quantities of food in the fortresses, thereby securing for the French armies a precision and certainty in military operations which had hitherto been wanting. The higher administration of the army, under the minister of war, fell into two branches, that of the commissaries and that of the inspecting officers. The duties of the former resembled those of a modern "routine" staff—issue of equipment, checking of returns, &c. The latter exercised functions analogous to those of a general staff, supervising the training and general efficiency of the troops. Louvois also created an excellent hospital service, mobile and stationary, founded the Hôtel des Invalides in Paris for the maintenance of old soldiers, established cadet schools for the training of young officers, and stimulated bravery and good conduct by reviving and creating military orders of merit.

83. The last half of the 17th century is a brilliant period in the annals of the French armies. Thoroughly organized, animated by the presence of the king, and led by such generals as Condé, Turenne, Luxembourg, Catinat and Vendôme, they made head against coalitions which embraced nearly all the powers of Europe, and made France the first military nation of Europe. The reverses of the later part of Louis XIV.'s reign were not of course without result upon the tone of the French army, and the campaigns of Marlborough and Eugene for a time diminished the repute in which the troops of Louis were held by other powers. Nevertheless the War of the Spanish Succession closed with French victories, and generals of the calibre of Villars and Berwick were not to be found in the service of every prince. The war of the Polish Succession in Germany and Italy reflected no discredit upon the French arms; and the German general staff, in its history of the wars of Frederick the Great, states that "in 1740 the French army was still regarded as the first in Europe." Since the death of Louvois very little had changed. The army was still governed as it had been by the great war minister, and something had been done to reduce evils against which even he had been powerless. A royal regiment of artillery had come into existence, and the engineers were justly regarded as the most skilful in Europe. Certain alterations had been made in the organization of both the guard and the line, and the total strength of the French in peace was somewhat less than 200,000. Relatively to the numbers maintained in other states, it was thus as powerful as before. Indeed, only one feature of importance differentiated the French army from its contemporaries—the proportion of officers to men, which was one to eleven. In view of this, the spirit of the army was necessarily that of its officers, and these were by no means the equals of their predecessors of the time of Turenne or Luxembourg. Louvois' principle of employing professional soldiers for command and wealthy men for colonelcies and captaincies was not deliberately adopted, but inevitably grew out of the circumstances of the time. The system answered fairly whilst continual wars gave the professional soldiers opportunities for distinction and advancement. But in a long peace the captains of eighteen and colonels of twenty-three blocked all promotion, and there was no work save that of routine to be done. Under these conditions the best soldiers sought service in other countries, the remainder lived only for pleasure, whilst the titular chiefs of regiments and companies rarely appeared on parade. Madame de Genlis relates how, when young courtiers departed to join their regiments for a few weeks' duty, the ladies of the court decked them with favours, as if proceeding on a distant and perilous expedition.

On the other hand, the fact that the French armies required large drafts of militia to bring up their regular forces to war strength gave them a vitality which was unusual in armies of the time. Even in the time of Louis XIV. the military spirit of the country had arisen at the threat of invasion, and the French armies of 1709 fought far more desperately, as the casualty lists of the allies at Malplaquet showed, than those of 1703 or 1704. In the time of the Revolution the national spirit of the French army formed a rallying-point for the forces of order, whereas Prussia, whose army was completely independent of the people, lost all power of defending herself after a defeat in the field. It is difficult to summarize the conduct of the royal armies in the wars of 1740–63. With a few exceptions the superior leaders proved themselves incompetent, and in three great battles, at least, the troops suffered ignominious defeat (Dettingen 1743, Rossbach 1757, Minden 1759). On the other hand,

Marshal Saxe and others of the younger generals were excellent commanders, and Fontenoy was a victory of the first magnitude. The administration, however, was corrupt and inefficient, and the general reputation of the French armies fell so low that Frederick the Great once refused an important command to one of his generals on the ground that his experience had been gained only against French troops.

Under Louis XVI. things improved somewhat; the American War and the successes of Lafayette and Rochambeau revived a more warlike spirit. Instruction was more carefully attended to, and a good system of drill and tactics was elaborated at the camp of St Omer. Attempts were made to reform the administration. Artillery and engineer schools had come into existence, and the intellectual activity of the best officers was remarkable (see Max Jähns, *Gesch. der Kriegswissenschaften*, vol. iii. passim). But the Revolution soon broke over France, and the history of the royal army was henceforward carried on by that revolutionary army, which, under a new flag, was destined to raise the military fame of France to its greatest height.

84. If Louis was the creator of the royal army, Carnot was so of the revolutionary army. At the outbreak of the Revolution the royal army consisted of 224 infantry battalions, 7 regiments of artillery, and 62 regiments of cavalry, numbering about 173,000 in all, but capable of augmentation on war strength to 210,000. To this might be added about 60,000 militia (see Chuquet, *Première invasion prussienne*).

The first step of the Constituent Assembly was the abrogation of an edict of 1781 whereby men of non-noble birth had been denied commissioned rank (1790). Thus, when many of the officers emigrated along with their fellows of the *noblesse*, trained non-commissioned officers, who would already have been officers save for this edict, were available to fill their places. The general scheme of reform (see CONSCRIPTION) was less satisfactory, but the formation of a National Guard, comprising in theory the whole military population, was a step of the highest importance. At this time the titles of regiments were abandoned in favour of numbers, and the costly and dangerous *Maison du Roi* abolished. But voluntary enlistment soon failed; the old corps, which kept up their discipline, were depleted, and the men went to the volunteers, where work was less exacting and promotion more rapid. "*Aussi fut-on*," says a French writer, "*réduit bientôt à forcer l'engagement volontaire et à imposer le choix du corps.*" The "first invasion" (July 1792) put an end to half-measures, and the country was declared "in danger." Even these measures, however, were purely designed to meet the emergency, and, after Valmy, enthusiasm waned to such a degree that, of a paper strength of 800,000 men (December 1792), only 112,000 of the line and 290,000 volunteers were actually present. The disasters of the following spring once more called for extreme energy, and 300,000 national guards were sent to the line, a step which was followed by a compulsory *levée en masse*; one million men were thus assembled to deal with the manifold dangers of civil and foreign war. France was saved by mere numbers and the driving energy of the Terrorists, not by discipline and organization. The latter was chaotic, and almost every element of success was wanting to the tumultuary levies of the year 1793 save a ferocious energy born of liberty and the guillotine. But under the Terrorist régime the army became the rallying-point of the nation, and when Lazare Carnot (*q.v.*) became minister of war a better organization and discipline began to appear. The amalgamation of the old army and the volunteers, which had been commenced but imperfectly carried out, was effected on a different and more thorough principle. The infantry was organized in demi-brigades of three battalions (usually one of the old army to two of volunteers). A permanent organization in divisions of all arms was introduced, and the ablest officers selected for the commands. Arsenals and manufactories of warlike stores were created, schools of instruction were re-established; the republican forces were transformed from hordes to armies, well disciplined, organized and equipped. Later measures followed the same lines, and the artillery and engineers, which in 1790 were admittedly the best in Europe and which owing to the *roturier* element in their officer cadres had not been disorganized by the emigration, steadily improved. The infantry, and in a less degree the cavalry, became good and trustworthy soldiers, and the glorious campaigns of 1794, 1795 and 1796, which were the direct result of Carnot's administration, bore witness to the potentialities of the essentially modern system. But, great as was the triumph of 1796-97, the exhaustion of years of continuous warfare had made itself felt: the armies were reduced to mere skeletons, and no sufficient means existed of replenishing them, till in 1798 the *conscription* was introduced. From that time the whole male population of France was practically at her ruler's disposal; and Napoleon had full scope for his genius in organizing these masses. His principal improvements were effected in the interval between the peace of Amiens and the war with the third coalition, while threatening the invasion of England. His armies were collected in large camps on the coasts of the Channel, and there received that organization which, with minor variations, they retained during all his campaigns, and which has since been copied by all European nations. The divisions had already given place to the army corps, and Napoleon completed the work of his predecessors. He withdrew the whole of the cavalry and a portion of the artillery from the divisions, and thus formed "corps troops" and cavalry and artillery reserves for the whole army. The grade of marshal of France was revived at Napoleon's coronation. At the same time, the operation of Jourdan's law, acquiesced in during times of national danger and even during peace, soon found opposition when the conscripts realized that long foreign wars were to be their lot. It was not the actual losses of the field armies, great as these undoubtedly were, which led Napoleon in the full tide of his career to adopt the fatal practice of "anticipating" the conscription, but the steady increase in the number of *réfractaires*, men who refused to come up for service. To hunt these men down, no less than forty thousand picked soldiers were engaged within the borders of France, and the actual French element in the armies of Napoleon grew less and less with every extension of the empire. Thus, in the Grand Army of 1809, about one-third of the corps of all arms were purely German, and in 1812 the army which invaded Russia, 467,000 strong, included 280,000 foreigners. In other words, the million of men produced by the original conscription of 1793 had dwindled to about half that number (counting the various subsidiary armies in Spain, &c.), and one hundred thousand of the best and sturdiest Frenchmen were engaged in a sort of civil war in France itself. The conscription was "anticipated" even in 1806, the conscripts for 1807 being called up before their time. As the later wars of the Empire closed one by one the foreign sources of recruiting, the conscription became more terrible every year, with the result that more *réfractaires* and more trusted soldiers to hunt them down were kept in non-effective employment. Finally the capacity for resistance was exhausted, and the army, from the marshals downward, showed that it had had enough.

85. One of the first acts of the Restoration was to abolish the conscription, but it had again to be resorted to within three years. In 1818 the annual contingent was fixed at 40,000, and the period of service at six years; in 1824 the contingent was increased to 60,000, and in 1832 to 80,000. Of this, however, a part only, according to the requirements of the service, were enrolled; the remainder were sent home on leave or furlough. Up to 1855 certain exemptions were authorized, and substitution or exchange of lots amongst young men who had drawn was permitted, but the individual drawn was obliged either to serve personally or find a substitute. The long series of Algerian wars produced further changes, and in 1855 the law of "dotation" or exemption by payment was passed, and put an end to personal substitution. The state now undertook to provide substitutes for all who paid a fixed sum, and did so by high bounties to volunteers or to soldiers for re-engaging. Although the price of exemption was fixed as high as £92, on an average 23,000 were claimed annually, and in 1859 as many as 42,000 were granted. Thus gradually the conscription became

rather subsidiary to voluntary enlistment, and in 1866, out of a total establishment of 400,000, only 120,000 were conscripts. Changes had also taken place in the constitution of the army. On the Restoration its numbers were reduced to 150,000, the old regiments broken up and recast, and a royal guard created in place of the old imperial one. When the revolution of July 1830 had driven Charles X. from his throne, the royal guard, which had made itself peculiarly obnoxious, was dissoved; and during Louis Philippe's reign the army was augmented to about 240,000 with the colours. Under the Provisional Government of 1848 it was further increased, and in 1854, when France allied herself with England against Russia, the army was raised to 500,000 men. The imperial guard was re-created, and every effort made to revive the old Napoleonic traditions in the army. In 1859 Napoleon III. took the field as the champion and ally of Italy, and the victories of Montebello, Magenta and Solferino raised the reputation of the army to the highest pitch, and for a time made France the arbiter of Europe. But the campaign of 1866 suddenly made the world aware that a rival military power had arisen, which was prepared to dispute that supremacy.

Marshal Niel (*q.v.*), the then war minister, saw clearly that the organization which had with difficulty maintained 150,000 men in Italy, was no match for that which had within a month thrown 250,000 into the very heart of Austria, while waging a successful war on the Main against Bavaria and her allies. In 1867, therefore, he brought forward a measure for the reorganization of the army. This was to have been a true "nation in arms" based on universal service, and Niel calculated upon producing a first-line army 800,000 strong—half with the colours, half in reserve—with a separate army of the second line. But many years must elapse before the full effect of this principle of recruiting can be produced, as the army is incomplete in some degree until the oldest reservist is a man who has been through the line training. Niel himself died within a year, and 1870 witnessed the complete ruin of the French army. The law of 1868 remained therefore no more than an expression of principle.

86. At the outbreak of the Franco-German War (*q.v.*) the French field troops consisted of 368 battalions, 252 squadrons, and 984 guns. The strength of the entire army on peace footing was 393,000 men; on war footing, 567,000. Disasters followed one another in rapid succession, and the bulk of this war-trained long-service army was captive in Germany within three months of the opening battle. But the spirit of the nation rose to the occasion as it had done in 1793. The next year's contingent of recruits was called out and hastily trained. Fourth battalions were formed from the depot cadres, and organized into *régiments de marche*. The *gardes mobiles* (Niel's creation) were mobilized, and by successive decrees and under various names nearly all the manhood of the country called to arms.

The regular troops raised as *régiments de marche*, &c., amounted to 213,000 infantry, 12,000 cavalry and 10,000 artillery. The *garde mobile* exceeded 300,000, and the mobilized national guard exceeded 1,100,000—of whom about 180,000 were actually in the field and 250,000 in Paris; the remainder preparing themselves in camps or depots for active work. Altogether the new formations amounted to nearly 1,700,000. Though, in the face of the now war-experienced well-led and disciplined Germans, their efforts failed, this cannot detract from the admiration which must be felt by every soldier for the patriotism of the people and the creative energy of their leaders, of whom Gambetta and Freycinet were the chief. After the war every Frenchman set himself to solve the army problem not less seriously than had every Prussian after Jena, and the reformed French army (see FRANCE) was the product of the period of national reconstruction. The adoption of the "universal service" principle of active army, reserves and second-line troops, the essential feature of which is the *line* training of every man, was almost as a matter of course the basis of the reorganization, for the want of a trained reserve was the most obvious cause of the disasters of "the terrible year."

GERMAN ARMY

87. The German army, strictly speaking, dates only from 1871, or at earliest 1866. Before the unification of the German empire or confederation, the several states possessed distinct armies, federal armies when required being formed from the contingents which the members of the union, like those of an ordinary alliance, engaged to furnish. The armies of the Holy Roman Empire were similarly formed from "single," "double," or "treble" contingents under the supreme command of specially appointed field marshals of the Empire. In the troubles of 1848 there was witnessed the curious spectacle of half of a victorious army being unable to pursue the enemy; this, being composed of "Prussian" as distinct from "federal contingent" troops, had to stop at the frontier of another state. The events of 1866 and 1870 put an end to all this, and to a very great extent to the separate armies of the old confederation, all being now remodelled on Prussian lines. The Prussian army therefore is at once the most important and historically the most interesting of the forces of the German empire. Its *début* (about 1630) was not satisfactory, and in the Thirty Years' War troops of Sweden, of the Emperor, of the League, &c., plundered Brandenburg unharmed. The elector, when appealed to for protection, could but answer, "Que faire? Ils ont des canons." The humiliations of this time, were, however, avenged by the troops of the next ruler of Brandenburg, called the Great Elector. The supposed invincibility of the Swedes did not prevent him from inflicting upon them a severe defeat at Fehrbellin, and thereafter the Prussian contingents which took part in the many European wars of the time acquitted themselves creditably. One of their generals was the famous Leopold of Anhalt-Dessau, and the reckless gallantry of this leader was conspicuous on many fields, from Blenheim to Malplaquet. But Leopold's greatest work was done in the years of peace (1715–40), during which Prussia was preparing the army with which Frederick the Great won his battles. He had introduced (about 1700) iron ramrods into the infantry service, and for over twenty years the Prussian infantry was drilled to a perfection which gave it a superiority of five to three over the best-drilled troops of the Austrian service, and still greater predominance over the French, which was then accounted the best in Europe. Frederick William I., king of Prussia, directed and supervised the creation of the new Prussian army, and Leopold was his principal assistant. In organization and methods of recruiting, as well as in tactical efficiency, the army of 1740 was equally pre-eminent. Then came the wars of Frederick the Great. It is not too much to say that the infantry won his earlier battles; the cavalry had been neglected both by Frederick William and by Leopold, and Frederick wrote that "it was not worth the devil's while to fetch it away." But the predominance of the infantry was so far indisputable that Frederick was able to devote himself to the reorganization of the mounted arm, with results which appeared in the splendid victories of Hohenfriedberg, Rossbach, Leuthen and Zorndorf. But long before the close of the Seven Years' War the incomparable infantry of the old army had disappeared, to be replaced by foreigners, deserters and vagabonds of all kinds, not to mention the unwilling Saxon and other recruits forced into the king's service. The army of 200,000 men which Frederick bequeathed to his successor was indeed superb, and deserved to be the model of Europe. But with Frederick's death the genius which had animated it, and which alone gave value to such heterogeneous materials, was gone. The long peace had the customary effect of sapping the efficiency of the long-service troops. They still retained their imposing appearance and precision of movement, and overweening self-confidence. But in 1806, after two crushing defeats and a series of humiliating surrenders, Prussia found herself at the feet of the conqueror, shorn of half her territory, obliged to receive French troops in all her towns and fortresses, and only existing on sufferance. But in these very disasters were laid the seeds of her future greatness. By the treaty of Tilsit the Prussian army was limited to 43,000 men. This limitation suggested

to Scharnhorst "universal service" on the *Krümper*[1] system already described (see § 36 above).

88. The bitter humiliation and suffering endured under the French yoke aroused a national spirit which was capable of any sacrifices. The civilian became eager to be trained to fight against the oppressor of his country; and when Prussia rose in 1813, the armies she poured into the field were no longer professional, but national armies, imperfectly trained and organized, but animated by a spirit which more than compensated for these defects. At the close of the war her rulers, with far-seeing sagacity, at once devoted themselves to organize on a permanent footing the system which had sprung up under the necessities and enthusiasm of the moment. Universal compulsory service, and a three years' term in the ranks, with further periods in the reserve and *Landwehr*, were then introduced; and though variations have subsequently been made in the distribution of time, the principles were substantially the same as those now in force. By the law of 1814 the periods of service were fixed at three years in the army, two in the reserve and fourteen in the *Landwehr*, and the annual contingent at 40,000 men. As the population increased, it was felt that the service was unequally distributed, pressing unnecessarily heavily on some, while others escaped altogether. Further, the experiences of Bronnzell and Olmütz in 1850, and of 1859, when Prussia armed in anticipation of a war with France, aroused great doubts as to the efficiency of the *Landwehr*, which then formed the bulk of Prussia's forces, and of whom many had been as long as ten years away from the colours. At this time the French remark that the Prussian army was "a sort of militia" was by no means untrue. Accordingly, by the law of 1860 the annual contingent was fixed at 63,000, the period in the reserve was increased from two to four years, and that in the *Landwehr* reduced from fourteen to five, The total armed force thus remained nearly the same (12 contingents of 63,000, in place of 19 of 40,000), but the army and its reserves were more than doubled (increased from 5 × 40,000 to 7 × 63,000) while the *Landwehr* was proportionately reduced.

This change was not effected without great opposition, and led to a prolonged struggle between the king, guided by Bismarck, and the parliament. It required the victories of 1866 and 1870, and the position thereby won for Prussia, to reconcile the nation to the new law. The military alliance (1866) of Prussia with the other German states gave place in 1871 to the union of all the armies into the German army as it is to-day. Some retained their old peculiarities of uniform, and even more than this was allowed to Bavaria and to Saxony, but the whole army, which has been increased year by year to its present strength, is modelled on the Prussian part of it. The Prussian army corps are the Guard, and the line numbered I. to XI., and XV. to XVIII.

89. The *Saxon Army* formerly played a prominent part in all the wars of northern Europe, chiefly in connexion with Poland. In the War of the Austrian Succession the Saxon army played a prominent part, but in the end it suffered a heavy defeat in the battle of Kesselsdorf (1745). In the Seven Years' War Saxony was overrun by the Prussians almost without resistance, and the military forces of the country under Field Marshal Rutowski were forced to surrender *en masse* at Pirna (1756); the men were compelled by Frederick the Great to join the Prussian army, and fought, though most unwillingly, through the remainder of the war as Prussian soldiers. A few outlying regiments which had not been involved in the catastrophe served with the Austrians, and on one occasion at least, at Kolin, inflicted a severe blow on the Prussians. At the outbreak of the wars of the French Revolution the Saxon army was over 30,000 strong. It took part in the campaign of Jena on the side of the Prussians, and during the Napoleonic domination in Germany Saxony furnished strong contingents to the armies of Napoleon, who in return recognized her elector as king, and largely increased his territories. The newly made king remained faithful to Napoleon even in his reverses; but the army was too German in feeling to fight willingly under the French flag. Their defection at Leipzig contributed not a little to the results of that bloody day. After the peace the king was shorn of a great part of his dominions, and the army was reconstituted on a smaller scale. In 1866 Saxony sided with Austria, and her army shared in the disasters of the brief campaign and the crowning defeat at Königgrätz. Under the crown prince's leadership, however, the Saxons distinguished themselves by their courage and steadiness wherever they were engaged. After the war Saxony became part of the North German Confederation, and in 1870–1871 her troops, under the command of the crown prince, formed the XII. corps of the great German army. They were assigned to the II. army of Prince Frederick Charles, and delivered the decisive attack on the French right at Gravelotte. Subsequently a IV. army was formed under the command of the crown prince, in which the XII. corps, now under Prince George of Saxony, served with unvarying credit in the campaign of Sedan and the siege of Paris. The Saxon army is now organized in every respect on Prussian lines, and forms two army corps (XII. at Dresden and XIX. at Leipzig) of the German army. The German emperor, in concert with the king of Saxony, names the officers for the higher commands. Saxony retains, however, her separate war ministry, budget, &c.; and appointments and promotion to all but the highest commands are made by the king. The colours of the older Saxon forces, and especially the green of the tunics, are retained in many of the uniforms of the present day.

90. The *Bavarian Army* has perhaps the most continuous record of good service in the field of any of the minor German armies. The oldest regiments date from the Thirty Years' War, in which the veteran army of the Catholic league, commanded by Count Tilly and formed on the nucleus of the Bavarian army, played a conspicuous part. Later in the war the Bavarian general, Count Mercy, proved himself a worthy opponent of Turenne and Condé. Henceforward the Bavarians were engaged in almost every war between France and Austria, taking part successively in the wars of the Grand Alliance, the Spanish Succession (in which they came into conflict with the English), and the Polish and Austrian Succession wars. In pursuance of the traditional anti-Austrian policy, the troops of Bavaria, led by a distinguished Bavarian, Marshal (Prince) Wrede, served in the campaigns of 1805 to 1813 side by side with the French, and Napoleon made the electorate into a kingdom. But in 1813 Bavaria joined the Alliance, and Wrede tried to intercept the French on their retreat from Leipzig. Napoleon, however, inflicted a severe defeat on his old general at Hanau, and opened his road to France. In 1866 the Bavarians took part against Prussia, but owing to their dilatoriness in taking the field, the Prussians were able to beat them in detail. In 1870, reorganized to some extent on Prussian lines, they joined their former enemy in the war against France, and bore their full share in the glories and losses of the campaign, the II. Bavarian corps having suffered more heavily than any but the III. Prussian corps. The I. Bavarian corps distinguished itself very greatly at Sedan and on the Loire. Bavaria still retains her separate war office and special organization, and the troops have been less affected by the Prussian influence than those of the other states. The Bavarian corps are numbered separately (I. Bav., Munich; II. Bav., Würzburg; III. Bav., Nuremberg), and the old light blue uniforms and other distinctive peculiarities of detail are still maintained.

91. *Württemberg* furnishes one army corps (XIII.; headquarters, Stuttgart), organized, clothed and equipped in all respects like the Prussian army. Like the Bavarians, the Württembergers fought against the Prussians in 1866, but in 1870 made common cause with them against the French, and by the convention entered into the following year placed their army permanently under the command of the Prussian king as emperor. The emperor nominates to the highest commands, but the king of Württemberg retains the nomination and appointment of officers in the lower grades.

92. The old *Hanoverian Army* disappeared, of course, with the annexation of Hanover to Prussia in 1866, but it is still represented officially by certain regiments of the X. army corps, and, in one case at least, battle honours won by the King's German Legion in the British service are borne on German colours of to-day. The *Hessian Army* is now represented by the XXV. (Grand-ducal Hessian) division, which forms part of the XVIII. army corps.

Italian Army

93. The old conscription law of the kingdom of Sardinia is the basis of the military organization of Italy, as its constitution is of that of the modern Italian kingdom. The Piedmontese have long borne a high reputation for their military qualities, a

[1] From *Krümperpferde* (cast horses attached to batteries, &c., for odd jobs), applied to the recruits in jest.

reputation shared by the rulers of the house of Savoy (*q.v.*), many of whom showed special ability in preserving the independence of their small kingdom between two such powerful neighbours as France and Austria. During the wars of the French Revolution Piedmont was temporarily absorbed into the French republic and empire. The Italian troops who fought under Napoleon proved themselves, in many if not most cases, the best of the French allies, and Italy contributed large numbers of excellent general officers to the *Grande Armée*.

After 1815 various causes combined to place Piedmont (Sardinia) at the head of the national movement which agitated Italy during the ensuing thirty years, and bring her in direct antagonism to Austria. Charles Albert, her then ruler, had paid great attention to the army, and when Italy rose against Austria in 1848 he took the field with an excellent force of nearly 70,000 men. At the outset fortune favoured the arms of Italy; but the genius and energy of Radetzky, the veteran Austrian commander, turned the tide, and in the summer of 1849 after many battles the Piedmontese army was decisively defeated at Novara, and her king compelled to sue for peace. Charles Albert abdicated in favour of his son Victor Emanuel, a prince who had already distinguished himself by his personal gallantry in the field. Under his care the army soon recovered its efficiency, and the force which joined the allied armies in the Crimea attracted general admiration from the excellence of its organization, equipment and discipline. In 1859 Piedmont again took up arms against Austria for the liberation of Italy; but this time she had the powerful assistance of France, and played but a subordinate part herself. In this campaign the Sardinian army was composed of one cavalry and five infantry divisions, and numbered about 60,000 combatants. By the peace of Villafranca, Italy, with the exception of Venetia, was freed from the Austrians, and Lombardy was added to Piedmont. The revolutionary campaign of Garibaldi in the following year united the whole peninsula under the rule of Victor Emanuel, and in 1866, when Italy for the third time took up arms against Austria—this time as the ally of Prussia—her forces had risen to nearly 450,000, of whom about 270,000 actually took the field. But in quality these were far from being equal to the old Piedmontese army; and the northern army, under the personal command of the king, was decisively defeated at Custozza by the archduke Albert of Austria.

The existing organization of the Italian army is determined by the laws of 1873, which made universal liability to service the basis of recruiting. The territorial system has not, however, been adopted at the same time, the materials of which the Italian army is composed varying so much that it was decided to blend the different types of soldiers so far as possible by causing them to serve together. The colonial wars in which Italian troops have taken part have been marked with great disasters, but relieved by the gallantry of the officers and the rank and file.

Russian Army

94. The history of the Russian army begins with the abolition of the Strelitz (*q.v.*) by Peter the Great in 1698, the nucleus of the new forces being four regiments of foot, two of which are well known to-day under their old titles of Preobrazhenski and Semenovski. Throughout the 18th century Russian military progress obeyed successive dynasties of western European models—first those of Prussia, then those of France. In the earlier part of the 19th century the army, used chiefly in wars against the revolutionary spirit, became, like others of that time, a dynastic force; subsequently the "nation in arms" principle reasserted itself, and on this basis has been carried out the reorganization of Russia's military power. The enormous development of this since 1874 is one of the most striking phenomena in recent military history. In 1892, in expectation of a general European war, whole armies were massed in the districts of Warsaw and Vilna, three-fifths of the entire forces being in position on the German and Austrian frontiers.

The Russo-Japanese War of 1904–5 is generally held to have proved that the fighting power of the Russian has in no way diminished in intrinsic value from that of the days of Zorndorf, Borodino and Sevastopol. The proverbial stubbornness of the rank and file is the distinctive quality of the armies of the tsar, and in view of the general adoption of two-years' service in other countries it is a matter for grave consideration whether, against European forces and in defence of their own homes, the Russians would not prove more than formidable antagonists to the men of more highly individualized races who are their probable opponents. Equally remarkable is the new power of redistribution possessed by Russia. Formerly it was usual to count upon one campaign at least elapsing before Russia could intervene effectively in European wars; much, in fact the greater part, of her losses in the Crimean War was due to the enormous distances which had to be traversed on foot. Nowadays the original equal distribution of the army over the country has been modified in accordance with the political needs of each moment. In 1892 the centre of gravity was shifted to Poland and Kiev, in 1904 the performances of the trans-Siberian railway in transporting troops to the seat of war in Manchuria excited the admiration of military Europe. The attitude of the army in the troubles which followed upon the Japanese War belongs to the history of Russia, not to that of military organization, and it will be sufficient to say that the conduct of the "nation in arms" at times of political unrest may vary between the extremes of unquestioning obedience to authority and the most dangerous form of licence, examples of both being frequent in the history of nearly all national armies. A remarkable innovation in the modern history of this army is the conversion of the whole of the cavalry, except a few *élite* regiments, into dragoons of the old type. After the war of 1904-5, however, this policy was reversed and the cavalry reformed on the usual model. The Cossacks still retain to a large extent the peculiarities of the light troops of the 18th century.

Spanish Army

95. The feudal sovereignties of medieval Spain differed but little, in their military organization, from other feudal states. As usual, mercenaries were the only forces on which reliance was placed for foreign wars. These troops called *almugávares* (Arabic=scouts) won a great reputation on Italian and Greek battlefields of the 13th century, and with many transformations in name and character appeared from time to time up to the Peninsular War. Castile, however, had a military system very different from the rest. The forces of the kingdom were composed of local contingents similar to the English *fyrd*, professional soldiers who were paid followers of the great lords, and the heavy cavalry of the military orders. The groups of cities called *Hermandades*, while they existed, also had permanent forces in their pay. At the union of Castile and Aragon the Castilian methods received a more general application. The new *Hermandad* was partly a light cavalry, partly a police, and was organized in the ratio of one soldier to every hundred families. In the conquest of Grenada (1482–92) *mesnadas* or contingents were furnished by the crown, the nobles and the cities, and permanently kept in the field. The *Hermandad* served throughout the war as a matter of course. From the veterans of this war was drawn the army which in the Italian wars won its reputation as the first army in Europe.

In 1596 the home defence of Spain was reorganized and the *ordenanza*, or militia, which was then formed of all men not belonging to the still extant feudal contingents, was generally analogous to the system of "assizes at arms" in England. This *ordenanza* served in the Peninsular War.

96. With the Italian wars of the early 16th century came the development of the regular army; a brief account of its place in the evolution of armies has been given above. Discipline, the feeling of comradeship and soldierly honour were the qualities which marked out the Spanish army as the model for others to follow, and for more than a century the Spanish army maintained its prestige as the first in Europe. The oldest regiments of the present Spanish army claiming descent from the *tercios* date from 1535. An officer whose regiment was reduced commonly took a pike in some other corps (*e.g.* Tilly), the *señor soldado* was counted as a gentleman, and his wife and family received state allowances. Nor was this army open only to Spaniards. Walloons, Italians, Burgundians and other nationalities ruled over by the Habsburgs all contributed their quotas. But the career of the old army came to an end at Rocroi (1643), and after this the forces of the monarchy began more and more to conform to the French model.

97. The military history of Spain from 1650 to 1700 is full of incident, and in the long war of the Spanish Succession both the army and the *ordenanza* found almost continuous employment. They were now organized, as were most other armies of Europe, on the lines of the French army, and in 1714 the old *tercios*, which had served in the Spanish Netherlands under Marlborough, were brought to Spain. The king's regiment "Zamora" of the present army descends from one of these which, as the *tercio* of Bovadilla, had been raised in 1580. The army underwent few changes of importance during the 18th century, and it is interesting to note that there were never less than three Irish regiments in the service. In 1808 the *Irlanda*, *Ultonia* (=Ulster) and *Hibernia* regiments had come to consist (as had similar corps in the French service before the Revolution) largely of native soldiers. At that time the Spanish army consisted of 119 Spanish and foreign (Swiss, Walloon and Irish) battalions, with 24 cavalry regiments and about 8000 artillery and engineers. There were further 51 battalions of militia, and the

total forces numbered actually 137,000. The part played by the Spanish standing army in the Peninsular War was certainly wholly insignificant relatively to these figures. It must be borne in mind, however, that only continued wars can give real value to long-service troops of the old style, and this advantage the Spanish regulars did not possess. Further, the general decadence of administration reacted in the usual way, the appointment of court favourites to high command was a flagrant evil, and all that can be urged is that the best elements of the army behaved as well as did the Prussians of 1806, that the higher leading and the administration of the army in the field were both sufficiently weak to have ruined most armies, and that the men were drawn from the same country and the same classes which furnished the *guerrilleros* whom it became fashionable to exalt at the expense of the soldiers. In the later campaigns of Wellington, Spanish divisions did good service, and the corps of La Romaña (a picked contingent of troops which had been sent before the war to Denmark at Napoleon's instance), though often defeated, always retained some cohesion and discipline. But the result of this war, the second French invasion, and the continued civil wars of the 19th century was the destruction of the old army, and the present army of Spain still bears traces of the confusion out of which it arose.

The most important changes were in 1870, when conscription was introduced, and in 1872, when universal service was proposed in its place. The military virtues of the rank and file and the devotion of the officers were conspicuously displayed in the Spanish-American War of 1898, and it cannot be claimed even for the Germans of 1870 that they fired so coolly and accurately as did the defenders of S. Juan and El Caney.

Turkish Army

98. The writers who have left the most complete and trustworthy contemporary accounts of the Turkish army in the 14th and 15th centuries, when it reached the height of its most characteristic development, are Bertrandon de la Brocquière, equerry to Philip the Good, duke of Burgundy, and Francesco Filelfo of Tolentino. Bertrandon, a professional soldier, visited Palestine in 1432, and returned overland in 1433, traversing the Balkan Peninsula by the main trade-route from Constantinople to Belgrade. He wrote an account of his journey for Philip: see *Early Travels in Palestine*, translated and edited by T. Wright (London, 1848). Filelfo served as secretary to the Venetian *baylo* at Constantinople, and recorded his observations in a series of letters (see Filelfo). Both ascribe the military superiority of the Turks over the nations of western Europe to two facts—firstly to their possession of a well-organized standing army, an institution unknown elsewhere, and secondly to their far stricter discipline, itself a result of their military organization and of the moral training afforded by Islam.

The regular troops comprised the Janissaries (*q.v.*), a corps of infantry recruited from captured sons of Christians, and trained to form a privileged caste of scientific soldiers and religious fanatics; and the Spahis, a body of cavalry similarly recruited, and armed with scimitar, mace and bow. Celibacy was one of the rules of this standing army, which, in its semi-monastic ideals and constitution, resembled the knightly orders of the West in their prime. The Janissaries numbered about 12,000, the Spahis about 8000. A second army of some 40,000 men, mostly mounted and armed like the Spahis, was feudal in character, and consisted chiefly of the personal followers of the Moslem nobility; more than half its numbers were recruited in Europe. This force of 60,000 trained soldiers was accompanied by a horde of irregulars, levied chiefly among the barbarous mountaineers of the Balkans and Asia Minor, and very ill-armed and ill-disciplined. Their numbers may be estimated at 140,000, for Bertrandon gives 200,000 as the total of the Turkish forces. Many 15th and 16th century writers give a smaller total, but refer only to the standing and feudal armies. Others place the total higher. Laonicus Chalcocondylas in his *Turcica Historia* states that at the siege of Constantinople in 1453 the sultan commanded 400,000 troops, but most other eye-witnesses of the siege give a total varying from 150,000 to 300,000. Many Christian soldiers of fortune enlisted with the Turks as artillerists or engineers, and supplied them at Constantinople with the most powerful cannon of the age. Other Christians were compelled to serve as engineers or in the ranks. As late as 1683 a corps of Wallachians was forced to join the Turkish army before Vienna, and entrusted with the task of bridging the Danube. But in the 18th and early 19th centuries the introduction of Christians tended to weaken the *moral* of the army already sapped by defeat; it was found impossible to maintain the discipline of the Janissaries, whose privileges had become a source of danger; and the feudal nobility became more and more independent of the sultan's authority. These three causes contributed to make reorganization inevitable.

The destruction of the Janissaries in 1826 marked the close of the history of the old Turkish army; already the re-creation of the service on the accepted models of western Europe had been commenced. This was still incomplete when the new force was called upon to meet the Russians in 1828, and though the army displayed its accustomed bravery, its defective organization and other causes led to its defeat. Since then the army has been almost as constantly on active service as the British; the Crimean War, the Russo-Turkish War of 1877 and the Greco-Turkish War of 1897 witnessed the employment of a large proportion of the sultan's available forces, while innumerable local revolts in different parts of the empire called for great exertions, and often for fierce fighting on the part of the troops locally in garrison and those sent up from the nearest provinces.

United States Army

99. The regular army of the United States has always been small. From the first it has been a voluntary force, and until 1898 its chief work in peace was to furnish numerous small posts on the frontier and amongst the Indians, and to act as a reserve to the civil power in the great cities. In war-time the regular army, if, as was usually the case, it was insufficient in numbers for the task of subduing the enemy, formed the nucleus of large armies raised "for the war." In 1790 the rank and file of the army, as fixed by act of Congress, amounted to 1216 men; and in 1814 an English expedition of only 3500 men was able to seize and burn Washington, the capital of a country which even then numbered eight millions of inhabitants. In 1861, at the beginning of the Civil War, the whole regular force amounted to about 15,300 men. In April of that year the president called out 75,000 volunteers for three months; and in May a further call for 42,000 was made. In July a call for 500,000 men was authorized by Congress, and as even this vast force proved insufficient it was found necessary to use a system of drafts. In October 1863 a levy of 300,000 men was ordered, and in February 1864 a further call of 500,000 was made. Finally, in the beginning of 1865 two further levies, amounting in all to 500,000 men, were ordered, but were only partially carried out in consequence of the cessation of hostilities. The total number of men called under arms by the government of the United States, between April 1861 and April 1865, amounted to 2,759,049, of whom 2,656,053 were actually embodied in the armies. If to these be added the 1,100,000 men embodied by the South during the same time, the total armed forces reach the enormous amount of nearly four millions, drawn from a population of only 32 millions—figures before which the celebrated uprising of the French nation in 1793, or the efforts of France and Germany in the Franco-German War, sink into insignificance. These 2,700,000 Federals were organized into volunteer regiments bearing state designations. The officers, except general and staff officers, were appointed by the governors of the respective states. The maximum authorized strength of the regular army never, during the war, exceeded 40,000 men; and the number in the field, especially towards the close of the war, was very much less. The states, in order to obtain men to fill their quotas, offered liberal bounties to induce men to enlist, and it therefore became very difficult to obtain recruits for the regular army, for which no bounties were given. The regular regiments accordingly dwindled away to skeletons. The number of officers present was also much reduced, since many of them, while retaining their regular commissions, held higher rank in the volunteer army. After the close of the Civil War the volunteers were mustered out; and by the act of Congress of the 28th of July 1866 the line of the army was made to consist of 10 regiments of cavalry of 12 troops each, 5 regiments of artillery of 12 batteries each and 45 regiments of infantry of 10 companies. The actual strength in August 1867 was 53,962. The act of the 3rd of March 1869 reduced the number of infantry regiments to 25 and the enlisted strength of the army to 35,036. The numbers were further reduced, without change in organization, to 32,788 in 1870 and to 25,000 in 1874. The latter number remained the maximum for twenty-four years.

In March 1898, in view of hostilities with Spain, the artillery was increased by 2 regiments, and, in April, 2 companies were added to each infantry regiment, giving it

3 battalions of 4 companies each. The strength of batteries, troops and companies was increased, the maximum enlisted strength reached during 1898 being over 63,000. A volunteer army was also organized. Of this army, 3 regiments of engineer troops, 3 of cavalry and 10 of infantry were United States volunteers, all the officers being commissioned by the president. The other organizations came from the states, the officers being appointed by the respective governors. As fast as they were organized and filled up, they were mustered into the service of the United States. The total number furnished for the war with Spain was 10,017 officers and 213,218 enlisted men. All general and staff officers were appointed by the president. Three hundred and eighty-seven officers of the regular army received volunteer commissions. After the conclusion of hostilities with Spain, the mustering out of the volunteers was begun, and by June 1899 all the volunteers, except those in the Philippines, were out of the service. The latter, as well as those serving elsewhere, having enlisted only for the war, were brought home and mustered out as soon as practicable.

The act of the 2nd of March 1899 added 2 batteries to each regiment of artillery. On the 2nd of February 1901 Congress passed an important bill providing for the reorganization and augmentation (max. 100,000) of the regular army, and other measures followed in the next years. (See UNITED STATES.)

MINOR ARMIES

100. *Dutch and Belgian Armies.*—The military power of the "United Provinces" dates its rise from the middle of the 16th century, when, after a long and sanguinary struggle, they succeeded in emancipating themselves from the yoke of Spain; and in the following century it received considerable development in consequence of the wars they had to maintain against Louis XIV. In 1702 they had in their pay upwards of 100,000 men, including many English and Scottish regiments, besides 30,000 in the service of the Dutch East India Company. But the slaughter of Malplaquet deprived the republic of the flower of the army. Its part in the War of the Austrian Succession was far from being as creditable as its earlier deeds, a Prussian army overran Holland in 1787 almost without opposition, and at the beginning of the wars of the French Revolution the army had fallen to 36,000 men. In 1795 Holland was conquered by the French under Pichegru, and in the course of the changes which ensued the army was entirely reorganized, and under French direction bore its share in the great wars of the empire.

With the fall of Napoleon and the reconstitution of the Netherlands, the Dutch-Belgian army, formed of the troops of the now united countries, came into existence. The army fought at Waterloo, but was not destined to a long career, for the revolution of 1830 brought about the separation of Belgium. A Dutch garrison under Baron Chassé, a distinguished veteran of the Napoleonic wars, defended Antwerp against the French under Marshal Gérard, and the Netherlands have been engaged in many arduous colonial wars in the East Indies. The Belgian army similarly has contributed officers and non-commissioned officers to the service of the Congo Free State.

101. *Swiss Army.*—The inhabitants of Switzerland were always a hardy and independent race, but their high military reputation dates from the middle of the 15th century, when the comparatively ill-armed and untrained mountaineers signally defeated Charles the Bold of Burgundy and the flower of the chivalry of Europe in the battles of Granson, Morat and Nancy. The Swabian war, towards the end of that century, and the Milanese war, at the beginning of the following one, added to the fame of the Swiss infantry, and made it the model on which that arm was formed all over Europe. The wealthier countries vied with each other in hiring them as mercenaries, and the poor but warlike Swiss found the profession of arms a lucrative one.

A brief account of the Swiss mercenaries will be found earlier in this article. Their fall was due in the end to their own indiscipline in the first place, and the rise of the Spanish standing army and its musketeers in the second. Yet it does not seem that the military reputation of the Swiss was discredited, even by reverses such as Marignan. On the contrary, they continued all through the 17th and 18th centuries to furnish whole regiments for the service of other countries, notably of France, and individuals, like Jomini in a later age, followed the career of the soldier of fortune everywhere. The most notable incident in the later military history of the Swiss, the heroic faithfulness of Louis XVI.'s Swiss guard, is proverbial, and has been commemorated with just pride by their countrymen. The French Revolutionary armies overran Switzerland, as they did all the small neighbouring states, and during Napoleon's career she had to submit to his rule, and furnish her contingent to his armies. On the fall of Napoleon she regained her independence, and returned to her old trade of furnishing soldiers to the sovereigns and powers of Europe. Charles X. of France had at one time as many as 17,000 Swiss in his pay; Naples and Rome had each four regiments. The recruiting for these foreign services was openly acknowledged and encouraged by the government. The young Swiss engaged usually for a period of four or six years; they were formed in separate regiments, officered by countrymen of their own, and received a higher rate of pay than the national regiments; and at the close of their engagement returned with their earnings to settle down on their paternal holdings. A series of revolutions, however, expelled them from France and Italy, and recently the advance of liberal ideas, and the creation of great national armies based on the principle of personal service, has destroyed their occupation. Switzerland is now remarkable in a military sense as being the only country that maintains no standing army (see Militia).

102. The *Swedish Army* can look back with pride to the days of Gustavus Adolphus and of Charles XII. The contributions made by it to the military science of the 17th century have been noticed above. The triumphs of the small and highly disciplined army of Charles were often such as to recall the similar victories of the Greeks under Alexander. The then nebulous armies of Russia and Poland resembled indeed the forces of Darius in the 4th century B.C., but Peter the Great succeeded at last in producing a true army, and the resistance of the Swedes collapsed under the weight of the vastly superior numbers then brought against them.

The *Danish Army* has a long and meritorious record of good service dating from the Thirty Years' War.

103. The existing Army of *Portugal* dates from the Peninsular War, when a considerable force of Portuguese, at one time exceeding 60,000 men, was organized under Marshal Beresford. Trained and partly officered by English officers, it proved itself not unworthy of its allies, and bore its full share in the series of campaigns and battles by which the French were ultimately expelled from Spain. At the peace the army numbered about 50,000 infantry and 5000 cavalry, formed on the English model, and all in the highest state of efficiency. This force was reduced in 1821, under the new constitutional government, to about one-half.

104. The *Rumanian, Bulgarian* and *Servian* armies are the youngest in Europe. The conduct of the Rumanians before Plevna in 1877 earned for them the respect of soldiers of all countries. Servia and Bulgaria came to war in 1885, and the Bulgarian soldiers, under the most adverse conditions, achieved splendid victories under the leadership of their own officers. In the crisis following the Austrian annexation of Bosnia-Herzegovina (1908-9), it seemed likely that the Servian forces might play an unexpectedly active part in war even with a strong power.

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The principal general military periodicals are:—English, *Journal of the R. United Service Institution*; United States, *Journal of the Military Service Institution*; French, *Revue d'histoire* and *Revue des armées étrangères* (general staff); Rau and Lauth, *L'État militaire des puissances* (about every 4 years); *Revue militaire générale*, founded in 1907 by General Langlois; *Almanach du drapeau* (a popular *aide-mémoire* published annually); German, the *Vierteljahrsheft* of the general staff: *Militär-Wochenblatt* (referred to above as *M.W.B.*—the supplements are of great value); von Löbell's *Jahresberichte* (annual detailed reports on the state, &c., of all armies—an English *précis* appears annually in the *Journal* of the R.U.S. Institution); Austrian, *Streffleurs öst. Militär-Zeitschrift*, with which was amalgamated (1907) the *Organ d. militärwissenschaft. Vereins*. The British War Office issues from time to time handbooks dealing with foreign armies, and, quarterly since April 1907, a critical review and bibliography of recent military literature in the principal languages, under the name of *Recent Publications of Military Interest*. (C. F. A.)

ARNAL, ÉTIENNE (1794–1872), French actor, was born at Meulan, Seine-et-Oise, on the 1st of February 1794. After serving in the army, and working in a button factory, he took to the stage. His first appearance (1815) was in tragedy, and for some time he was unsuccessful; it was not until 1827 that he showed his real ability in comedy parts, especially in plays by Félix August Duvert (1795–1876) and Augustin Théodore Lauzanne (1805–1877), whose *Cabinets particuliers* (1832), *Le Mari de la dame de chœurs* (1837), *Passé minuit*, *L'Homme blasé* (1843), *La Clef dans le dos* (1848), &c., contained parts written for him. He was twenty years at the Vaudeville, and completed at the various Parisian theatres a stage career of nearly half a century. Arnal was the author of *Epître à bouffé* (1840), which is reprinted in his volume of poetry, *Boutades en vers* (1861).

ARNALDUS DE VILLA NOVA, also called ARNALDUS DE VILLANUEVA, ARNALDUS VILLANOVANUS or ARNAUD DE VILLENEUVE (*c.* 1235–1313), alchemist, astrologer and physician, appears to have been of Spanish origin, and to have studied chemistry, medicine, physics, and also Arabian philosophy. After having lived at the court of Aragon, he went to Paris, where he gained a considerable reputation; but he incurred the enmity of the ecclesiastics and was forced to flee, finally finding an asylum in Sicily. About 1313 he was summoned to Avignon by Pope Clement V., who was ill, but he died on the voyage. Many alchemical writings, including *Thesaurus Thesaurorum* or *Rosarius Philosophorum*, *Novum Lumen*, *Flos Florum*, and *Speculum Alchimiae*, are ascribed to him, but they are of very doubtful authenticity. Collected editions of them were published at Lyons in 1504 and 1532 (with a biography by Sympborianus Campegius), at Basel in 1585, at Frankfort in 1603, and at Lyons in 1686. He is also the reputed author of various medical works, including *Breviarium Practicae*.

See J. B. Hauréau in the *Histoire littéraire de la France* (1881), vol. 28; E. Lalande, *Arnaud de Villeneuve, sa vie et ses œuvres* (Paris, 1896). A list of writings is given by J. Ferguson in his *Bibliotheca Chemica* (1906). See also U. Chevalier, *Repertoire des sources hist., &c., Bio-bibliographie* (Paris, 1903).

ARNAUD, HENRI (1641–1721), pastor and general of the Vaudois or Waldensians of Piedmont, was born at Embrun. About 1650 his family returned to their native valley of Luserna, where Arnaud was educated at La Tour (the chief village), later visiting the college at Basel (1662 and 1668) and the Academy at Geneva (1666). He then returned home, and seems to have been pastor in several of the Vaudois valleys before attaining that position at La Tour (1685). He was thus the natural leader of his co-religionists after Victor Amadeus expelled them (1686) from their valleys, and most probably visited Holland, the ruler of which, William of Orange, certainly gave him help and money. Arnaud occupied himself with organizing his 3000 countrymen who had taken refuge in Switzerland, and who twice (1687–1688) attempted to regain their homes. The English revolution of 1688, and the election of William to the throne, encouraged the Vaudois to make yet another attempt. Furnished with detailed instructions from the veteran Josué Janavel (prevented by age from taking part in the expedition) Arnaud, with about 1000 followers, started (August 17, 1689) from near Nyon on the Lake of Geneva for the *glorieuse rentrée*. On the 27th of August, the valiant band, after many hardships and dangers,

reached the Valley of St Martin, having passed by Sallanches and crossed the Col de Very (6506 ft.), the Enclave de la Fenêtre (7425 ft.), the Col du Bonhomme (8147 ft.), the Col du Mont Iseran (9085 ft.), the Grand Mont Cenis (6893 ft.), the Petit Mont Cenis (7166 ft.), the Col de Clapier (8173 ft.), the Col de Côteplane (7589 ft.), and the Col du Piz (8550 ft.). They soon took refuge in the lofty and secure rocky citadel of the Balsille, where they were besieged (October 24, 1689 to May 14, 1690) by the troops (about 4000 in number) of the king of France and the duke of Savoy. They maintained this natural fortress against many fierce attacks and during the whole of a winter. In particular, on the 2nd of May, one assault was defeated without the loss of a single man of Arnaud's small band. But another attack (May 14) was not so successful, so that Arnaud withdrew his force, under cover of a thick mist, and led them over the hills to the valley of Angrogna, above La Tour. A month later the Vaudois were received into favour by the duke of Savoy, who had then abandoned his alliance with France for one with Great Britain and Holland. Hence for the next six years the Vaudois helped Savoy against France, though suffering much from the repeated attacks of the French troops. But by a clause in the treaty of peace of 1696, made public in 1698, Victor Amadeus again became hostile to the Vaudois, about 3000 of whom, with Arnaud, found a shelter in Protestant countries, mainly in Württemberg, where Arnaud became the pastor of Dürrmenz-Schönenberg, N.W. of Stuttgart (1699). Once again (1704–1706) the Vaudois aided the duke against France. Arnaud, however, took no part in the military operations, though he visited England (1707) to obtain pecuniary aid from Queen Anne. He died at Schönenberg (which was the church hamlet of the parish of Dürrmenz) in 1721. It was during his retirement that he compiled from various documents by other hands his *Histoire de la glorieuse rentrée des Vaudois dans leurs vallées*, which was published (probably at Cassel) in 1710, with a dedication to Queen Anne. It was translated into English (1827) by H. Dyke Acland, and has also appeared in German and Dutch versions. A part of the original MS. is preserved in the Royal Library in Berlin.

See K. H. Klaiber, *Henri Arnaud, ein Lebensbild* (Stuttgart, 1880); A. de Rochas d'Aiglun, *Les Vallées vaudoises* (Paris, 1881); various chapters in the *Bulletin du bicentenaire de la glorieuse rentrée* (Turin, 1889). (W. A. B. C.)

ARNAULD, the surname of a family of prominent French lawyers, chiefly remembered in connexion with the Jansenist troubles of the 17th century. At their head was ANTOINE ARNAULD (1560–1619), a leader of the Paris bar; in this capacity he delivered a famous philippic against the Jesuits in 1594, accusing them of gross disloyalty to the newly converted Henry IV. This speech was afterwards known as the original sin of the Arnaulds.

Of his twenty children several grew up to fight the Jesuits on more important matters. Five gave themselves up wholly to the church. HENRI ARNAULD (1597–1692), the second son, became bishop of Angers in 1649, and represented Jansenism on the episcopal Bench for as long as forty-three years. The youngest son, ANTOINE (1612–1694), was the most famous of Jansenist theologians (see below). The second daughter, ANGÉLIQUE (1591–1661), was abbess and reformer of Port Royal; here she was presently joined by her sister AGNES (1593–1671) and two younger sisters, both of whom died early.

Only two of Antoine's children married—ROBERT ARNAULD D'ANDILLY (1588–1674), the eldest son, and CATHERINE LEMAISTRE (1590–1651), the eldest daughter. But both of these ended their lives under the shadow of the abbey. Andilly's five daughters all took the veil there; the second, ANGÉLIQUE DE ST JEAN ARNAULD D'ANDILLY (1624–1684) rose to be abbess, was a writer of no mean repute, and one of the most remarkable figures of the second generation of Jansenism. One of Andilly's sons became a hermit at Port Royal; the eldest, ANTOINE (1615–1699), was first a soldier, afterwards a priest. As the Abbé Arnauld, he survives as author of some interesting *Memoirs* of his time. The second son, SIMON ARNAULD DE POMPONNE (1616–1699), early entered public life. After holding various embassies, he rose to be foreign secretary to Louis XIV., and was created marquis de Pomponne. Lastly Madame Lemaistre and two of her sons became identified with Port Royal. On her husband's death she took the veil there. Her eldest son, ANTOINE LEMAISTRE (1608–1658), became the first of the *solitaires*, or hermits of Port Royal. There he was joined by his younger brother, ISAAC LEMAISTRE DE SACI (1613–1684), who presently took holy orders, and became confessor to the hermits.

The Arnaulds' connexion with Port Royal (*q.v.*)—a convent of Cistercian nuns in the neighbourhood of Versailles—dated back to 1599, when the original Antoine secured the abbess's chair for his daughter Angélique, then a child of eight. About 1608 she started to reform her convent in the direction of its original Rule; but about 1623 she made the acquaintance of du Vergier (*q.v.*) and thenceforward began to move in a Jansenist direction. Her later history is entirely bound up with the fortunes of that revival. Angélique's strength lay chiefly in her character. Her sister and collaborator, Agnes, was also a graceful writer; and her *Letters*, edited by Prosper Feugère (2 vols., Paris, 1858), throw most valuable light on the inner aims and aspirations of the Jansenist movement. The first relative to join their projects of reform was their nephew, Antoine Lemaistre, who threw up brilliant prospects at the bar to settle down at the Abbey gates (1638). Here he was presently joined by his brother, de Saci, and other hermits, who led an austere semi-monastic existence, though without taking any formal vow. In 1646 they were joined by their uncle, Arnauld d'Andilly, hitherto a personage of some importance at court and in the world; he was a special favourite of the queen regent, Anne of Austria, and had held various offices of dignity in the government. Uncle and nephews passed their time partly in ascetic exercises—though Andilly never pretended to vie in austerity with the younger men—partly in managing the convent estates, and partly in translating religious classics. Andilly put Josephus, St Augustine's *Confessions*, and many other works, into singularly delicate French. Lemaistre attacked the lives of the saints; in 1654 Saci set to work on a translation of the Bible. His labours were interrupted by the outbreak of persecution. In 1661 he was forced to go into hiding; in 1666 he was arrested, thrown into the Bastille, and kept there more than two years. Meanwhile his friends printed his translation of the New Testament—really in Holland, nominally at Mons in the Spanish Netherlands (1667). Hence it is usually known as the *Nouveau Testament de Mons*. It found enthusiastic friends and violent detractors. Bossuet approved its orthodoxy, but not its over-elaborate style; and it was destructively criticized by Richard Simon, the founder of Biblical criticism in France. On the other hand it undoubtedly did much to popularize the Bible, and was bitterly attacked by the Jesuits on that ground.

Le grand Arnauld.

By far the most distinguished of the family, however, was Antoine—*le grand* Arnauld, as contemporaries called him—the twentieth and youngest child of the original Antoine. Born in 1612, he was originally intended for the bar; but decided instead to study theology at the Sorbonne. Here he was brilliantly successful, and was on the high-road to preferment, when he came under the influence of du Vergier, and was drawn in the direction of Jansenism. His book, *De la fréquente Communion* (1643), did more than anything else to make the aims and ideals of this movement intelligible to the general public. Its appearance raised a violent storm, and Arnauld eventually withdrew into hiding; for more than twenty years he dared not make a public appearance in Paris. During all this time his pen was busy with innumerable Jansenist pamphlets. In 1655 two very outspoken *Lettres à un duc et pair* on Jesuit methods in the confessional brought on a motion to expel him from the Sorbonne. This motion was the immediate cause of Pascal's *Provincial Letters*. Pascal, however, failed to save his friend; in February 1656 Arnauld was solemnly degraded. Twelve years later the tide of fortune turned. The so-called peace of Clement IX. put an end to

persecution. Arnauld emerged from his retirement, was most graciously received by Louis XIV., and treated almost as a popular hero. He now set to work with Nicole (*q.v.*) on a great work against the Calvinists: *La Perpétuité de la foi catholique touchant l'eucharistie*. Ten years later, however, another storm of persecution burst. Arnauld was compelled to fly from France, and take refuge in the Netherlands, finally settling down at Brussels. Here the last sixteen years of his life were spent in incessant controversy with Jesuits, Calvinists and misbelievers of all kinds; here he died on the 8th of August 1694. His inexhaustible energy is best expressed by his famous reply to Nicole, who complained of feeling tired. "Tired!" echoed Arnauld, "when you have all eternity to rest in?" Nor was this energy by any means absorbed by purely theological questions. He was one of the first to adopt the philosophy of Descartes, though with certain orthodox reservations; and between 1683 and 1685 he had a long battle with Malebranche on the relation of theology to metaphysics. On the whole, public opinion leant to Arnauld's side. When Malebranche complained that his adversary had misunderstood him, Boileau silenced him with the question: "My dear sir, whom do you expect to understand you, if M. Arnauld does not?" And popular regard for Arnauld's penetration was much increased by his *Art de penser*, commonly known as the *Port-Royal Logic*, which has kept its place as an elementary text-book until quite modern times. Lastly a considerable place has quite lately been claimed for Arnauld among the mathematicians of his age; a recent critic even describes him as the Euclid of the 17th century. In general, however, since his death his reputation has been steadily on the wane. Contemporaries admired him chiefly as a master of close and serried reasoning; herein Bossuet, the greatest theologian of the age, was quite at one with d'Aguesseau, the greatest lawyer. But a purely controversial writer is seldom attractive to posterity. Anxiety to drive home every possible point, and cut his adversary off from every possible line of retreat, makes him seem intolerably prolix. "In spite of myself," Arnauld once said regretfully, "my books are seldom very short." And even lucidity may prove a snare to those who trust to it alone, and scornfully refuse to appeal to the imagination or the feelings. It is to be feared that, but for his connexion with Pascal, Arnauld's name would be almost forgotten—or, at most, live only in the famous epitaph Boileau consecrated to his memory—

> "Au pied de cet autel de structure grossière
> Gît sans pompe, enfermé dans une vile bière
> Le plus savant mortel qui jamais ait écrit."

Full details as to the lives and writings of the Arnaulds will be found in the various books mentioned at the close of the article on Port Royal. The most interesting account of Angélique will be found in *Mémoires pour servir à l'histoire de Port-Royal* (3 vols., Utrecht, 1742). Three volumes of her correspondence were also published at the same time and place. There are excellent modern lives of her in English by Miss Frances Martin (*Angélique Arnauld*, 1873) and by A. K. H. (*Angélique of Port Royal*, 1905). Antoine Arnauld's complete works—thirty-seven volumes in forty-two parts—were published in Paris, 1775–1781. No modern biography of him exists; but there is a study of his philosophy in Bouillier, *Histoire de la philosophie cartésienne* (Paris, 1868); and his mathematical achievements are discussed by Dr Bopp in the 14th volume of the *Abhandlungen zur Geschichte der mathematischen Wissenschaften* (Leipzig, 1902). The memoirs of Arnauld d'Andilly and of his son, the abbé Arnauld, are reprinted both in Petitot's and Poujoulat's collections of memoirs illustrative of the 17th century. (ST. C.)

ARNAULT, ANTOINE VINCENT (1766–1834), French dramatist, was born in Paris in January 1766. His first play, *Marius à Minturnes* (1791), immediately established his reputation. A year later he followed up his first success with a second republican tragedy, *Lucrèce*. He left France during the Terror and on his return was arrested by the revolutionary authorities, but was liberated through the intervention of Fabre d'Eglantine and others. He was commissioned by Bonaparte in 1797 with the reorganization of the Ionian Islands, and was nominated to the Institute and made secretary general of the university. He was faithful to his patron through his misfortunes, and after the Hundred Days remained in exile until 1819. In 1829 he was re-elected to the Academy and became perpetual secretary in 1833. Others of his plays are *Blanche et Montcassin, ou les Vêpriens* (1798); and *Germanicus* (1816), the performance of which was the occasion of a disturbance in the *parterre* which threatened serious political complications. His tragedies are perhaps less known now than his *Fables* (1813, 1815 and 1826), which are written in very graceful verse. Arnault collaborated in a *Vie politique et militaire de Napoléon* (1822), and wrote some very interesting *Souvenirs d'un sexagénaire* (1833), which contain much out-of-the-way information about the history of the years previous to 1804. Arnault died at Goderville on the 16th of September 1834.

His eldest son, Émilien Lucien (1787–1863), wrote several tragedies, the leading rôles in which were interpreted by Talma.

See Sainte-Beuve, *Causeries du lundi*, vol. 7. Arnault's *Œuvres complètes* (4 vols.) were published at the Hague and Paris in 1818–1819, and again (8 vols.) at Paris in 1824.

ARNDT, ERNST MORITZ (1769–1860), German poet and patriot, was born on the 26th of December 1769 at Schoritz in the island of Rügen, which at that time belonged to Sweden. He was the son of a prosperous farmer, and emancipated serf of the lord of the district, Count Putbus; his mother came of well-to-do German yeoman stock. In 1787 the family removed into the neighbourhood of Stralsund, where Arndt was enabled to attend the academy. After an interval of private study he went in 1791 to the university of Greifswald as a student of theology and history, and in 1793 removed to Jena, where he fell under the influence of Fichte. On the completion of his university course he returned home, was for two years a private tutor in the family of Ludwig Kosegarten (1758–1818), pastor of Wittow and poet, and having qualified for the ministry as a "candidate of theology," assisted in the church services. At the age of twenty-eight he renounced the ministry, and for eighteen months he led a wandering life, visiting Austria, Hungary, Italy, France and Belgium. Returning homewards up the Rhine, he was moved by the sight of the ruined castles along its banks to intense bitterness against France. The impressions of this journey he later described in *Reisen durch einen Theil Teutschlands, Ungarns, Italiens und Frankreichs in den Jahren 1798 und 1799* (1802–1804). In 1800 he settled in Greifswald as *privat-docent* in history, and the same year published *Über die Freiheit der alten Republiken*. In 1803 appeared *Germanien und Europa*, "a fragmentary ebullition," as he himself called it, of his views on the French aggression. This was followed by one of the most remarkable of his books, *Versuch einer Geschichte der Leibeigenschaft in Pommern und Rügen* (Berlin, 1803), a history of serfdom in Pomerania and Rügen, which was so convincing an indictment that King Gustavus Adolphus IV. in 1806 abolished the evil. Arndt had meanwhile risen from *privat-docent* to extraordinary professor, and in 1806 was appointed to the chair of history at the university. In this year he published the first part of his *Geist der Zeit*, in which he flung down the gauntlet to Napoleon and called on his countrymen to rise and shake off the French yoke. So great was the excitement it produced that Arndt was compelled to take refuge in Sweden to escape the vengeance of Napoleon. Settling in Stockholm, he obtained government employment, but devoted himself to the great cause which was nearest his heart, and in pamphlets, poems and songs communicated his enthusiasm to his countrymen. Schill's heroic death at Stralsund impelled him to return to Germany and, under the disguise of "Almann, teacher of languages," he reached Berlin in December 1809. In 1810 he returned to Greifswald, but only for a few months. He again set out on his adventurous travels, lived in close contact with the first men of his time, such as Blücher, Gneisenau and Stein, and in 1812 was summoned by the last named to St Petersburg to assist in the organization of the final struggle against France. Meanwhile, pamphlet after pamphlet, full of bitter hatred of the French oppressor, came from his pen, and his stirring patriotic songs, such as *Was ist das deutsche Vaterland? Der Gott, der Eisen wachsen liess*, and *Was blasen die Trompeten?* were on all lips. When, after the peace, the university of Bonn was founded in 1818, Arndt was appointed to

the chair of modern history. In this year appeared the fourth part of his *Geist der Zeit*, in which he criticized the reactionary policy of the German powers. The boldness of his demands for reform offended the Prussian government, and in the summer of 1819 he was arrested and his papers confiscated. Although speedily liberated, he was in the following year, at the instance of the Central Commission of Investigation at Mainz, established in accordance with the Carlsbad Decrees, arraigned before a specially constituted tribunal. Although not found guilty, he was forbidden to exercise the functions of his professorship, but was allowed to retain the stipend. The next twenty years he passed in retirement and literary activity. In 1840 he was reinstated in his professorship, and in 1841 was chosen rector of the university. The revolutionary outbreak of 1848 rekindled in the venerable patriot his old hopes and energies, and he took his seat as one of the deputies to the National Assembly at Frankfort. He formed one of the deputation that offered the imperial crown to Frederick William IV., and indignant at the king's refusal to accept it, he retired with the majority of von Gagern's adherents from public life. He continued to lecture and to write with freshness and vigour, and on his 90th birthday received from all parts of Germany good wishes and tokens of affection. He died at Bonn on the 29th of January 1860. Arndt was twice married, first in 1800, his wife dying in the following year; a second time in 1817.

Arndt's untiring labour for his country rightly won for him the title of "the most German of all Germans." His lyric poems are not, however, all confined to politics. Many among the Gedichte (1803–1818; complete edition, 1860) are religious pieces of great beauty. Among his other works are *Reise durch Schweden* (1797); *Nebenstunden, eine Beschreibung und Geschichte der schottländischen Inseln und der Orkaden* (1820); *Die Frage über die Niederlande* (1831); *Erinnerungen aus dem äusseren Leben* (an autobiography, and the most valuable source of information for Arndt's life, 1840); *Rhein- und Ahrwanderungen* (1846), *Wanderungen und Wandlungen mit dem Reichsfreiherrn von Stein* (1858), and *Pro populo Germanico* (1854), which was originally intended to form the fifth part of the *Geist der Zeit*. Arndt's *Werke* have been edited by H. Rösch and H. Meisner in 8 vols. (not complete) (1892–1898). Biographies have been written by E. Langenberg (1869) and Wilhelm Baur (5th ed., 1882); see also H. Meisner and R. Geerds, *E. M. Arndt, ein Lebensbild in Briefen* (1898), and R. Thiele, *E. M. Arndt* (1894). There are monuments to his memory at Schoritz, his birthplace, and at Bonn, where he is buried.

ARNDT, JOHANN (1555–1621), German Lutheran theologian, was born at Ballenstedt, in Anhalt, and studied in several universities. He was at Helmstadt in 1576; at Wittenberg in 1577. At Wittenberg the crypto-Calvinist controversy was then at its height, and he took the side of Melanchthon and the crypto-Calvinists. He continued his studies in Strassburg, under the professor of Hebrew, Johannes Pappus (1549–1610), a zealous Lutheran, the crown of whose life's work was the forcible suppression of Calvinistic preaching and worship in the city, and who had great influence over him. In Basel, again, he studied theology under Simon Sulzer (1508–1585), a broad-minded divine of Lutheran sympathies, whose aim was to reconcile the churches of the Helvetic and Wittenberg confessions. In 1581 he went back to Ballenstedt, but was soon recalled to active life by his appointment to the pastorate at Badeborn in 1583. After some time his Lutheran tendencies exposed him to the anger of the authorities, who were of the Reformed Church. Consequently, in 1590 he was deposed for refusing to remove the pictures from his church and discontinue the use of exorcism in baptism. He found an asylum in Quedlinburg (1590), and afterwards was transferred to St Martin's church at Brunswick (1599). Arndt's fame rests on his writings. These were mainly of a mystical and devotional kind, and were inspired by St Bernard, J. Tauler and Thomas à Kempis. His principal work, *Wahres Christentum* (1606–1609), which has been translated into most European languages, has served as the foundation of many books of devotion, both Roman Catholic and Protestant. Arndt here dwells upon the mystical union between the believer and Christ, and endeavours, by drawing attention to Christ's life *in* His people, to correct the purely forensic side of the Reformation theology, which paid almost exclusive attention to Christ's death *for* His people. Like Luther, Arndt was very fond of the little anonymous book, *Deutsche Theologie*. He published an edition of it and called attention to its merits in a special preface. After *Wahres Christentum*, his best-known work is *Paradiesgärtlein aller christlichen Tugenden*, which was published in 1612. Both these books have been translated into English; *Paradiesgärtlein* with the title the *Garden of Paradise*. Several of his sermons are published in R. Nesselmann's *Buch der Predigten* (1858). Arndt has always been held in very high repute by the German Pietists. The founder of Pietism, Philipp Jacob Spener, repeatedly called attention to him and his writings, and even went so far as to compare him with Plato (cf. Karl Scheele, *Plato und Johann Arndt, Ein Vortrag*, &c., 1857).

A collected edition of his works was published in Leipzig and Görlitz in 1734. A valuable account of Arndt is to be found in C. Aschmann's *Essai sur la vie, &c., de J. Arndt*. See further, Herzog-Hauck, *Realencyklopädie*.

ARNE, THOMAS AUGUSTINE (1710–1778), English musical composer, was born in London on the 12th of March 1710, his father being an upholsterer. Intended for the legal profession, he was educated at Eton, and afterwards apprenticed to an attorney for three years. His natural inclination for music, however, proved irresistible, and his father, finding from his performance at an amateur musical party that he was already a skilful violinist, furnished him with the means of educating himself in his favourite art. On the 7th of March 1733 he produced his first work at Lincoln's Inn Fields theatre, a setting of Addison's *Rosamond*, the heroine's part being performed by his sister, Susanna Maria, who afterwards became celebrated as Mrs Cibber. This proving a success was immediately followed by a burletta, entitled *The Opera of Operas*, based on Fielding's *Tragedy of Tragedies*. The part of Tom Thumb was played by Arne's young brother, and the opera was produced at the Haymarket theatre. On the 19th of December 1733 Arne produced at the same theatre the masque *Dido and Aeneas*, a subject of which the musical conception had been immortalized for Englishmen more than half a century earlier by Henry Purcell. Arne's individuality of style first distinctly asserted itself in the music to Dr Dalton's adaptation of Milton's *Comus*, which was performed at Drury Lane in 1738, and speedily established his reputation. In 1740 he wrote the music for Thomson and Mallet's *Masque of Alfred*, which is noteworthy as containing the most popular of all his airs—"Rule, Britannia!" In 1740 he also wrote his beautiful settings of the songs, "Under the greenwood tree," "Blow, blow, thou winter wind" and "When daisies pied," for a performance of Shakespeare's *As You Like It*. Four years before this, in 1736, he had married Cecilia, the eldest daughter of Charles Young, organist of All Hallows Barking. She was considered the finest English singer of the day and was frequently engaged by Handel in the performance of his music. In 1742 Arne went with his wife to Dublin, where he remained two years and produced his oratorio *Abel*, containing the beautiful melody known as the Hymn of Eve, the operas *Britannia*, *Eliza* and *Comus*, and where he also gave a number of successful concerts. On his return to London he was engaged as leader of the band at Drury Lane theatre (1744), and as composer at Vauxhall (1745). In this latter year he composed his successful pastoral dialogue, *Colin and Phoebe*, and in 1746 the song, "Where the bee sucks." In 1759 he received the degree of doctor of music from Oxford. In 1760 he transferred his services to Covent Garden theatre, where on the 28th of November he produced his *Thomas and Sally*. Here, too, on the 2nd of February 1762 he produced his *Artaxerxes*, an opera in the Italian style with recitative instead of spoken dialogue, the popularity of which is attested by the fact that it continued to be performed at intervals for upwards of eighty years. The libretto, by Arne himself, was a very poor translation of Metastasio's *Artaserse*. In 1762 also was produced the ballad-opera *Love in a Cottage*. His oratorio *Judith*, of which the first performance was on the 27th of February 1761 at Drury Lane, was revived at the chapel of the Lock hospital, Pimlico, on the

29th of February 1764, in which year was also performed his setting of Metastasio's *Olimpiade* in the original language at the King's theatre in the Haymarket. At a later performance of *Judith* at Covent Garden theatre on the 26th of February 1773 Arne for the first time introduced female voices into oratorio choruses. In 1769 he wrote the musical parts for Garrick's ode for the Shakespeare jubilee at Stratford-on-Avon, and in 1770 he gave a mutilated version of Purcell's *King Arthur*. One of his last dramatic works was the music to Mason's *Caractacus*, published in 1775. Though inferior to Purcell in intensity of feeling, Arne has not been surpassed as a composer of graceful and attractive melody. There is true genius in such airs as "Rule, Britannia!" and "Where the bee sucks," which still retain their original freshness and popularity. As a writer of glees he does not take such high rank, though he deserves notice as the leader in the revival of that peculiarly English form of composition. He was author as well as composer of *The Guardian outwitted*, *The Rose*, *The Contest of Beauty and Virtue*, and *Phoebe at Court*. Dr Arne died on the 5th of March 1778, and was buried at St Paul's, Covent Garden.

See also the article in Grove's *Dictionary* (new ed.); and two interesting papers in the *Musical Times*, November and December 1901.

ARNETH, ALFRED, Ritter von (1819–1897), Austrian historian, born at Vienna on the 10th of July 1819, was the son of Joseph Calasanza von Arneth (1791–1863), a well-known historian and archaeologist, who wrote a history of the Austrian empire (Vienna, 1827) and several works on numismatics. Alfred Arneth studied law, and became an official of the Austrian state archives, of which in 1868 he was appointed keeper. He was a moderate liberal in politics and a supporter of the ideal of German unity. As such he was elected to the Frankfort parliament in 1848. In 1861 he became a member of the Lower Austrian diet and in 1869 was nominated to the Upper House of the Austrian Reichsrath. In 1879 he was appointed president of the *Kaiserliche Akademie der Wissenschaften* (Academy of Sciences) at Vienna, and in 1896 succeeded von Sybel as chairman of the historical commission at Munich. He died on the 30th of July 1897.

Arneth was an indefatigable worker, and, as director of the archives, his broad-minded willingness to listen to the advice of experts, as well as his own sound sense, did much to promote the more scientific treatment and use of public records in most of the archives of Europe. His scientific temper and the special facilities which he enjoyed for drawing from original sources give to his numerous historical works a very special value.

Among his publications may be mentioned: *Leben des Feldmarschalls Grafen Guido Starhemberg* (Vienna, 1863); *Prinz Eugen von Savoyen* (3 vols., *ib.* 1864); *Gesch. der Maria Theresa* (10 vols., *ib.* 1863–1879); *Maria Theresa u. Marie Antoinette, ihr Briefwechsel* (*ib.* 1866); *Marie Antoinette, Joseph II. und Leopold II., ihr Briefwechsel* (1866); *Maria Theresa und Joseph II., ihre Korrespondenz samt Briefen Josephs an seinen Bruder Leopold* (3 vols., 1867); *Beaumarchais und Sonnenfels* (1868); *Joseph II. und Katharina von Russland, ihr Briefwechsel* (1869); *Johann Christian Barthenstein und seine Zeit* (1871); *Joseph II. und Leopold von Toskana, ihr Briefwechsel* (2 vols., 1872); *Briefe der Kaiserin Maria Theresa an ihre Kinder und Freunde* (4 vols., 1881); *Marie Antoinette: Correspondance secrète entre Marie-Thérèse et le comte de Mercy-Argenteau* (3 vols., Paris, 1875), in collaboration with Auguste Geffroy; *Graf Philipp Cobenzl und seine Memoiren* (1885); *Correspondance secrète du comte de Mercy-Argenteau avec l'empereur Joseph II. et Kaunitz* (2 vols., 1889–1891), in collaboration with Jules Flammermont; *Anton Ritter von Schmerling. Episoden aus seinem Leben 1835, 1848–1849* (1895); *Johann Freiherr von Wessenberg, ein österreichischer Staatsmann des 19. Jahrh.* (2 vols., 1898). Arneth also published in 1893 two volumes of early reminiscences under the title of *Aus meinem Leben*.

ARNHEM, or Arnheim, the capital of the province of Gelderland, Holland, on the right bank of the Rhine (here crossed by a pontoon bridge), and a junction station 35 m. by rail E.S.E. of Utrecht. Pop. (1900) 57,240. It is connected by tramway with Zutphen and Utrecht, and there is a regular service of steamers to Cologne, Amsterdam, Nijmwegen, Tiel, 's Hertogenbosch and Rotterdam. Arnhem is a gay and fashionable town prettily situated at the foot of the Veluwe hills, and enjoys a special reputation for beauty on account of its wooded and hilly surroundings, which have attracted many wealthy people to its neighbourhood. The Groote Kerk of St Eusebius, built in the third quarter of the 15th century, contains the marble monument to Charles (d. 1538), the last duke of Gelderland of the Egmont dynasty. High up against the wall is an effigy of the same duke in his armour. The fine lofty tower contains a chime of forty-five bells. The Roman Catholic church of St Walburgis is of earlier date, and a new Roman Catholic church dates from 1894. The town hall was built as a palace by Maarten van Rossum, Duke Charles's general, at the end of the 15th century, and was only converted to its present use in 1830. Its grotesque external ornamentation earned for it the name of Duivelshuis, or devil's house. The provincial government house occupies the site of the former palace of the dukes of Gelderland. Other buildings are the court-house, a public library containing many old works, a theatre, a large concert-hall, a museum of antiquities (as well as a separate collection of Spanish antiquities), a gymnasium, a teachers' and art school, a building (1880) to contain the provincial archives, a hospital (1889) and barracks. On account of its proximity to the fertile Betuwe district and its situation near the confluence of the Rhine and Ysel, the markets and shipping of Arnhem are in a flourishing condition. A wharf for building and repairing iron steamers was constructed in 1889. The manufactures include woollen and cotton goods, paper, earthenware, soap, carriages, furniture and tobacco, which is cultivated in the neighbourhood. Wool-combing and dyeing are also carried on, and there are oil and timber mills.

The environs of Arnhem are much admired. Following either the Zutphen or the Utrecht road, numerous pleasing views of the Rhine valley present themselves, and country houses and villas appear among the woods on every side. At Bronbeek, a short distance east of the town, is a hospital endowed by King William III. for soldiers of the colonial army. Beyond is the popular summer resort of Velp, with the castle of Biljoen built by Charles, duke of Gelderland, in 1530, and the beautiful park of the ancient castle of Rozendaal in the vicinity. The origin of the castle of Rozendaal is unknown. The first account of it is in connexion with a tournament given there by Reinald I., count of Gelderland, in the beginning of the 14th century, and it ever after remained the favourite residence of the counts and dukes of Gelderland. About the beginning of the 18th century fountains and lanes in the style of those at Versailles were laid out in the park, and soon after the castle itself, of which only the round tower remained (and is still standing), was rebuilt. The park is open to the public, and is famous for the beauty of the beech avenues and fir woods. Beyond this is De Steeg, another popular resort, whence stretches the famous Middachten Allee of beech trees to Dieren. On the Apeldoorn road is Sonsbeek, with a wooded park and small lakes, formerly a private seat and now belonging to the municipality. On the west of Arnhem is another pleasure ground, called the Reeberg, with a casino, and the woods of Heienoord. Close by is the ancient and well-preserved castle of Doornwerth with its own chapel. It was the seat of an independent lordship until 1402, after which time it was held in fief from the dukes of Gelderland. Beyond Doornwerth, at Renkum, is the royal country seat called Oranje-Nassau's Oord, which was bought by the crown in 1881.

History.—Arnhem, called *Arnoldi Villa* in the middle ages, is, according to some, the *Arenacum* of the Romans, and is first mentioned in a document in 893. In 1233 Otto II., count of Gelderland, chose this spot as his residence, conferred municipal rights on the town, and fortified it. At a later period it entered the Hanseatic League. In 1473 it was captured by Charles the Bold of Burgundy. In 1505 it received the right of coining from Philip, son of the emperor Maximilian I. In 1514 Charles of Egmont, duke of Gelderland, took it from the Spaniards; but in 1543 it fell to the emperor Charles V., who made it the seat of the council of Gelderland. It joined the union of Utrecht in 1579, and came finally under the effective government of the states-general in 1585, all the later attacks of the Spaniards being repulsed. In 1586 Sir Philip Sidney died in the town from

the effects of his wound received before Zutphen. The French took the town in 1672, but left it dismantled in 1674. It was refortified by the celebrated Dutch general of engineers, Coehoorn, in the beginning of the 18th century. In 1795 it was again stormed by the French, and in 1813 it was taken from them by the Prussians under Bülow. Gardens and promenades have now taken the place of the old ramparts, the last of which was levelled in 1853.

ARNICA, a genus of plants belonging to the natural order Compositae, and containing 18 species, mostly north-west American. The most important species is *Arnica montana* (mountain tobacco), a perennial herb found in upland meadows in northern and central Europe (but not extending to Britain), and on the mountains of western and central Europe. A closely allied species (*A. angustifolia*), with very narrow leaves, is met with in Arctic Asia and America. The heads of flowers are large, 2 to 2½ in. across, orange-yellow in colour, and borne on the summit of the stem or branches; the outer ray-flowers are an inch in length. The achenes (fruits) are brown and hairy, and are crowned by a tuft of stiffish hairs (pappus). The root-stock of *A. montana* is tough, slender, of a dark brown colour and an inch or two in length. It gives off numerous simple roots from its under side, and shows on its upper side the remains of rosettes of leaves. It yields an essential oil in small quantity, and a resinous matter called arnicin, $C_{12}H_{22}O_2$, a yellow crystalline substance with an acrid taste. The tincture prepared from it is an old remedy which has a popular reputation in the treatment of bruises and sprains. The plant was introduced into English gardens about the middle of the 18th century, but is not often grown; it is a handsome plant for a rockery.

ARNIM, ELISABETH (BETTINA) VON (1785–1859), German authoress, sister of Klemens Brentano, was born at Frankfort-on-Main on the 4th of April 1785. After being educated at a convent school in Fritzlar, she lived for a while with her grandmother, the novelist, Sophie Laroche (1731–1807), at Offenbach, and from 1803 to 1806 with her brother-in-law, Friedrich von Savigny, the famous jurist, at Marburg. In 1807 she made at Weimar the acquaintance of Goethe, for whom she entertained a violent passion, which the poet, although entering into correspondence with her, did not requite, but only regarded as a harmless fancy. Their friendship came to an abrupt end in 1811, owing to " Bettina's " insolent behaviour to Goethe's wife. In this year she married Ludwig Achim von Arnim (*q.v.*), by whom she had seven children. After her husband's death in 1831, her passion for Goethe revived, and in 1835 she published her remarkable book, *Goethes Briefwechsel mit einem Kinde*, which purported to be a correspondence between herself and the poet. Regarded at first as genuine, it was afterwards for many years looked upon as wholly fictitious, until the publication in 1879 of G. von Loeper's *Briefe Goethes an Sophie Laroche und Bettina Brentano, nebst dichterischen Beilagen*, which proved it to be based on authentic material, though treated with the greatest poetical licence. Equally fantastic is her correspondence *Die Günderode* (1840), with her unhappy friend, the poet, Karoline von Günderode (1780–1806), who committed suicide, and that with her brother Klemens Brentano, under the title *Klemens Brentanos Frühlingskranz* (1844). She also published *Dies Buch gehört dem König* (1843), in which she advocated the emancipation of the Jews, and the abolition of capital punishment. Among her other works may be mentioned *Ilius Pamphilius und die Ambrosia* (1848), also a supposititious correspondence. In all her writings she showed real poetical genius, combined with evidence of an unbalanced mind and a mannerism which becomes tiresome. She died at Berlin on the 20th of January 1859. Part of a design by her for a colossal statue of Goethe, executed in marble by the sculptor Karl Steinhäuser (1813–1878), is in the museum at Weimar.

Her collected works (*Sämtliche Schriften*) were published in Berlin in 11 vols., 1853. Goethe's *Briefwechsel mit einem Kinde* has been edited by H. Grimm (4th ed., Berlin, 1890). See also C. Alberti, *B. von Arnim* (Leipzig, 1885); Moritz Carriere, *Bettina von Arnim* (Breslau, 1887), and the literature cited under Ludwig von Arnim.

ARNIM, HARRY KARL KURT EDUARD VON, Count (1824–1881), German diplomatist, was a member of one of the most numerous and most widely spread families of the Prussian nobility. He was born in Pomerania on the 3rd of October 1824, and brought up by his uncle Heinrich von Arnim, who was Prussian ambassador at Paris and foreign minister from March to June 1848, while Count Arnim-Boytzenburg, whose daughter Harry von Arnim afterwards married, was minister-president. It is noticeable that the uncle was brought before a court of justice and fined for publishing a pamphlet directed against the ministry of Manteuffel. After holding other posts in the diplomatic service Arnim was in 1864 appointed Prussian envoy (and in 1867 envoy of the North German Confederation) at the papal court. In 1869 he proposed that the governments should appoint representatives to be present at the Vatican council, a suggestion which was rejected by Bismarck, and foretold that the promulgation of papal infallibility would bring serious political difficulties. After the recall of the French troops from Rome he attempted unsuccessfully to mediate between the pope and the Italian government. He was appointed in 1871 German commissioner to arrange the final treaty with France, a task which he carried out with such success that in 1871 he was appointed German envoy at Paris, and in 1872 received his definite appointment as ambassador, a post of the greatest difficulty and responsibility. Differences soon arose between him and Bismarck; he wished to support the monarchical party which was trying to overthrow Thiers, while Bismarck ordered him to stand aloof from all French parties; he did not give that implicit obedience to his instructions which Bismarck required. Bismarck, however, was unable to recall him because of the great influence which he enjoyed at court and the confidence which the emperor placed in him. He was looked upon by the Conservative party, who were trying to overthrow Bismarck, as his successor, and it is said that he was closely connected with the court intrigues against the chancellor. In the beginning of 1874 he was recalled and appointed to the embassy at Constantinople, but this appointment was immediately revoked. A Vienna newspaper published some correspondence on the Vatican council, including confidential despatches of Arnim's, with the object of showing that he had shown greater foresight than Bismarck. It was then found that a considerable number of papers were missing from the Paris embassy, and on the 4th of October Arnim was arrested on the charge of embezzling state papers. This recourse to the criminal law against a man of his rank, who had held one of the most important diplomatic posts, caused great astonishment. His defence was that the papers were not official, and he was acquitted on the charge of embezzlement, but convicted of undue delay in restoring official papers and condemned to three months' imprisonment. On appeal the sentence was increased to nine months. Arnim avoided imprisonment by leaving the country, and in 1875 published anonymously at Zürich a pamphlet entitled " Pro nihilo," in which he attempted to show that the attack on him was caused by Bismarck's personal jealousy. For this he was accused of treason, insult to the emperor, and libelling Bismarck, and in his absence condemned to five years' penal servitude. From his exile in Austria he published two more pamphlets on the ecclesiastical policy of Prussia, " Der Nunzius kommt! " (Vienna, 1878), and " Quid faciamus nos?" (*ib.* 1879). He made repeated attempts, which were supported by his family, to be allowed to return to Germany in order to take his trial afresh on the charge of treason; his request had just been granted when he died on the 19th of May 1881.

In 1876 Bismarck carried an amendment to the criminal code making it an offence punishable with imprisonment or a fine up to £250 for an official of the foreign office to communicate to others official documents, or for an envoy to act contrary to his instructions. These clauses are commonly spoken of in Germany as the "Arnim paragraphs." (J. W. He.)

ARNIM, LUDWIG ACHIM (JOACHIM) VON (1781–1831), German poet and novelist, was born at Berlin on the 26th of January 1781. He studied natural science at Halle and

Göttingen, and published one or two essays on scientific subjects; but his bent was from the first towards literature. From the earlier writings of Goethe and Herder he learned to appreciate the beauties of German traditional legends and folk-songs; and, forming a collection of these, published the result (1806–1808), in collaboration with Klemens Brentano (*q.v.*) under the title *Des Knaben Wunderhorn*. From 1810 onward he lived with his wife Bettina, Brentano's sister, alternately at Berlin and on his estate at Wiepersdorf, near Dahme in Brandenburg, where he died on the 21st of January 1831. Arnim was a prolific and versatile writer, gifted with a sense of humour and a refined imagination—qualities shown in the best-known of his works, *Des Knaben Wunderhorn*, deficient as this is in the philological accuracy and faithfulness to original sources which would now be expected of such a compilation. In general, however, his writings, full as they are of the exaggerated sentiment and affectations of the romantic school, make but little appeal to modern taste. There are possible exceptions, such as the short stories *Fürst Ganzgott und Sänger Halbgott* and *Der tolle Invalide auf dem Fort Ratonneau* and the unfinished romance *Die Kronenwächter* (1817), which promised to develop into one of the finest historical romances of the 19th century. Among Arnim's other works may be mentioned *Hollins Liebesleben* (1802), *Der Wintergarten* (1809), a collection of tales; *Armut, Reichtum Schuld, und Busse der Gräfin Dolores* (1810), a novel; *Halle und Jerusalem* (1811), a dramatic romance; and one or two smaller novels, such as *Isabella von Ägypten* (1812).

Arnim's *Sämtliche Werke* were edited by his widow and published in Berlin in 1839–1840; second edition in 22 vols., 1853–1856. Selections have been edited by J. Dohmke (1892); M. Koch, *Arnim, Klemens und Bettina Brentano, Görres* (1893). *Des Knaben Wunderhorn* has been frequently republished, the best edition being that of A. Birlinger and W. Crecelius (2 vols., 1872–1876). See R. Steig, *Achim von Arnim und Klemens Brentano* (1894).

ARNIM-BOYTZENBURG, HANS GEORG VON (1581–1641), German general and diplomatist, was born in 1581 at Boytzenburg in Brandenburg. From 1613 to 1617 he served in the Swedish army under Gustavus Adolphus, took part in the Russian War, and afterwards fought against the Turks in the service of the king of Poland. In 1626, though a Protestant, he was induced by Wallenstein to join the new imperial army, in which he quickly rose to the rank of field marshal, and won the esteem of his soldiers as well as that of his commander, whose close friend and faithful ally he became. This attachment to Wallenstein, and a spirit of religious toleration, were the leading motives of a strange career of military and political inconstancy. Thus the dismissal of Wallenstein and the perilous condition of German Protestantism after the edict of Restitution combined to induce Arnim to quit the imperial service for that of the elector of Saxony. He had served under Gustavus many years before, and later he had defeated him in the field, when in command of a Polish army; the fortune of war now placed Arnim at the head of the Saxon army which fought by the side of the Swedes at Breitenfeld (1631), and indeed the alliance of these two Protestant powers in the cause of their common religion was largely his work. The reappearances of Wallenstein, however, caused him to hesitate and open negotiations, though he did not attempt to conceal his proceedings from the elector and Gustavus. During the Lützen campaign, Arnim was operating with success at the head of an allied army in Silesia. In the following year he was under the hard necessity of opposing his old friend in the field, but little was done by either; the complicated political situation which followed the death of Gustavus at Lützen led him into a renewal of the private negotiations of the previous year, though he did nothing actually treasonable in his relations with Wallenstein. In 1634 Wallenstein was assassinated, and Arnim began at once more active operations. He won an important victory at Liegnitz in May 1634, but from this time he became more and more estranged from the Swedes. The peace of Prague followed, in which Arnim's part, though considerable, was not all-important (1635). Soon after this event he refused an offer of high command in the French army and retired from active life. From 1637 to 1638 he was imprisoned in Stockholm, having been seized at Boytzenburg by the Swedes on suspicion of being concerned in various intrigues. He made his escape ultimately, and returned to Saxony. Arnim died suddenly at Dresden in 1641, whilst engaged in raising an army to free German soil from foreign armies of all kinds. (See THIRTY YEARS' WAR.)

See K. G. Helbig, "Wallenstein und Arnim" (1850) and "Der Prager Friede," in Raumer's *Historisches Taschenbuch* (1858); also E. D. M. Kirchner, *Das Schloss Boytzenburg, &c.* (1860) and *Archiv für die sächsische Geschichte*, vol. viii. (1870).

ARNO, ARN or AQUILA (*c.* 750–821), bishop and afterwards archbishop of Salzburg, entered the church at an early age, and after passing some time at Freising became abbot of Elnon, or St Amand as it was afterwards called, where he made the acquaintance of Alcuin. In 785 he was made bishop of Salzburg and in 787 was employed by Tassilo III., duke of the Bavarians, as an envoy to Charlemagne at Rome. He appears to have attracted the notice of the Frankish king, through whose influence in 798 Salzburg was made the seat of an archbishopric; and Arno, as the first holder of this office, became metropolitan of Bavaria and received the pallium from Pope Leo III. The area of his authority was extended to the east by the conquests of Charlemagne over the Avars, and he began to take a prominent part in the government of Bavaria. He acted as one of the *missi dominici*, and spent some time at the court of Charlemagne, where he was known by the assembled scholars as Aquila, and his name appears as one of the signatories to the emperor's will. He established a library at Salzburg, furthered in other ways the interests of learning, and presided over several synods called to improve the condition of the church in Bavaria. Soon after the death of Charlemagne in 814, Arno appears to have withdrawn from active life, although he retained his archbishopric until his death on the 24th of January 821. Aided by a deacon named Benedict, Arno drew up about 788 a catalogue of lands and proprietary rights belonging to the church in Bavaria, under the title of *Indiculus* or *Congestum Arnonis*. An edition of this work, which is of considerable value to historical students, was published at Munich in 1869 with notes by F. Keinz. Many other works were produced under the protection of Arno, among them a Salzburg consuetudinary, an edition of which appears in *Quellen und Erörterungen zur bayrischen und deutschen Geschichte*, Band vii., edited by L. Rockinger (Munich, 1856). It has been suggested by W. von Giesebrecht that Arno was the author of an early section of *Annales Laurissenses majores*, which deals with the history of the Frankish kings from 741 to 829, and of which an edition appears in *Monumenta Germaniae historica. Scriptores*, Band i. pp. 128-131, edited by G. H. Pertz (Hanover, 1826). If this supposition be correct, Arno was the first extant writer to apply the name *Deutsch* (*theodisca*) to the German language.

ARNO (anc. *Arnus*), a river of Italy which rises from the Monte Falterona, about 25 m. E.N.E. of Florence, 4265 ft. above the sea. It first runs S.S.E. through a beautiful valley, the Casentino; near Arezzo it turns W., and at Montevarchi N.N.W.; 10 m. below it forces its way through the limestone rock at Incisa and 10 m. farther on, at Pontassieve, it is joined by the Sieve. Thence it runs westward to Florence and through the gorge of Golfolina onwards to Empoli and Pisa, receiving various tributaries in its course, and falls into the sea 7½ m. west of Pisa, after a total course of 155 m. In prehistoric times the river ran straight on along the valley of the Chiana and joined the Tiber near Orvieto; and there was a great lake, the north end of which was at Incisa and the south at the lake of Chiusi. The distance from Pisa to the mouth in the time of Strabo was only 2½ m. The Serchio (anc. *Auser*), which joined the Arno at Pisa in ancient times, now flows into the sea independently. The Arno is navigable for barges as far as Florence; but it is liable to sudden floods, and brings down with it large quantities of earth and stones, so that it requires careful regulation. The most remarkable inundations were those of 1537 and 1740; in the former year the water rose to 8 ft. in the streets of Florence. The valley between Incisa and Arezzo contains accumulations of fossil bones of the deer, elephant, rhinoceros, mastodon, hippopotamus, bear, tiger, &c.

ARNOBIUS (called *Afer*, and sometimes "the Elder"), early Christian writer, was a teacher of rhetoric at Sicca Venerea in proconsular Africa during the reign of Diocletian. His conversion to Christianity is said by Jerome to have been occasioned by a dream; and the same writer adds that the bishop to whom Arnobius applied distrusted his professions, and asked some proof of them, and that the treatise *Adversus Gentes* was composed for this purpose. But this story seems rather improbable; for Arnobius speaks contemptuously of dreams, and besides, his work bears no traces of having been written in a short time, or of having been revised by a Christian bishop. From internal evidence (bk. iv. 36) the time of composition may be fixed at about A.D. 303. Nothing further is known of the life of Arnobius. He is said to have been the author of a work on rhetoric, which, however, has not been preserved. His great treatise, in seven books, *Adversus Gentes* (or *Nationes*), on account of which he takes rank as a Christian apologist, appears to have been occasioned by a desire to answer the complaint then brought against the Christians, that the prevalent calamities and disasters were due to their impiety and had come upon men since the establishment of their religion. In the first book Arnobius carefully discusses this complaint; he shows that the allegation of greater calamities having come upon men since the Christian era is false; and that, even if it were true, it could by no means be attributed to the Christians. He skilfully contends that Christians who worship the self-existent God cannot justly be called less religious than those who worship subordinate deities, and concludes by vindicating the Godhead of Christ. In the second book Arnobius digresses into a long discussion on the soul, which he does not think is of divine origin, and which he scarcely believes to be immortal. He even says that a belief in the soul's immortality would tend to remove moral restraint, and have a prejudicial effect on human life. In the concluding chapters he answers the objections drawn from the recent origin of Christianity. Books iii., iv. and v. contain a violent attack on the heathen mythology, in which he narrates with powerful sarcasm the scandalous chronicles of the gods, and contrasts with their grossness and immorality the pure and holy worship of the Christian. These books are valuable as a repertory of mythological stories. Books vi. and vii. ably handle the questions of sacrifices and worship of images. The confusion of the final chapter points to some interruption. The work of Arnobius appears to have been written when he was a recent convert, for he does not possess a very extensive knowledge of Scripture. He knows nothing of the Old Testament, and only the life of Christ in the New, while he does not quote directly from the Gospels. He is also at fault in regard to the Jewish sects. He was much influenced by Lucretius and had read Plato. His statements concerning Greek and Roman mythology are based respectively on the *Protrepticus* of Clement of Alexandria, and on Antistius Labeo, who belonged to the preceding generation and attempted to restore Neoplatonism. There are some pleasing passages in Arnobius, but on the whole he is a tumid and a tedious author.

EDITIONS.—Migne, *Patr. Lat.* iv. 349; A. Reifferscheich in the *Vienna Corpus Script. Eccles. Lat.* (1875).

TRANSLATIONS.—A. H. Bryce and H. Campbell in *Ante-Nicene Fathers*, vi.

LITERATURE.—H. C. G. Moule in *Dict. Chr. Biog.* i.; Herzog-Hauck, *Realencyklopädie*; and G. Kruger, *Early Chr. Lit.* p. 304 (where full bibliographies are given).

ARNOBIUS ("the younger"), Christian priest or bishop in Gaul, flourished about 460. He is the author of a mystical and allegorical commentary on the Psalms, first published by Erasmus in 1522, and by him attributed to the elder Arnobius. It has been frequently reprinted, and in the edition of De la Barre, 1580, is accompanied by some notes on the Gospels by the same author. To him has sometimes been ascribed the anonymous treatise, *Arnobii catholici et Serapionis conflictus de Deo trino et uno . . . de gratiae liberi arbitrii concordia*, which was probably written by a follower of Augustine. The opinions of Arnobius, as appears from the commentary, are semi-Pelagian.

ARNOLD, known as "ARNOLD OF BRESCIA" (d. 1155), one of the most ardent adversaries of the temporal power of the popes. He belonged to a family of importance, if not noble, and was born probably at Brescia, in Italy, towards the end of the 11th century. He distinguished himself in his monastic studies, and went to France about 1115. He studied theology in Paris, but there is no proof that he was a pupil of Abelard. Returning to Italy he became a canon regular. His life was rigidly austere, St Bernard calling him "homo neque manducans neque bibens." He at once directed his efforts against the corruption of the clergy, and especially against the temporal ambitions of the high dignitaries of the church. During the schism of Anacletus (1131–1137) the town of Brescia was torn by the struggles between the partisans of Pope Innocent II. and the adherents of the anti-pope, and Arnold gave effect to his abhorrence of the political episcopate by inciting the people to rise against their bishop, and, exiled by Innocent II., went to France. St Bernard accused him of sharing the doctrines of Abelard (see *Ep.* 189, 195), and procured his condemnation by the council of Sens (1140) at the same time as that of the great scholastic. This was perhaps no more than the outcome of the fierce polemical spirit of the abbot of Clairvaux, which led him to include all his adversaries under a single anathema. It seems certain that Arnold professed moral theology in Paris, and several times reprimanded St Bernard, whom he accused of pride and jealousy. St Bernard, as a last resort, begged King Louis VII. to take severe measures against Arnold, who had to leave France and take refuge at Zürich. There he soon became popular, especially with the lay nobility; but, denounced anew by St Bernard to the ecclesiastical authorities, he returned to Italy, and turned his steps towards Rome (1145). It was two years since, in 1143, the Romans had rejected the temporal power of the pope. The urban nobles had set up a republic, which, under forms ostensibly modelled on antiquity (*e.g.* patriciate, *senatus populusque romanus*, &c.), concealed but clumsily a purely oligarchical government. Pope Eugenius III. and his adherents had been forced after a feeble resistance to resign themselves to exile at Viterbo. Arnold, after returning to Rome, immediately began a campaign of virulent denunciation against the Roman clergy, and, in particular, against the Curia, which he stigmatized as a "house of merchandise and den of thieves." His enemies have attributed to him certain doctrinal heresies, but their accusations do not bear examination. According to Otto of Freising (*Lib. de gestis Friderici*, bk. ii. chap. xx.) the whole of his teaching, outside the preaching of penitence, was summed up in these maxims:—"Clerks who have estates, bishops who hold fiefs, monks who possess property, cannot be saved." His eloquence gained him a hearing and a numerous following, including many laymen, but consisting principally of poor ecclesiastics, who formed around him a party characterized by a rigid morality and not unlike the Lombard Patarenes of the 11th century. But his purely political action was very restricted, and not to be compared with that of a Rienzi or a Savonarola. The Roman revolution availed itself of Arnold's popularity, and of his theories, but was carried out without his aid. His name was associated with this political reform solely because his was the only vigorous personality which stood out from the mass of rebels, and because he was the principal victim of the repression that ensued. On the 15th of July 1148 Eugenius III. anathematized Arnold and his adherents; but when, a short time afterwards, the pope, through the support of the king of Naples and the king of France, succeeded in entering Rome, Arnold remained in the town unmolested, under the protection of the senate. But in 1152 the German king Conrad III., whom the papal party and the Roman republic had in vain begged to intervene, was succeeded by Frederick I. Barbarossa. Frederick, whose authoritative temper was at once offended by the independent tone of the Arnoldist party, concluded with the pope a treaty of alliance (October 16, 1152) of such a nature that the Arnoldists were at once put in a minority in the Roman government; and when the second successor of Eugenius III., the energetic and austere Adrian IV.(the

Englishman, Nicholas Breakspear), placed Rome under an interdict, the senate, already rudely shaken, submitted, and Arnold was forced to fly into Campania (1155). At the request of the pope he was seized by order of the emperor Frederick, then in Italy, and delivered to the prefect of Rome, by whom he was condemned to death. In June 1155 Arnold was hanged, his body burnt, and the ashes were thrown into the Tiber. His death produced but a feeble sensation in Rome, which was already pacified, and passed almost unnoticed in Italy. The adherents of Arnold do not appear actually to have formed, either before or after his death, a heretical sect. It is probable that his adherents became merged in the communities of the Lombard Waldenses, who shared their ideas on the corruption of the clergy. Legend, poetry, drama and politics have from time to time been much occupied with the personality of Arnold of Brescia, and not seldom have distorted it, through the desire to see in him a hero of Italian independence and a modern democrat. He was before everything an ascetic, who denied to the church the right of holding property, and who occupied himself only as an accessory with the political and social consequences of his religious principles.

The bibliography of Arnold of Brescia is very vast and of very unequal value. The following works will be found useful: W. von Giesebrecht, *Arnold von Brescia* (Munich, 1873); G. Gaggia, *Arnaldo da Brescia* (Brescia, 1882); and notices by Vacandard in the *Revue des questions historiques* (Paris, 1884), pp. 52-114, by R. Breyer in the *Histor. Taschenbuch* (Leipzig, 1889), vol. viii. pp. 123-178, and by A. Hausrath in *Neue Heidelberg. Jahrb.* (1891), Band i. pp. 72-144. (P. A.)

ARNOLD, BENEDICT (1741–1801), American soldier, born in Norwich, Connecticut, on the 14th of January 1741. He was the great-grandson of Benedict Arnold (1615–1678), thrice colonial governor of Rhode Island between 1663 and 1678; and was the fourth in direct descent to bear the name. He received a fair education but was not studious, and his youth was marked by the same waywardness which characterized his whole career. At fifteen he ran away from home and took part in an expedition against the French, but, restless under restraint, he soon deserted and returned home. In 1762 he settled in New Haven, where he became the proprietor of a drug and book shop; and he subsequently engaged successfully in trade with the West Indies. Immediately after the battle of Lexington Arnold led the local militia company, of which he was captain, and additional volunteers to Cambridge, and on the 29th of April 1775 he proposed to the Massachusetts Committee of Safety an expedition against Crown Point and Ticonderoga. After a delay of four days the offer was accepted, and as a colonel of Massachusetts militia he was directed to enlist in the west part of Massachusetts and in the neighbouring colonies the men necessary for the undertaking. He was forestalled, however, by Ethan Allen (*q.v.*), acting on behalf of some members of the Connecticut Assembly. Under him, reluctantly waiving his own claim to command, Arnold served as a volunteer; and soon afterwards, Massachusetts having yielded to Connecticut, and having angered Arnold by sending a committee to make an inquiry into his conduct, he resigned and returned to Cambridge. He was then ordered to co-operate with General Richard Montgomery in the invasion of Canada, which he had been one of the first to suggest to the Continental Congress. Starting with 1100 men from Cambridge on the 17th of September 1775, he reached Gardiner, Maine, on the 20th, advanced through the Maine woods, and after suffering terrible privations and hardships, his little force, depleted by death and desertion, reached Quebec on the 13th of November. The garrison had been forewarned, and Arnold was compelled to await the coming of Montgomery from Montreal. The combined attack on the 31st of December 1775 failed; Montgomery was killed, and Arnold was severely wounded. Arnold, who had been commissioned a brigadier-general in January 1776, remained in Canada until the following June, being after April in command at Montreal.

Some time after the retreat from Canada, charges of misconduct and dishonesty, growing chiefly out of his seizure from merchants in Montreal of goods for the use of his troops, were brought against him; these charges were tardily investigated by the Board of War, which in a report made on the 23rd of May 1777, and confirmed by Congress, declared that his "character and conduct" had been "cruelly and groundlessly aspersed." Having constructed a flotilla on Lake Champlain, Arnold engaged a greatly superior British fleet near Valcour Island (October 11, 1776), and after inflicting severe loss on the enemy, made his escape under cover of night. Two days later he was overtaken by the British fleet, which however he, with only one war-vessel, and that crippled, delayed long enough to enable his other vessels to make good their escape, fighting with desperate valour and finally running his own ship aground and escaping to Crown Point. The engagement of the 11th was the first between British and American fleets. Arnold's brilliant exploits had drawn attention to him as one of the most promising of the Continental officers, and had won for him the friendship of Washington. Nevertheless, when in February 1777 Congress created five new major-generals, Arnold, although the ranking brigadier, was passed over, partly at least for sectional reasons—Connecticut had already two major-generals—in favour of his juniors. At this time it was only Washington's urgent persuasion that prevented Arnold from leaving the service. Two months later while he was at New Haven, Governor Tryon's descent on Danbury took place; and Arnold, who took command of the militia after the death of General Wooster, attacked the British with such vigour at Ridgefield (April 27, 1777) that they escaped to their ships with difficulty.

In recognition of this service Arnold was now commissioned major-general (his commission dating from 17th February) but without his former relative rank. After serving in New Jersey with Washington, he joined General Philip Schuyler in the Northern Department, and in August 1777 proceeded up the Mohawk Valley against Colonel St Leger, and raised the siege of Fort Stanwix (or Schuyler). Subsequently, after Gates had superseded Schuyler (August 19), Arnold commanded the American left wing in the first battle of Saratoga (September 19, 1777). His ill-treatment at the hands of General Gates, whose jealousy had been aroused, led to a quarrel which terminated in Arnold being relieved of command. He remained with the army, however, at the urgent request of his brother officers, and although nominally without command served brilliantly in the second battle of Saratoga (October 7, 1777), during which he was seriously wounded. For his services he was thanked by Congress, and received a new commission giving him at last his proper relative rank.

In June 1778 Washington placed him in command of Philadelphia. Here he soon came into conflict with the state authorities, jealous of any outside control. In the social life of Philadelphia, largely dominated by families of Loyalist sympathies, Arnold was the most conspicuous figure; he lived extravagantly, entertained lavishly, and in April 1779 took for his second wife, Margaret Shippen (1760–1804), the daughter of Edward Shippen (1729–1806), a moderate Loyalist, who eventually became reconciled to the new order and was in 1799-1805 chief-justice of the state. Early in February 1779 the executive council of Pennsylvania, presided over by Joseph Reed, one of his most persistent enemies, presented to Congress eight charges of misconduct against Arnold, none of which was of any great importance. Arnold at once demanded an investigation, and in March a committee of Congress made a report exonerating him; but Reed obtained a reconsideration, and in April 1779 Congress, though throwing out four charges, referred the other four to a court-martial. Despite Arnold's demand for a speedy trial, it was December before the court was convened. It was probably during this period of vexatious delay that Arnold, always sensitive and now incited by a keen sense of injustice, entered into a secret correspondence with Sir Henry Clinton with a view to joining the British service. On the 26th of January 1780 the court, before which Arnold had ably argued his own case, rendered its verdict, practically acquitting him of all intentional wrong, but, apparently in deference to the Pennsylvania authorities, directing Washington to reprimand him

for two trivial and very venial offences. Arnold, who had confidently expected absolute acquittal, was inflamed with a burning anger that even Washington's kindly reprimand, couched almost in words of praise, could not subdue.

It was now apparently that he first conceived the plan of betraying some important post to the British. With this in view he sought and obtained from Washington (August 1780) command of West Point, the key to the Hudson River Valley. Arnold's offers now became more explicit, and, in order to perfect the details of the plot, Clinton's adjutant-general, Major John André, met him near Stony Point on the night of the 21st of September. On the 23rd, while returning by land, André with incriminating papers was captured, and the officer to whom he was entrusted unsuspectingly sent information of his capture to Arnold, who was thus enabled to escape to the British lines. Arnold, commissioned a brigadier-general in the British army, received £6315 in compensation for his property losses, and was employed in leading an expedition into Virginia which burned Richmond, and in an attack upon New London (*q.v*) in September 1781. In December 1781 he removed to London and was consulted on American affairs by the king and ministry, but could obtain no further employment in the active service. Disappointed at the failure of his plans and embittered by the neglect and scorn which he met in England, he spent the years 1787–1791 at St John, New Brunswick, once more engaging in the West India trade, but in 1791 he returned to London, and after war had broken out between Great Britain and France, was active in fitting out privateers. Gradually sinking into melancholia, worn down by depression, and suffering from a nervous disease, he died at London on the 14th of June 1801.

Arnold had three sons—Benedict, Richard and Henry—by his first wife, and four sons—Edward Shippen, James Robertson, George and William Fitch—by his second wife; five of them, and one grandson, served in the British army. Benedict (1768–1795) was an officer of the artillery and was mortally wounded in the West Indies. Edward Shippen (1780–1813) became lieutenant of the Sixth Bengal Cavalry and later paymaster at Muttra, India. James Robertson (1781–1854) entered the corps of Royal Engineers in 1798, served in the Napoleonic wars, in Egypt and in the West Indies, and rose to the rank of lieutenant-general, was an aide-de-camp to William IV., and was created a knight of the Hanoverian Guelphic order and a knight of the Crescent. George (1787–1828) was a lieutenant-colonel in the Second Bengal Cavalry at the time of his death. William Fitch (1794–1828) became a captain in the Nineteenth Royal Lancers; his son, William Trail (1826–1855) served in the Crimean War as captain of the Fourth Regiment of Foot and was killed during the siege of Sevastopol.

Bibliography.—Jared Sparks' *Life and Treason of Benedict Arnold* (Boston, 1835), in his "Library of American Biography," is biassed and unfair. The best general account is Isaac Newton Arnold's *Life of Benedict Arnold* (Chicago, 1880), which, while offering no apologies or defence of his treason, lays perhaps too great emphasis on his provocations. Charles Burr Todd's *The Real Benedict Arnold* (New York, 1903) is a curious attempt to make Arnold's wife wholly responsible for his defection. François de Barbé-Marbois's *Complot d' Arnold et de Sir H. Clinton contre les États-Unis* (Paris, 1816) contains much interesting material, but is inaccurate. Two good accounts of the Canadian Expedition are Justin H. Smith's *Arnold's March from Cambridge to Quebec* (New York, 1903), which contains a reprint of Arnold's journal of the expedition; and John Codman's *Arnold's Expedition to Quebec* (New York, 1901). Arnold's *Letters on the Expedition to Canada* were printed in the Maine Historical Society's *Collections* for 1831 (repr. 1865). See also William Abbatt, *The Crisis of the Revolution* (New York, 1899); *The Northern Invasion of 1780* (Bradford Club Series, No. 6, New York, 1866); "The Treason of Benedict Arnold" (letters of Sir Henry Clinton to Lord George Germaine) in *Pennsylvania Magazine of History and Biography*, vol. xxii. (Philadelphia, 1898); and *Proceedings of a General Court Martial for the Trial of Major-General Arnold* (Philadelphia, 1780; reprinted with introduction and notes, New York, 1865).

ARNOLD, SIR EDWIN (1832–1904), British poet and journalist, was born on the 10th of June 1832, and was educated at the King's school, Rochester; King's College, London; and University College, Oxford, where in 1852 he gained the Newdigate prize for a poem on Belshazzar's feast. On leaving Oxford he became a schoolmaster, and went to India as principal of the government Sanskrit College at Poona, a post which he held during the mutiny of 1857, when he was able to render services for which he was publicly thanked by Lord Elphinstone in the Bombay council. Returning to England in 1861 he worked as a journalist on the staff of the *Daily Telegraph*, a newspaper with which he continued to be associated for more than forty years. It was he who, on behalf of the proprietors of the *Daily Telegraph* in conjunction with the *New York Herald*, arranged for the journey of H. M. Stanley to Africa to discover the course of the Congo, and Stanley named after him a mountain to the north-east of Albert Edward Nyanza. Arnold must also be credited with the first idea of a great trunk line traversing the entire African continent, for in 1874 he first employed the phrase "a Cape to Cairo railway" subsequently popularized by Cecil Rhodes. It was, however, as a poet that he was best known to his contemporaries. *The Light of Asia* appeared in 1879 and won an immediate success, going through numerous editions both in England and America. It is an Indian epic, dealing with the life and teaching of Buddha, which are expounded with much wealth of local colour and not a little felicity of versification. The poem contains many lines of unquestionable beauty; and its immediate popularity was rather increased than diminished by the twofold criticism to which it was subjected. On the one hand it was held by Oriental scholars to give a false impression of Buddhist doctrine; while, on the other, the suggested analogy between Sakyamuni and Christ offended the taste of some devout Christians. The latter criticism probably suggested to Arnold the idea of attempting a second narrative poem of which the central figure should be the founder of Christianity, as the founder of Buddhism had been that of the first. But though *The Light of the World* (1891), in which this idea took shape, had considerable poetic merit, it lacked the novelty of theme and setting which had given the earlier poem much of its attractiveness; and it failed to repeat the success attained by *The Light of Asia*. Arnold's other principal volumes of poetry were *Indian Song of Songs* (1875), *Pearls of the Faith* (1883), *The Song Celestial* (1885), *With Sadi in the Garden* (1888), *Potiphar's Wife* (1892) and *Adzuma* (1893). In his later years Arnold resided for some time in Japan, and his third wife was a Japanese lady. In *Seas and Lands* (1891) and *Japonica* (1892) he gives an interesting study of Japanese life. He received the order of C.S.I. on the occasion of the proclamation of Queen Victoria as empress of India in 1877, and in 1888 was created K.C.I.E. He also possessed decorations conferred by the rulers of Japan, Persia, Turkey and Siam. Sir Edwin Arnold died on the 24th of March 1904.

ARNOLD, GOTTFRIED (1666–1714), German Protestant divine, was born at Annaberg, in Saxony, where his father was a schoolmaster. In 1682 he went to the Gymnasium at Gera, and three years later to the university of Wittenberg. Here he made a special study of theology and history, and afterwards, through the influence of P. J. Spener, "the father of pietism," he became tutor in Quedlinburg. His first work, *Die Erste Liebe zu Christo*, to which in modern times attention was again directed by Leo Tolstoy, appeared in 1696. It went through five editions before 1728, and gained the author much reputation. In the year after its publication he was invited to Giessen as professor of church history. The life and work here, however, proved so distasteful to him that he resigned in 1698, and returned to Quedlinburg. In 1699 he began to publish his largest work, described by Tolstoy (*The Kingdom of God is within You*, chap. iii.) as "remarkable, although little known," *Unparteiische Kirchen- und Ketzerhistorie*, in which he has been thought by some to show more impartiality towards heresy than towards the Church (cp. Otto Pfleiderer, *Development of Theology*, p. 277). His next work, *Geheimniss der göttlichen Sophia*, published in 1700, seemed to indicate that he had developed a form of mysticism. Soon afterwards, however, his acceptance of a pastorate marked a change, and he produced a number of noteworthy works on practical theology. He was also known as the author

of sacred poems. Gottfried Arnold has rightly been classed with the pietistic section of Protestant historians (*Bibliotheca Sacra*, 1850).

See Calwer-Zeller, *Theologisches Handwörterbuch*, and the account of him in Albert Knapp's new edition of *Die erste Liebe zu Christo* (1845).

ARNOLD, MATTHEW (1822–1888), English poet, literary critic and inspector of schools, was born at Laleham, near Staines, on the 24th of December 1822. When it is said that he was the son of the famous Dr Arnold of Rugby, and that Winchester, Rugby and Balliol College, Oxford, contributed their best towards his education, it seems superfluous to add that, in estimating Matthew Arnold and his work, training no less than original endowment has to be considered. A full academic training has its disadvantages as well as its gains. In the individual no less than in the species the history of man's development is the history of the struggle between the impulse to express original personal force and the impulse to make that force bow to the authority of custom. Where in any individual the first of these impulses is stronger than usual, a complete academic training is a gain; but where the second of these impulses is the dominant one, the effect of the academic habit upon the mind at its most sensitive and most plastic period is apt to be crippling. In regard to Matthew Arnold, it would be a bold critic of his life and his writings who should attempt to say what his work would have been if his training had been different. In his judgments on Goethe, Wordsworth, Byron, Shelley and Hugo, it may be seen how strong was his impulse to bow to authority. On the other hand, in Arnold's ingenious reasoning away the conception of Providence to "a stream of tendency not ourselves which makes for righteousness," we see how strong was his natural impulse for taking original views. The fact that the very air Arnold breathed during the whole of the impressionable period of his life was academic is therefore a very important fact to bear in mind.

In one of his own most charming critical essays he contrasts the poetry of Homer, which consists of "natural thoughts in natural words," with the poetry of Tennyson, which consists of "distilled thoughts in distilled words." "Distilled" is one of the happiest words to be found in poetical criticism, and may be used with equal aptitude in the criticism of life. To most people the waters of life come with all their natural qualities—sweet or bitter—undistilled. Only the ordinary conditions of civilization, common to all, flavoured the waters of life to Shakespeare, to Cervantes, to Burns, to Scott, to Dumas, and those other great creators whose minds were mirrors—broad and clear—for reflecting the rich drama of life around them. To Arnold the waters of life came distilled so carefully that the wonder is that he had any originality left. A member of the upper stratum of that "middle class" which he despised, or pretended to despise—the eldest son of one of the most accomplished as well as one of the most noble-tempered men of his time—Arnold from the moment of his birth drank the finest distilled waters that can be drunk even in these days. Perhaps, on the whole, the surprising thing is how little he suffered thereby. Indeed those who had formed an idea of Arnold's personality from their knowledge of his "culture," and especially those who had been delighted by the fastidious and feminine delicacy of his prose style, used to be quite bewildered when for the first time they met him at a dinner-table or in a friend's smoking-room. His prose was so self-conscious that what people expected to find in the writer was the Arnold as he was conceived by certain "young lions" of journalism whom he satirized—a somewhat over-cultured *petit-maître*—almost, indeed, a coxcomb of letters. On the other hand, those who had been captured by his poetry expected to find a man whose sensitive organism responded nervously to every uttered word as an aeolian harp answers to the faintest breeze. What they found was a broad-shouldered, manly—almost burly—Englishman with a fine countenance, bronzed by the open air of England, wrinkled apparently by the sun, wind-worn as an English skipper's, open and frank as a fox-hunting squire's—and yet a countenance whose finely chiselled features were as high-bred and as commanding as Wellington's or Sir Charles Napier's. The voice they heard was deep-toned, fearless, rich and frank, and yet modulated to express every *nuance* of thought, every movement of emotion and humour. In his prose essays the humour he showed was of a somewhat thin-lipped kind; in his more important poems he showed none at all. It was here, in this matter of humour, that Arnold's writings were specially misleading as to the personality of the man. Judged from his poems, it was not with a poet like the writer of "The Northern Farmer," or a poet like the writer of "Ned Bratts," that any student of poetry would have dreamed of classing him. Such a student would actually have been more likely to class him with two of his contemporaries between whom and himself there were but few points in common, the "humourless" William Morris and the "humourless" Rossetti. For, singularly enough, between him and them there was this one point of resemblance: while all three were richly endowed with humour, while all three were the very lights of the sets in which they moved, the moment they took pen in hand to write poetry they became sad. It would almost seem as if, like Rossetti, Arnold actually held that poetry was not the proper medium for humour. No wonder, then, if the absence of humour in his poetry did much to mislead the student of his work as to the real character of the man.

After a year at Winchester, Matthew Arnold entered Rugby school in 1837. He early began to write and print verses. His first publication was a Rugby prize poem, *Alaric at Rome*, in 1840. This was followed in 1843, after he had gone up to Oxford in 1840 as a scholar of Balliol, by his poem *Cromwell*, which won the Newdigate prize. In 1844 he graduated with second-class honours, and in 1845 was elected a fellow of Oriel College, where among his colleagues was A. H. Clough, his friendship with whom is commemorated in that exquisite elegy *Thyrsis*. From 1847 to 1851 he acted as private secretary to Lord Lansdowne; and in the latter year, after acting for a short time as assistant-master at Rugby, he was appointed to an inspectorship of schools, a post which he retained until two years before his death. He married, in June 1851, the daughter of Mr Justice Wightman. Meanwhile, in 1849, appeared *The Strayed Reveller, and other Poems, by A*, a volume which gained a considerable esoteric reputation. In 1852 he published another volume under the same initial, *Empedocles on Etna, and other Poems*. *Empedocles* is as undramatic a poem perhaps as was ever written in dramatic form, but studded with lyrical beauties of a very high order. In 1853 Arnold published a volume of *Poems* under his own name. This consisted partially of poems selected from the two previous volumes. A second series of poems, which contained, however, only two new ones, was published in 1855. So great was the impression made by these in academic circles, that in 1857 Arnold was elected professor of poetry at Oxford, and he held the chair for ten years. In 1858 he published his classical tragedy, *Merope*. Nine years afterwards his *New Poems* (1867) were published. While he held the Oxford professorship he published several series of lectures, which gave him a high place as a scholar and critic. The essays[1] *On Translating Homer: Three Lectures given at Oxford*, published in 1861, supplemented in 1862 by *On Translating Homer: Last Words*, a fourth lecture given in reply to F. W. Newman's *Homeric Translation in Theory and Practice* (1861), and *On the Study of Celtic Literature*, published in 1867, were full of subtle and brilliant if not of profound criticism. So were the two series of *Essays in Criticism*, the first of which, consisting of articles reprinted from various reviews, appeared in 1865. The essay on "A Persian Passion Play" was added in the editions of 1875; and a second series, edited by Lord Coleridge, appeared in 1888.

Arnold's poetic activity almost ceased after he left the chair of poetry at Oxford. He was several times sent by government to make inquiries into the state of education in France, Germany, Holland and other countries; and his reports, with their thorough-going and searching criticism of continental methods,

[1] These essays were edited in 1905 with an introduction by W. H. D. Rouse.

as contrasted with English methods, showed how conscientiously he had devoted some of his best energies to the work. His fame as a poet and a literary critic has somewhat overshadowed the fact that he was during thirty-five years of his life—from 1851 to 1886—employed in the Education Department as one of H.M. inspectors of schools, while his literary work was achieved in such intervals of leisure as could be spared from the public service. At the time of his appointment the government, by arrangement with the religious bodies, entrusted the inspection of schools connected with the Church of England to clergymen, and agreed also to send Roman Catholic inspectors to schools managed by members of that communion. Other schools—those of the British and Foreign Society, the Wesleyans, and undenominational schools generally—were inspected by laymen, of whom Arnold was one. There were only three or four of these officers at first, and their districts were necessarily large. It is to the experience gained in intercourse with Nonconformist school managers that we may attribute the curiously intimate knowledge of religious sects which furnished the material for some of his keen though good-humoured sarcasms. The Education Act of 1870, which simplified the administrative system, abolished denominational inspection, and thus greatly reduced the area assigned to a single inspector. Arnold took charge of the district of Westminster, and remained in that office until his resignation, taking also an occasional share in the inspection of training colleges for teachers, and in conferences at the central office. His letters, *passim*, show that some of the routine which devolved upon him was distasteful, and that he was glad to entrust to a skilled assistant much of the duty of individual examination and the making up of schedules and returns. But the influence he exerted on schools, on the department, and on the primary education of the whole country, was indirectly far greater than is generally supposed. His annual reports, of which more than twenty were collected into a volume by his friend and official chief, Sir Francis (afterwards Lord) Sandford, attracted, by reason of their freshness of style and thought, much more of public attention than is usually accorded to blue-book literature; and his high aims, and his sympathetic appreciation of the efforts and difficulties of the teachers, had a remarkable effect in raising the tone of elementary education, and in indicating the way to improvement. In particular, he insisted on the formative elements of school education, on literature and the "humanities," as distinguished from the collection of scraps of information and "useful knowledge"; and he sought to impress all the young teachers with the necessity of broader mental cultivation than was absolutely required to obtain the government certificate. In his reports also he dwelt often and forcibly on the place which the study of the Bible, not the distinctive formularies of the churches, ought to hold in English schools. He urged that besides the religious and moral purposes of Scriptural teaching, it had a literary value of its own, and was the best instrument in the hands even of the elementary teacher for uplifting the soul and refining and enlarging the thoughts of young children.

On three occasions Arnold was asked to assist the government by making special inquiries into the state of education in foreign countries. These duties were especially welcome to him, serving as they did as a relief from the monotony of school inspection at home, and as opportunities for taking a wider survey of the whole subject of education, and for expressing his views on principles and national aims as well as administrative details. In 1859, as foreign assistant commissioner, he prepared for the duke of Newcastle's commission to inquire into the subject of elementary education a report (printed 1860) which was afterwards reprinted (1861) in a volume entitled *The Popular Education of France, with Notices of that of Holland and Switzerland.* In 1865 he was again employed as assistant-commissioner by the Schools Inquiry Commission under Lord Taunton; and his report on this subject, *On Secondary Education in Foreign Countries* (1866), was subsequently reprinted under the title *Schools and Universities on the Continent* (1868). Twenty years later he was sent by the Education Department to make special inquiries on certain specified points, *e.g.* free education, the status and training of teachers, and compulsory attendance at schools. The result of this investigation appeared as a parliamentary paper, *Special Report on certain points connected with Elementary Education in Germany, Switzerland and France,* in 1886. He also contributed the chapter on "Schools" (1837–1887) to the second volume of Mr Humphry Ward's *Reign of Queen Victoria.* Part of his official writings may be studied in *Reports for Elementary Schools* (1852–1882), edited by Sir F. Sandford in 1889.

All these reports form substantial contributions to the history and literature of education in the Victorian age. They have been quoted often, and have exercised marked influence on subsequent changes and controversies. One great purpose underlies them all. It is to bring home to the English people a conviction that education ought to be a national concern, that it should not be left entirely to local, or private, or irresponsible initiative, that the watchful jealousy so long shown by Liberals, and especially by Nonconformists, in regard to state action was a grave practical mistake, and that in an enlightened democracy, animated by a progressive spirit and noble and generous ideals, it was the part of wisdom to invoke the collective power of the state to give effect to those ideals. To this theme he constantly recurred in his essays, articles and official reports. "*Porro unum est necessarium.* One thing is needful; organize your secondary education."

In 1883 a pension of £250 was conferred on Arnold in recognition of his literary merits. In the same year he went to the United States on a lecturing tour, and again in 1886, his subjects being "Emerson" and the "Principles and Value of Numbers." The success of these lectures, though they were admirable in matter and form, was marred by the lecturer's lack of experience in delivery. It is sufficient, further, to say that *Culture and Anarchy: an Essay in Political and Social Criticism,* appeared in 1869; *St Paul and Protestantism, with an Introduction on Puritanism and the Church of England* (1870); *Friendship's Garland: being the Conversations, Letters and Opinions of the late Arminius Baron von Thunder-ten-Tronckh* (1871); *Literature and Dogma: an Essay towards a Better Apprehension of the Bible* (1873); *God and the Bible: a Review of Objections to Literature and Dogma* (1875); *Last Essays on Church and Religion* (1877); *Mixed Essays* (1879); *Irish Essays and Others* (1882); *Discourses in America* (1885). Such essays as the first of these, embodying as they did Arnold's views of theological and polemical subjects, attracted much attention at the time of their publication, owing to the state of the intellectual atmosphere at the moment; but it is doubtful, perhaps, whether they will be greatly considered in the near future. Many severe things have been said, and will be said, concerning the inadequacy of poets like Coleridge and Wordsworth when confronting subjects of a theological or philosophical kind. Wordsworth's High Church Pantheism and Coleridge's disquisitions on the Logos seem farther removed from the speculations of to-day than do the dreams of Lucretius. But these two great writers lived before the days of modern science. Arnold, living only a few years later, came at a transition period when the winds of tyrannous knowledge had blown off the protecting roof that had covered the centuries before, but when time and much labour were needed to build another roof of new materials—a period when it was impossible for the poet to enjoy either the quietism of High Church Pantheism in which Wordsworth had basked, or the sheltering protection of German metaphysics under which Coleridge had preached—a period, nevertheless, when the wonderful revelations of science were still too raw, too cold and hard, to satisfy the yearnings of the poetic soul. Objectionable as Arnold's rationalizing criticism was to contemporary orthodoxy, and questionable as was his equipment in point of theological learning, his spirituality of outlook and ethical purpose were not to be denied. Yet it is not Arnold's views that have become current coin so much as his literary phrases—his craving for "culture" and "sweetness and light," his contempt for "the dissidence of Dissent and the Protestantism

of the Protestant religion," his "stream of tendency not ourselves making for righteousness," his classification of "Philistines and barbarians"—and so forth. His death at Liverpool, of heart failure on the 15th of April 1888, was sudden and quite unexpected.

Arnold was a prominent figure in that great galaxy of Victorian poets who were working simultaneously—Tennyson, Browning, Rossetti, William Morris and Swinburne—poets between whom there was at least this connecting link, that the quest of all of them was the old-fashioned poetical quest of the beautiful. Beauty was their watchword, as it had been the watchword of their immediate predecessors—Wordsworth, Coleridge, Keats, Shelley and Byron. That this group of early 19th-century poets might be divided into two—those whose primary quest was physical beauty, and those whose primary quest was moral beauty—is no doubt true. Still, in so far as beauty was their quest they were all akin. And so with the Victorian group to which Arnold belonged. As to the position which he takes among them opinions must necessarily vary. On the whole, his place in the group will be below all the others. The question as to whether he was primarily a poet or a *prosateur* has been often asked. If we were to try to answer that question here, we should have to examine his poetry in detail—we should have to inquire whether his primary impulse of expression was to seize upon the innate suggestive power of words, or whether his primary impulse was to rely upon the logical power of the sentence. In nobility of temper, in clearness of statement, and especially in descriptive power, he is beyond praise. But intellect, judgment, culture and study of great poets may do much towards enabling a prose-writer to write what must needs be called good poetry. What they cannot enable him to do is to produce those magical effects which poets of the rarer kind can achieve by seizing that mysterious, suggestive power of words which is far beyond all mere statement. Notwithstanding the exquisite work that Arnold has left behind him, some critics have come to the conclusion that his primary impulse in expression was that of the poetically-minded *prosateur* rather than that of the born poet. And this has been said by some who nevertheless deeply admire poems like "The Scholar Gypsy," "Thyrsis," "The Forsaken Merman," "Dover Beach," "Heine's Grave," "Rugby Chapel," "The Grande Chartreuse," "Sohrab and Rustum," "The Sick King in Bokhara," "Tristram and Iseult," &c. It would seem that a man may show all the endowments of a poet save one, and that one the most essential—the instinctive mastery over metrical effects.

In all literary expression there are two kinds of emphasis, the emphasis of sound and the emphasis of sense. Indeed the difference between those who have and those who have not the true rhythmic instinct is that, while the former have the innate faculty of making the emphasis of sound and the emphasis of sense meet and strengthen each other, the latter are without that faculty. But so imperfect is the human mind that it can rarely apprehend or grasp simultaneously these two kinds of emphasis. While to the born *prosateur* the emphasis of sense comes first, and refuses to be more than partially conditioned by the emphasis of sound, to the born poet the emphasis of sound comes first, and sometimes will, even as in the case of Shelley, revolt against the tyranny of the emphasis of sense. Perhaps the very origin of the old quantitative metres was the desire to make these two kinds of emphasis meet in the same syllable. In manipulating their quantitative metrical system the Greeks had facilities for bringing one kind of emphasis into harmony with the other such as are unknown to writers in accentuated metres. This accounts for the measureless superiority of Greek poetry in verbal melody as well as in general harmonic scheme to all the poetry of the modern world. In writers so diverse in many ways as Homer, Æschylus, Sophocles, Pindar, Sappho, the harmony between the emphasis of sound and the emphasis of sense is so complete that each of these kinds of emphasis seems always begetting, yet always born of the other. When in Europe the quantitative measures were superseded by the accentuated measures a reminiscence was naturally and inevitably left behind of the old system; and the result has been, in the English language at least, that no really great line can be written in which the emphasis of accent, the emphasis of quantity and the emphasis of sense do not meet on the same syllable. Whenever this junction does not take place the weaker line, or lines, are always introduced, not for makeshift purposes, but for variety, as in the finest lines of Milton and Wordsworth. Wordsworth no doubt seems to have had a theory that the accent of certain words, such as "without," "within," &c., could be disturbed in an iambic line; but in his best work he does not act upon his theory, and endeavours most successfully to make the emphasis of accent, of quantity and of sense meet. It might not be well for a poem to contain an entire sequence of such perfect lines as

"I thought of Chatterton, the marvellous boy,"

or

"Thy soul was like a star and dwelt apart,"

for then the metricist's art would declare itself too loudly and weaken the imaginative strength of the picture. But such lines should no doubt form the basis of the poem, and weaker lines—lines in which there is no such combination of the three kinds of emphasis—should be sparingly used, and never used for makeshift purposes. Now, neither by instinct nor by critical study was Arnold ever able to apprehend this law of prosody. If he does write a line of the first order, metrically speaking, he seems to do so by accident. Such weak lines as these are constantly occurring—

"The poet, to whose mighty heart
Heaven doth a quicker pulse impart,
Subdues that energy to scan
Not his own course, but that of man."

Much has been said about what is called the "Greek temper" of Matthew Arnold's muse. A good deal depends upon what it meant by the Hellenic spirit. But if the Greek temper expresses itself, as is generally supposed, in the sweet acceptance and melodious utterance of the beauty of the world as it is, accepting that beauty without inquiring as to what it means and as to whither it goes, it is difficult to see where in Arnold's poetry this temper declares itself. Surely it is not in *Empedocles on Etna*, and surely it is not in *Merope*. If there is a poem of his in which one would expect to find the joyous acceptance of life apart from questionings about the civilization in which the poet finds himself environed (its hopes, its fears, its aspirations and its failures)—such questionings, in short, as were for ever vexing Arnold's soul—it would be in "The Scholar Gypsy," a poem in which the poet tries to throw himself into the mood of a "Romany Rye." The great attraction of the gypsies to Englishmen of a certain temperament is that they alone seem to feel the joyous acceptance of life which is supposed to be specially Greek. Hence it would have been but reasonable to look, if anywhere, for the expression of Arnold's Greek temper in a poem which sets out to describe the feelings of the student who, according to Glanville's story, left Oxford to wander over England with the Romanies. But instead of this we got the old fretting about the unsatisfactoriness of modern civilization. Glanville's Oxford student, whose story is glanced at now and again in the poem, flits about in the scenery like a cloud-shadow on the grass; but the way in which Arnold contrives to avoid giving us the faintest idea either dramatic or pictorial of the student about whom he talks so much, and the gypsies with whom the student lived, is one of the most singular feats in poetry. The reflections which come to a young Oxonian lying on the grass and longing to escape life's fitful fever without shuffling off this mortal coil, are, no doubt, beautiful reflections beautifully expressed, but the temper they show is the very opposite of the Greek. To say this is not in the least to disparage Arnold. "A man is more like the age in which he lives," says the Chinese aphorism, "than he is like his own father and mother," and Arnold's polemical writings alone are sufficient to show that the waters of life he drank were from fountains distilled, seven times distilled, at the topmost slope of 19th-century civilization. Mr George Meredith's "Old Chartist" exhibits far more of the temper of acceptance than does any poem by Matthew Arnold.

His most famous critical dictum is that poetry is a "criticism

of life." What he seems to have meant is that poetry is the crowning fruit of a criticism of life; that just as the poet's metrical effects are and must be the result of a thousand semi-conscious generalizations upon the laws of cause and effect in metric art, so the beautiful things he says about life and the beautiful pictures he paints of life are the result of his generalizations upon life as he passes through it, and consequently that the value of his poetry consists in the beauty and the truth of his generalizations. But this is saying no more than is said in the line—

" Rien n'est beau que le vrai; le vrai seul est aimable "—

or in the still more famous lines—

" ' Beauty is truth, truth beauty,'—that is all
Ye know on earth, and all ye need to know."

To suppose that Arnold confounded the poet with the writer of *pensées* would be absurd. Yet having decided that poetry consists of generalizations on human life, in reading poetry he kept on the watch for those generalizations, and at last seemed to think that the less and not the more they are hidden behind the dramatic action, and the more unmistakably they are intruded as generalizations, the better. For instance, in one of his essays he quotes those lines from the " Chanson de Roland " of Turoldus, where Roland, mortally wounded, lays himself down under a pine-tree with his face turned towards Spain and the enemy, and begins to " call many things to remembrance; all the lands which his valour conquered, and pleasant France, and the men of his lineage, and Charlemagne, his liege lord, who nourished him "—

" De plusurs choses à remembrer li prist,
De tantes teres cume li bers cunquist,
De dulce France, des humes de sun ligu,
De Carlemagne sun seignor ki l'nurrit."

" That," says Arnold, " is primitive work, I repeat, with an undeniable poetic quality of its own. It deserves such praise, and such praise is sufficient for it." Then he contrasts it with a famous passage in Homer—that same passage which is quoted in the article POETRY, for the very opposite purpose to that of Arnold's, quoted indeed to show how the epic poet, leaving the dramatic action to act as chorus, weakens the *ἀπάτη* of the picture—the passage in the *Iliad* (iii. 243-244) where the poet, after Helen's pathetic mention of her brother's comments on the causes of their absence, " criticizes life " and generalizes upon the impotence of human intelligence, the impotence even of human love, to pierce the darkness in which the web of human fate is woven. He appends Dr Hawtrey's translation:—

Ὣς φάτο· τοὺς δ' ἤδη κάτεχεν φυσίζοος αἶα
ἐν Λακεδαίμονι αὖθι, φίλῃ ἐν πατρίδι γαίῃ.

" So said she; they long since in Earth's soft arms were reposing
There, in their own dear land, their fatherland, Lacedaemon."

" We are here," says Arnold, " in another world, another order of poetry altogether; here is rightly due such supreme praise as that which M. Vitel gives to the *Chanson de Roland*. If our words are to have any meaning, if our judgments are to have any solidity, we must not heap that supreme praise upon poetry of an order immeasurably inferior." He does not see that the two passages cannot properly be compared at all. In the one case the poet gives us a dramatic picture; in the other, a comment on a dramatic picture.

Perhaps, indeed, the place Arnold held and still holds as a critic is due more to his exquisite felicity in expressing his views than to the penetration of his criticism. Nothing can exceed the easy grace of his prose at the best. It is conversational and yet absolutely exact in the structure of the sentences; and in spite of every vagary, his distinguishing note is urbanity. Keen-edged as his satire could be, his writing for the most part is as urbane as Addison's own. His influence on contemporary criticism and contemporary ideals was considerable, and generally wholesome. His insistence on the necessity of looking at " the thing in itself," and the need for acquainting oneself with " the best that has been thought and said in the world," gave a new stimulus alike to originality and industry in criticism; and in his own selection of subjects—such as *Joubert*, or the *de Guêrins*—he opened a new world to a larger class of the better sort of readers, exercising in this respect an awakening influence in his own time akin to that of Walter Pater a few years afterwards. The comparison with Pater might indeed be pressed further, and yet too far. Both were essentially products of Oxford. But Arnold, whose description of that " home of lost causes, and forsaken beliefs, and unpopular names, and impossible loyalties," is in itself almost a poem, had a classical austerity in his style that savoured more intimately of Oxford tradition, and an ethical earnestness even in his most flippant moments which kept him notably aloof from the more sensuous school of aesthetics.

The first collected edition of Arnold's poems was published in 1869 in two volumes, the first consisting of *Narrative and Elegiac Poems*, and the second of *Dramatic and Lyric Poems*. Other editions appeared in 1877, 1881; a library edition (3 vols., 1885); a one-volume reprint of the poems printed in the library edition with one or two additions (1890). Publications by Matthew Arnold not mentioned in the foregoing article include: *England and the Italian Question* (1859), a pamphlet; *A French Eton; or, Middle Class Education and the State* (1864); *Higher Schools and Universities in Germany* (1874), a partial reprint from *Schools and Universities on the Continent* (1868); *A Bible Reading for Schools*; *The Great Prophecy of Israel's Restoration*, an arrangement of *Isaiah*, chs. xl.-lxvi. (1872), republished with additions and varying titles in 1875 and 1883; an edition of the *Six Chief Lives from Johnson's Lives of the Poets* (1878); editions of the *Poems of Wordsworth* (1879), and the *Poetry of Byron* (1881), for the Golden Treasury Series, with prefatory essays reprinted in the second series of *Essays in Criticism*; an edition of *Letters, Speeches and Tracts on Irish Affairs by Edmund Burke* (1881); and many contributions to periodical literature. *The Letters of Matthew Arnold* (1848–1888) were collected and arranged by George W. E. Russell in 1895, reprinted 1901. *Matthew Arnold's Note Books, with a Preface by the Hon. Mrs Wodehouse*, appeared in 1902. A complete and uniform edition of *The Works of Matthew Arnold* (15 vols., 1904–1905) includes the letters as edited by Mr Russell. Vol. iii. contains a complete bibliography of his works, many of the early editions of which are very valuable, by Mr T. B. Smart, who published a separate bibliography in 1892. A valuable note on the rather complicated subject of Arnold's bibliography is given by Mr H. Buxton Forman in Arnold's *Poems, Narrative, Elegiac and Lyric* (Temple Classics, 1900).

It was Arnold's expressed desire that his biography should not be written, and before his letters were published they underwent considerable editing at the hands of his family. There are, however, monographs on Matthew Arnold (1899) in *Modern English Writers* by Prof. Saintsbury, and by Mr H. W. Paul (1902), in the English Men of Letters Series. These two works are supplemented by Mr G. W. E. Russell, who, as the editor of Arnold's letters, is in a sense the official biographer, in *Matthew Arnold* (1904, Literary Lives Series). There are also studies of Arnold in Mr J. M. Robertson's *Modern Humanists* (1891), and in W. H. Hudson's *Studies in Interpretation* (1896), in Sir J. G. Fitch's *Thomas and Matthew Arnold* (1897), and a review of some of the works above mentioned in the *Quarterly* for January 1905 by T. H. Warren. (T. W.-D.; J. G. F.)

ARNOLD, SAMUEL (1740–1802), English composer, was born at London on the 10th of August 1740. He received a thorough musical education at the Chapel Royal, and when little more than twenty years of age was appointed composer at Covent Garden theatre. Here, in 1765, he produced his popular opera, *The Maid of the Mill*, many of the songs in which were selected from the works of Italian composers. In 1776 he transferred his services to the Haymarket theatre. In 1783 he was made composer to George III. Between 1765 and 1802 he wrote as many as forty-three operas, after-pieces and pantomimes, of which the best were *The Maid of the Mill, Rosamond, Inkle and Yarico, The Battle of Hexham, The Mountaineers*. His oratorios included *The Cure of Saul* (1767), *Abimelech* (1768), *The Resurrection* (1773), *The Prodigal Son* (1777) and *Elisha* (1795). In 1783 he became organist to the Chapel Royal. In 1786 he began an edition of Handel's works, which extended to 40 volumes, but was never completed. In 1793 he became organist of Westminster Abbey, where he was buried after his death on the 22nd of October 1802. Arnold is chiefly remembered now for the publication of his *Cathedral Music, being a collection in score of the most valuable and useful compositions for that service by the several English masters of the last 200 years* (1790).

ARNOLD, THOMAS (1795–1842), English clergyman and headmaster of Rugby school, was born at West Cowes, in the Isle of Wight, on the 13th of June 1795. He was the son of William and Martha Arnold, the former of whom occupied the

situation of collector of customs at Cowes. His father died suddenly of spasm in the heart in 1801, and his early education was confided by his mother to her sister, Miss Delafield. From her tuition he passed to that of Dr Griffiths, at Warminster, in Wiltshire, in 1803; and in 1807 he was removed to Winchester, where he remained until 1811, having entered as a commoner, and afterwards become a scholar of the college. In after life he retained a lively feeling of interest in Winchester school, and remembered with admiration and profit the regulative tact of Dr Goddard, and the preceptorial ability of Dr Gabell, who were successively head-masters during his stay there.

From Winchester he removed to Oxford in 1811, where he became a scholar at Corpus Christi College; in 1815 he was elected fellow of Oriel College; and there he continued to reside until 1819. This interval was diligently devoted to the pursuit of classical and historical studies, to preparing himself for ordination, and to searching investigations, under the stimulus of continual discussion with a band of talented and congenial associates, of the profoundest questions in theology, ecclesiastical polity and social philosophy. The authors he most carefully studied at this period were Thucydides and Aristotle, and for their writings he formed an attachment which remained to the close of his life, and exerted a powerful influence upon his mode of thought and opinions, as well as upon his literary occupations in subsequent years. Herodotus also came in for a considerable share of his regard, but more, apparently, for recreation than for work. Accustomed freely and fearlessly to investigate whatever came before him, and swayed by a scrupulous dread of insincerity, he was doomed to long and anxious hesitation concerning some of the fundamental points of theology before arriving at a firm conviction of the truth of Christianity. Once satisfied, however, his faith remained clear and firm; and thenceforward his life became that of a supremely *religious* man.

To the name of Christ he was prepared to "surrender his whole soul," and to render before it "obedience, reverence without measure, intense humility, most unreserved adoration" (*Sermons*, vol. iv. p. 210). He did not often talk about religion; he had not much of the accredited phraseology of piety even when he discoursed on spiritual topics; but more than most men he was directed by religious principle and feeling in all his conduct. He left Oxford in 1819 and settled at Laleham, near Staines, where he took pupils for the university. His spare time was devoted to the prosecution of studies in philology and history, more particularly to the study of Thucydides, and of the new light which had been cast upon Roman history and upon historical method in general by the researches of Niebuhr. He was also occasionally engaged in preaching, and it was whilst here that he published the first volume of his sermons. Shortly after he settled at Laleham, he married Mary, youngest daughter of the Rev. John Penrose, rector of Fledborough, Nottinghamshire. After nine years spent at Laleham he was induced to offer himself as a candidate for the vacant head-mastership of Rugby; and though he entered somewhat late upon the contest, and though none of the electors was personally known to him, he was elected in December 1827. In June 1828 he received priest's orders; in April and November of the same year he took his degrees of B.D. and D.D., and in August entered on his new office.

In one of the testimonials which accompanied his application to the trustees of Rugby, the writer stated it as his conviction that "if Mr Arnold were elected, he would change the face of education all through the public schools of England." This somewhat hazardous pledge was nobly redeemed. Under Arnold's superintendence the school became not merely a place where a certain amount of classical or general learning was to be obtained, but a sphere of intellectual, moral and religious discipline, where healthy characters were formed, and men were trained for the duties, and struggles and responsibilities of life. His energies were chiefly devoted to the business of the school; but he found time also for much literary work, as well as for an extensive correspondence. Five volumes of sermons, an edition of Thucydides, with English notes and dissertations, a History of Rome in three vols. 8vo, beside numerous articles in reviews, journals, newspapers and encyclopaedias, are extant to attest the untiring activity of his mind, and his patient diligence during this period. His interest also in public matters was incessant, especially ecclesiastical questions, and such as bore upon the social welfare and moral improvement of the masses.

In 1841, after fourteen years at Rugby, Dr Arnold was appointed by Lord Melbourne, then prime minister, to the chair of modern history at Oxford. On the 2nd of December 1841 he delivered his inaugural lecture. Seven other lectures were delivered during the first three weeks of the Lent term of 1842. When the midsummer vacation arrived, he was preparing to set out with his family to Fox How in Westmoreland, where he had purchased some property and built a house. But he was suddenly attacked by angina pectoris, and died on Sunday, the 12th of June 1842. His remains were interred on the following Friday in the chancel of Rugby chapel, immediately under the communion table.

The great peculiarity and charm of Dr Arnold's nature seemed to lie in the supremacy of the moral and the spiritual element over his whole being. He was not a notable scholar, and he had not much of what is usually called tact in his dealings either with the juvenile or the adult mind. What gave him his power, and secured for him so deeply the respect and veneration of his pupils and acquaintances, was the intensely religious character of his whole life. He seemed ever to act from a severe and lofty estimate of duty. To be just, honest and truthful, he ever held to be the first aim of his being.

His *Life* was written by Dean Stanley (1845).

ARNOTT, NEIL (1788–1874), Scottish physician, was born at Arbroath on the 15th of May 1788. He studied medicine first at Aberdeen, and subsequently in London under Sir Everard Home (1756–1832), through whom he obtained, while yet in his nineteenth year, the appointment of full surgeon to an East Indiaman. After making two voyages to China he settled in 1811 to practise in London, and speedily acquired high reputation in his profession. Within a few years he was made physician to the French and Spanish embassies, and in 1837 he became a physician extraordinary to the queen. From his earliest youth Arnott had an intense love of natural philosophy, and to this was added an inventiveness which served him in good stead in his profession and yielded the "Arnott water-bed," the "Arnott ventilator," the "Arnott stove," &c. He was the author of several works bearing on physical science or its applications, the most important being his *Elements of Physics* (1827), which went through six editions in his lifetime. In 1838 he published a treatise on *Warming and Ventilating*, and, in 1855, one on the *Smokeless Fireplace*. He was a strong advocate of scientific, as opposed to purely classical, education; and he manifested his interest in natural philosophy by the gift of £2000 to each of the four universities of Scotland and to the university of London, to promote its study in the experimental and practical form. He died in London on the 2nd of March 1874.

ARNOULD-PLESSY, JEANNE SYLVANIE (1819–1897), French actress, was born in Metz on the 7th of September 1819, the daughter of a local actor named Plessy. She was a pupil of Samson at the Conservatoire in 1829, and made her *début* as Emma at the Comédie Française in 1834 in Alexandre Duval's *La Fille d'honneur*. She had an immense success, and Mlle Mars, to whom the public already compared her, took her up. Until 1845 she had prominent parts in all the plays, new and old, at the Théâtre Français, when suddenly at the height of her success, she left Paris and went to London, marrying the dramatic author, J. F. Arnould (d. 1854), a man much older than herself. The Comédie Française, after having tried in vain to bring her back, brought a suit against her, and obtained heavy damages. In the meantime Madame Arnould-Plessy accepted an engagement at the French theatre at St Petersburg, where she played for nine years. In 1855 she returned to Paris and was re-admitted to the Comédie Française, as *pensionnaire* with an engagement for eight years. This second part of her career was even more brilliant than the first. She revived some of her old rôles, but began to abandon the *jeunes premières* for

the "lead," in which she had a success unequalled since the retirement of Mlle Mars. Her later triumphs were especially associated with new plays by Émile Augier, *Le Fils de Giboyer* and *Maître Guerin*. Her last appearance was in Edouard Cadol's *La Grand-maman*; she retired in 1876, and died in 1897.

ARNSBERG, a town of Germany, in the Prussian province of Westphalia, romantically situated on an eminence almost surrounded by the river Ruhr, 44 m. S.E. of Münster and 58 m. E.N.E. of Düsseldorf by rail. Pop. (1900) 8490. It is the seat of the provincial authorities, and has three churches, a court of appeal, a Roman Catholic gymnasium, which was formerly the Benedictine abbey of Weddinghausen, a library, a normal school and a chamber of commerce. Weaving, brewing and distilling are carried on, and there are manufactories of white lead, shot and paper, works for the production of railway plant, and saw-mills. Near the town are the ruins of the castle of the counts of Arnsberg, the last of whom, Gottfried, sold his countship, in 1368, to the archbishop of Cologne. The countship was incorporated by the archbishops in their duchy of Westphalia, which in 1802 was assigned to Hesse-Darmstadt and in 1815 to Prussia. The town, which had received its first charter in 1237 and later joined the Hanseatic League, became the capital of the duchy.

ARNSTADT, a town in the principality of Schwarzburg-Sondershausen, Germany, on the river Gera, 11 m. S. of Erfurt, with which it is connected by rail. Pop. (1900) 14,413. There are five churches, four Protestant and one Catholic. The Evangelical Liebfrauenkirche, a Romanesque building (mainly 12th-century), has two octagonal towers and a 10th-century porch. The palace contains collections of pictures and porcelain, and attached to it is a magnificent tower, all that remains of the castle built in 1560. The town hall dates from 1561. The industries of Arnstadt include iron and other metal founding, the manufacture of leather, cloth, tobacco, weighing-machines, paper, playing-cards, chairs, gloves, shoes, iron safes, and beer, and market-gardening and trade in grain and wood are carried on. There are copper-mines in the neighbourhood, as well as tepid saline springs, the waters of which are used for bathing, and are much frequented in summer. Arnstadt dates back to the 8th century. It was bought in 1306 by the counts of Schwarzburg, who lived here till 1716.

ARNSWALDE, a town of Germany, in the kingdom of Prussia, in a marshy district between four lakes, 20 m. S.W. of Stargard and on the main line between that place and Posen. Besides the Gothic church there are no noteworthy public buildings. Its industries include iron founding, machinery, and manufactures of cloth, matches and starch. Pop. (1900) 8665.

ARNULF (*c.* 850–899), Roman emperor, illegitimate son of Carloman, king of Bavaria and Italy, was made margrave of Carinthia about 876, and on his father's death in 880 his dignity and possessions were confirmed by the new king of the east Franks, Louis III. The failure of legitimate male issue of the later Carolingians gave Arnulf a more important position than otherwise he would have occupied; but he did homage to the emperor Charles the Fat in 882, and spent the next few years in constant warfare with the Slavs and the Northmen. In 887, however, Arnulf identified himself with the disgust felt by the Bavarians and others at the incapacity of Charles the Fat. Gathering a large army, he marched to Tribur; Charles abdicated and the Germans recognized Arnulf as their king, a proceeding which L. von Ranke describes as "the first independent action of the German secular world." Arnulf's real authority did not extend far beyond the confines of Bavaria, and he contented himself with a nominal recognition of his supremacy by the kings who sprang up in various parts of the Empire. Having made peace with the Moravians, he gained a great and splendid victory over the Northmen near Louvain in October 891, and in spite of some opposition succeeded in establishing his illegitimate son, Zwentibold, as king of the district afterwards called Lorraine. Invited by Pope Formosus to deliver him from the power of Guido III., duke of Spoleto, who had been crowned emperor, Arnulf went to Italy in 894, but after storming Bergamo and receiving the homage of some of the nobles at Pavia, he was compelled by desertions from his army to return. The restoration of peace with the Moravians and the death of Guido prepared the way for a more successful expedition in 895 when Rome was stormed by his troops; and Arnulf was crowned emperor by Formosus in February 896. He then set out to establish his authority in Spoleto, but on the way was seized with paralysis. He returned to Bavaria, where he died on the 8th of December 899, and was buried at Regensburg. He left, by his wife Ota, a son Louis surnamed the Child. Arnulf possessed the qualities of a soldier, and was a loyal supporter of the church.

See "Annales Fuldenses" in the *Monumenta Germaniae historica. Scriptores*, Band i. (Hanover and Berlin, 1826); E. Dümmler, *Geschichte des ostfränkischen Reichs* (Leipzig, 1887–1888); M. J. L. de Gagern, *Arnulfi imperatoris vita* (Bonn, 1837); E. Dümmler, *De Arnulfo Francorum rege* (Berlin, 1852); W. B. Wenck, *Die Erhebung Arnulfs und der Zerfall des karolingischen Reiches* (Leipzig, 1852); O. Dietrich, *Beiträge zur Geschichte Arnolfs von Kärnthen und Ludwigs des Kindes* (Berlin, 1890); E. Mühlbacher, *Die Regesten des Kaiserreichs unter den Karolingern* (Innsbruck, 1881).

AROIDEAE (Arum family), a large and wide-spread botanical order of Monocotyledons containing about 1000 species in 105 genera. It is generally distributed in temperate and tropical regions, but especially developed in warm countries. The common British representative of the order, *Arum maculatum*

Arum maculatum, Cuckoo-pint. About ⅔ scale of nature.
1. Leaves and inflorescence.
2. Underground root-stock.
3. Lower part of spathe cut open.
4. Spike of fruits. Showing in succession (from below) female flowers, male flowers, and sterile flowers forming a ring of hairs borne on the spadix.

(cuckoo-pint, lords and ladies, or wake robin), gives a meagre idea of its development. The plants are generally herbaceous, often, however, reaching a gigantic size, but are sometimes shrubby, as in *Pothos*, a genus of shrubby climbing plants, chiefly Malayan. *Monstera* is a tropical American genus of climbing shrubs, with large often much-perforated leaves; the fruiting spikes of a Mexican species, *M. deliciosa*, are eaten. The roots of the climbing species are of interest in their adaptation

to the mode of life of the plant. For instance, some species of *Philodendron* have a growth like that of ivy, with feeding roots penetrating the soil and clasping roots which fix the plant to its support. In other species of the genus the seed germinates on a branch, and the seedling produces clasping roots, and roots which grow downwards hanging like stout cords, and ultimately reaching the ground. The leaves, which show great variety in size and form, are generally broad and net-veined, but in sweet-flag (*Acorus Calamus*) are long and narrow with parallel veins. In *Arum* the blade is simple, as also in the so-called arum-lily (*Richardia*), a South African species common in Britain as a greenhouse plant, and in *Caladium*, a tropical South American genus, and *Alocasia* (tropical Asia), species of which are favourite warm-greenhouse plants on account of their variegated leaves. In other genera the leaves are much divided and sometimes very large; those of *Dracontium* (tropical America) may be 15 ft. high, with a long stem-like stalk and a much-branched spreading blade. The East Indian genus *Amorphophallus* has a similar habit. A good series of tropical aroids is to be seen in the aroid house at Kew. The so-called water cabbage (*Pistia Stratiotes*) is a floating plant widely distributed in the tropics, and consisting of rosettes of broadish leaves several inches across and a tuft of roots hanging in the water.

The small flowers are densely crowded on thick fleshy spikes, which are associated with, and often more or less enveloped by, a large leaf (bract), the so-called spathe, which, as in cuckoo-pint, where it is green in colour, *Richardia*, where it is white, creamy or yellow, *Anthurium*, where it is a brilliant scarlet, is often the most striking feature of the plant. The details of the structure of the flower show a wide variation; the flowers are often extremely simple, sometimes as in *Arum*, reduced to a single stamen or pistil. The fruit is a berry—the scarlet berries of the cuckoo-pint are familiar objects in the hedges in late summer. The plants generally contain an acrid poisonous juice. The underground stems (rhizomes or tubers) are rich in starch; from that of *Arum maculatum* Portland arrowroot was formerly extensively prepared by pounding with water and then straining; the starch was deposited from the strained liquid.

The order is represented in Britain by *Arum maculatum*, a low herbaceous plant common in woods and hedgerows in England, but probably not wild in Scotland. It grows from a whitish root-stock which sends up in the spring a few long-stalked, arrow-shaped leaves of a polished green, often marked with dark blotches. These are followed by the inflorescence, a fleshy spadix bearing in the lower part numerous closely crowded simple unisexual flowers and continued above into a purplish or yellowish appendage; the spadix is enveloped by a leafy spathe, constricted in the lower part to form a chamber, in which are the flowers. The mouth of this chamber is protected by a ring of hairs pointing downwards, which allow the entrance but prevent the escape of small flies; after fertilization of the pistils the hairs wither. The insects visit the plant in large numbers, attracted by the foetid smell, and act as carriers of the pollen from one spathe to another. As the fruit ripens the spathe withers, and the brilliant red berries are exposed.

The sweet-flag *Acorus Calamus* (*q.v.*), which occurs apparently wild in England in ditches, ponds, &c., is supposed to have been introduced.

AROLSEN, a town of Germany, capital of the principality of Waldeck, 25 m. N.W. of Cassel, with which it is connected by rail via Warburg. Pop. 3000. It lies in a pleasant undulating country at an elevation of 900 ft. above the sea. The Evangelical parish church contains some fine statues by Christian Rauch, and the palace (built 1710–1720), in addition to a valuable library of 30,000 vols., a collection of coins and pictures, among the latter several by Angelica Kauffmann. Arolsen is the birthplace of the sculptor C. Rauch and of the painters Wilhelm and Friedrich Kaulbach.

ARONA, a town of Piedmont, Italy, in the province of Novara, on the W. bank of Lake Maggiore, 3 m. from its S. extremity, 23 m. N. of Novara, and 42 m. N.W. of Milan by rail. Pop. (1901) 4700. It is a railway centre of some importance on the Simplon line, and is also the southern terminus of the steamers which ply on Lake Maggiore. The church of S. Maria contains a fine altar-piece by Gaudenzio Ferrari. On a hill to the north of the town stands a colossal bronze statue of S. Carlo Borromeo (born here in 1538), erected in 1697. The pedestal, of red granite, is 42 ft. high, and the statue 70 ft. high; the latter is hollow, and can be ascended from within.

ARPEGGIO (from Ital. *arpeggiare*, to play upon the harp), in music, the notes of a chord, played in rapid succession as on a harp, and not together.

ARPI (Gr. Ἀργύριππα), an ancient city of Apulia, 20 m. W. of the sea coast, and 5 m. N. of the modern Foggia. The legend attributes its foundation to Diomedes, and the figure of a horse, which appears on its coins, shows the importance of horse-breeding in early times in the district. Its territory extended to the sea, and Strabo says that from the extent of the city walls one could gather that it had once been one of the greatest cities of Italy. As a protection against the Samnites Arpi became an ally of Rome, and remained faithful until after the battle of Cannae, but Fabius captured it in 213 B.C., and it never recovered its former importance. It lay on a by-road from Luceria to Sipontum. No Roman inscriptions have, indeed, been found here, and remains of antiquity are scanty. Foggia is its medieval representative. (T. As.)

ARPINO (anc. *Arpinum*), a town of Campania, Italy, in the province of Caserta, 1475 ft. above sea-level; 12 m. by rail N.W. of Roccasecca, a station on the railway from Naples to Rome. Pop. (1901) 10,607. Arpino occupies the lower part of the site of the ancient Volscian town of Arpinum, which was finally taken from the Samnites by the Romans in 305 B.C. It became a *civitas sine suffragio*, but received full privileges (*civitas cum suffragio*) in 188 B.C. with Formiae and Fundi; it was governed as a *praefectura* until the Social War, and then became a *municipium*. The ancient polygonal walls, which are still finely preserved, are among the best in Italy. They are built of blocks of pudding-stone, originally well jointed, but now much weathered. They stand free in places to a height of 11 ft., and are about 7 ft. wide at the top. A single line of wall, with medieval round towers at intervals, runs on the north side from the present town to Civitavecchia (2055 ft.), on the site of the ancient citadel. Here is the Porta dell' Arco, a gate of the old wall, with an aperture 15 ft. high, formed by the gradual inclination of the two sides towards one another. Below Arpino, in the valley of the Liris, between the two arms of its tributary the Fibrenus, and ¾ m. north of Isola del Liri, lies the church of S. Domenico, which marks the site of the villa in which Cicero was born and frequently resided. Near it is an ancient bridge, of a road which crossed the Liris to Cereatae (modern Casamari). The painter Giuseppe Cesari (1560–1640), more often known as the Cavaliere d' Arpino, was also born here.

See O. E. Schmidt, *Arpinum, eine topographisch-historische Skizze* (Meissen, 1900). (T. As.)

ARQUÀ PETRARCA, a village of Venetia, Italy, in the province of Padua, 3 m. to the S.W. of Battaglia. Pop. (1901) 1573. It is chiefly famous as the place where Petrarch lived his last few years and died in 1374. His house still exists, and his tomb, a sarcophagus supported by four short columns of red marble, stands in front of the church. Near Arquà, on the banks of the small Lago della Costa, is the site of a prehistoric lake village, excavations in which have produced interesting results.

See A. Moschetti and F. Cordenone in *Bollettino del Museo Civico di Padova*, iv. (1901), 102 seq.

ARQUEBUS (also called harquebus, hackbut, &c.), a firearm of the 16th century, the immediate predecessor of the musket. The word itself is certainly to be derived from the German *Hakenbühse* (mod. *Hakenbüchse*, cf. Eng. *hackbut* and *hackbush*), "hook gun." The "hook" is often supposed to refer to the bent shape of the butt, which differentiated it from the straight-stocked hand gun, but it has also been suggested that the original arquebus had a metal hook near the muzzle, which was used to grip the wall (or other fixed object) so as to steady the aim and take up the force of recoil, that from this

the name *Hakenbüchse* spread till it became the generic name for small arms, and that the original form of the weapon then took the name of *arquebus à croc*. The French form *arquebuse* and Italian *arcobugio*, *archibugio*, often and wrongly supposed to indicate the hackbut's affinity with the crossbow (" hollow bow " or " mouthed bow "), are popular corruptions, the Italian being apparently the earlier of the two and supplanting the first and purest French form *haquebut*. Previous to the French wars in Italy, hand-gun men and even arbalisters seem to have been called arquebusiers, but in the course of these wars the arquebus or hackbut came into prominence as a distinct type of weapon. The Spanish arquebusiers, who used it with the greatest effect in the Italian wars, notably at Bicocca (1522) and Pavia (1525), are the originators of modern infantry fire action. Filippo Strozzi made many improvements in the arquebus about 1530, and his weapons were effective up to four and five hundred paces. He also standardized the calibres of the arquebuses of the French army, and from this characteristic feature of the improved weapon arose the English term " caliver." In the latter part of the 16th century (*c.* 1570) the arquebus began to be displaced by the musket.

ARQUES-LA-BATAILLE, a village of France, in the department of Seine-Inférieure, 4 m. S.E. of Dieppe by the Western railway. Pop. (1906) 1250. Arques is situated near the confluence of the rivers Varenne and Bethune; the forest of Arques stretches to the north-east. The interest of the place centres in the castle dominating the town, which was built in the 11th century by William of Arques; his nephew, William the Conqueror, regarding it as a menace to his own power, besieged and occupied it. After frequently changing hands, it came into the possession of the English, who were expelled in 1449 after an occupation of thirty years. In 1589 its cannon decided the battle of Arques in favour of Henry IV. Since 1869 the castle has been state property. The first line of fortification was the work of Francis I.; the second line and the donjon date back to the 11th century. The church of Arques, a building of the 16th century, preserves a fine stone rood screen, statuary, stained glass and other relics of the Renaissance period.

ARRACK, Rack or Rak, a generic name applied to a variety of spirituous liquors distilled in the Far East. According to some authorities the word is derived from the Arabic *arak* (perspiration), but according to others (see Morewood's *History of Inebriating Liquors*, 1834, p. 140) it is derived from the *areca-nut*, a material from which a variety of arrack was long manufactured, and is of Indian origin. The liquor to which this or a similar name is applied is (or was, since the introduction of European spirits and methods of manufacture is gradually causing the native spirit industries on the old lines to decay) manufactured in India, Ceylon, Siam, Java, Batavia, China, Corea, &c., and its manufacture still constitutes a considerable industry. The term arrack as designating a distilled liquor does not, however, appear to have been confined to the Far East, as, in Timkowski's *Travels*, it is stated that a spirit distilled from koumiss (*q.v.*) by the Tatars, Mongols and presumably the Caucasian races generally, is called *arrack*, *araka* or *ariki*. In Ceylon arrack is distilled chiefly from palm toddy, which is the fermented juice drawn from the unexpanded flower-spathes of various palms, such as the Palmyra palm (*Borassus flabelliformis*) and the cocoa palm (*Cocos nucifera*). At the beginning of the 19th century the arrack industry of Ceylon was of considerable dimensions, whole woods being set apart for no other purpose than that of procuring toddy, and the distillation of the spirit took place at every village round the coast. The land rents in 1831 included a sum of £35,573 on the cocoa-nut trees, and the duties on the manufacture and retail of the spirit amounted to over £30,000. On the Indian continent arrack is made from palm toddy, rice and the refuse of the sugar refineries, but mainly from the flowers of the muohwa or mahua tree (*Bassia latifolia*). The mahua flowers are very rich in sugar, and may, according to H. H. Mann, contain as much as 58 % of fermentable sugar, calculated on the total solids. Even at the present day the process of manufacture is very primitive, the fermentation as a rule being carried on in so concentrated a liquid that complete fermentation rarely takes place. According to Mann, the total sugar in the liquor ready for fermentation may reach 20 %. The ferment employed (it is so impure that it can scarcely be called yeast) is obtained from a previous fermentation, and, as the latter is never vigorous, it is not surprising that the resulting spirit contains, compared with the more scientifically prepared European spirits, a very high proportion of by-products (acid, fusel oil, &c.). The injurious nature of these native spirits has long been known and has been frequently set down to the admixture of drugs, such as hemp (*ganga*), but a recent investigation of this question appears to show that this is not generally the case. The chemical constitution of these liquors alone affords sufficient proof of their inferior and probably injurious character.

See H. H. Mann, *The Analyst* (1904).

ARRAH, a town of British India, headquarters of Shahabad district, in the Patna division of Bengal, situated on a navigable canal connecting the river Sone with the Ganges. It is a station on the East Indian railway, 368 m. from Calcutta. In 1901 the population was 40,170. Arrah is famous for an incident in the Mutiny, when a dozen Englishmen, with 50 Sikhs, defended an ordinary house against 2000 Sepoys and a multitude of armed insurgents, perhaps four times that number. A British regiment, despatched to their assistance from Dinapur, was disastrously repulsed; but they were ultimately relieved, after eight days' continuous fighting, by a small force under Major (afterwards Sir Vincent) Eyre.

ARRAIGNMENT (from Lat. *ad*, to, and *rationare*, to reason, call to account), a law term, properly denoting the calling of a person to answer in form of law upon an indictment. After a true bill has been found against a prisoner by the grand jury, he is called by name to the bar, the indictment is read over to him, and he is asked whether he be guilty or not of the offence charged. This is the arraignment. Formerly, it was usual to require the prisoner to hold up his hand, in order to identify him the more completely, but this practice is now obsolete, as well as that of asking him how he will be tried. His plea in answer to the charge is then entered, or a plea of not guilty is entered for him if he stands mute of malice and refuses to plead. If a person is mute by the visitation of God (*i.e.* deaf and dumb), it will be no bar to an arraignment if intelligence can be conveyed to him by signs or symbols. If he pleads guilty, sentence may be passed forthwith; if he pleads not guilty, he is then given in charge to a jury of twelve men to inquire into the truth of the indictment. He may also plead in abatement, or to the jurisdiction, or demur on a point of law. Several defendants, except those entitled to the privilege of peerage, charged on the same indictment, are arraigned together.

In Scots law the term for arraignment is *calling the diet*.

The *Clerk of Arraigns* is a subordinate officer attached to assize courts and to the Old Bailey. He is appointed by the clerk of assize (see Assize) and acts as his deputy. He assists at the arraignment of prisoners, and puts the formal questions to the jury when delivering their verdict.

ARRAN, EARLS OF. The extinct Scottish title of the earls of Arran (not to be confused with the modern Irish earls of Arran—from the Arran or Aran Islands, Galway—a title created in 1762) was borne by some famous characters in Scottish history. Except the first earl, Thomas Boyd (see Arran), and James Stewart, all the holders of this title were members of the Hamilton family.

James Hamilton, 1st earl of Arran of the new creation (*c.* 1475–1529), son of James, 1st Lord Hamilton, and of Mary Stewart, daughter of James II. of Scotland, was born about 1475, and succeeded in 1479 to his father's titles and estates. In 1489 he was made sheriff of Lanark, was appointed a privy councillor to James IV., and in 1503 negotiated in England the marriage between the king and Margaret Tudor. Hamilton excelled in the knightly exercises of the day, and the same year on the 11th of August, after distinguishing himself in a famous tournament, he was created earl and justiciary of Arran. In

1504 as lieutenant-general of the realm he was employed in reducing the Hebrides, and about the same time in an expedition with 10,000 men in aid of John, king of Denmark. In 1507 he was sent ambassador to France, and on his return through England was seized and imprisoned by Henry VII. After the accession of Henry VIII., Arran, in 1509, signed the treaty of peace between the two countries, and later, when hostilities began, was given command of a great fleet equipped for the aid of France in 1513. The expedition proved a failure, Arran wasting time by a useless attack on Carrickfergus, lingering for months on the Scottish coast, and returning with a mere remnant of his fleet, the larger ships having probably been purchased by the French government. During his absence the battle of Flodden had been lost, and Arran found his rival Angus, who enjoyed Henry's support, married to the queen dowager and in control of the government. Arran naturally turned to the French party and supported the regency of the duke of Albany. Later, however, becoming impatient of the latter's monopoly of power, he entered into various plots against him, and on Albany's departure in 1517 he was chosen president of the council of regency and provost of Edinburgh. The same year he led an expedition to the border to punish the murderers of the French knight La Bastie. In September, however, after a temporary absence with the young king, the gates of Edinburgh were shut against him by the Douglases, and on the 30th of April 1520 the fierce fight of "Cleanse the Causeway" took place in the streets between the two factions, in which the Hamiltons were worsted. The quarrel, however, between Angus and his wife, the queen-mother, with whom Arran now allied himself, gave the latter another opportunity of regaining power, which he held from 1522, after Albany's return to France, till 1524, when he was forced to include Angus in the government. In 1526, on the refusal of the latter to give up his control of the king on the expiry of his term of office, Arran took up arms, but retreated before Angus's forces, and having made terms with him, supported him in his close custody of the king, in September defeating the earl of Lennox, who was marching to Edinburgh to liberate James. On the proscription of Angus and the Douglases, Arran joined the king at Stirling. He died in 1529. His eldest son James succeeded him.

James Hamilton, 2nd earl of Arran and duke of Châtelherault (*c.* 1515–1575), accompanied James V. in 1536 to France, and on the latter's death in 1542 was, in consequence of his position as next successor to the throne after the infant Mary, proclaimed protector of the realm and heir-presumptive of the crown, in 1543. He was a zealous supporter of the reformation, authorized the translation and reading of the Scriptures in the vulgar tongue, and at first supported the English policy in opposition to Cardinal Beaton, whom he arrested on the 27th of January 1543, arranging the treaty with England and the marriage of Mary with Prince Edward in July, and being offered by Henry the hand of the princess Elizabeth for his son. But on the 3rd of September he suddenly joined the French party, met Beaton at Stirling, and abjured his religion for Roman Catholicism. On the 13th of January 1544, with Angus, Lennox and others, he signed a bond repudiating the English alliance. In 1544 an attempt was made to transfer the regency from him to Mary of Lorraine, but Arran fortified Edinburgh and her forces retired; in March 1545 a truce was arranged by which each had a share in the government. Meanwhile, immediately on the repudiation of the treaty, war had broken out with England, and Arran was unable either to maintain order within the realm or defend it from outside aggression, the Scots being defeated at Pinkie on the 10th of September 1547. He reluctantly agreed in July 1548 to the marriage of the dauphin with Mary, whom he had designed for his son, to the appeal for French aid, and to the removal of Mary for security to France, and on the 5th of February 1549 was created duke of Châtelherault in Poitou, his eldest son James being henceforth commonly styled earl of Arran. In June 1548 he had also been made a knight of the order of St Michael in France. On the 12th of April 1554 he abdicated in favour of the queen-mother, whose government he supported till after the capture of Edinburgh in October 1559 by the lords of the congregation, when he declared himself on their side and took the Covenant. The same month he was one of the council of the Protestant lords, joined them in suspending Mary of Lorraine from the regency, and was made provisionally one of the governors of the kingdom. In order to discredit him with the English government a letter was forged by his enemies, in which Arran declared his allegiance to Francis II., but the plot was exposed. On the 27th of February 1560 he agreed to the treaty of Berwick with Elizabeth, which placed Scotland under her protection. The death the same year of Francis II. renewed his hopes of a union between his son and Mary, but disappointment drove him into an attitude of hostility to the court. In 1562 he was accused by his son, probably already insane, of plots against Mary's person, and he was obliged to give up Dumbarton Castle. Lennox claimed precedence over Arran in the succession to the throne, on the plea of the latter's supposed illegitimacy, and his restoration to favour in 1564, together with the project of Mary's marriage with Darnley, still further embittered Arran; he refused to appear at court, was declared a traitor, and fled to England, where on his consent to go into exile for five years he received a pardon from Mary. In 1566 he went to France, where he made vain attempts to regain his confiscated duchy. After the murder of Darnley in 1567 he was nominated by Mary on her abdication one of the regents, and he returned to Scotland in 1569 as a strong supporter of her cause. In March in an assembly of nobles called by Murray, he acknowledged James as king, but on the 5th of April he was arrested for not fulfilling the compact, and continued in confinement till April 1570. After Murray's assassination in January 1570, the regency in July was given to Lennox, and in June 1571 Arran assembled a parliament, when it was declared that Mary's abdication was obtained by fear, and the king's coronation was annulled. On the 28th of August he was declared a traitor and "forfeited," but he continued to support Mary's hopeless cause and to appeal for help to France and Spain, in spite of the pillage of his houses and estates, till February 1573, when he acknowledged James's authority and laid down his arms. He died on the 22nd of January 1575. He was by general consent a weak, fickle man, whose birth alone called him to high office. He married Margaret, daughter of James Douglas, 3rd earl of Morton, and had, besides several daughters, four sons: James, who succeeded him as 3rd earl of Arran, John, 1st marquess of Hamilton, David, and Claud, Lord Paisley, ancestor of the dukes of Abercorn.

James Hamilton, 3rd earl (*c.* 1537–1609), was styled earl of Arran after the creation of his father as duke of Châtelherault in 1549; the latter title did not descend to him, having been resumed by the French crown. His father's ambition destined him for the hand of Mary queen of Scots, and his union with the princess Elizabeth was proposed by Henry VIII. as the price of his father's adherence to the English interest. He was early involved in the political troubles in which Scotland was then immersed. In 1546 he was seized as a hostage at St Andrews by the murderers of Cardinal Beaton and released in 1547. In 1550 he went to France, was given the command of the Scots guards, and in 1557 distinguished himself in the defence of St Quentin. He became a strong adherent of the reformed doctrine. His arrest was ordered by Henry II. in 1559, Mary (probably in consequence of his projected union with Elizabeth which would have raised the Hamiltons higher than the Stuarts) declaring her wish that he should be "used as an arrant traitor." He, however, escaped to Geneva and then to England, and had an interview with Elizabeth in August. He returned to Scotland in September, where he supported his father's adherence to the lords of the Congregation against Mary of Lorraine, upheld the alliance with Elizabeth, and became one of the leaders of the Protestant party in the subsequent fighting, in particular organizing, together with Lord James Stuart (afterwards earl of Murray), in 1560, a stubborn resistance to the French at Dysart, and saving Fife. In November 1559 he had declined Bothwell's challenge to single combat. Subsequently he signed the treaty of Berwick, became one of the lords of the Congregation, and was appointed a visitor

for the destruction of the religious houses. The same year proposals were again made for his marriage with Elizabeth, which were rejected by the latter in 1561; and subsequently after the death of Francis II. (in December 1560), he became, with the strong support of the Protestants and Hamiltons, a suitor for Mary, also without success. He was chosen a member of her council on her arrival in Scotland in 1561, but took up a hostile attitude to the court in consequence of the practice of the Roman Catholic religion. He now showed marked signs of insanity, and was confined in Edinburgh Castle, where he remained till May 1566. He had then lost the power of speech, and from 1568 he lived in retirement with his mother at Craignethan Castle, while his estates were administered by his brother John, afterwards 1st marquess of Hamilton. In 1579, at the time of the fresh prosecution of the Hamiltons, when the helpless Arran was also included in the attainder of his brothers and his titles forfeited, the castle was besieged on the pretence of delivering him from unlawful confinement, and Arran and his mother were brought to Linlithgow, while the charge of his estates was taken over by the government. In 1580 James Stewart (see below) was appointed his guardian, and in 1581 acquired the earldom; but his title and estates were restored after Stewart's disgrace in 1586, when the forfeiture was repealed. Arran died unmarried in March 1609, the title devolving on his nephew James, 2nd marquess of Hamilton.

James Stewart (d. 1595), the rival earl of Arran above referred to, was the son of Andrew Stewart, 2nd Lord Ochiltree. He served in his youth with the Dutch forces in Holland against the Spanish, and returned to Scotland in 1579. He immediately became a favourite of the young king, and in 1580 was made gentleman of the bedchamber and tutor of his cousin, the 3rd earl of Arran. The same year he was the principal accuser of the earl of Morton, and in 1581 was rewarded for having accomplished the latter's destruction by being appointed a member of the privy council, and by the grant the same year, to the prejudice of his ward, of the earldom of Arran and the Hamilton estates, on the pretence that the children of his grandmother's father, the 1st earl of Arran, by his third wife, from whom sprang the succeeding earls of Arran, were illegitimate. He claimed the position of second person in the kingdom as nearest to the king by descent. The same year he married Elizabeth, daughter of John Stewart, earl of Atholl, and wife of the earl of March, after both had been compelled to undergo the discipline of the kirk on account of previous illicit intercourse. He became the rival of Lennox for the chief power in the kingdom, but both were deprived of office by the raid of Ruthven on the 22nd of August 1582, and Arran was imprisoned till September under the charge of the earl of Gowrie. In 1583, however, he assembled a force of 12,000 men against the new government; the Protestant lords escaped over the border, and Arran, returning to power, was made governor of Stirling Castle and in 1584 lord chancellor. The same year Gowrie was captured through Arran's treachery and executed after the failure of the plot of the Protestant lords against the latter's government. He now obtained the governorship of Edinburgh Castle and was made provost of the city and lieutenant-general of the king's forces. Arran induced the English government to refrain from aiding the banished lords, and further secured his power by the forfeitures of his opponents. His tyranny and insolence, however, stirred up a multitude of enemies and caused his rapid fall from power. His agent in England, Patrick, Master of Gray, was secretly conspiring against him at Elizabeth's court. On account of the murder of Lord Russell on the border in July 1585, of which he was accused by Elizabeth, he was imprisoned at the castle of St Andrews, and subsequently the banished lords with Elizabeth's support entered Scotland, seized the government and proclaimed Arran a traitor. He fled in November, and from this time his movements are furtive and uncertain. In 1586 he was ordered to leave the country, but it is doubtful whether he ever quitted Scotland. He contrived secretly to maintain friendly communications with James, and in 1592 returned to Edinburgh, and endeavoured unsuccessfully to get reinstated in the court and kirk. Subsequently he is reported as making a voyage to Spain, probably in connexion with James's intrigues with that country. His unscrupulous and adventurous career was finally terminated towards the close of 1595 by his assassination near Symontown in Lanarkshire at the hands of Sir James Douglas (nephew of his victim the earl of Morton), who carried his head in triumph on the point of a spear through the country, while his body was left a prey to the dogs and swine. He had three sons, the eldest of whom became Lord Ochiltree.

ARRAN, the largest island of the county of Bute, Scotland, at the mouth of the Firth of Clyde. Its greatest length, from the Cock of Arran to Bennan Head, is about 20 m., and the greatest breadth—from Drumadoon Point to King's Cross Point—is 11 m. Its area is 105,814 acres or 165 sq. m. In 1891 its population was 4824, in 1901, 4819 (or 29 persons to the sq. m.). In 1901 there were 1900 persons who spoke English and Gaelic and nine Gaelic only. There is daily winter communication with Brodick and Lamlash by steamer from Ardrossan, and in summer by many steamers which call not only at these piers, but at Corrie, Whiting Bay and Loch Ranza.

The chief mountains are in the north. The highest is Goatfell (2866 ft., the name said to be a corruption of the Gaelic *Goadh Bhein*, "mountain of the winds"). Others are Caistel Abhail (2735 ft., "peaks of the castles"), Beinn Tarsuinn (2706 ft.), Cir Mhor (2618 ft.) and Beinn Nuis (2597 ft.). In the south Tighvein (1497 ft.) and Cnoc Dubh (1385 ft.) are the most important. Owing to the mountainous character of the island, glens are numerous. Glen Rosa and Glen Sannox are remarkable for their wild beauty, and among others are Iorsa, Catacol, Chalmadale, Cloy, Shant, Shurig, Tuie, Clachan, Monamore, Ashdale (with two cascades) and Scorrodale. Excepting Loch Tanna, the inland lakes are small. Loch Ranza, an arm of the sea, is one of the most beautiful in Scotland. The streams, or "waters" as they are called, are nearly all hill burns, affording good fishing.

The oldest rocks, consisting of slate, mica-schists and grits, which have been correlated with the metamorphic series of the eastern Highlands, form an incomplete ring round the granite in the north of the island and occupy the whole of the west coast from Loch Ranza south to Dougrie. On the east side in North Glen Sannox Burn, they are associated with cherts, grits and dark schists with pillowy lavas, tuffs and agglomerates which, on lithological grounds, have been regarded as probably of the same age as the Arenig cherts and volcanic rocks in the south of Scotland. The Lower Old Red Sandstone strata are separated from the foregoing series by a fault and form a curving belt extending from Corloch on the east coast south by Brodick Castle to Dougrie on the west shore. Consisting of red sandstones, mudstones and conglomerates, they are inclined at high angles usually away from the granite massif and the encircling metamorphic rocks. They are associated with a thin band of lava visible on the west side of the island near Auchencar and traceable inland to Garbh Thorr. The Upper Old Red Sandstone, composed of red sandstone and conglomerates, is only sparingly developed. The strata occur on the east shore between the Fallen Rocks and Corrie, and they appear along a narrow strip to the east and south of the lower division of the system, between Sannox Bay and Dougrie. On the north side of North Glen Sannox they rest unconformably on the Lower Old Red rocks. Contemporaneous lavas, highly decomposed, are intercalated with this division on the north side of North Glen Sannox where the band is highly faulted. The Carboniferous rocks of Arran include representatives of the Calciferous Sandstone, the three subdivisions of the Carboniferous Limestone series, and to a small extent the Coal Measures, and are confined to the north part of the island. They appear on the east coast between the Fallen Rocks and the Cock of Arran, where they form a strip about a quarter of a mile broad, bounded on the west by a fault. Here there is an ascending sequence from the Calciferous Sandstone, through the Carboniferous Limestone with thin coals formerly worked, to the Coal Measures, the strata being inclined at high angles to the north. On the south side of a well-marked

anticline in the Upper Old Red Sandstone at North Sannox, the Carboniferous strata reappear on the coast with a south dip showing a similar ascending sequence for about half a mile. The lower limestones are well seen at Corrie, but the thin coals are not there represented. From Corrie they can be traced southwards and inland to near the head of Ben Lister Glen. The small development of Upper Carboniferous strata, visible on the shore south of Corrie and in Ben Lister Glen, consists of sandstones, red and mottled clays and purple shales, which yield plant-remains of Upper Carboniferous facies. These may represent partly the Millstone Grit and partly the Coal Measures. Contemporaneous volcanic rocks, belonging to three stages of the Carboniferous formation, occur in Arran. The lowest group is on the horizon of the Calciferous Sandstone series, being visible at Corrie where it underlies the Corrie limestone, and is traceable southwards beyond Brodick. The second is represented by a thin lava, associated with the Upper Limestone group of the Carboniferous Limestone series, and the highest is found in Ben Lister Glen intercalated with the Upper Carboniferous strata, and may be the equivalent of the volcanic series which, in Ayrshire, occupies the position of the Millstone Grit. The Triassic rocks are arranged in two groups, a lower, composed of conglomerates and sandstones, and an upper one consisting of red and mottled shales and marls with thin sandstones and nodular limestones. In the extreme north at the Cock of Arran, there is a small development of these beds; they also occupy the whole of the east coast south of Corrie, and they spread over the south part of the island south of a line between Brodick Bay and Machrie Bay on the west. At Corrie and the Cock of Arran they rest on Upper Carboniferous strata; in Ben Lister Glen, on the lower limestone group of the Carboniferous Limestone series; and on the west coast they repose on the Old Red Sandstone. There is, therefore, a clear discordance between the Trias and all older strata in Arran. The former extension of Rhaetic, Liassic and Cretaceous formations in the island is indicated by the presence of fragments of these strata in a large volcanic vent on the plateau, on the south side of the road leading from Brodick to Shiskine. The fossils from the Rhaetic beds belong to the *Avicula contorta* zone, those from the Lias to the *Ammonites angulatus* zone, while the blocks of limestone with chert contain *Inoceramus*, Cretaceous foraminifera and other organisms. The materials yielding these fossils are embedded in a course volcanic agglomerate which gives rise to crags and is pierced by acid and basic igneous rocks. One of the striking features in the geology of Arran is the remarkable series of intrusive igneous rocks of Tertiary age which occupy nearly one-half of the area and form the wildest and grandest scenery in the island. Of these the most important is the great oval mass of granite in the North, composed of two varieties; one, coarse-grained and older, forms the outside rim, while the fine-grained and newer type occurs in the interior. Another granite area appears on the south side of the road between Brodick and Shiskine, where it is associated with granophyre and quartz-diorite and traverses the volcanic vent of post-Cretaceous or Tertiary age already described. In the south of the island there are sills and dykes of felsite, quartz-porphyry, rhyolite, trachyte and pitchstone. The felsite sheets are well represented in Holy Island. It is worthy of note that the dykes and sheets of felsite are seldom pierced by the basalt dykes and are probably about the most recent of the intrusive rocks. The best example of the basic sills forms the Clauchland Hills and runs out to sea at Clauchland Point. Finally the basic dykes of dolerite, basalt and augite-andesite are abundant and traverse the various sedimentary formations and the granite.

The chief crops are oats and potatoes. Cattle and sheep are raised in considerable numbers. The game, which is abundant, consisting of blackcock and grouse, is strictly preserved. A few red deer still occur in the wilder hilly district. The fisheries are of some value, Loch Ranza being an important station.

Standing stones, cairns and other memorials of a remote antiquity occur near Tormore, on Machrie Bay, Lamlash, and other places. The Norse raiders found a home in Arran for a long period until the defeat of Haakon V. at Largs (1263) compelled them to retire. The chief name in the island's history is that of Robert Bruce, who found shelter in the King's Caves on the western coast. One was reputed to be his kitchen, another his cellar, a third his stable, while the hill above was styled the King's Hill. From a point still known as King's Cross he crossed over to Carrick, in answer to the signal which warned him that the moment for the supreme effort for his country was come. In Glen Cloy the ruins of a fort bear the name of Bruce's Castle, in which his men lay concealed, and on the southern arm of Loch Ranza stands a picturesque ruined castle which is said to have been his hunting-seat. Kildonan Castle, near the south-eastern-most point, is a fine ruin of the 14th century, once a royal stronghold. The island gave the title of earl to Thomas Boyd, who married the elder sister of James III., a step so unpopular with his peers that he had to fly the country, and the title soon afterwards passed to the Hamiltons. Brodick Castle, the ancestral seat of the dukes of Hamilton, is a splendid mansion on the northern shore of Brodick Bay.

Brodick is the chief village in Arran, but most of the dwelling-houses have been built at Invercloy, close to the pier. Three m. south (by road) is Lamlash, on a fine bay so completely sheltered by Holy Island as to form an excellent harbour for ships of all sizes. Four m. to the north lies the village of Corrie which takes its name from a rugged hollow in the hill of Am Binnein (2172 ft.)which overshadows it. Daniel Macmillan (1813–1857), the founder of the publishing firm of Macmillan & Co., was a native of Corrie.

About a mile and a half east of Lamlash village lies Holy Island, which forms a natural breakwater to the bay. It is 1¾ m. long, nearly ¾ m. wide, and its finely-marked basaltic cone rises to a height of 1030 ft. The island takes its name from the fact that St Molios, a disciple of St Columba, founded a church near the north-western point. In the saint's cave on the shore may be seen the rocky shelf on which he made his bed, but his remains were interred in the hamlet of Clachan, some 2 m. from Blackwaterfoot. Off the south-eastern coast, ¾ m. from Port Dearg, lies the pear-shaped isle of Pladda, which serves as the telegraph station from which the arrival of vessels in the Clyde is notified to Glasgow and Greenock.

ARRANT (a variant of "errant," from Lat. *errare*, to wander), a word at first used in its original meaning of wandering, as in "knight-errant," thus an arrant or itinerant preacher, an arrant thief, one outlawed and wandering at large; the meaning easily passed to that of self-declared, notorious, and by the middle of the 16th century was confined, as an intensive adjective, to words of opprobrium and abuse, an arrant coward meaning thus a self-declared, downright coward.

ARRAS, a city of northern France, chief town of the department of Pas-de-Calais, 38 m. N.N.E. of Amiens on the Northern railway between that city and Lille. Pop (1906) 20,738. Arras is situated in a fertile plain on the right and southern bank of the Scarpe, at its junction with the Crinchon which skirts the town on the south and east. Of the fortifications erected by Vauban in the 17th century, only a gateway and the partially dismantled citadel, nicknamed *la Belle Inutile*, are left. The most interesting quarter lies in the east of the town, where the lofty houses which border the spacious squares known as the Grande and the Petite Place are in the Flemish style. They are built with their upper storeys projecting over the footway and supported on columns so as to form arcades; beneath these are deep cellars extending under the squares themselves. The celebrated hôtel de ville of the 16th century overlooks the Petite Place; its belfry, which contains a fine peal of bells, rises to a height of 240 ft. The decoration is in the richest Gothic style, and is especially admirable in the case of the windows. Of the numerous ecclesiastical buildings the cathedral, a church of the 18th century possessing some good pictures, is the most important. It occupies the site of the church of the abbey of St Vaast, the buildings of which adjoin it and contain the bishop's palace, the ecclesiastical seminary, a museum of antiquities, paintings and sculptures, and a rich library.

Arras is the seat of a prefect and of a bishop. It has tribunals

of first instance and of commerce, a chamber of commerce, a branch of the Bank of France, a communal college, training colleges, and a school of military engineering. Its industrial establishments include oil-works, dye-works and breweries, and manufactories of hosiery, railings and other iron-work, and of oil-cake. For the tapestry manufacture formerly flourishing at Arras see TAPESTRY. It has a very important market for cereals and oleaginous grains. The trade of the town is facilitated by the canalization of the Scarpe, the basin of which forms the port.

Before the opening of the Christian era Arras was known as *Nemetacum*, or *Nemetocenna*, and was the chief town of the Atrebates, from which the word Arras is derived. Passing under the rule of the Romans, it became a place of some importance, and traces of the Roman occupation have been found. In 407 it was destroyed by the Vandals, and having been partially rebuilt, came into the hands of the Franks. Christianity was introduced by St Vedast (Vaast), who founded a bishopric at Arras about 500. This was soon transferred to Cambrai, but brought back to its original seat about 1100. As the chief town of the province of Artois, Arras passed to Baldwin I., count of Flanders, in 863, and about 880 was ravaged by the Normans. During this troubled period it retained some vestiges of its former trade, and the woollen manufacture was established here at an early date. Early in the 12th century a commune was established here, but the earliest known charter only dates from about 1180; owing to the importance of Arras, this soon became a model for many neighbouring communes. At this time the city appears to have been divided into two parts, one dependent upon the bishop, and the other upon the count. When Philip Augustus, king of France, married Isabella, niece of Philip, count of Flanders, Arras came under the rule of the French king, who confirmed its privileges in 1194. As part of Artois it came in 1237 to Robert, son of Louis VIII., king of France, and in 1384 to Philip the Bold, duke of Burgundy, who promised to respect its privileges. Anxious to recover the city for France, Louis XI. placed a garrison therein after the death of Charles the Bold, duke of Burgundy, in 1477. This was driven out by the inhabitants, and Louis then stormed Arras, razed the walls, deported the citizens, whose places were taken by Frenchmen, and changed the name to *Franchise*. The successor of Louis, Charles VIII., restored the city to its former name and position, and as part of the inheritance of Mary, daughter and heiress of Charles the Bold, it was contended for by the French king, and his rival, the German king, Maximilian I. The peace of Senlis in 1493 gave Arras to Maximilian, and in spite of attacks by the French, it remained under the rule of the Habsburgs until 1640. Taken in this year by the French, this capture was ratified by the peace of the Pyrenees in 1659, and henceforward it remained part of France. It suffered severely during the French Revolution, especially from Joseph Lebon, who, like the brothers Maximilien and Augustin Robespierre, was a native of the town. Owing to its position and importance, Arras has been the scene of various treaties. In 1414 the peace between the Armagnacs and the Burgundians was made here, and in 1435 a congress met here to make peace between the English and their Burgundian allies on the one side, and the French on the other, and after the English representatives had withdrawn, a treaty was signed on the 20th of September between France and Burgundy. In 1482 Louis XI. made a treaty here with the estates and towns of Flanders about the inheritance of Mary of Burgundy, wife of the German king Maximilian I.

See E. Lecesne, *Histoire d'Arras jusqu'en 1789* (Arras, 1880); *Arras sous la Révolution* (Arras, 1882–1883).

ARRAY (from the O. Fr. *areyer*, Med. Lat. *arredare*, to get ready), an orderly arrangement, particularly the drawing up of an army in position of battle. From the 13th century onwards in England "Commissions of Array" issued from the king for the levy of military forces (see MILITIA). In English law the term is used for the setting in order, name by name, of the panel of a jury, which may be challenged as a whole, "to the array," or individually, "to the polls."

ARRENOTOKOUS, ARRENOTOKY (from Gr. ἄρρην, male, and τόκος, from τίκτειν, to beget), biological terms proposed by Leuckart and Eduard von Siebold to denote those parthenogenetic females which produce male young, while "thelytokous" and "thelytoky" would denote their producing female young.

ARREST (Fr. *arrester*, *arrêter*, to stop or stay), the restraint of a man's person, for the purpose of compelling him to be obedient to the law. It is defined to be the execution of the command of some court of record or officer of justice.

Arrests in England are either in civil or in criminal cases.

I. *In Civil Cases.*—The arrest must be by virtue of a precept or order out of some court, and must be effected by corporal seizing or touching the defendant's body, or as directed by the writ, *capias et attachias*, take and catch hold of. And if the defendant make his escape it is a *rescous*, or rescue, and attachment may be had against him, and the bailiff may then justify the breaking open of the house in which he is, to carry him away.

Arrests on mesne process (see PROCESS), before judgment obtained, were abolished by the Debtors Act 1869, s. 6; an exception, however, is made in cases in which the plaintiff proves, at any time before final judgment, by evidence on oath to the satisfaction of a judge of one of the superior courts, that he has a good cause of action to the amount of £50, that the defendant is about to quit the country, and that his absence will materially prejudice the plaintiff in prosecuting his action. In such cases an order for arrest may be obtained till security to the amount of the claim be found.

Formerly a judgment creditor might arrest his debtor under a writ of *capias ad satisfaciendum*, but since 1869 imprisonment for debt has been abolished in England, except in certain cases, and in these the period of detention must not exceed one year.

The following persons are privileged from arrest, viz., 1st, members of the royal family and the ordinary servants of the king or queen regnant, chaplains, lords of the bedchamber, &c. This privilege does not extend to servants of a consort queen or dowager. 2nd, peers of the realm, peeresses by birth, creation or marriage, Scottish and Irish peers and peeresses. 3rd, members of the House of Commons during the session of parliament, and for a convenient time (forty days) before and after it. Members of Convocation appear to have the same privilege. 4th, foreign ambassadors and their "domestics and domestic servants." Temporary privilege from arrest in civil process is enjoyed by barristers travelling on circuit, by parties, witnesses or attorneys connected with a cause, and by clergymen whilst performing divine service.

The arrest of any privileged person is irregular *ab initio*, and the party may be discharged on motion. The only exception is as to indictable crimes, such as treason, felony and breach of the peace.

There are no longer any places where persons are privileged from arrest, such as the Mint, Savoy, Whitefriars, &c., on the ground of their being ancient palaces.

Except in cases of treason, felony or breach of the peace, an arrest cannot be made on a Sunday, and if made it is void (Sunday Observance Act 1677); but it may be made in the night as well as in the day.

II. *In Criminal Cases.*—All persons whatsoever are, without distinction, equally liable to this arrest, and any man may arrest without warrant or precept, and outer doors may be broken open for that purpose. The arrest may be made,—1st, by warrant; 2nd, by an officer without warrant; 3rd, by a private person without warrant; or, 4th, by a hue and cry.

1. Warrants are ordinarily granted by justices of the peace on information or complaint in writing and upon oath, and they must be indorsed when it is intended they should be executed in another county by a magistrate of that county (see Indictable Offences Act 1848). A warrant issued by a metropolitan police magistrate can be executed anywhere by a metropolitan police officer. Warrants are also granted in cases of treason or other offence affecting the government by the privy council, or one of the secretaries of state, and also by the chief or other justice of the court of king's bench (*bench-warrant*) in cases of felony,

misdemeanour or indictment found, or criminal information granted in that court. Every warrant ought to specify the offence charged, the authority under which the arrest is to be made, the person who is to execute it and the person who is to be arrested. A warrant remains in force till executed or discharged by order of a court. An officer may break open doors in order to execute a warrant in cases of treason, felony or indictable offences, provided that, on demand, admittance cannot otherwise be obtained. (See WARRANT.)

2. The officers who may arrest without warrant are,—justices of the peace, for felony or breach of the peace committed in their presence; the sheriff and the coroner in their county, for felony; constables, for treason, felony or breach of the peace committed in their view,—and within the metropolitan police district they have even larger powers (Metropolitan Police Acts 1829–1895).

3. A private person is bound to arrest for a felony committed in his presence, under penalty of fine and imprisonment. By the Prevention of Offences Act 1851, a private person is allowed to arrest any one whom he finds committing an indictable offence by night, and under the Malicious Damage Act 1861, any person committing an offence against that act may be arrested without warrant by the owner of the property damaged, or his servants, or persons authorized by him. So, too, by the Coinage Offences Act 1861, s. 31, any person may arrest any one whom he shall find committing any offence relating to the coin, or other offence against that act.

A person arrested without warrant must not be detained in private custody but must be taken with all convenient speed to a police station or justice and there charged (Summary Jurisdiction Act 1879).

4. The arrest by hue and cry is where officers and private persons are concerned in *pursuing* felons, or such as have dangerously wounded others. By the Fugitive Offenders Act 1881, provision was made for the arrest in the United Kingdom of persons committing treason, and felony in any of the British colonies and vice versa; as to the arrest of fugitives in foreign countries see EXTRADITION.

The remedy for a wrongful arrest is by an action for false imprisonment.

In Scotland the law of arrest in criminal procedure has a general constitutional analogy with that of England, though the practice differs with the varying character of the judicatories. Colloquially the word arrest is used in compulsory procedure for the recovery of debt; but the technical term applicable in that department is *caption*, and the law on the subject is generically different from that of England. There never was a practice in Scottish law corresponding with the English arrest in mesne process; but by old custom a warrant for caption could be obtained where a creditor made oath that he had reason to believe his debtor meditated flight from the country, and the writ so issued is called a warrant against a person *in meditatione fugae*. Imprisonment of old followed on ecclesiastical cursing, and by fiction of law in later times it was not the creditor's remedy, but the punishment of a refractory person denounced rebel for disobedience to the injunctions of the law requiring fulfilment of his obligation. The system was reformed and stripped of its cumbrous fictions by an act of the year 1837. Although the proceedings against the person could only follow on completed process, yet, by a peculiarity of the Scottish law, documents executed with certain formalities, and by special statute bills and promissory notes, can be registered in the records of a court for execution against the person as if they were judgments of the court.

The general principles as to the law of arrest in most European countries correspond more or less exactly to those prevailing in England.

An *arrest of a ship*, which is the method of enforcing the admiralty process *in rem*, founded either on a maritime lien or on a claim against the ship, is dealt with under ADMIRALTY JURISDICTION.

See also article ATTACHMENT.

Arrest of Judgment is the assigning just reason why judgment should not pass, notwithstanding verdict given, either in civil or in criminal cases, and from intrinsic causes arising on the face of the record.

United States.—The law of arrest assimilates to that existing in England. Actual manual touching is not necessary (*Pike* v. *Hanson*, 9 N.H. 491; *Hill* v. *Taylor*, 50 Mich. 549); words of arrest by the officer, not protested against and no resistance offered, are sufficient (*Emery* v. *Chesley*, 18 N.H. 198; *Goodell* v. *Tower*, 1904, 58 Am. Rep. 790). Words of arrest, staying over night at prisoner's house, going with him before the magistrate next day constitute arrest (*Courtery* v. *Dozier*, 20 Ga. 369). Restraining a person in his own house is arrest.

In civil cases in most of the states arrest for debt is abolished, except in cases of fraud or wilful injury to persons or property by constitutional provision or by statute. One arrested under process of a federal court cannot be arrested under that of a state court for the same cause. There is no provision in the United States constitution as to imprisonment for debt, but congress has enacted (in Rev. Stat., s. 990) that all the provisions of the law of any state applicable to such imprisonment shall apply to the process of federal courts in that state. A woman can be arrested in New York for wilful injury to person, character or property, and in certain other cases (Code, s. 553). The president, federal officials, governors of states, members of congress and of state legislatures (during the session), marines, soldiers and sailors on duty, voters while going to and from the polls, judges, court officials (1904, 100 N.W. 591), coroners and jurors while attending upon their public duties, lawyers, parties and witnesses while going to, attending or returning from court, and generally married women without separate property, are exempt from arrest.

In criminal cases a bench-warrant in New York may be served in any county without being backed by a magistrate (Code Crim. Proc., s. 304). In Nebraska one found violating the law may be arrested and detained until a legal warrant can be issued (Crim. Code, s. 283). A bail may lawfully recapture his principal (1905) 121 Georgia Rep. 594. Foreign ambassadors and ministers and their servants are exempt from arrest. Exemption from arrest is a privilege, not of the court, as in England, but of the person, and can be waived (*Petrie* v. *Fitzgerald*, 1 Daly 401).

ARRESTMENT, in Scots law, the process by which a creditor detains the goods or effects of his debtor in the hands of third parties till the debt due to him shall be paid. It is divided into two kinds: (1) Arrestment in security, used when proceedings are commencing, or in other circumstances where a claim may become, but is not yet, enforceable; and (2) Arrestment in execution, following on the decree of a court, or on a registered document, under a clause or statutory power of registration, according to the custom of Scotland. By the process of arrestment the property covered is merely retained in place; to realize it for the satisfaction of the creditor's claim a further proceeding called "furthcoming" is necessary. By old practice, alimentary funds, *i.e.* those necessary for subsistence, were not liable to arrestment. By the Wages Arrestment Limitation (Scotland) Act 1870, the wages of all labourers, farm-servants, manufacturers, artificers and work-people are not arrestable except (1) in so far as they exceed 20s. per week; but the expense of the arrestment is not to be charged against the debtor unless the sum recovered exceed the amount of the said expense; or (2) under decrees for alimentary allowances and payments, or for rates and taxes imposed by law.

ARRETIUM (mod. *Arezzo*), an ancient city of Etruria, in the upper valley of the Arno, situated on the Via Cassia, 50 m. S.E. of Florentia. The site of the original city is not quite certain; some writers place it on the isolated hill called Poggio di S. Cornelio, 2½ m. to the S.E., where remains of a fortified *enceinte* still exist (cf. F. Noack in *Römische Mitteilungen*, 1897, p. 186); while others maintain, and probably rightly, that it occupied the hill at the summit of the modern town, where the medieval citadel (*fortezza*) was erected, and which was enclosed by an ancient wall. Numerous Etruscan tombs have been discovered within the lower portion of the area of the modern town, which

appears to correspond in site with the Roman (*C.I.L.* xi. p. 1082; G. Gamurrini in *Notizie degli scavi*, 1883, 262; 1887, 437). Vitruvius (ii. 8. 9) and Pliny (*Nat. Hist.* xxxv. 173) speak of the strength of its walls of bricks, but these have naturally disappeared. Many remains of Roman buildings have been discovered within the modern town, and the amphitheatre is still visible in the southern angle. Arretium appears as one of the cities which aided the Tarquins after their expulsion. It was an opponent of Rome at the end of the 4th and beginning of the 3rd century B.C., but soon sought for help against the attacks of the Gauls, against whom it was almost a frontier fortress. It was an important Roman base during the Hannibalic wars (though at one time it threatened defection—Livy xxvii. 21-24), and in 205 B.C. was able to furnish Scipio with a considerable quantity of arms and provisions (Livy xxviii. 45). In 187 B.C. the high road was extended as far as Bononia. Arretium took the part of Marius against Sulla, and the latter settled some of his veterans there as colonists. Caesar, or Octavian, added others, so that there are three classes, *Arretini veteres*, *Fidentiores*, and *Iulienses*. A considerable contingent from Arretium joined Catiline and in 49 B.C. Caesar occupied it. C. Maecenas[1] was perhaps a native of Arretium. Its fertility was famous in ancient times, and still more the red pottery made of the local clay, with its imitation of chased silver. The reliefs upon it are sometimes of considerable beauty, and large quantities of it, and the sites of several of the kilns, have been discovered in and near Arretium. It was also considerably exported. See *Corp. Inscrip. Lat.* xi. (Berlin, 1901) p. 1081, and *Notizie degli scavi, passim* (especially, 1884, 369, for the discovery of a fine group of the moulds from which these vases were made). The museum contains a very fine collection of these and a good collection of mediæval majolica. (T. As.)

ARRHENIUS, SVANTE AUGUST (1859–), Swedish physicist and chemist, was born on the 19th of February 1859, at Schloss Wijk, near Upsala. He studied at Upsala from 1876 to 1881 and at Stockholm from 1881 to 1884, then returning to Upsala as privat-docent in physical chemistry. He spent two years from 1886 to 1888 in travelling, and visited Riga Polytechnic and the universities of Würzburg, Graz, Amsterdam and Leipzig. In 1891 he was appointed lecturer in physics at Stockholm and four years later became full professor. Arrhenius is specially associated with the development of the theory of electrolytic dissociation, and his great paper on the subject, *Recherches sur la conductibilité galvanique des électrolytes*—(1) *conductibilité galvanique des solutions aqueuses extrêmement diluées*, (2) *théorie chimique des électrolytes*, was presented to the Stockholm Academy of Sciences in 1883. He was subsequently continuously engaged in extending the applications of the doctrine of electrolytic conduction in relation not only to the problems of chemical action but also, on the supposition that in certain conditions the air conducts electrolytically, to the phenomena of atmospheric electricity. In 1900 he published a *Lärobok i teoretik elektrokemi*, which was translated into German and English, and his *Lehrbuch der kosmischen Physik* appeared in 1903. In 1904 he delivered at the university of California a course of lectures, the object of which was to illustrate the application of the methods of physical chemistry to the study of the theory of toxins and antitoxins, and which were published in 1907 under the title *Immunochemistry*. In his *Worlds in the Making* (1908), an English translation of *Das Werden der Welten* (1907), he combated the generally accepted doctrine that the universe is tending to what Clausius termed *Wärmetod* through exhaustion of all sources of heat and motion, and suggested that by virtue of a mechanism which maintains its available energy it is self-renovating, energy being "degraded" in bodies which are in the solar state, but "elevated" or raised to a higher level in bodies which are in the nebular state. He further put forward the conception that life is universally diffused, constantly emitted from all habitable worlds in the form of spores which traverse space for years or ages, the majority being ultimately destroyed by the heat of some blazing star, but some few finding a resting-place on bodies which have reached the habitable stage.

[1] The name Cilnius was apparently never borne by Maecenas himself, though he is so described, *e.g.* by Tacitus, *Ann.* vi. 11, cf. Macrob. ii. 4, 12. The Cilnii with whom Maecenas was connected were a noble Etruscan family.

ARRIA, in Roman history, the heroic wife of Caecina Paetus. When her husband was implicated in the conspiracy of Scribonianus against the emperor Claudius (A.D. 42), and condemned to death, she resolved not to survive him. She accordingly stabbed herself with a dagger, which she then handed to him with the words, "Paetus, it does not hurt" (*Paete, non dolet*; see Pliny, *Epp.* iii. 16; Martial i. 14; Dio Cassius lx. 16). Her daughter, also called Arria, was the wife of Thrasea Paetus. When he was condemned to death by Nero, she would have imitated her mother's example, but was dissuaded by her husband, who entreated her to live for the sake of their children. She was sent into banishment (Tacitus, *Annals*, xvi. 34).

ARRIAN (FLAVIUS ARRIANUS), of Nicomedia in Bithynia, Greek historian and philosopher, was born about A.D. 96, and lived during the reigns of Hadrian, Antoninus Pius and Marcus Aurelius. In recognition of his abilities, he received the citizenship of both Athens and Rome. He was greatly esteemed by Hadrian, who appointed him governor (*legatus*) of Cappadocia (131–137), in which capacity he distinguished himself in a campaign against the Alani. This is the only instance before the 3rd century in which a first-rate Roman military command was given to a Greek. Arrian spent a considerable portion of his time at Athens, where he was archon 147–148. With his retirement or recall from Cappadocia his official career came to an end. In his declining years, he retired to his native place, where he devoted himself to literary work. He died about 180. His biography, by Dio Cassius, is lost.

When young, Arrian was the pupil and friend of Epictetus, who had probably withdrawn to Nicopolis, when Domitian expelled all philosophers from Rome. He took verbatim notes of his teacher's lectures, which he subsequently published under the title of *The Dissertations* (Διατριβαί), in eight books, of which the first four are extant and constitute the chief authority for Stoic ethics, and *The Encheiridion* (*i.e.* Manual) *of Epictetus*, a handbook of moral philosophy, for many years a favourite instruction book with both Christians and pagans. It was adapted for Christian use by St Nilus of Constantinople (5th century), and Simplicius (about 550) wrote a commentary on it which we still possess.

The most important of Arrian's original works is his *Anabasis of Alexander*, in seven books, containing the history of Alexander the Great from his accession to his death. Arrian's chief authorities were, as he tells us, Aristobulus of Cassandreia and Ptolemy, son of Lagus (afterwards king of Egypt), who both accompanied Alexander on his campaigns. In spite of a too indulgent view of his hero's defects, and some over-credulity, Arrian's is the most complete and trustworthy account of Alexander that we possess.

Other extant works of Arrian are: *Indica*, a description of India in the Ionic dialect, including the voyage of Nearchus, intended as a supplement to the *Anabasis*; *Acies Contra Alanos*, a fragment of importance for the knowledge of Roman military affairs; *Periplus of the Euxine*, an official account written (131) for the emperor Hadrian; *Tactica*, attributed by some to Aelianus, who wrote in the reign of Trajan; *Cynegeticus*, a treatise on the chase, supplementing Xenophon's work on the same subject; the *Periplus of the Erythraean Sea*, attributed to him, is by a later compiler. Amongst his lost works may be mentioned: Τὰ μετ' Ἀλέξανδρον, a history of the period succeeding Alexander, of which an epitome is preserved in Photius; histories of Bithynia, the Alani and the Parthian wars under Trajan; the lives of Timoleon of Syracuse, Dion of Syracuse and a famous brigand named Timoleon. Arrian's style is simple, lucid and manly; but his language, though pure, presents some peculiarities. He was called "Xenophon the younger" from his imitation of that writer, and he even speaks of himself as Xenophon.

Complete works ed. F. Dübner (1846); *Anabasis*, C. Abicht (1889); with notes, C. W. Krüger (1835), C. Sintenis (1867), C. Abicht (1875); *Scripta Minora*, R. Hercher and A. Eberhard (1885); A. J. Roos, i., containing the *Anabasis* (Teubner series, 1907). English translations: *Anabasis*, Rooke (1812); *Anabasis* and *Indica*, E. J. Chinnock (1893); *Voyage of Nearchus* with the spurious *Periplus*, W. Vincent (1807), J. W. M'Crindle (Calcutta, 1879); *Periplus of the Euxine*, W. Falconer (1805); *Cynegeticus* [W. Dansey] (1831). See also E. Bolla, *Arriano di Nicomedia* (1890); E. Schwartz in Pauly-Wissowa's *Realencyclopädie der classischen Alterthumswissenschaft* (1896); H. F. Pelham, "Arrian as Legate of Cappadocia," in *English Historical Review*, October 1896; article GREECE: *History, ancient*, "Authorities."

ARRIS (Fr. *areste*, or *arête*), in architecture, the sharp edge or angle in which two sides or surfaces meet.

ARRONDISSEMENT (from *arrondir*, to make round), an administrative subdivision of a department in France. Dating nominally from 1800, the arrondissement was really a re-creation of the "district" of 1790. It comprises within itself the canton and the commune. It differs from the department and from the commune in being merely an administrative division and not a complete legal personality with power to acquire and possess. The purposes for which it exists are, again, unlike those of the department and the commune, comparatively limited. It is the electoral district for the chamber of deputies, each arrondissement returning one member; if the population is in excess of 100,000 it is divided into two or more constituencies. It is also a judicial district having a court of first instance. It is under the control of a sub-prefect. There are 362 arrondissements in the 87 departments. Each arrondissement has a council, with as many members as there are cantons, whose function is to subdivide among the communes their *quota* of the direct taxes charged to the arrondissement by the general council of the department. (See FRANCE.) Somewhat different from the arrondissements of the department are the arrondissements (20 in number) into which Paris is divided. They bear a certain resemblance to the sub-municipalities created in London by the London Government Act 1899, and each forms a local administrative unit (see PARIS).

France is also subdivided, for purposes of defence, into five *maritime* divisions, termed arrondissements. Instituted originally under the Consulate, they were suppressed in 1815, but re-established again in 1826. They are under the direction of maritime prefects, who, by a decree of 1875, must be vice-admirals in the navy.

ARROWROOT. A large proportion of the edible starches obtained from the rhizomes or root-stocks of various plants are known in commerce under the name of arrowroot. Properly the name should be restricted to the starch yielded by two or three species of *Maranta* (nat. ord. Marantaceae), the chief of which is

FIG. 1. FIG. 2.

Arrowroot Plant (*Maranta arundinacea*).—Fig. 1, stem, leaves and flowers; fig. 2, tubers.

M. arundinacea; and when genuine or West Indian arrowroot is spoken of, it is understood that this is the variety meant. *Maranta arundinacea* is probably a native of Guiana and western Brazil, but it has long been cultivated in the West Indian Islands, and has now spread to most tropical countries. The plant is a herbaceous perennial with a creeping root-stock which gives off fleshy cylindrical branches or tubers, covered with pale brown or white scales and afterwards ringed with their scars. It is at the period when these tubers are gorged with starch, immediately before the season of rest, that it is ripe for use. In addition to about 25% of starch, the tubers contain a proportion of woody tissue, vegetable albumen and various salts. The arrowroot may be separated on a small scale in the same manner as potato-starch is frequently prepared, that is, by peeling the root and grating it in water, when the starch falls to the bottom. The liquor is then drained off, and the starch purified by repeated washings till it is ready for drying. On a large scale the manufacture of arrowroot is conducted with specially arranged machinery. The rhizomes when dug up are washed free of earthy impurities and afterwards skinned. Subsequently, according to Pereira's *Materia Medica*, "the carefully skinned tubers are washed, then ground in a mill, and the pulp washed in tinned-copper cylindrical washing-machines. The fecula (dim. of Lat. *faex*, dregs, or sediment) is subsequently dried in drying-houses. In order to obtain the fecula free from impurity, pure water must be used, and great care and attention paid in every step of the process. The skinning or peeling of the tubers must be performed with great nicety, as the cuticle contains a resinous matter which imparts colour and a disagreeable flavour to the starch. German-silver palettes are used for skinning the deposited fecula, and shovels of the same metal for packing the dried fecula. The drying is effected in pans, covered with white gauze to exclude dust and insects."

Arrowroot is distinguished by the granules agglomerating into small balls, by slightly crepitating when rubbed between the fingers, and by yielding with boiling water a fine, transparent, inodorous and pleasant-tasting jelly. In microscopic structure the granules present an ovoid form, marked with concentric lines very similar to potato-starch, but readily distinguished by having a "hilum" marking at the thick extremity of the granule, while in potato-starch the same appearance occurs at the thin end (compare figs. 3 and 4 below). In addition to the West Indian supplies, arrowroot is found in the commerce of Brazil, the East Indies, Australia, Cape Colony and Natal.

The name "arrowroot" is derived from the use by the Mexican Indians of the juice of the fresh root as an application to wounds produced by poisoned arrows. Sir Hans Sloane refers to it in his *Catalogue of Jamaica Plants* (1696), and it is said to have been introduced into England by William Houston about 1732. It is grown as a stove-plant in botanic gardens. The slender, much-branched stem is 5 or 6 ft. high, and bears numerous leaves with long, narrow sheaths and large spreading ovate blades, and a few short-stalked white flowers.

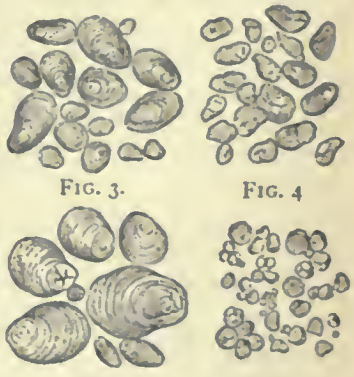


FIG. 3. FIG. 4

FIG. 5. FIG. 6.

Starch Granules magnified.

Fig. 3. Potato. Fig. 4. Arrowroot. Fig. 5. Tous-les-mois. Fig. 6. Manihot.

Tous-les-mois, or Tulema arrowroot, also from the West Indies, is obtained from several species of *Canna*, a genus allied to *Maranta*, and cultivated in the same manner. The granules of *tous-les-mois* are readily distinguishable by their very large size (fig. 5). East Indian arrowroot is obtained from the root-stocks of several species of the genus *Curcuma* (nat. ord. Zingiberaceae), chiefly *C. angustifolia*, a native of central India. Brazilian arrowroot is the starch of the cassava plant, a species of Manihot (fig. 6), which when agglutinated on hot plates forms the tapioca of commerce. The cassava is cultivated in the East Indian Archipelago as well as in South America. *Tacca*, or *Otaheite*

arrowroot, is the produce of *Tacca pinnatifida*, the pia plant of the South Sea Islands. Portland arrowroot was formerly prepared on the Isle of Portland from the tubers of the common cuckoo-pint, *Arum maculatum*. Various other species of arum yield valuable food-starches in hot countries. Under the name of British arrowroot the farina of potatoes is sometimes sold, and the French excel in the preparation of imitations of the more costly starches from this source. The chief use, however, of potato-farina as an edible starch is for adulterating other and more costly preparations. This falsification can readily be detected by microscopic examination, and the accompanying drawings exhibit the appearance under the microscope of the principal starches we have described. Although these starches agree in chemical composition, their value as articles of diet varies considerably, owing to different degrees of digestibility and pleasantness of taste. Arrowroot contains about 82% of starch, and about 1% of proteid and mineral matter. Farina, or British arrowroot, at about one-twelfth the price, is just as useful and pleasant a food.

ARROWSMITH, the name of an English family of geographers. The first of them, Aaron Arrowsmith (1750–1823), migrated to London from Winston in Durham when about twenty years of age, and was employed by John Cary, the engraver. In 1790 he made himself famous by his large chart of the world on Mercator's projection. Four years later he published another large map of the world on the globular projection, with a companion volume of explanation. The maps of North America (1796) and Scotland (1807) are the most celebrated of his many later productions. He left two sons, Aaron and Samuel, the elder of whom was the compiler of the *Eton Comparative Atlas*, of a Biblical atlas, and of various manuals of geography. They carried on the business in company with John Arrowsmith (1790–1873), nephew of the elder Aaron. In 1834 John published his *London Atlas*, the best set of maps then in existence. He followed up the atlas with a long series of elaborate and carefully executed maps, those of Australia, America, Africa and India being especially valuable. In 1863 he received the gold medal of the Royal Geographical Society, of which body he was one of the founders.

ARROYO (O. Sp. *arrogio*, Lat. *arrogium*, a rivulet or stream), the channel of a stream cut in loose earth, found often at the head of a gully, where the water flows only at certain seasons of the year.

ARSACES, a Persian name, which occurs on a Persian seal, where it is written in cuneiform characters. The most famous Arsaces was the chief of the Parni, one of the nomadic Scythian or Dahan tribes in the desert east of the Caspian Sea. A later tradition, preserved by Arrian, derives Arsaces I. and Tiridates from the Achaemenian king Artaxerxes II., but this has evidently no historical value. Arsaces, seeking refuge before the Bactrian king Diodotes, invaded Parthia, then a province of the Seleucid empire, about 250 B.C. (Strabo xi. p. 515, cf. Arrian p. 1, Müller, in Photius, *Cod.* 58, and Syncellus p. 284). After two years (according to Arrian) he was killed, and his brother Tiridates, who succeeded him and maintained himself for a short time in Parthia, during the dissolution of the Seleucid empire by the attacks of Ptolemy III. (247 ff.), was defeated and expelled by Seleucus II. (about 238). But when this king was forced, by the rebellion of his brother, Antiochus Hierax, to return to the west, Tiridates came back and defeated the Macedonians (Strabo xi. pp. 513, 515; Justin xli. 4; Appian, *Syr.* 65; Isidorus of Charax 11). He was the real founder of the Parthian empire, which was of very limited extent until the final decay of the Seleucid empire, occasioned by the Roman intrigues after the death of Antiochus IV. Epiphanes (165 B.C.), enabled Mithradates I. and his successors to conquer Media and Babylonia. Tiridates adopted the name of his brother Arsaces, and after him all the other Parthian kings (who by the historians are generally called by their proper names), amounting to the number of about thirty, officially wear only the name Arsaces. With very few exceptions only the name ΑΡΣΑΚΗΣ (with various epithets) occurs on the coins of the Parthian kings, and the obverse generally shows the seated figure of the founder of the dynasty, holding in his hand a strung bow. The Arsacidian empire was overthrown in A.D. 226 by Ardashir (Artaxerxes), the founder of the Sassanid empire, whose conquests began about A.D. 212. The name Arsaces of Persia is also borne by some kings of Armenia, who were of Parthian origin. (See PERSIA and PARTHIA.) (ED. M.)

ARS-AN-DER-MOSEL, a town of Germany, in the imperial province Alsace-Lorraine, 5 m. S. of Metz on the railway to Novéant. It has a handsome Roman Catholic church and extensive foundries. In the vicinity are the remains of a Roman aqueduct, which formerly spanned the valley. Pop. 5000.

ARSCHOT, PHILIPPE DE CROY, DUKE OF (1526–1595), governor-general of Flanders, was born at Valenciennes, and inherited the estates of the ancient and wealthy family of Croy. Becoming a soldier, he was made a knight of the order of the Golden Fleece by Philip II., king of Spain, and was afterwards employed in diplomatic work. He took part in the troubles in the Netherlands, and in 1563 refused to join William the Silent and others in their efforts to remove Cardinal Granvella from his post. This attitude, together with Arschot's devotion to the Roman Catholic Church, which he expressed by showing his delight at the massacre of St Bartholomew, led Philip of Spain to regard him with still greater favour, which, however, was withdrawn in consequence of Arschot's ambiguous conduct when welcoming the new governor, Don John of Austria, to the Netherlands in 1576. In spite, however, of his being generally distrusted by the inhabitants of the Netherlands, he was appointed governor of the citadel of Antwerp when the Spanish troops withdrew in 1577. After a period of vacillation he deserted Don John towards the end of that year. Jealous of the prince of Orange, he was then the head of the party which induced the archduke Matthias (afterwards emperor) to undertake the sovereignty of the Netherlands, and soon afterwards was appointed governor of Flanders by the state council. A strong party, including the burghers of Ghent, distrusted the new governor; and Arschot, who was taken prisoner during a riot at Ghent, was only released on promising to resign his office. He then sought to regain the favour of Philip of Spain, and having been pardoned by the king in 1580 again shared in the government of the Netherlands; but he refused to serve under the count of Fuentes when he became governor-general in 1594, and retired to Venice, where he died on the 11th of December 1595.

See J. L. Motley, *The Rise of the Dutch Republic.*

ARSENAL, an establishment for the construction, repair, receipt, storage and issue of warlike stores; details as to *matériel* will be found under AMMUNITION, ORDNANCE, &c. The word "arsenal" appears in various forms in Romanic languages (from which it has been adopted into Teutonic), *i.e.* Italian *arzanale*, Spanish *arsenal*, &c.; Italian also has *arzana* and *darsena*, and Spanish a longer form *atarazanal*. The word is of Arabic origin, being a corruption of *daraṣ-ṣinā'ah*, house of trade or manufacture, *dar*, house, *al*, the, and *ṣina'ah*, trade, manufacture, *ṣana'a*, to make. Such guesses as *arx navalis*, naval citadel, *arx senatus* (*i.e.* of Venice, &c.), are now entirely rejected.

A first-class arsenal, which can renew the *matériel* and equipment of a large army, embraces a gun factory, carriage factory, laboratory and small-arms ammunition factory, small-arms factory, harness, saddlery and tent factories, and a powder factory; in addition it must possess great store-houses. In a second-class arsenal the factories would be replaced by workshops. The situation of an arsenal should be governed by strategical considerations. If of the first class, it should be situated at the base of operations and supply, secure from attack, not too near a frontier, and placed so as to draw in readily the resources of the country. The importance of a large arsenal is such that its defences would be on the scale of those of a large fortress. The usual subdivision of branches in a great arsenal is into A, Storekeeping; B, Construction; C, Administration. Under A we should have the following departments and stores:—Departments of issue and receipt, pattern room, armoury department, ordnance or park, harness, saddlery and accoutrements, camp equipment, tools and instruments,

engineer store, magazines, raw material store, timber yard, breaking-up store, unserviceable store. Under B—Gun factory, carriage factory, laboratory, small-arms factory, harness and tent factory, powder factory, &c. In a second-class arsenal there would be workshops instead of these factories. C—Under the head of administration would be classed the chief director of the arsenal, officials military and civil, non-commissioned officers and military artificers, civilian foremen, workmen and labourers, with the clerks and writers necessary for the office work of the establishments. In the manufacturing branches are required skill, and efficient and economical work, both executive and administrative; in the storekeeping part, good arrangement, great care, thorough knowledge of all warlike stores, both in their active and passive state, and scrupulous exactness in the custody, issue and receipt of stores. For fuller details the reader is referred to papers by Sir E. Collen, R.A., in vol. viii., and Lieut. C. E. Grover, R.E., in vol. vi. *Proceedings of R. Artillery Institution.* In England the Royal Arsenal, Woolwich, manufactures and stores the requirements of the army and navy (see WOOLWICH).

ARSENIC (symbol As, atomic weight 75·0), a chemical element, known to the ancients in the form of its sulphides. Aristotle gave them the name *σανδαράκη*, and Theophrastus mentions them under the name *ἀρσενικόν*. The oxide known as white arsenic is mentioned by the Greek alchemist Olympiodorus, who obtained it by roasting arsenic sulphide. These substances were all known to the later alchemists, who used minerals containing arsenic in order to give a white colour to copper. Albertus Magnus was the first to state that arsenic contained a metal-like substance, although later writers considered it to be a bastard or semi-metal, and frequently called it *arsenicum rex*. In 1733 G. Brandt showed that white arsenic was the calx of this element, and after the downfall of the phlogiston theory the views concerning the composition of white arsenic were identical with those which are now held, namely that it is an oxide of the element.

Arsenic is found in the uncombined condition in various localities, but more generally in combination with other metals and sulphur, in the form of more or less complex sulphides. Native arsenic is usually found as granular or curvilaminar masses, with a reniform or botryoidal surface. These masses are of a dull grey colour, owing to surface tarnish; only on fresh fractures is the colour tin-white with metallic lustre. The hardness is 3·5 and the specific gravity 5·63–5·73. Crystals of arsenic belong to the rhombohedral system, and have a perfect cleavage parallel to the basal plane; natural crystals are, however, of rare occurrence, and are usually acicular in habit. Native arsenic occurs usually in metalliferous veins in association with ores of antimony, silver, &c.; the silver mines of Freiberg in Saxony, St Andreasberg in the Harz, and Chañarcillo in Chile being well-known localities. Attractive globular aggregates of well-developed radiating crystals have been found at Akatani, a village in the province Echizen, in Japan.

Arsenic is a constituent of the minerals arsenical iron, arsenical pyrites or mispickel, tin-white cobalt or smaltite, arsenical nickel, realgar, orpiment, pharmacolite and cobalt bloom, whilst it is also met with in small quantities in nearly all specimens of iron pyrites. The ordinary commercial arsenic is either the naturally occurring form, which is, however, more or less contaminated with other metals, or is the product obtained by heating arsenical pyrites, out of contact with air, in earthenware retorts which are fitted with a roll of sheet iron at the mouth, and an earthenware receiver. By this method of distillation the arsenic sublimes into the receiver, leaving a residue of iron sulphide in the retort. For further purification, it may be sublimed, after having been previously mixed with a little powdered charcoal, or it may be mixed with a small quantity of iodine and heated. It can also be obtained by the reduction of white arsenic (arsenious oxide) with carbon. An electro-metallurgical process for the extraction of arsenic from its sulphides has also been proposed (German Patent, 67,973). These compounds are brought into solution by means of polysulphides of the alkali metals and the resultant liquor run into the cathode compartment of a bath, which is divided by diaphragms into a series of anode and cathode chambers; the anode divisions being closed and gas-tight, and containing carbon or platinum electrodes. The arsenic solution is decomposed at the cathode, and the element precipitated there.

Arsenic possesses a steel-grey colour, and a decided metallic lustre; it crystallizes on sublimation and slow condensation in rhombohedra, isomorphous with those of antimony and tellurium. It is very brittle. Its specific gravity is given variously from 5·395 to 5·959; its specific heat is 0·083, and its coefficient of linear expansion 0·00000559 (at 40° C.). It is volatile at temperatures above 100° C. and rapidly vaporizes at a dull red heat. It liquefies when heated under pressure, and its melting point lies between 446° C. and 457° C. The vapour of arsenic is of a golden yellow colour, and has a garlic odour. The vapour density is 10·6 (air = 1) at 564° C., corresponding to a tetratomic molecule As_4; at a white heat the vapour density shows a considerable lowering in value, due to the dissociation of the complex molecule.

By condensing arsenic vapour in a glass tube, in a current of an indifferent gas, such as hydrogen, amorphous arsenic is obtained, the deposit on the portion of the tube nearest to the source of heat being crystalline, that farther along (at a temperature of about 210° C.) being a black amorphous solid, while still farther along the tube a grey deposit is formed. These two latter forms possess a specific gravity of 4·710 (14° C.) [A. Bettendorff, *Annalen*, 1867, 144, p. 110], and by heating at about 358°–360° C. pass over into the crystalline variety. Arsenic burns on heating in a current of oxygen, with a pale lavender-coloured flame, forming the trioxide. It is easily oxidized by heating with concentrated nitric acid to arsenic acid, and with concentrated sulphuric acid to arsenic trioxide; dilute nitric acid only oxidizes it to arsenious acid. It burns in an atmosphere of chlorine forming the trichloride; it also combines directly with bromine and sulphur on heating, while on fusion with alkalis it forms arsenites.

Arsenic and most of its soluble compounds are very poisonous, and consequently the methods used for the detection of arsenic are very important. For full accounts of methods used in detecting minute traces of arsenic in foods, &c., see "Report to Commission to Manchester Brewers' Central Association," the *Analyst*, 1900, 26, p. 8; "Report of Conjoint Committee of Society of Chemical Industry and Society of Public Analysts," the *Analyst*, 1902, 27, p. 48; T. E. Thorpe, *Journal of the Chemical Society*, 1903, 83, p. 774; O. Hehner and others, *Journal of Society of Chemical Industry*, 1902, 21, p. 94; also ADULTERATION.

Arsenic and arsenical compounds generally can be detected by (*a*) *Reinsch's test*: A piece of clean copper is dipped in a solution of an arsenious compound which has been previously acidified with pure hydrochloric acid. A grey film is produced on the surface of the copper, probably due to the formation of a copper arsenide. The reaction proceeds better on heating the solution. On removing, washing and gently drying the metal and heating it in a glass tube, a white crystalline sublimate is formed on the cool part of the tube; under the same conditions antimony does not produce a crystalline sublimate.

(*b*) *Fleitmann's test* and *Marsh's test* depend on the fact that arsenic and its compounds, when present in a solution in which hydrogen is being generated, are converted into arseniuretted hydrogen, which can be readily detected either by its action on silver nitrate solution or by its decomposition on heating. In Fleitmann's test, the solution containing the arsenious compound is mixed with pure potassium hydroxide solution and a piece of pure zinc or aluminium foil dropped in and the whole then heated. A piece of bibulous paper, moistened with silver nitrate, is held over the mouth of the tube, and if arsenic be present, a grey or black deposit is seen on the paper, due to the silver nitrate being reduced by the arseniuretted hydrogen. Antimony gives no reaction under these conditions, so that the method can be used to detect arsenic in the presence of antimony, but the test is not so delicate as either Reinsch's or Marsh's method.

In the Marsh test the solution containing the arsenious compounds is mixed with pure hydrochloric acid and placed in an apparatus in which hydrogen is generated from pure zinc and pure sulphuric acid. The arseniuretted hydrogen produced is passed through a tube containing lead acetate paper and soda-lime, and finally through a narrow glass tube, constricted at various points, and heated by a very small flame. As the arseniuretted hydrogen passes over

the heated portion it is decomposed and a black deposit formed. Instead of heating the tube, the gas may be ignited at the mouth of the tube and a cold surface of porcelain or platinum placed in the flame, when a black deposit is formed on the surface. This may be distinguished from the similar antimony deposit by its ready solubility in a solution of sodium hypochlorite. A blank experiment should always be carried out in testing for small quantities of arsenic, to ensure that the materials used are quite free from traces of arsenic. It is to be noted that the presence of nitric acid interferes with the Marsh test; and also that if the arsenic is present as an *arsenic* compound it must be reduced to the *arsenious* condition by the action of sulphurous acid. Arsenic compounds can be detected in the dry way by heating in a tube with a mixture of sodium carbonate and charcoal when a deposit of black amorphous arsenic is produced on the cool part of the tube, or by conversion of the compound into the trioxide and heating with dry sodium acetate when the offensive odour of the extremely poisonous cacodyl oxide is produced. In the wet way, arsenious oxide and arsenites, acidified with hydrochloric acid, give a yellow precipitate of arsenic trisulphide on the addition of sulphuretted hydrogen; this precipitate is soluble in solutions of the alkaline hydroxides, ammonium carbonate and yellow ammonium sulphide. Under like conditions arsenates only give a precipitate on long-continued boiling.

Arsenic is usually estimated either in the form of magnesium pyroarsenate or as arsenic sulphide. For the pyroarsenate method it is necessary that the arsenic should be in the *arsenic* condition, if necessary this can be effected by heating with nitric acid; the acid solution is then mixed with " magnesia mixture " and made strongly alkaline by the addition of ammonia. It is then allowed to stand twenty-four hours, filtered, washed with dilute ammonia, dried, ignited to constant weight and weighed, the filter paper being incinerated separately after moistening with nitric acid. From the weight of magnesium pyroarsenate obtained the weight of arsenic can be calculated.

In the sulphide method, the arsenic should be in the *arsenious* form. Sulphuretted hydrogen is passed through the liquid until it is thoroughly saturated, the excess of sulphuretted hydrogen is expelled from the solution by a brisk stream of carbon dioxide, and the precipitate is filtered on a Gooch crucible and washed with water containing a little sulphuretted hydrogen and dried at 100° C.; it is then well washed with small quantities of pure carbon disulphide to remove any free sulphur, again dried and weighed. Arsenic can also be estimated by volumetric methods; for this purpose it must be in the *arsenious* condition, and the method of estimation consists in converting it into the *arsenic* condition by means of a standard solution of iodine, in the presence of a cold saturated solution of sodium bicarbonate.

The atomic weight of arsenic has been determined by many different chemists. J. Berzelius, in 1818, by heating arsenious oxide with excess of sulphur obtained the value 74·3; J. Pelouze (*Comptes rendus*, 1845, 20, p. 1047) titrated arsenic chloride with silver solution and obtained 75·0; and F. Kessler (*Pogg. Ann.* 1861, 113, p. 134) by converting arsenic trisulphide in hydrochloric acid solution into arsenic pentasulphide also obtained 75·0.

Compounds.—Arsenic forms two hydrides:—The *dihydride*, As_2H_2, is a brown velvety powder formed when sodium or potassium arsenide is decomposed by water. It is a somewhat unstable substance, decomposing on being heated, with liberation of hydrogen. Arsenic *trihydride* (arsine or arseniuretted hydrogen), AsH_3, is formed by decomposing zinc arsenide with dilute sulphuric acid; by the action of nascent hydrogen on arsenious compounds, and by the electrolysis of solutions of arsenious and arsenic acids; it is also a product of the action of organic matter on many arsenic compounds. It is a colourless gas of unpleasant smell, excessively poisonous, very slightly soluble in water. It easily burns, forming arsenious oxide if the combustion proceeds in an excess of air, or arsenic if the supply of air is limited; it is also decomposed into its constituent elements when heated. It liquefies at −40° C. and becomes solid at −118·9° C. (K. Olszewski). Metals such as tin, potassium and sodium, when heated in the gas, form arsenides, with liberation of hydrogen; and solutions of gold and silver salts are reduced by the gas with precipitation of metallic gold and silver. Chlorine, bromine and iodine decompose arsine readily, the action being most violent in the case of chlorine.

Arsenic tribromide, $AsBr_3$, is formed by the direct union of arsenic and bromine, and subsequent distillation from the excess of arsenic; it forms colourless deliquescent prisms which melt at 20°–25° C., and boil at 220° C. Water decomposes it, a small quantity of water leading to the formation of the *oxybromide*, AsOBr, whilst a large excess of water gives arsenious oxide, As_4O_6.

Arsenic certainly forms two, or possibly three iodides. The *di-iodide*, As_2I_4 or AsI_2, which is prepared by heating one part of arsenic with two parts of iodine, in a sealed tube to 230° C., forms dark cherry-red prisms, which are easily oxidized, and are readily decomposed by water. The *tri-iodide*, AsI_3, prepared by subliming arsenic and iodine together in a retort, by leading arsine into an alcoholic iodine solution, or by boiling powdered arsenic and iodine with water, filtering and evaporating, forms brick-red hexagonal tables, of specific gravity 4·39, soluble in alcohol, ether and benzene, and in a large excess of water; in the presence of a small quantity of water, it is decomposed with formation of hydriodic acid and an insoluble basic salt of the composition $4AsOI{\cdot}3As_4O_6{\cdot}24H_2O$. It combines with alkaline iodides to form very unstable compounds. The *penta-iodide*, AsI_5, appears to be formed when a mixture of one part of arsenic and seven parts of iodine is heated to 190° C., but on dissolving the resulting product in carbon bisulphide and crystallizing from this solvent, only the tri-iodide is obtained.

Arsenic trichloride, $AsCl_3$, is prepared by distilling white arsenic with concentrated sulphuric acid and common salt, or by the direct union of arsenic with chlorine, or from the action of phosphorus pentachloride on white arsenic. It is a colourless oily heavy liquid of specific gravity 2·205 (0° C.), which, when pure and free from chlorine, solidifies at −18°C., and boils at 132°C. It is very poisonous and decomposes in moist air with evolution of white fumes. With a little water it forms arsenic oxychloride, AsOCl, and with excess of water it is completely decomposed into hydrochloric acid and white arsenic. It combines directly with ammonia to form a solid compound variously given as $AsCl_3{\cdot}3NH_3$, or $2AsCl_3{\cdot}7NH_3$, or $AsCl_3{\cdot}4NH_3$.

Arsenic trifluoride, AsF_3, is prepared by distilling white arsenic with fluorspar and sulphuric acid, or by heating arsenic tribromide with ammonium fluoride; it is a colourless liquid of specific gravity 2·73, boiling at 63° C.; it fumes in air, and in contact with the skin produces painful wounds. It is decomposed by water into arsenious and hydrofluoric acids, and absorbs ammonia forming the compound $2AsF_3{\cdot}5NH_3$. By the action of gaseous ammonia on arsenious halides at −30° C. to −40° C., *arsenamide*, $As(NH_2)_3$, is formed. Water decomposes it into arsenious oxide and ammonia, and when heated to 60° it loses ammonia and forms *arsenimide*, $As_2(NH)_3$ (C. Hugot, *Compt. rend.* 1904, 139, p. 54). For AsF_5, see *Ber.*, 1906, 39, p. 67.

Two oxides of arsenic are definitely known to exist, namely the trioxide (white arsenic), As_4O_6, and the pentoxide, As_2O_5, while the existence of a suboxide, As_2O(?), has also been mooted. Arsenic trioxide has been known from the earliest times, and was called *Hüttenrauch* (furnace-smoke) by Basil Valentine. It occurs naturally in the mineral claudetite, and can be artificially prepared by burning arsenic in air or oxygen. It is obtained commercially by roasting arsenical pyrites in either a Brunton's or Oxland's rotatory calciner, the crude product being collected in suitable condensing chambers, and afterwards refined by resublimation, usually in reverberatory furnaces, the foreign matter being deposited in a long flue leading to the condensing chambers. White arsenic exists in two crystalline forms (octahedral and prismatic) and one amorphous form; the octahedral form is produced by the rapid cooling of arsenic vapour, or by cooling a warm saturated solution in water, or by crystallization from hydrochloric acid, and also by the gradual transition of the amorphous variety, this last phenomenon being attended by the evolution of heat. Its specific gravity is 3·7; it is only slightly soluble in cold water, but is more soluble in hot water, the solution reacting faintly acid. The prismatic variety of the oxide can be obtained by crystallization from a saturated boiling solution in potassium hydroxide, or by the crystallization of a solution of silver arsenite in nitric acid. Its specific gravity is 4·15. In the amorphous condition it can be obtained by condensing the vapour of the oxide at as high a temperature as possible, when a vitreous mass is produced, which melts at 200° C., has a specific gravity of 3·68–3·798, and is more soluble in water than the crystalline variety.

Arsenious oxide is very poisonous. It acts as a reducing agent; it is not convertible into the pentoxide by the direct action of oxygen; and its solution is reduced by many metals (*e.g.* zinc, tin and cadmium) with precipitation of arsenic and formation of arseniuretted hydrogen. The solution of arsenious oxide in water reacts acid towards litmus and contains tribasic arsenious acid, although on evaporation of the solution the trioxide is obtained and not the free acid. The salts of the acid are, however, very stable, and are known as arsenites. Of these salts several series are known, namely the ortho-arsenites, which are derivatives of the acid H_3AsO_3, the meta-arsenites, derivatives of $HAsO_2$, and the pyro-arsenites, derivatives of $H_4As_2O_5$. The arsenites of the alkali metals are soluble in water, those of the other metals are insoluble in water, but are readily soluble in acids. A neutral solution of an arsenite gives a yellow precipitate of silver arsenite, Ag_3AsO_3, with silver nitrate solution, and a yellowish-green precipitate (Scheele's green) of cupric hydrogen arsenite, $CuHAsO_3$, with copper sulphate solution. By the action of oxidizing agents such as nitric acid, iodine solution, &c., arsenious acid is readily converted into arsenic acid, in the latter case the reaction proceeding according to the equation $H_3AsO_3+I_2+H_2O=H_3AsO_4+2HI$. Arsenic pentoxide, As_2O_5, is most easily obtained by oxidation of a solution of arsenious acid with nitric acid; the solution on concentration deposits the compound $2H_3AsO_4{\cdot}H_2O$ (below 15° C.), which on being heated to a dark red heat loses its water of crystallization and leaves a white vitreous mass of the pentoxide. This substance dissolves slowly in water, forming arsenic acid; by heating to redness it decomposes into arsenic and oxygen. It deliquesces in moist air, and is easily reduced to arsenic by heating with carbon.

Arsenic acid, H_3AsO_4, is prepared as shown above, the compound $2H_3AsO_4{\cdot}H_2O$ on being heated to 100° C. parting with its water of crystallization and leaving a residue of the acid, which crystallizes in needles. On heating to 180° C. it loses water and yields pyro-arsenic acid, $H_4As_2O_7$, which at 200° C. loses more water and leaves

a crystalline mass of meta-arsenic acid, $HAsO_3$. These latter two acids are only stable in the solid state; they dissolve readily in water with evolution of heat and immediate transformation into the ortho-arsenic acid. The salts of arsenic acid, termed arsenates, are isomorphous with the phosphates, and in general character and reactions resemble the phosphates very closely; thus both series of salts give similar precipitates with "magnesia mixture" and with ammonium molybdate solution, but they can be distinguished by their behaviour with silver nitrate solution, arsenates giving a reddish-brown precipitate, whilst phosphates give a yellow precipitate.

There are three known compounds of arsenic and sulphur, namely, realgar As_2S_2, orpiment As_2S_3, and arsenic pentasulphide As_2S_5. Realgar occurs native in orange prisms of specific gravity 3·5; it is prepared artificially by fusing together arsenic and sulphur, but the resulting products vary somewhat in composition; it is readily fusible and sublimes unchanged, and burns on heating in a current of oxygen, forming arsenic trioxide and sulphur dioxide.

Orpiment (*auri pigmentum*) occurs native in pale yellow rhombic prisms, and can be obtained in the amorphous form by passing a current of sulphuretted hydrogen gas through a solution of arsenious oxide or an arsenite, previously acidified with dilute hydrochloric acid. It melts easily and volatilizes. It burns on heating in air, and is soluble in solutions of alkaline hydroxides and carbonates, forming thioarsenites, $As_2S_3+4KHO=K_2HAsO_2+K_2HAsS_3+H_2O$. On acidifying the solution so obtained with hydrochloric acid, the whole of the arsenic is reprecipitated as trisulphide, $K_2HAsO_2+K_2HAsS_3+4HCl=4KCl+3H_2O+As_2S_3$. Arsenic pentasulphide, As_2S_5, can be prepared by fusing the trisulphide with the requisite amount of sulphur; it is a yellow easily-fusible solid, which in absence of air can be sublimed unchanged; it is soluble in solutions of the caustic alkalis, forming thioarsenates, which can also be obtained by the action of alkali polysulphides on orpiment. The thioarsenites and thioarsenates of the alkali metals are easily soluble in water, and are readily decomposed by the action of mineral acids. Arsenic compounds containing selenium and sulphur are known, such as arsenic seleno-sulphide, $AsSeS_2$, and arsenic thio-selenide, $AsSSe_2$. Arsenic phosphide, AsP, results when phosphine is passed into arsenic trichloride, being precipitated as a red-brown powder.

Many organic arsenic compounds are known, analogous to those of nitrogen and phosphorus, but apparently the primary and secondary arsines, $AsH_2{\cdot}CH_3$ and $AsH(CH_3)_2$, do not exist, although the corresponding chlorine derivatives, $AsCl_2{\cdot}CH_3$, methyl arsine chloride, and $AsCl(CH_3)_2$, dimethyl arsine chloride, are known. The tertiary arsines, such as $As(CH_3)_3$, trimethyl arsine, and the quaternary arsonium iodides and hydroxides, $(CH_3)_4AsI$ and $(CH_3)_4As{\cdot}OH$, tetramethyl arsonium iodide and hydroxide, have been obtained. The arsines and arsine chlorides are liquids of overpowering smell, and in some cases exert an extremely irritating action on the mucous membrane. They do not possess basic properties; the halogen in the chlorine compounds is readily replaced by oxygen, and the oxides produced behave like basic oxides. The chlorides $AsCl_2{\cdot}CH_3$ and $AsCl(CH_3)_2$ as well as $As(CH_3)_3$ are capable of combining with two atoms of chlorine, the arsenic atom apparently changing from the tri- to the penta-valent condition, and the corresponding oxygen compounds can also be oxidized to compounds containing one oxygen atom or two hydroxyl groups more, forming acids or oxides. The compounds of the type AsX_3, *e.g.* $AsCl_4{\cdot}CH_3$, $AsCl_3(CH_3)_2$, on heating break down, with separation of methyl chloride and formation of compounds of the type AsX_3; the breaking down taking place more readily the fewer the number of methyl groups in the compound. The dimethyl arsine (or cacodyl) compounds have been most studied. On distillation of equal parts of dry potassium acetate and arsenious oxide, a colourless liquid of unbearable smell passes over, which is spontaneously inflammable and excessively poisonous. It is sometimes called Cadet's fuming liquid, and its composition was determined by R. Bunsen, who gave it the name cacodyl oxide (κακώδης, stinking); its formation may be shown thus:

$$As_4O_6+8CH_3CO_2K=2[(CH_3)_2As]_2O+4K_2CO_3+4CO_2.$$

The liquid is spontaneously inflammable owing to the presence of free cacodyl, $As_2(CH_3)_4$, which is also obtained by heating the oxide with zinc clippings in an atmosphere of carbon dioxide; it is a liquid of overpowering odour, and boils at 170° C. Cacodyl oxide boils at 150° C., and on exposure to air takes up oxygen and water and passes over into the crystalline cacodylic acid, thus:

$$[(CH_3)_2As]_2O+H_2O+O_2=2(CH_3)_2As{\cdot}O{\cdot}OH.$$

Pharmacology.—Of arsenic and its compounds, arsenious acid (dose $\frac{1}{60}$–$\frac{1}{15}$ gr.) and its preparation liquor arsenicalis, Fowler's solution (dose 2–8 ♏), are in very common use. The iodide of arsenic (dose $\frac{1}{30}$–$\frac{1}{15}$ gr.) is one of the ingredients of Donovan's solution (see MERCURY); and iron arsenate (dose $\frac{1}{10}$–$\frac{1}{4}$ gr., in a pill), a mixture of ferrous and ferric arsenates with some iron oxide, is of great use in certain cases. Sodium arsenate ($\frac{1}{10}$–$\frac{1}{10}$ gr.) is somewhat less commonly prescribed, though all the compounds of this metal have great value in experienced hands.

Externally, arsenious acid is a powerful caustic when applied to raw surfaces, though it has no action on the unbroken skin. Internally, unless the dose be extremely small, all preparations are severe gastro-intestinal irritants. This effect is the same however the drug be administered, as, even after subcutaneous injection, the arsenic is excreted into the stomach after absorption, and thus sets up gastritis in its passage through the mucous membrane. In minute doses it is a gastric stimulant, promoting the flow of gastric juice. It is quickly absorbed into the blood, where its presence can be demonstrated especially in the white blood corpuscles. In certain forms of anaemia it increases the number of the red corpuscles and also their haemoglobin content. None of these known effects of arsenic is sufficient to account for the profound change that a course of the drug will often produce in the condition of a patient. It has some power of affecting the general metabolism, but no wholly satisfactory explanation is forthcoming. According to Binz and Schultz its power is due to the fact that it is an oxygen-carrier, arsenious acid withdrawing oxygen from the protoplasm to form arsenic acid, which subsequently yields up its oxygen again. It is thus vaguely called an alterative, since the patient recovers under its use. It is eliminated chiefly by the urine, and to a less extent by the alimentary canal, sweat, saliva, bile, milk, tears, hair, &c., but it is also stored up in the body mainly in the liver and kidneys.

Therapeutics.—Externally arsenious acid has been much used by quack doctors to destroy morbid growths, &c., a paste or solution being applied, strong enough to kill the mass of tissue and make it slough out quickly. But many accidents have resulted from the arsenic being absorbed, and the patient thereby poisoned. Internally it is useful in certain forms of dyspepsia, but as some patients are quite unable to tolerate the drug, it must always be administered in very small doses at first, the quantity being slowly increased as tolerance is shown. Children as a rule bear it better than adults. It should never be given on an empty stomach, but always after a full meal. Certain cases of anaemia which do not yield to iron are often much improved by arsenic, though in other apparently similar ones it appears to be valueless. It is the routine treatment for pernicious anaemia and Hodgkin's disease, though here again the drug may be of no avail. For the neuralgia and anaemia following malaria, for rheumatoid arthritis, for chorea and also asthma and hay fever, it is constantly prescribed with excellent results. Certain skin diseases, as psoriasis, pemphigus and occasionally chronic eczema, are much benefited by its use, though occasionally a too prolonged course will produce the very lesion for which under other circumstances it is a cure. A recent method of using the drug is in the form of sodium cacodylate by subcutaneous injection, and this preparation is said to be free from the cumulative effects sometimes arising after the prolonged use of the other forms. Other organic derivatives employed are sodium metharsenite and sodium anilarsenate or atoxyl; hypodermic injections of the latter have been used in the treatment of sleeping sickness. Occasionally, as among the Styrians, individuals acquire the habit of arsenic-eating, which is said to increase their weight, strength and appetite, and clears their complexion. The probable explanation is that an antitoxin is developed within them.

Toxicology and Forensic Medicine.—The commonest source of arsenical poisoning is the arsenious acid or white arsenic, which in one form is white and opaque, like flour, for which it has been mistaken with fatal results. Also, as it has little taste and no colour it is easily mixed with food for homicidal purposes. When combined with potash or soda it is used to saturate fly-papers, and strong solutions can be obtained by soaking these in water; this fact has also been used with criminal intent. Copper arsenite (or Scheele's green) used to be much employed as a pigment for wall-papers and fabrics, and toxic effects have resulted from their use. Metallic arsenic is probably not poisonous, but as it usually becomes oxidized in the alimentary canal, the usual symptoms of arsenical poisoning follow its use.

In acute poisoning the interval between the reception of the poison and the onset of symptoms ranges from ten minutes, or even less, if a strong solution be taken on an empty stomach, to

twelve or more hours if the drug be taken in solid form and the stomach be full of food. The usual period, however, is from half an hour to an hour. In a typical case a sensation of heat developing into a burning pain is felt in the throat and stomach. This is soon followed by uncontrollable vomiting, and a little later by severe purging, the stools being first of all faecal but later assuming a rice water appearance and often containing blood. The patient suffers from intense thirst, which cannot be relieved, as drinking is immediately followed by rejection of the swallowed fluid. There is profound collapse, the features are sunken, the skin moist and cyanosed. The pulse is feeble and irregular, and respiration is difficult. The pain in the stomach is persistent, and cramps in the calves of the legs add to the torture. Death may be preceded by coma, but consciousness is often maintained to the end. The similarity of the symptoms to those of cholera is very marked, but if the suspicion arises it can soon be cleared up by examining any of the secretions for arsenic. More rarely the poison seems to centre itself on the nerve centres, and gastro-intestinal symptoms may be almost or quite absent. In such cases the acute collapse occurs in company with both superficial and deep anaesthesia of the limbs, and is soon followed by coma terminating in death. In criminal poisoning repeated doses are usually given, so that such cases may not be typical, but will present some of the aspects of acute and some of chronic arsenical poisoning. As regards treatment, the stomach must be washed out with warm water by means of a soft rubber tube, an emetic being also administered. Then, if available, freshly precipitated ferric hydrate must be given, which can be prepared by adding a solution of ammonia to one of iron perchloride. The precipitate is strained off, and the patient can swallow it suspended in water. While this is being obtained, magnesia, castor oil or olive oil can be given; or failing all these, copious draughts of water. The collapse must be treated with hot blankets and bottles, and subcutaneous injections of brandy, ether or strychnine. The pain can be lessened by injections of morphia.

Arsenic may be gradually absorbed into the system in very small quantities over a prolonged period, the symptoms of chronic poisoning resulting. The commonest sources used to be wall-papers, fabrics, artificial flowers and toys: also certain trades, as in the manufacture of arsenical sheep-dipping. But at the present time cases arising from these causes occur very rarely. In 1900 an outbreak of "peripheral neuritis" with various skin affections occurred in Lancashire, which was traced to beer made from glucose and invert sugar, in the preparation of which sulphuric acid contaminated with arsenic was said to have been used. But the nature of the disease in this case was decidedly obscure. The symptoms so closely resembled those of *beri-beri* that it has also been suggested that the illness was the same, and was caused by the manufacture of the glucose from mouldy rice (see BERI-BERI), though no proof of this was possible. The earliest symptoms are slight gastric disorders, loss of appetite and general malaise, followed later by colicky pains, irritation of eyelids and skin eruptions. But sooner or later peripheral neuritis develops, usually beginning with sensory disturbances, tingling, numbness, formication and occasionally cutaneous anaesthesia. Later the affected muscles become exquisitely tender, and then atrophy, while the knee-jerk or other reflex is lost. Pigmentation of the skin may occur in the later stages. Recovery is very slow, and in fatal cases death usually results from heart failure.

After acute poisoning, the stomach at a *post-mortem* presents signs of intense inflammation, parts or the whole of its mucous membrane being of a colour varying from dark red to bright vermilion and often corrugated. Submucous haemorrhages are usually present, but perforation is rare. The rest of the alimentary canal exhibits inflammatory changes in a somewhat lesser degree. After chronic poisoning a widely spread fatty degeneration is present. Arsenic is found in almost every part of the body, but is retained in largest amount by the liver, secondly by the kidneys. After death from chronic poisoning it is found present even in the brain and spongy bone. The detection of arsenic in criminal cases is effected either by Reinsch's test or by Marsh's test, the urine being the secretion analysed when available. But Reinsch's test cannot be used satisfactorily for a quantitative determination, nor can it be used in the presence of chlorates or nitrates. And Marsh's test is very unmanageable with organic liquids on account of the uncontrollable frothing that takes place. But in such cases the organic matter can be first destroyed by one of the various methods, usually the moist method devised by Fresenius being chosen.

ARSENIUS (*c.* 354–450), an anchorite, said to have been born of a noble Roman family, who achieved a high reputation for his knowledge of Greek and Roman literature. He was appointed by Theodosius the Great, tutor of the young princes Arcadius and Honorius, but at the age of forty he retired to Egypt, where for forty years he lived in monastic seclusion at Scetis in the Thebais, under the spiritual guidance of St John the Dwarf. He is said to have gained the admiration of his fellows by the extreme rigour of his asceticism. The remainder of his life he spent at Canopus, and Troë near Memphis, where he died at the age of ninety-five. Of his writings two collections of admonitory maxims are extant: the first, Διδασκαλία καὶ παραίνεσις, containing instructions for monks, is published with a Latin version by Fr. Combefis in *Auctarium biblioth. patr. novissim.* (Paris, 1672), pp. 301 f.; the second is a collection of forty-four wise sayings put together by his friends under the title of Ἀποφθέγματα (see Cotelerius, *Eccl. graec. monum.*, 1677, i. pp. 353-372). In the Roman Catholic Church his festival is on the 19th of July, in the Orthodox Eastern Church on the 8th of May. His biography by Simeon Metaphrastes is largely fiction.

ARSENIUS AUTORIANUS (13th century), patriarch of Constantinople, lived about the middle of the 13th century. He received his education in Nicaea at a monastery of which he later became the abbot, though not in orders. Subsequently he gave himself up to a life of solitary asceticism in a Bithynian monastery, and is said, probably wrongly, to have remained some time in a monastery on Mount Athos. From this seclusion he was in A.D. 1255 called by Theodore II. Lascaris to the position of patriarch at Nicaea, and four years later, on that emperor's death, became joint guardian of his son John. His fellow-guardian Georgios Mouzalon was immediately murdered by Michael Palaeologus, who assumed the position of tutor. Arsenius then took refuge in the monastery of Paschasius, retaining his office of patriarch but refusing to discharge its duties. Nicephorus of Ephesus was appointed in his stead. In 1261 Michael, having recovered Constantinople, induced Arsenius again to undertake the office of patriarch, but soon incurred his severe censure by ordering the young prince John to be blinded. Arsenius went so far as to excommunicate the emperor, who, having vainly sought for pardon, took refuge in false accusations against Arsenius and caused him to be banished to Proconnesus, where some years afterwards (according to Fabricius in 1264; others say in 1273) he died. Throughout these years he declined to remove the sentence of excommunication which he had passed upon Michael, and after his death, when the new patriarch Josephus gave absolution to the emperor, the quarrel was carried on between the "Arsenites" and the "Josephists." The "Arsenian schism" lasted till 1315, when reconciliation was effected by the patriarch Niphon (see Gibbon, *Decline and Fall of the Roman Empire*, ed. J. B. Bury, 1898, vol. vi. 467 foll.). Arsenius is said to have prepared from the decisions of the councils and the works of the Fathers a summary of divine laws under the title *Synopsis Canonum*. This was published (Greek original and Latin version) by G. Voël and H. Justel in *Bibliotheca Jur. Canon. Vet.* (Paris, 1661), 749 foll. Some hold that the *Synopsis* was the work of another Arsenius, a monk of Athos (see L. Petit in Vacant's *Dict. théol. cathol.* i. col. 1994); the ascription depends on whether the patriarch Arsenius did or did not sojourn at Mount Athos.

See Georgius Pachymeres ii. 15, iii. *passim*, iv. 1-16; Nicephorus Gregoras iii. 1, iv. 1; for the will of Arsenius see Cotelerius, *Monumenta*, ii. 168.

ARSES, Persian king, youngest son of Artaxerxes III., was raised to the throne in 338 B.C. by Bagoas (*q.v.*), who had

murdered his father and all his brothers. But when the young king tried to make himself independent, Bagoas killed him too, with all his children, in the third year of his reign (336) (Diod. 17.5; Strabo 15. 736; Trogus, Prol. x., Alexander's despatch to Darius III.; Arrian ii. 14. 5, and the chronographers). In Plutarch, *De fort. Alex.* ii. 3. 5, he is called *Oarses*; in Johannes Antioch. p. 38, *Arsamos*; in the canon of Ptolemy, *Aroges* (by Elias of Nisibis, *Pirūz*); in a chronological tablet from Babylon (Brit. Mus. Sp. ii. 71, *Zeitschrift für Assyriologie*, viii. 176, x. 64) he is abbreviated into *Ar.* See PERSIA: *Ancient History*. (ED. M.)

ARSINOË, the name of four Egyptian princesses of the Ptolemaic dynasty. The name was introduced into the Ptolemaic dynasty by the mother of Ptolemy I. This Arsinoë was originally a mistress of Philip II. of Macedon, who presented her to a Macedonian soldier Loqus shortly before Ptolemy was born. It was, therefore, assumed by the Macedonians that the Ptolemaic house was really descended from Philip (see PTOLEMIES).

1. Daughter of Lysimachus, king of Thrace, first wife of Ptolemy II. Philadelphus (285–247 B.C.). Accused of conspiring against her husband, who perhaps already contemplated marriage with his sister, also named Arsinoë, she was banished to Coptos, in Upper Egypt. Her son Ptolemy was afterwards king under the title of Euergetes. It is supposed by some (*e.g.* Niebuhr, *Kleine Schriften*; cf. Ehrlichs, *De Callimachi hymnis*) that she is to be identified with the Arsinoë who became wife of Magas, king of Cyrene, and that she married him after her exile to Coptos. But this hypothesis is apparently without foundation. Magas before his death had betrothed his daughter Berenice to the son of his brother Ptolemy II. Philadelphus, but Arsinoë, disliking the projected alliance, induced Demetrius the Fair, son of Demetrius Poliorcetes, to accept the throne of Cyrene as husband of Berenice. She herself, however, fell in love with the young prince, and Berenice in revenge formed a conspiracy, and, having slain Demetrius, married Ptolemy's son (see BERENICE, 3).

2. Daughter of Ptolemy I. Soter and Berenice. Born about 316 B.C., she married Lysimachus, king of Thrace, who made over to her the territories of his divorced wife, Amastris. To secure the succession for her own children she brought about the murder of her stepson Agathocles. Lysandra, the wife of Agathocles, took refuge with Seleucus, king of Syria, who made war upon Lysimachus and defeated him (281). After her husband's death Arsinoë fled to Ephesus and afterwards to Cassandreia in Macedonia. Seleucus, who had seized Lysimachus's kingdom, was murdered in 281 by Ptolemy Ceraunus (half-brother of Arsinoë), who thus became master of Thrace and Macedonia. To obtain possession of Cassandreia, he offered his hand in marriage to Arsinoë, and being admitted into the town, killed her two younger sons and banished her to Samothrace. Escaping to Egypt, she became the wife of her full brother Ptolemy II., the first instance of the practice (afterwards common) of the Greek kings of Egypt marrying their sisters. She was a woman of a masterful character and won great influence. Her husband, though she bore him no children, was devoted to her and paid her all possible honour after her death in 271. He gave her name to a number of cities, and also to a district (nome) of Egypt.[1] It is related that he ordered the architect Dinochares to build a temple in her honour in Alexandria; in order that her statue, made of iron, might appear to be suspended in the air, the roof was to consist of an arch of loadstones (Pliny, *Hist. Nat.* xxxiv. 42). Coins were also struck, showing her crowned and veiled on the obverse, with a double cornucopia on the reverse. She was worshipped as a goddess under the title of Θεὰ φιλάδελφος, and she and her husband as Θεοὶ ἀδελφοί (Justin xxiv. 2, 3; Pausanias i. 7).

See von Prott, *Rhein. Mus.* liii. (1898), pp. 460 f.

3. Daughter of Ptolemy III. Euergetes, sister and wife of Ptolemy IV. Philopator. She seems to be erroneously called Eurydice by Justin (xxx. 2), and Cleopatra by Livy (xxvii. 4). Her presence greatly encouraged the troops at the battle of Raphia (217), in which Antiochus the Great was defeated. Her husband put her to death to please his mistress Agathocleia, a Samian dancer (between 210 and 205). She was worshipped as Θεὰ φιλοπάτωρ; she and her husband as Θεοὶ φιλοπάτορες (Polybius v. 83, 84, xv. 25-33).

4. Youngest daughter of Ptolemy XIII. Auletes, and sister of the famous Cleopatra. During the siege of Alexandria by Julius Caesar (48) she was recognized as queen by the inhabitants, her brother, the young Ptolemy, being then held captive by Caesar. Caesar took her with him to Rome as a precaution. After Caesar's triumph she was allowed to return to Alexandria. After the battle of Philippi she was put to death at Miletus (or in the temple of Artemis at Ephesus) by order of Mark Antony, at the request of her sister Cleopatra (Dio Cassius xlii. 39; Caesar, *Bell. civ.* iii. 112; Appian, *Bell. civ.* v. 9).

AUTHORITIES.—For general authorities see article PTOLEMIES. The article "Arsinoë" in Pauly-Wissowa's *Realencyclopädie* contains a full list of those who bore the name, and also of the numerous towns which were called after the various princesses.

ARSINOITHERIUM (so called from the Egyptian queen Arsinoë), a gigantic horned mammal from the Middle Eocene beds of the Fayum, Egypt, representing a sub-order of Ungulata, called Barypoda. The skull is remarkable for carrying a huge pair of horn-cores above the muzzle, which seem to be the enlarged nasal bones, and a rudimentary pair farther back; the front horn-cores, like the rest of the skull, consist of a mere shell of bone, and were probably clothed in life with horny sheaths. The teeth form a continuous even series, the small canines being crowded between the incisors and premolars; the crowns of the cheek-series are tall (hypsodont), with a distinctive pattern of their own. Although the brain is relatively larger, the bones of the limbs, especially the short, five-toed feet, approximate to those of the Amblypoda and Proboscidea; but in the articulation of the astragalus with both the navicular and cuboid *Arsinoitherium* is nearer the former than the latter group.

It is probable, however, that these resemblances are mainly due to parallelism in development, and are in all three cases adaptations necessary to support the enormous weight of the body. On the other hand, the marked resemblance of the structure of the tarsus is probably indicative of descent from nearly allied condylarthrous ancestors (see PHENACODUS). No importance can be attached to the presence of horns as an indication of affinity between *Arsinoitherium* and the Amblypoda; and there are important differences in the structure of the skulls of the two, notably in the external auditory meatus, the occiput, the premaxillae, the palatal foramina and the lower jaw.

From the Proboscidea *Arsinoitherium* differs broadly in skull structure, in the form of the cheek-teeth, and in the persistence of the complete dental series of forty-four without gaps or enlargement of particular teeth. Whether there is any relationship with the Hyracoidea cannot be determined until we are acquainted with the forerunners of *Arsinoitherium*, which is evidently a highly specialized type.

It may be added that as the name Barypoda has been used at an earlier date for another group of animals, the alternative title Embrithopoda has been suggested in case the former should be considered barred.

See C. W. Andrews, *Descriptive Catalogue of the Tertiary Vertebrata of the Fayum, British Museum* (1906). (R. L.*)

ARSON (from Lat. *ardere*, to burn), a crime which has been described as the malicious and voluntary burning of the house of another (3 Co. *Inst.* 66). At common law in England it is an offence of the degree of felony. In the Roman civil law arson was punishable by death. It appears early in the history of English law, being known in ancient laws by the term of *boernet*. It is mentioned by Cnut as one of the bootless crimes, and under the Saxon laws was punishable by death. The sentence of death for arson was, says Stephen (*Commentaries*, iv. 89), in the reign of Edward I. executed by a kind of *lex talionis*, for the incendiaries were burnt to death; a punishment which was inflicted also under

[1] The appendix to pt. ii. of the Tebtunis series of papyri (Grenfell, Hunt and Goodspeed, 1907) contains a lengthy account of the topography of the Arsinoite nome.

the Gothic institutions. Death continued to be the penalty at least down to the reign of King John, according to a reported case (Gloucester Pleas, pl. 216), but in course of time the penalty became that of other common-law felonies, death by the gallows. It is one of the earliest crimes in which the *mens rea*, or criminal intent, was taken special notice of. Bracton deals at length with the *mala conscientia*, which he says is necessary for this crime, and contrasts it with *negligentia* (f. 146 b), while in many early indictments malice aforethought (*malitia praecogitata*) appears. Arson was deprived of "benefit of clergy" under the Tudors, while an act of 8 Henry VI. c. 6 (1429) made the wilful burning of houses, under particular circumstances, high treason, but acts of 1 Ed. VI. c. 12 (1547) and 1 Mary (1553) reduced it to an ordinary felony. The English law concerning arson was consolidated by 7 & 8 Geo. IV. c. 30, which was repealed and re-enacted by the Malicious Damage Act 1861.

The common-law offence of arson (which has been greatly enlarged by the act of 1861) required some part of the house to be actually burnt; neither a bare intention nor even an actual attempt by putting fire in or towards it will constitute the offence, if no part was actually burnt, but the burning of any part, however trifling, is sufficient, and the offence is complete even if the fire is put out or goes out of itself. The burning must be malicious and wilful, otherwise it is only a trespass. If a man by wilfully setting fire to his own house burn the house of his neighbour also, it will be a felony, even though the primary intention of the party was to burn his own house only. The word *house*, in the definition of the offence at common law, extends not only to dwelling-houses, "but to all out-houses which are parcel thereof, though not adjoining thereto." Barns with corn and hay in them, though distant from a house, are within the definition.

The different varieties of the offence are specified in the Malicious Damage Act 1861. The following crimes are thereby made felonies: (1) setting fire to any church, chapel, meeting-house or other place of divine worship; (2) setting fire to a dwelling-house, any person being therein; (3) setting fire to a house, out-house, manufactory, farm-building, &c., with intent to impose and defraud any person; (4) setting fire to buildings appertaining to any railway, port, dock or harbour; or (5) setting fire to any public building. In these cases the act provides that the person convicted shall be liable, at the discretion of the court, to be kept in penal servitude for life, or for any term not less than three years (altered to *five* years by the Penal Servitude Acts Amendment Act 1864), or to be imprisoned for any time not exceeding two years, with or without hard labour, and, if a male under sixteen years of age, with or without whipping. Setting fire to other buildings, and setting fire to goods in buildings under such circumstances that, if the building were thereby set fire to, the offence would amount to felony, are subject to the punishments last enumerated, with this exception that the period of penal servitude is limited to fourteen years. The attempt to set fire to any building, or any matter or thing not enumerated above, is punishable as a felony. Russell says (*Crimes*, p. 1781) that the term building is no doubt very indefinite, but it was used in 9 & 10 Vict. c. 25, s. 2; and it was thought much better to adopt this term and leave it to be interpreted as each case might arise, than to attempt to define; as any such attempt would probably have failed in producing any expression more certain than the term "building" itself. In *R.* v. *Manning*, 1872 (L.R. 1 C.C.R. 338), it was held that an unfinished house was a building within the meaning of the act. The setting fire to crops of hay, grass, corn, &c., is punishable by penal servitude for any period not exceeding fourteen years, but setting fire to stacks of the same, or any cultivated vegetable produce, or to peat, coals, &c., is regarded as a more serious offence, and the penal servitude may be for life. For the attempt to commit the last two offences penal servitude is limited to seven years. Setting fire to mines of coal, anthracite or other mineral fuel is visited with the full measure of penalty, and in the case of an attempt the penal servitude is limited to fourteen years. By the Dockyards, &c., Protection Act 1772 it is a felony punishable by death wilfully and maliciously to set fire to any of His Majesty's ships or vessels of war, or any of His Majesty's arsenals, magazines, dockyards, rope-yards, victualling offices or buildings therein, or any timber, material, stores or ammunition of war therein or in any part of His Majesty's dominions. If the person guilty of the offence is a person subject to naval discipline, he is triable by court-martial, and if found guilty, a sentence of capital punishment may be passed. The Malicious Damage Act 1861, s. 43, also includes as a felony the setting fire to any ship or vessel, with intent to prejudice any owner or part owner of the vessel, or of any goods on the same, or any person who has underwritten any policy of insurance on the vessel, or upon any goods on board the same.

In Scotland the offence equivalent to arson in England is known by the more expressive name of fire-raising. The crime was punishable capitally by old consuetudinary law, but it is now no longer capital, and may be tried in the sheriff court (50 & 51 Vict. c. 35, s. 56). Formerly the public prosecutor had the privilege of declining to demand capital punishment, and he invariably did so. *Wilful fire-raising*, which is the most heinous form of the crime, requires the raising of fire, without any lawful object, but with the deliberate intention of destroying certain premises or things, whether directly by the application of fire thereto, or indirectly by its application to something contained in or forming part of or communicating with them; also the intention to destroy premises or things of a certain description (much as mentioned above); and such premises or things must be the property of another than the accused. *Wicked, culpable and reckless fire-raising* differs from wilful fire-raising in that the fire is raised *without* the deliberate intention of destroying premises or things, but while the accused was engaged in some unlawful act, or while he was in such a state of passion, excitement or recklessness as not to care what results might follow from his acts.

United States.—The same general principles apply to this crime in American law. In some states by statute the intent to injure or defraud must be shown, *e.g.* when the property is insured. In New York one who wilfully burns property (including a vessel or its cargo) with intent to defraud or prejudice the insurer thereof, though the offence of arson is not committed, is punishable by imprisonment for not more than five years (N.Y. Pen. Code, ss. 575, 578). There must be an intent to destroy the building (*ibid.* s. 490; California Code, s. 447). An agreement to commit arson is conspiracy (*ibid.* s. 171). Killing a person in committing the crime of arson is murder in the first degree (*ibid.* s. 183); this is so in California, even where the crime is merely an attempt to commit arson (Cal. Pen. Code, s. 189). Explosion of a house by gunpowder or dynamite is arson (Texas Pen. Code, art. 761), but a charge of arson by "burning" will not be sustained by proof of exploding by dynamite, even though part of the building is burnt by the explosion (*Landers* v. *State* [Tex.], 47 S.W. 1008).

AUTHORITIES.—W. S. Holdsworth, *History of English Law*, vol. iii.; Pollock and Maitland, *History of English Law*; Stephen, *History of Criminal Law*, vol. iii.; Stephen, *Commentaries*; Russell on *Crimes*.

ARSONVAL, a village of France in the department of Aube, lies on the right bank of the Aube, about 30 m. east of Troyes. It has a church dating from the 12th century. Pop. 434.

ARSOT, the name of a forest in France, in the immediate neighbourhood of Belfort. It has an area of about 1500 acres, is almost encircled by a small stream, the Eloie, and is about 1400 ft. above the sea. On the east it is continued by the forest of Denney, which contains the fortress of Roppe, dominating the road from Colmar into France.

ARSUF, a town on the coast of Palestine, 12 m. N.N.E. of Jaffa, famous as the scene of a victory of the crusaders under Richard I. of England over the army of Saladin. After the capture of Acre on the 12th of July 1191, the army of the crusaders, under Richard Cœur-de-Lion and the duke of Burgundy, opened their campaign for the recovery of Jerusalem by marching southward towards Jaffa, from which place it was intended to move direct upon the holy city. The march was

along the sea-shore, and, the forces of Saladin being in the vicinity, the army moved in such a formation as to be able to give battle at any moment. Richard thus moved slowly, but in such compact order as to arouse the admiration even of the enemy. The right column of baggage and supplies, guarded by infantry, was nearest the sea, the various corps of heavy cavalry, one behind the other, formed the central column, and on the exposed left flank was the infantry, well closed up, and "level and firm as a wall," according to the testimony of Saracen authors. The columns were united into a narrow rectangle by the advanced and rear guards. The whole march was a running fight between untiring horse-archers and steady infantry. Only once did the column open out, and the opportunity was swiftly seized by the Saracens, yet so rapid was the rally of the crusaders that little damage was done (August 25). The latter maintained for many days an absolutely passive defence, and could not be tempted to fight; Richard and his knights made occasional charges, but quickly withdrew, and on the 7th of September this irregular skirmishing, in which the crusaders had scarcely suffered at all, culminated in the battle of Arsuf. Saladin had by now decided that the only hope of success lay in compelling the rear of the Christians' column to halt—and thus opening a gap, should the van be still on the move. Richard, on the other hand, had prepared for action by closing up still more, and as the crusaders were now formed a simple left turn brought them into two lines of battle, infantry in first line, cavalry in second line. Near Arsuf the road entered a defile between the sea and a wooded range of hills; and from the latter the whole Moslem army suddenly burst forth. The weight of the attack fell upon the rear of Richard's column, as Saladin desired. The column slowly continued its march, suffering heavily in horses, but otherwise unharmed. The first assault thus made no impression, but a fierce hand-to-hand combat followed, in which the Hospitallers, who formed the rear of the Christian army, were hard pressed. Their grand master, like many other subordinates in history, repeatedly begged to be allowed to charge, but Richard, who on this occasion showed the highest gift of generalship, that of feeling the pulse of the fight, waited for the favourable moment. Almost as he gave the signal for the whole line to charge, the sorely pressed Hospitallers rode out upon the enemy on their own initiative. At once the whole of the cavalry followed suit. The head (or right wing) and centre were not closely engaged, and their fleeter opponents had time to ride off, but the rear of the column carried all before it in its impetuous onset, and cut down the Saracens in great numbers. A second charge, followed by a third, dispersed the enemy in all directions. The total loss of the Saracens was more than tenfold that of the Christians, who lost but seven hundred men. The army arrived at Jaffa on the 10th of September.

See Oman, *Hist. of the Art of War*, ii. 303-317.

ARSURE, a village of France in the department of Jura, has some stone quarries and extensive layers of peat in its neighbourhood. Its church has a choir dating from the 11th century. Pop. 370.

ARSURES, a village of France in the department of Jura, situated on a small stream, the Lurine. It is surrounded by vineyards, from which excellent wine is produced. Pop. 233.

ART, a word in its most extended and most popular sense meaning everything which we distinguish from Nature. Art and Nature are the two most comprehensive genera of which the human mind has formed the conception. Under the genus Nature, or the genus Art, we include all the phenomena of the universe. But as our conception of Nature is indeterminate and variable, so in some degree is our conception of Art. Nor does such ambiguity arise only because some modes of thought refer a greater number of the phenomena of the universe to the genus Nature, and others a greater number to the genus Art. It arises also because we do not strictly limit the one genus by the other. The range of the phenomena to which we point, when we say Art, is never very exactly determined by the range of the other phenomena which at the same time we tacitly refer to the order of Nature. Everybody understands the general meaning of a phrase like Chaucer's "Nature ne Art ne koude him not amende," or Pope's "Blest with each grace of nature and of art." In such phrases we intend to designate familiarly as Nature all which exists independently of our study, forethought and exertion—in other words, those phenomena in ourselves or the world which we do not originate but find; and we intend to designate familiarly as Art all which we do not find but originate—or, in other words, the phenomena, which we add by study, forethought and exertion to those existing independently of us. But we do not use these designations consistently. Sometimes we draw an arbitrary line in the action of individuals and societies, and say, Here Nature ends and Art begins—such a law, such a practice, such an industry even, is natural, and such another is artificial; calling those natural which happen spontaneously and without much reflection, and the others artificial. But this line different observers draw at different places. Sometimes we adopt views which waive the distinction altogether. One such view is that wherein all phenomena are regarded as equally natural, and the idea of Nature is extended so as to include "all the powers existing in either the outer or the inner world, and everything which exists by means of those powers." In this view Art becomes a part of Nature. It is illustrated in the familiar passage of Shakespeare, where Polixenes reminds Perdita that

> "Nature is made better by no mean,
> But nature makes that mean: so, over that art
> Which, you say, adds to nature, is an art
> That nature makes." . . .
> "This is an art
> Which does mend nature, change it rather, but
> The art itself is nature."

A posthumous essay of John Stuart Mill contains a full philosophical exposition and defence of this mode of regarding the relations of Nature and Art. Defining Nature as above, and again as a "collective name for all facts, actual and possible," that writer proceeds to say that such a definition

"is evidently inapplicable to some of the modes in which the word is familiarly employed. For example, it entirely conflicts with the common form of speech by which Nature is opposed to Art, and natural to artificial. For in the sense of the word Nature which has thus been defined, and which is the true scientific sense, Art is as much Nature as anything else; and everything which is artificial is natural—Art has no independent powers of its own: Art is but the employment of the powers of Nature for an end. Phenomena produced by human agency, no less than those which, as far as we are concerned, are spontaneous, depend on the properties of the elementary forces, or of the elementary substances and their compounds. The united powers of the whole human race could not create a new property of matter in general, or of any one of its species. We can only take advantage for our purposes of the properties we find. A ship floats by the same laws of specific gravity and equilibrium as a tree uprooted by the wind and blown into the water. The corn which men raise for food grows and produces its grain by the same laws of vegetation by which the wild rose and the mountain strawberry bring forth their flowers and fruit. A house stands and holds together by the natural properties, the weight and cohesion of the materials which compose it. A steam engine works by the natural expansive force of steam, exerting a pressure upon one part of a system of arrangements, which pressure, by the mechanical properties of the lever, is transferred from that to another part, where it raises the weight or removes the obstacle brought into connexion with it. In these and all other artificial operations the office of man is, as has often been remarked, a very limited one; it consists of moving things into certain places. We move objects, and by doing this, bring some things into contact which were separate, or separate others which were in contact; and by this simple change of place, natural forces previously dormant are called into action, and produce the desired effect. Even the volition which designs, the intelligence which contrives, and the muscular force which executes these movements, are themselves powers of Nature."

Another mode of thought, in some sort complementary to the last, is based on the analogy which the operations of forces external to a man bear to the operations of man himself. Study, forethought and exertion are assigned to Nature, and her operations are called operations of Art. This view was familiar to ancient systems of philosophy, and especially to that of the Stoics. According to the report of Cicero, Nature as conceived by Zeno was a fire, and at the same time a voluntary agent having the power or art of creating things with regularity and design ("naturam esse ignem artificiosum ad gignendum progredientem via"). To this fire not merely creative force and

systematic action were ascribed, but actual personality. Nature was "non artificiosa solum, sed plane artifex." "That which in the works of human art is done by hands, is done with much greater art by Nature, that is, by a fire which exercises an art and is the teacher of other arts." This conception of Nature as an all-generating fire, and at the same time as a personal artist both teaching and including in her own activity all the human arts, on the one hand may be said, with Polixenes and J. S. Mill, to merge Art in Nature; but on the other hand it finds the essence of Nature in the resemblance of her operations to those of Art. "It is the *proprium* of art," according to the same system, "to create and beget," and the reasoning proceeds —Nature creates and begets, therefore Nature is an artist or Demiurgus. A kindred view is set forth by Sir Thomas Browne in the *Religio Medici*, when he declares that "all things are artificial; for Nature is the Art of God."

But these modes of thought, according to which, on the one hand, the processes of Art are included among processes of Nature, or on the other the processes of Nature among the processes of Art, are exceptional. In ordinary use the two conceptions, each of them somewhat vague and inexact, are antithetical. Their antithesis was what Dr Johnson had chiefly in his mind when he defined Art as "the power of doing something which is not taught by Nature or by instinct." But this definition is insufficient, because the abstract word Art, whether used of all arts at once or of one at a time, is a name not only for the power of doing something, but for the exercise of the power; and not only for the exercise of the power, but for the rules according to which it is exercised; and not only for the rules, but for the result. Painting, for instance, is an art, and the word connotes not only the power to paint, but the act of painting; and not only the act, but the laws for performing the act rightly; and not only all these, but the material consequences of the act or the thing painted. So of agriculture, navigation and the rest. Exception might also be taken to Dr Johnson's definition on the ground that it excludes all actions of instinct from the genus Art, whereas usage has in more languages than one given the name of Art to several of those ingenuities in the lower animals which popular theory at the same time declares to be instinctive. Dante, for instance, speaks of boughs shaken by the wind, but not so violently as to make the birds forgo their Art—

"Non però dal lor esser dritto sparte
Tanto, che gl' augelletti per le cime
Lasciasser d' operar ogni lor *arte*."

And Fontenelle, speaking in the language not of poetry but of science:—"Most animals—as, for instance, bees, spiders and beavers—have a kind of art peculiar to themselves; but each race of animals has no more than one art, and this one has had no first inventor among the race. Man, on the other hand, has an infinity of different arts which were not born with his race, and of which the glory is his own." Dr Johnson might reply that those properties of variety and of originality or individual invention, which Fontenelle himself alleges in the ingenuities of man but not in those of the lower animals, are sufficient to make a generic difference, and to establish the impropriety of calling a honeycomb or a spider's web a work of Art. It is not our purpose to trespass on ground so debateable as that of the nature of consciousness in the lower animals. Enough that when we use the term Art of any action, it is because we are thinking of properties in the action from which we infer, whether justly or not, that the agent voluntarily and designedly puts forth skill for known ends and by regular and uniform methods. If, then, we were called upon to frame a general definition of Art, giving the word its widest and most comprehensive meaning, it would run thus:—*Every regulated operation or dexterity by which organized beings pursue ends which they know beforehand, together with the rules and the result of every such operation or dexterity.*

Here it will be well to consider very briefly the natural history of the name which has been given to this very comprehensive conception by the principal branches of civilized mankind. Our own word Art the English language has taken, as all the Romance languages of modern Europe have taken theirs, directly from the Latin. The Latin *ars*, according to the prevailing opinion of philologists, proceeds from a root AR, of which the primitive signification was to put or fit things together, and which is to be found in a large family of Greek words. The Greek *τέχνη*, the name both for arts in the particular and art in the abstract, is by its root related both to *τέκ-των* and *τέκ-νον*, and thus contains the allied ideas of making and begetting. The *proprium* of art in the logic of the Stoics, "to create and beget," was strictly in accordance with this etymology. The Teutonic *Kunst* is formed from *können*, and *können* is developed from a primitive *Ich kann*. In *kann* philology is inclined to recognize a preterite form of a lost verb, of which we find the traces in *Kin-d*, a child; and the form *Ich kann* thus meaning originally "I begot," contains the germ of the two several developments,—*können*, "to be master," "to be able," and *kennen*, "to know." We thus see that the chief Indo-European languages have with one consent extended a name for the most elementary exercise of a constructive or productive power, till that name has covered the whole range of the skilled and deliberate operations of sentient beings.

In proportion as men left out of sight the idea of creation, of constructing or producing, "artificiosum esse ad gignendum," which is the primitive half of this extended notion, and attended only to the idea of skill, of proceeding by regular and disciplined methods, "progredi via," which is the superadded half, the whole notion Art, and the name for it, might become subject to a process of thought which, if analysed, would be like this:—What is done by regular and disciplined methods is Art; facts are observed and classified, and a systematic view of the order of the universe obtained, by regular and disciplined methods; the observing and classifying of facts, and obtaining a systematic view of the order of the universe, is therefore Art. To a partial extent this did unconsciously take place. Science, of which the essence is only in knowledge and theory, came to be spoken of as Art, of which the essence is all in practice and production. Cicero, notwithstanding his citation of the Stoical dictum that practice and production were of the essence of Art, elsewhere divides Art into two kinds—one by which things are only contemplated in the mind, another by which something is produced and done. ("Quumque artium aliud eiusmodi sit, ut tantummodo rem cernat; aliud, ut moliatur aliquid et faciat." —*Acad.* ii. 7.) Of the former kind his instance is geometry; of the latter the art of playing on the lyre. Now geometry, understanding by geometry an acquisition of the mind, that is, a collected body of observations and deductions concerning the properties of space and magnitude, is a science and not an art; although there is an art of the geometer, which is the skill by which he solves any given problem in his science, and the rules of that skill, and his exertion in putting it forth. And so every science has its instrumental art or practical discipline; and in as far as the word Art is used only of the practical discipline or dexterity of the geometer, the astronomer, the logician, the grammarian, or other person whose business it is to collect and classify facts for contemplation, in so far the usage is just. The same justification may be extended to another usage, whereby in Latin, and some of its derivative languages, the name Art came to be transferred in a concrete sense to the body of rules, the written code or manual, which lays down the discipline and regulates the dexterity; as *ars grammatica*, *ars logica*, *ars rhetorica* and the rest. But when the word is stretched so as to mean the sciences, as theoretical acquisitions of the mind, that meaning is illegitimate. Whether or not Cicero, in the passage above quoted, had in his mind the science of geometry as a collected body of observations and deductions, it is certain that the Ciceronian phrase of the *liberal arts*, the *ingenuous arts*, both in Latin and its derivatives or translations in modern speech, has been used currently to denote the sciences themselves, and not merely the disciplines instrumental to them. The *trivium* and the *quadrivium* (grammar, logic and rhetoric—geometry, astronomy, music and arithmetic) have been habitually called arts, when some of them have been named in that sense in which they mean

not arts but sciences, "only contemplating things in the mind." Hence the nomenclature, history and practical organization, especially in Britain, of one great division of university studies: the division of "arts," with its "faculty," its examinations, and its degrees.

In the German language the words for Art and Science have in general been loosely interchanged. The etymology of the word for Art secured a long continuance for this ambiguity. *Kunst* was employed indiscriminately in both the senses of the primitive *Ich kann*, to signify what I know, or Science, and what I can do, or Art. It was not till the end of the 17th century that a separate word for Science, the modern *Wissenschaft*, came into use. On the other hand, the Greek word τέχνη, with its distinct suggestion of the root signification to make or get, acted probably as a safeguard against this tendency. The distinction between τέχνη, Art or practice, and ἐπιστήμη, knowledge or Science, is observed, though not systematically, in Greek philosophy. But for our present purpose, that of making clear the true relation between the one conception and the other, further quotation is rendered superfluous by the discussion the subject has received at the hands of the modern writer already quoted. Between Art, of which we practise the rules, and Science, of which we entertain the doctrines, J. S. Mill establishes the difference in the simplest shape, by pointing out that one grammatical mood is proper for the conclusions of Science, and another for those of Art. Science enunciates her conclusions in the indicative mood, whereas "the imperative is the characteristic of Art, as distinguished from Science." And as Art utters her conclusions in her own form, so she supplies the substance of her own major premise.

"Every art has one first principle, or general major premise, not borrowed from science, that which enunciates the object aimed at, and affirms it to be a desirable object. The builder's art assumes that it is desirable to have buildings; architecture (as one of the fine arts) that it is desirable to have them beautiful and imposing. The hygienic and medical arts assume, the one that the preservation of health, the other that the cure of disease, are fitting and desirable ends. These are not propositions of science. Propositions of science assert a matter of fact—an existence, a co-existence, a succession, or a resemblance. The propositions now spoken of do not assert that anything is, but enjoin or recommend that something should be. They are a class by themselves. A proposition of which the predicate is expressed by the words *ought* or *should be* is generically different from one which is expressed by *is* or *will be*."

And the logical relation of Art and Science, in other words, the manner of framing the intermediate member between the general major premise of Art and its imperative conclusion, is thus defined:—

"The Art [in any given case] proposes to itself an end to be attained, defines the end, and hands it over to the Science. The Science receives it, considers it as a phenomenon or effect to be studied, and having investigated its causes and conditions, sends it back to Art with a theorem of the causes and combinations by which it could be produced. Art then examines these combinations of circumstances, and according as any of them are or are not in human power, pronounces the end attainable or not. The only one of the premises, therefore, which Art supplies, is the original major premise, which asserts that the attainment of the given end is desirable. Science, then, lends to Art the proposition (obtained by a series of inductions or deductions) that the performance of certain actions will attain the end. From these premises Art concludes that the performance of these actions is desirable, and finding it also practicable, converts the theorem into a rule or precept. . . . The grounds, then, of every rule of Art are to be found in the theorems of Science. An Art, or a body of Art, consists of the rules, together with as much of the speculative propositions as comprises the justification of these rules. The complete Art of any matter includes a selection of such a portion from the Science as is necessary to show on what conditions the effects, which the Art aims at producing, depend. And Art in general consists of the truths of Science arranged in the most convenient order for practice, instead of the order which is most convenient for thought. Science groups and arranges its truths so as to enable us to take in at one view as much as possible of the general order of the universe. Art, though it must assume the same general laws, follows them only into such of their detailed consequences as have led to the formation of rules of conduct, and brings together from parts of the field of Science most remote from one another, the truths relating to the production of the different and heterogeneous causes necessary to each effect which the exigencies of practical life require to be produced."—(Mill's *Logic*, vol. ii. pp. 542-549).

The whole discussion may be summed up thus. Science consists in knowing, Art consists in doing. What I must do in order to know, is Art subservient to Science: what I must know in order to do, is Science subservient to Art.

Art, then, is defined by two broad distinctions: first, its popular distinction from Nature; and next, its practical and theoretic distinction from Science. Both of these distinctions are observed in the terms of our definition given above. Within the proper limits of this definition, the conception of Art, and the use of the word for it, have undergone sundry variations. These variations correspond to certain vicissitudes or developments in the order of historical facts and in society. The requirements of society, stimulating the ingenuity of its individual members, have led to the invention of arts and groups of arts, constantly progressing, with the progress of civilization, in number, in complexity, and in resource. The religious imagination of early societies, who find themselves in possession of such an art or group of arts, forgets the history of the invention, and assigns it to the inspiration or special grace of some god or hero. So the Greeks assigned the arts of agriculture to Triptolemus, those of spinning and navigation to Athena, and of music to Apollo. At one stage of civilization one art or group of arts is held in higher esteem, another at another. In societies, like most of those of the ancient world, where slaves were employed in domestic service, and upon the handicrafts supplying the immediate utilities of life—food, shelter and clothing—these constituted a group of servile arts. The arts of husbandry or agriculture, on the other hand, have alternately been regarded as servile and as honourable according as their exercise has been in the hands of a subject class, as under feudal institutions, or, as under the Roman republic, of free cultivators. Under feudal institutions, or in a society in a state of permanent war, the allied arts of war and of government have been held the only honourable class. In commercial states, like the republics of Italy, the arts of gain, or of production (other than agricultural) and distribution, have made good their title to equal estimation and greater power beside the art of captains. But among peaceful arts, industries or trades, some have always been held to be of higher and others of lower rank; the higher rank being assigned to those that required larger operations, higher training, or more thoughtful conduct, and yielded ampler returns—the lower rank to those which called for simple manual exercise, especially if such exercise was of a disagreeable or degrading kind. In the cities of Italy, where both commerce and manufactures were for the first time organized on a considerable scale, the name *arte*, Art, was retained to designate the gilds or corporations by which the several industries were exercised; and, according to the nature of the industry, the art was classed as higher or lower (*maggiore* and *minore*).

The arts of which we have hitherto spoken have arisen from positive requirements, and supply what are strictly utilities, in societies; not excluding the art of war, at least so far as concerns one-half of war, the defensive half. But war continued to be an honourable pursuit, because it was a pursuit associated with birth, power and wealth, as well as with the virtue of courage, in cases where it had no longer the plea of utility, but was purely aggressive or predatory; and the arts of the chase have stood in this respect in an analogous position to those of war.

There are other arts which have not had their origin in positive practical needs, but have been practised from the first for pleasure or amusement. The most primitive human beings of whom we have any knowledge, the cave-dwellers of the palaeolithic period, had not only the useful art of chipping stones into spear-heads, knife-heads and arrow-heads, and making shafts or handles of these implements out of bone; they had also the ornamental art of scratching upon the bone handle the outlines of the animals they saw—mammoth, rhinoceros or reindeer—or of carving such a handle into a rude resemblance of one of these animals. Here we have a skill exercised, in the first case, for pure fancy or pleasure, and in the second, for adding an element of fancy or pleasure to an element of utility. Here, therefore, is the

germ of all those arts which produce imitations of natural objects for purposes of entertainment or delight, as painting, sculpture, and their subordinates; and of all those which fashion useful objects in one way rather than another because the one way gives pleasure and the other does not, as architecture and the subordinate decorative arts of furniture, pottery and the rest. Arts that work in a kindred way with different materials are those of dancing and music. Dancing works with the physical movements of human beings. Music works with sound. Between that imitative and plastic group, and the group of these which only produce motion or sound and pass away, there is the intermediate group of eloquence and the drama, which deal with the expression of human feeling in spoken words and acted gestures. There is also the comprehensive art of poetry, which works with the material of written words, and can ideally represent the whole material of human life and experience. Of all these arts the end is not use but pleasure, or pleasure before use, or at least pleasure and use conjointly. In modern language, there has grown up a usage which has put them into a class by themselves under the name of the Fine Arts, as distinguished from the Useful or Mechanical Arts. (See AESTHETICS and FINE ARTS.) Nay more, to them alone is often appropriated the use of the generic word Art, as if they and they only were the arts κατ'ἐξοχήν. And further yet, custom has reduced the number which the class-word is meant to include. When Art and the works of Art are now currently spoken of in this sense, not even music or poetry is frequently denoted, but only architecture, sculpture and painting by themselves, or with their subordinate and decorative branches. In correspondence with this usage, another usage has removed from the class of *arts*, and put into a contrasted class of *manufactures*, a large number of industries and their products, to which the generic term Art, according to our definition, properly applies. The definition covers the *mechanical* arts, which can be efficiently exercised by mere trained habit, rote or calculation, just as well as the fine arts, which have to be exercised by a higher order of powers. But the word Art, becoming appropriated to the fine arts, has been treated as if it necessarily carried along with it, and as if works to be called works of art must necessarily possess, the attributes of free individual skill and invention, expressing themselves in ever new combinations of pleasurable contrivance, and seeking perfection not as a means towards some ulterior practical end but as an ideal end in itself. (S. C.)

ARTA (*Narda, i.e.* ἐν Ἄρδᾳ, or *Zarta, i.e.* εἰς Ἄρτα), a town of Greece, in the province of Arta, 59 m. N.N.W. of Mesolonghi. Pop. about 7000. It is built on the site of the ancient Ambracia (*q.v.*), its present designation being derived from a corruption of the name of the river Arachthus (Arta) on which it stands. This enters the Gulf of Arta some distance south of the town. The river forms the frontier between Greece and Turkey, and is crossed by a picturesque bridge, which is neutral ground. There are a few remains of old cyclopean walls. The town contains also a Byzantine castle, built on the lofty site of the ancient citadel; a palace belonging to the Greek metropolitan; a number of mosques, synagogues and churches, the most remarkable being the church of the Virgin of Consolation, founded in 819. The streets of the town were widened and improved in 1869. Manufacture of woollens, cottons, Russia leather and embroidery is carried on, and there is trade in cattle, wine, tobacco, hemp, hides and grain. Much of the neighbouring plain is very fertile, and the town is surrounded with gardens and orchards, in which orange, lemon and citron come to great perfection. In 1083 Arta was taken by Bohemund of Tarentum; in 1449 by the Turks; in 1688 by the Venetians. In 1797 it was held by the French, but in the following year, 1798, Ali Pasha of Iannina captured it. During the Greek War of Independence it suffered severely, and was the scene of several conflicts, in which the ultimate success was with the Turks. An insurrection in 1854 was at once repressed. It was ceded to Greece in 1881. In the Greco-Turkish War of 1897 the Greeks gained some temporary successes at Arta during April and May.

ARTA, GULF OF (anc. *Sinus Ambracius*), an inlet of the Ionian Sea, 25 m. long and 10 broad, most of the northern shores of which belong to Turkey, the southern and eastern to Greece. Its only important affluent, besides the Arta, is the Luro (anc. *Charadra*), also from the north. The gulf abounds with mullets, soles and eels. Around its shores are numerous ruins of ancient cities: Actium at the entrance, where the famous battle was fought in 31 B.C.; Nicopolis, Argos, Limnaea and Olpae; and several flourishing towns, such as Preveza, Arta (anc. *Ambracia*), Karavasara or Karbasaras, and Vonitza.

The river ARTA (anc. *Arachthus* or *Aratthus*, in Livy xxxviii. 3, *Aretho*) is the chief river of Epirus, and is said to have been navigable in ancient times as far as Ambracia. Below this town it flows through a marshy plain, consisting mainly of its own alluvium; its upper course is through the territory of the Molossians; its total length is about 80 m.

ARTABANUS, the name of a number of Persian princes, soldiers and administrators. The most important are the following:—

1. Brother of Darius I., and, according to Herodotus, the trusted adviser of his nephew Xerxes. Herodotus makes him a principal figure in epic dialogues: he warns Darius not to attack the Scythians (iv. 83; cf. also iv. 143), and predicts to Xerxes his defeat by the Greeks (vii. 10 ff., 46 ff.); Xerxes sent him home to govern the empire during the campaign (vii. 52, 53).

2. Vizier of Xerxes (Ctesias, *Pers.* 20), whom he murdered in 465 B.C. According to Aristotle, *Pol.* v. 1311 b, he had previously killed Xerxes' son Darius, and was afraid that the father would avenge him; according to Ctesias, *Pers.* 29, Justin iii. 1, Diod. xi. 69, he killed Xerxes first and then pretended that Darius had murdered him, and instigated his brother Artaxerxes to avenge the parricide. At all events, during the first months of the reign of Artaxerxes I., he was the ruling power in the state (therefore the chronographers wrongly reckon him as king, with a reign of seven months), until Artaxerxes, having learned the truth about the murder of his father and his brother, overwhelmed and killed Artabanus and his sons in open fight.

3. A satrap of Bactria, who revolted against Artaxerxes I., but was defeated in two battles (Ctes. *Pers.* 31).

The name was borne also by four Parthian kings. The Parthian king Arsaces, who was attacked by Antiochus III. in 209, has been called Artabanus by some modern authors without any reason.

4. ARTABANUS I., successor of his nephew Phraates II. about 127 B.C., perished in a battle against the Tochari, a Mongolian tribe, which had invaded the east of Iran (Justin xli. 2). He is perhaps identical with the Artabanus mentioned in Trogus, Prol. xlii.

5. ARTABANUS II. *c.* A.D. 10–40, son of an Arsacid princess (Tac. *Ann.* vi. 48), lived in the East among the Dahan nomads. He was raised to the throne by those Parthian grandees who would not acknowledge Vonones I., whom Augustus had sent from Rome (where he lived as hostage) as successor of his father Phraates IV. The war between the two pretenders was long and doubtful; on a coin Vonones mentions a victory over Artabanus. At last Artabanus defeated his rival completely and occupied Ctesiphon; Vonones fled to Armenia, where he was acknowledged as king, under the protection of the Romans. But when Artabanus invaded Armenia, Vonones fled to Syria, and the emperor Tiberius thought it prudent to support him no longer. Germanicus, whom he sent to the East, concluded a treaty with Artabanus, in which he was recognized as king and friend of the Romans. Armenia was given (A.D. 18) to Zeno, the son of the king of Pontus (Tac. *Ann.* ii. 3 f., 58; Joseph. *Ant.* 18. 24).

Artabanus II., like all Parthian princes, was much troubled by the opposition of the grandees. He is said to have been very cruel in consequence of his education among the Dahan barbarians (Tac. *Ann.* vi. 41). To strengthen his power he killed all the Arsacid princes whom he could reach (Tac. *Ann.* vi. 31). Rebellions of the subject nations may have occurred also. We learn that he intervened in the Greek city Seleucia in favour of the oligarchs (Tac. *Ann.* vi. 48), and that two Jewish brigands

maintained themselves for years in Neerda in the swamps of Babylonia, and were acknowledged as dynasts by Artabanus (Jos. *Ant.* 18. 9). In A.D. 35 he tried anew to conquer Armenia, and to establish his son Arsaces as king there. A war with Rome seemed inevitable. But that party among the Parthian magnates which was hostile to Artabanus applied to Tiberius for a king of the race of Phraates. Tiberius sent Phraates's grandson, Tiridates III., and ordered L. Vitellius (the father of the emperor) to restore the Roman authority in the East. By very dexterous military and diplomatic operations Vitellius succeeded completely. Artabanus was deserted by his followers and fled to the East. Tiridates, who was proclaimed king, could no longer maintain himself, because he appeared to be a vassal of the Romans; Artabanus returned from Hyrcania with a strong army of Scythian (Dahan) auxiliaries, and was again acknowledged by the Parthians. Tiridates left Seleucia and fled to Syria. But Artabanus was not strong enough for a war with Rome; he therefore concluded a treaty with Vitellius, in which he gave up all further pretensions (A.D. 37). A short time afterwards Artabanus was deposed again, and a certain Cinnamus was proclaimed king. Artabanus took refuge with his vassal, the king Izates of Adiabene; and Izates by negotiations and the promise of a complete pardon induced the Parthians to restore Artabanus once more to the throne (Jos. *Ant.* 20. 3). Shortly afterwards Artabanus died, and was succeeded by his son, Vardanes, whose reign was still more turbulent than that of his father.

6. ARTABANUS III. reigned a short time in A.D. 80 (on a coin of this year he calls himself Arsaces Artabanus) and the following years, and supported a pretender who rose in Asia Minor under the name of Nero (Zonaras xi. 18), but could not maintain himself against Pacorus II.

7. ARTABANUS IV., the last Parthian king, younger son of Vologaeses IV., who died A.D. 209. He rebelled against his brother Vologaeses V. (Dio Cass. vii. 12), and soon obtained the upper hand, although Vologaeses V. maintained himself in a part of Babylonia till about A.D. 222. The emperor Caracalla, wishing to make use of this civil war for a conquest of the East in imitation of his idol, Alexander the Great, attacked the Parthians in 216. He crossed the Tigris, destroyed the towns and spoiled the tombs of Arbela; but when Artabanus advanced at the head of an army, he retired to Carrhae. There he was murdered by Macrinus in April 217. Macrinus was defeated at Nisibis and concluded a peace with Artabanus, in which he gave up all the Roman conquests, restored the booty, and paid a heavy contribution to the Parthians (Dio Cass. lxxviii. 26 f.). But at the same time, the Persian dynast Ardashir (*q.v.*) had already begun his conquests in Persia and Carmania. When Artabanus tried to subdue him his troops were defeated. The war lasted several years; at last Artabanus himself was vanquished and killed (A.D. 226), and the rule of the Arsacids came to an end.

See further PERSIA: *History*, § ancient, and works there quoted.
(ED. M.)

ART AND PART, a term used in Scots law to denote the aiding or abetting in the perpetration of a crime,—the being an accessory before or at the perpetration of the crime. There is no such offence recognized in Scotland as that of being an accessory after the fact.

ARTAPHERNES, more correctly ARTAPHRENES, brother of Darius Hystaspis, and satrap of Sardis. It was he who received the embassy from Athens sent probably by Cleisthenes (*q.v.*) in 507 B.C., and subsequently warned the Athenians to receive back the "tyrant" Hippias. Subsequently he took an important part in suppressing the Ionian revolt (see IONIA, ARISTAGORAS, HISTIAEUS), and after the war compelled the cities to make agreements by which all differences were to be settled by reference. He also measured out their territories in parasangs and assessed their tributes accordingly (Herod. vi. 42). In 492 he was superseded in his satrapy by Mardonius (Herodotus v. 25, 30-32, 35, &c.; Diod. Sic. x. 25). His son, of the same name, was appointed (490), together with Datis, to take command of the expedition sent by Darius to punish Athens and Eretria for their share in the Ionian revolt. After the defeat of Marathon he returned to Asia. In the expedition of Xerxes, ten years later, he was in command of the Lydians and Mysians (Herod. vi. 94, 119; vii. 74; Aesch. *Persae*, 21).

Aeschylus in his list of Persian kings (*Persae*, 775 ff.), which is quite unhistorical, mentions two kings with the name Artaphrenes, who may have been developed out of these two Persian commanders. (ED. M.)

ARTAXERXES, a name representing Pers. *Artakhshatra*, "he whose empire is well-fitted" or "perfected", Heb. *Artakhshasta*, Bab. *Artakshatsu*, Susian *Irtakshashsha* (and variants), Gr. Ἀρταξέρξης, Ἀρτοξέρξης, and in an inscription of Tralles (Dittenberger, *Sylloge*, 573) Ἀρταξέσσης; Herodotus (vi. 98) gives the translation *μέγας ἀρήιος*, and considers the name as a compound of Xerxes, showing thereby that he knew nothing of the Persian language; the later Persian form is *Ardashir*, which occurs in the form Artaxias (Artaxes) as the name of some kings of Armenia. It was borne by three kings of the Achaemenian dynasty of ancient Persia; though, so long as its meaning was understood, it can have been adopted by the kings only after their accession to the throne.

1. ARTAXERXES I., surnamed *Macrocheir*, *Longimanus*, "Longhand," because his right hand was longer than his left (Plut. *Artax.* i.). He was the younger son of Xerxes, and was raised to the throne in 465 by the vizier Artabanus, the murderer of his father. After a few months he became aware of the crimes of the vizier, and slew him and his sons in a hand-to-hand fight in the palace. His reign was, on the whole, peaceful; the empire had reached a period of stagnation. Plutarch (*Artax.* i.) says that he was famous for his mild and magnanimous character, Nepos (*de Reg.* i.) that he was exceedingly beautiful and valiant. From the authentic report of his cup-bearer Nehemiah we see that he was a kind, good-natured, but rather weak monarch, and he was undoubtedly much under the baneful influence of his mother Amestris (for whose mischievous character cf. Herod. ix. 109 ff.) and his sister and wife Amytis. The peacefulness of his rule was interrupted by several insurrections. At the very beginning the satrap Artabanus raised a rebellion in Bactria, but was defeated in two battles. More dangerous was the rebellion of Egypt under Inarus (Inarōs), which was put down by Megabyzus only after a long struggle against the Egyptians and the Athenians (460–454). Out of it sprang the rebellion of Megabyzus, who was greatly exasperated because, though he had persuaded Inarus to surrender by promising that his life would be spared, Artaxerxes, yielding to the entreaties of his wife Amytis, who wanted to take revenge on Inarus for the death of her brother Achaemenes, the satrap of Egypt, had surrendered him to her for execution.

In spite of his weakness, Artaxerxes I. was not unsuccessful in his polity. In 448 the war with Athens was terminated by the treaty concluded by Callias (but see CALLIAS and CIMON), by which the Athenians left Cyprus and Egypt to the Persians, while Persia gave up nothing of her rights, but promised not to make use of them against the Greek cities on the Asiatic coast, which had gained their liberty (Ed. Meyer, *Forschungen zur alt. Gesch.* ii. 71 ff.). In the Samian and the Peloponnesian wars, Artaxerxes remained neutral, in spite of the attempts made by both Sparta and Athens to gain his alliance.

During the reign of Artaxerxes I. the Jewish religion was definitely established and sanctioned by law in Jerusalem, on the basis of a firman granted by the king to the Babylonian priest Ezra in his seventh year, 458 B.C., and the appointment of his cup-bearer Nehemiah as governor of Judaea in his twentieth year, 445 B.C. The attempts which have been made to deny the authenticity of those parts of the books of Ezra and Nehemiah which contain an account of these two men, taken from their own memoirs, or to place them in the reign of Artaxerxes II., are not convincing (cf. Ed. Meyer, *Die Entstehung des Judentums*, 1896; see further JEWS, §§ 19, 21, 22; EZRA AND NEHEMIAH).

Artaxerxes I. died in December 425, or January 424 (Thuc. iv. 50). To his reign must belong the famous quadrilingual alabaster vases from Egypt (on which his name is written in Persian,

Susian and Babylonian cuneiform characters and in hieroglyphics), for Artaxerxes II. and III. did not possess Egypt. A great many tablets, dated from his reign, have been found in Nippur (published by H. von Hilprecht and Clay, *The Babylonian Expedition of the University of Pennsylvania*, series A, vol. ix.), and a few others at other places in Babylonia. Inscriptions of the king himself are not extant; his grandson mentions his buildings in Susa. For the suggested identification of Artaxerxes I. with the Biblical Ahasuerus, see AHASUERUS.

2. ARTAXERXES II., surnamed *Mnemon*, the eldest son of Darius II., whom he succeeded in the spring of 404. According to Ctesias (*Pers.* 57; Plut. *Artax.* i.) he was formerly called Arsaces or Arsikas, whereas Dinon (Plut. *Artax.* i.) calls him Oarses. This is corroborated by a Babylonian tablet with observations of the moon (Brit. Mus. Sp. ii. 749; *Zeitsch. f. Assyriologie*, vii. 223), which is dated from the 26th year of "Arshu, who is Artakshatsu," *i.e.* 379 B.C. (cp. Ed. Meyer, *Forschungen zur alten Geschichte*, ii. 466 ff.). When Artaxerxes II. mounted the throne, the power of Athens had been broken by Lysander, and the Greek towns in Asia were again subjects of the Persian empire. But his whole reign is a time of continuous decay; the original force of the Persians had been exhausted in luxury and intrigues, and the king, though personally brave and good-natured, was quite dependent upon his favourites and his harem, and especially upon his mother Parysatis. In the beginning of his reign falls the rebellion of his brother Cyrus, who was secretly favoured by Parysatis and by Sparta. Although Cyrus was defeated at Cunaxa, this rebellion was disastrous inasmuch as it opened to the Greeks the way into the interior of the empire, and demonstrated that no oriental force was able to withstand a band of well-trained Greek soldiers. Subsequently Greek mercenaries became indispensable not only to the king but also to the satraps, who thereby gained the means for attempting successful rebellions, into which they were provoked by the weakness of the king, and by the continuous intrigues between the Persian magnates. The reign is, therefore, a continuous succession of rebellions. Egypt soon revolted anew and could not be subdued again. When in 399 war broke out between Sparta and Persia, the Persian troops in Asia Minor were quite unable to resist the Spartan armies. The active and energetic Persian general Pharnabazus succeeded in creating a fleet by the help of Evagoras, king of Salamis in Cyprus, and the Athenian commander Conon, and destroyed the Spartan fleet at Cnidus (August 394). This victory enabled the Greek allies of Persia (Thebes, Athens, Argos, Corinth) to carry on the Corinthian war against Sparta, and the Spartans had to give up the war in Asia Minor. But it soon became evident that the only gainers by the war were the Athenians, who in 389, under Thrasybulus, tried to found their old empire anew (see DELIAN LEAGUE). At the same time Evagoras attempted to conquer the whole of Cyprus, and was soon in open rebellion. The consequence was that, when in 388 the Spartan admiral Antalcidas (*q.v.*) came to Susa, the king was induced to conclude a peace with Sparta by which Asia fell to him and European Greece to Sparta. After the peace, Evagoras was attacked. He lost his conquests, but had to be recognized as independent king of Salamis (380 B.C.). Two expeditions against Egypt (385–383 and 374–372) ended in complete failure. At the same period there were continuous rebellions in Asia Minor; Pisidia, Paphlagonia, Bithynia and Lycia, threw off the Persian yoke and Hecatomnus, the satrap of Caria, obtained an almost independent position. Similar wars were going on against the mountain tribes of Armenia and Iran, especially against the Cadusians on the Caspian Sea. In this war Artaxerxes is said to have distinguished himself personally (380 B.C.), but got into such difficulties in the wild country that he was glad when Tiribazus succeeded in concluding a peace with the Cadusian chieftains.

By the peace of Antalcidas the Persian supremacy was proclaimed over Greece; and in the following wars all parties, Spartans, Athenians, Thebans, Argives continually applied to Persia for a decision in their favour. After the battle of Leuctra, when the power of Thebes was founded by Epaminondas, Pelopidas went to Susa (367) and restored the old alliance between Persia and Thebes. The Persian supremacy, however, was not based upon the power of the empire, but only on the discord of the Greeks. Shortly after the edict by which the king had proclaimed his alliance with Thebes, and the conditions of the general peace which he was going to impose upon Greece, his weakness became evident, for since 366 all the satraps of Asia Minor (Datames, Ariobarzanes, Mausolus, Orontes, Artabazus) were in rebellion again, in close alliance with Athens, Sparta and Egypt. The king could do little against them; even Autophradates, satrap of Lydia, who had remained faithful, was forced for some time to unite himself with the rebels. But every one of the allies mistrusted all the others; and the sole object of every satrap was to improve his condition and his personal power, and to make a favourable peace with the king, for which his neighbours and former allies had to pay the costs. The rebellion was at last put down by a series of treacheries and perfidious negotiations. Some of the rebels retained their provinces; others were punished, as opportunity offered. Mithradates betrayed his own father Ariobarzanes, who was crucified, and murdered Datames, to whom he had introduced himself as a faithful ally. When the long reign of Artaxerxes II. came to its close in the autumn of 359 the authority of the empire had been restored almost everywhere.

Artaxerxes himself had done very little to obtain this result. In fact, in the last years of his reign he had sunk into a perfect dotage. All his time was spent in the pleasures of his harem, the intrigues of which were further complicated by his falling in love with and marrying his own daughter Atossa (according to the Persian religion a marriage between the nearest relations is no incest). At the same time, his sons were quarrelling about the succession; one of them, Ochus, induced the father by a series of intrigues to condemn to death three of his older brothers, who stood in his way. Shortly afterwards, Artaxerxes II. died.

In this reign an important innovation took place in the Persian religion. Berossus (in Clemens Alex. *Protrept.* i. 5. 65) tells us that the Persians knew of no images of the gods until Artaxerxes II. erected images of Anaitis in Babylon, Susa, Ecbatana, Persepolis, Bactra, Damascus, Sardis. This statement is proved correct by the inscriptions; all the former kings name only Auramazda (Ahuramazda), but Artaxerxes II. in his building inscriptions from Susa and Ecbatana invokes Ahuramazda, Anahita and Mithra. These two gods belonged to the old popular religion of the Iranians, but had until then been neglected by the true Zoroastrians; now they were introduced into the official worship much in the way in which the cult of the saints came into the Christian religion. About the history of Artaxerxes II. we are comparatively well informed from Greek sources; for the earlier part of his reign from Ctesias and Xenophon (*Anabasis*), for the later times from Dinon of Ephesus, the historian of the Persians (from whom the account of Justin is derived), from Ephorus (whose account is quoted by Diodorus) and others. Upon these sources is based the biography of the king by Plutarch.

3. ARTAXERXES III. is the title adopted by Ochus, the son of Artaxerxes II., when he succeeded his father in 359. The chronographers generally retain the name Ochus, and in the Babylonian inscriptions he is called "Umasu, who is called Artakshatsu." The same form of the name (probably pronounced Uvasu) occurs in the Syrian version of the canon of Ptolemy by Elias of Nisibis (Amōs).

Artaxerxes III. was a cruel but an energetic ruler. To secure his throne he put to death almost all his relatives, but he suppressed the rebellions also. In 356 he ordered all the satraps to dismiss their mercenaries. Most of them obeyed; Artabazus of Phrygia, who tried to resist and was supported by his brothers-in-law, Mentor and Memnon of Rhodes, was defeated and fled to Philip of Macedon. Athens, whose general Chares had supported Artabazus, was by the threatening messages of the king forced to conclude peace, and to acknowledge the independence of its rebellious allies (355 B.C.). Then the king attempted

to subjugate Egypt, but two expeditions were unsuccessful, and, in consequence, Sidon and the other Phoenician towns, and the princes of Cyprus, rebelled against Persia and defeated the Persian generals. After great preparations the king came in person, but again the attack on Egypt was repelled by the Greek generals of Nectanebus (346). One or two years later Artaxerxes, at the head of a great army, began the siege of Sidon. The Sidonian king Tennes considered resistance hopeless, and betrayed the town to the Persian king, assisted by Mentor, who had been sent with Greek troops from Egypt to defend the town. Artaxerxes repressed the rebellion with great cruelty and destroyed the town. The traitor Tennes was put to death, but Mentor rose high in the favour of the king, and entered into a close alliance with the eunuch Bagoas, the king's favourite and vizier. They succeeded in subjecting the other rebels, and, after a hard fight at Pelusium, and many intrigues, conquered Egypt (343); Nectanebus fled to Ethiopia. Artaxerxes used his victory with great cruelty; he plundered the Egyptian temples and is said to have killed the Apis. After his return to Susa, Bagoas ruled the court and the upper satrapies, while Mentor restored the authority of the empire everywhere in the west. He deposed or killed many Greek dynasts, among them the famous Hermias of Atarneus, the protector of Aristotle, who had friendly relations with Philip (342 B.C.). When Philip attacked Perinthus and Byzantium (340), Artaxerxes sent them support, by which they were enabled to withstand the Macedonians; Philip's antagonists in Greece, Demosthenes and his party, hoped to get subsidies from the king, but were disappointed.

In 338 Artaxerxes III., with his older sons, was killed by Bagoas, who raised his youngest son Arses to the throne. Artaxerxes III. is said never to have entered the country of Persia proper, because, being a great miser, he would not pay the present of a gold piece for every Persian woman, which it was usual to give on such occasions (Plut. *Alex.* 69). But we have a building inscription from Persepolis, which contains his name and genealogy, and invocations of Ahuramazda and Mithra.

For the relations of Artaxerxes I.—III. with the Jews see JEWS, §§19-21. For bibliographical references see PERSIA: *Ancient History*.

The name Artaxerxes was adopted by Bessus when he proclaimed himself king after the assassination of Darius III. It was borne by several dynasts of Persis, when it formed an independent kingdom in the time of the Parthian empire (on their coins they call themselves Artakhshathr; one of them is mentioned by Lucian, *Macrobii*, 15), and by three kings of the Sassanid dynasty, who are better known under the modern form Ardashir (*q.v.*). (ED. M.)

ARTEDI, PETER (1705–1735), Swedish naturalist, was born in the province of Angermania, in Sweden, on the 22nd of February 1705. Intending to become a clergyman, he went, in 1724, to study theology at Upsala, but he turned his attention to medicine and natural history, especially ichthyology, upon the study of which he exercised great influence (see ICHTHYOLOGY). In 1728 his countryman Linnaeus arrived in Upsala, and a lasting friendship was formed between the two. In 1732 both left Upsala, Artedi for England, and Linnaeus for Lapland; but before parting they reciprocally bequeathed to each other their manuscripts and books in the event of death. He was accidentally drowned on the 27th of September 1735 at Amsterdam, where he was engaged in cataloguing the collections of Albert Seba, a wealthy Dutchman, who had formed what was perhaps the richest museum of his time. According to agreement, his manuscripts came into the hands of Linnaeus, and his *Bibliotheca Ichthyologica* and *Philosophia Ichthyologica*, together with a life of the author, were published at Leiden in the year 1738.

ARTEGA, a tribe of African "Arabs," said to be descendants of a sheik of that name who came from Hadramut in pre-Islamic days, settling near Tokar. The name is said to be "patrician," and the Artega may be regarded as the most ancient stock in the Suakin district. They are now an inferior mixed race. They were all followers of the mahdi and khalifa in the Sudan wars (1883–1898).

See *Anglo-Egyptian Sudan*, edited by Count Gleichen (London, 1905).

ARTEL (Russ. for "gang"), the name for the co-operative associations in Russia. Originally, the artels were true examples of productive co-operation, bodies of working-men associating together for the purpose of jointly undertaking some piece of work, and dividing the profits. This original form of artel still survives among the fishermen of Archangel. Artels have come, however, to be little more than trade gilds, with mutual responsibility. (For details see RUSSIA.)

ARTEMIDORUS. (1) A geographer "of Ephesus" who flourished about 100 B.C. After studying at Alexandria, he travelled extensively and published the results of his investigations in a large work on general geography (Τὰ γεωγραφούμενα) in eleven books, much used by Strabo and others. The original work is lost, but we possess many small fragments and larger fragments of an abridgment made by Marcianus of Heracleia (5th century), which contains the periplus of the Euxine and accounts of Bithynia and Paphlagonia. (See Müller, *Geographi Graeci Minores*; Bunbury, *History of Ancient Geography*; Stiehle, "Der Geograph Artemidoros von Ephesos," in *Philologus*, xi., 1856). (2) A soothsayer and interpreter of dreams, who flourished in the 2nd century A.D., during the reigns of Hadrian and the Antonines. He called himself Daldianus from his mother's birthplace, Daldis in Lydia, in order to make its name known to the world. His Ὀνειροκριτικά, or interpretation of dreams, was said to have been written by command of Apollo Daldianus, whose initiated votary he was. It is in four books, with an appendix containing a collection of prophetic dreams which had been realized. The first three books, addressed to Cassius Maximus, a Phoenician rhetorician (perhaps identical with Maximus of Tyre), treat of dreams and divination generally; the fourth—with a reply to his critics—and the appendix are dedicated to his son, also named Artemidorus and an interpreter of dreams. Artemidorus boasts of the trouble expended on his work; he had read all the authorities on dreams, travelled extensively, and conversed with all who had studied the subject. The work is valuable as affording an insight into ancient superstitions. According to Suidas, Artemidorus also wrote on augurs and cheiromancy, but all trace of these works is lost. (Editions: Reiff, 1805, Hercher, 1864; translation and notes, Krauss, 1881; English translation by Wood, 1644, and later editions.)

ARTEMIS, one of the principal goddesses in Greek mythology, the counterpart of the Roman Diana. The suggested etymologies of the name (see O. Gruppe, *Griechische Mythologie*, ii. p. 1267, note 2), as in the case of most of the Olympian deities, are unsatisfactory, and throw no light upon her significance and characteristics. The Homeric and later conception of Artemis, though by no means the original one, may be noticed first. She is the daughter of Zeus and Leto, twin-sister and counterpart of Apollo. She is said to have been born a day before him (on the 6th of the month) and tradition assigns them different birthplaces—Delos to Apollo, Ortygia to Artemis. But Ortygia ("home of quails") applies still to Delos, and may well have been a synonym for that island. In its original sense it does not apply either to the island of Ortygia at Syracuse, or to Ortygia near Ephesus, which also claimed the honour of having been the birthplace of the goddess. Artemis is the goddess of chastity, an aspect of her character which gradually assumed more and more importance—the protectress of young men and maidens, who defies and contemns the power of Aphrodite. Her resemblance to her brother is shown in many ways. Like him, armed with bow and arrows, she deals death to mortals, sometimes gently and suddenly, especially to women, but also as a punishment for offences against herself or morality. With him she takes part in the combat with Python and with Tityus, in the slaughter of the children of Niobe, while alone she executes vengeance on Orion. Although Apollo has nothing to do with the earlier cult of Artemis, nor Artemis with that of Delphi, their association was a comparatively early one, and probably originated in Delos. Here the connexion of Artemis with the Hyperborean legend (see APOLLO) is shown in the names of the maidens (Opis, Hecaerge) who were supposed to have brought offerings from the north to Delos, where they were buried. Both Opis (or Oupis) and Hecaerge are names of Artemis, the latter being the feminine of Hecaergos, an epithet of Apollo. Like her brother, she is not

only a goddess who deals death, but she is also a healing and a purifying divinity, *οὐλία* ("the healer," cf. Apollo Oulios), *λύη*, *λυαία* ("purifier,") and *σώτειρα*, "she who saves from all evils" (cf. Apollo *ἀποτρόπαιος*). Her connexion with the prophetic art is doubtful, although mention is made of an Artemis Sibylla. To her association with Apollo are certainly to be referred the names Delphinia and Pythia, and the titles referring to state and family life—*προστατηρία*, *πατριῶτις*, *βουλαία*. It probably accounts for her appearance as a goddess of seafarers, the bestower of fair weather and prosperous voyages. At Phigalia in Arcadia, Eurynome, represented as half woman and half fish, was probably another form of Artemis. To the same association may be traced her slight connexion with music, song and dance.

It is in the Arcadian and Athenian rites and legends, however, which are certainly earlier than Homer, that the original conception of the goddess is to be found. These tend to show that Artemis was first and foremost a nature goddess, whose cult shows numerous traces of totemism. As a goddess of fertilizing moisture, lakes, rivers, springs, and marshy lowlands are brought into close connexion with her. Thus she is *λιμναία*, *δέσποινα λίμνης* ("lady of the lake"), *ἑλεία* ("of marshes"), *ποταμία* ("of rivers," especially of the Cladaus and Alpheus, whence her name *Ἀλφειαία*). Her influence is very active in promoting the increase of the fruits of the field, hence she is specially a goddess of agriculture. She drives away the mice (cf. Apollo Smintheus) and slays the Aloidae, the corn spirits; she is the friend of the reapers, and requires her share of the first fruits. Her character as a harvest goddess is clearly shown in the legend of the Calydonian boar, sent by her to ravage the fields out of resentment at not having received a harvest offering from Oeneus (see MELEAGER). As *ἐπιμύλιος* and *ἐπικλιβάνιος* ("presiding over the mill and the oven") she extends her protection over the further development of the grain for the use of man.

Artemis was naturally also a goddess of trees and vegetation. Near Orchomenus her wooden image stood in a large cedar-tree —an indication that her worship was originally that of the tree itself (*κεδρεᾶτις*, "the cedar goddess"); at Caryae there was an image of Artemis *καρυᾶτις* ("the nut-tree goddess"). Two curious epithets in this connexion deserve notice: *λυγοδέσμα* ("bound with withies"), derived from the legend that the image of Artemis Orthia was found in a thicket of withies, which twined round it and kept it upright (*λύγος* is the *agnus castus*, and points to Artemis in her relation to women); and *ἀπαγχομένη* ("the suspended"), probably a reference to the custom of hanging the mask or image of a vegetation-divinity on a tree to obtain fertility (Farnell, *Cults of the Greek States*, ii. p. 429; cf. the "swing" festival (*αἰώρα*) of the Greeks, and the *oscilla* of the Romans).

The functions of the goddess extended from the vegetable to the animal world, to the inhabitants of the woods and mountains. This is clearly expressed in the cult of Artemis Laphria (possibly connected with *λάφυρα*, "spoils"), at whose festivals all kinds of animals, both wild and tame, as well as fruits, were thrown together on a huge wood fire. Her general name in this connexion was *ἀγροτέρα* ("roaming the wilds," not necessarily "goddess of the chase," an aspect less familiar in the older religion), to whom five hundred goats were offered every year by the Athenians as a thanksgiving in commemoration of the victory at Marathon. Numerous animals were sacred to her, and at Syracuse all kinds of wild beasts, including a lioness, were carried in procession in her honour. It has been observed that she is rather the patroness of the wild beasts of the field than of the more agricultural or domestic animals (Farnell, *Cults*, ii. p. 431), although the epithet *ἡμερασία* ("the tamer," according to others, the "gentle" goddess of healing) seems to refer to her connexion with the latter. The bear was especially associated with her in Arcadia, and in her worship as Artemis Brauronia at Brauron in Attica. According to the legend, Callisto, an Arcadian nymph, became by Zeus the mother of Arcas, the eponymous hero of the Arcadians. Zeus, to conceal the amour, changed Callisto into a she-bear; Hera, however, discovered it, and persuaded Artemis to slay Callisto, who was placed amongst the stars as *ἄρκτος* ("the bear"). There is no doubt that Callisto is identical with Artemis; her name is an obvious variation of *καλλίστη*, a frequent epithet of the goddess, to whom a temple was erected on the hill where Callisto was supposed to be buried. It is suggested by M. Kraus in *Classical Review*, February 1908, that Aphaea, the cult-name of Artemis at Aegina, is of Semitic origin and means "beautiful." Closely connected with this legend is the worship of Artemis Brauronia. The accounts of its institution, which differ in detail, agree that it was intended to appease the wrath of the goddess at the killing of a bear. A number of young girls, between five and ten years of age, wearing a bear-skin (afterwards a saffron-coloured robe) danced a bear-dance, called *ἀρκτεία*, the girls themselves being called *ἄρκτοι*. In one account, a maiden was ordered to be sacrificed to the bear Artemis, but a certain man who had a goat called it his daughter and offered it up in secret, just as at Munychium a fawn dressed up as a girl was sacrificed to the goddess. In place of the goat or fawn a bear might have been expected, but the choice may have been influenced by the animal totem of the tribe into whose hands the ritual fell. The whole is a reminiscence of earlier times, when the goddess herself was a bear, to whom human sacrifice was offered. Callisto was originally a bear-goddess worshipped in Arcadia, identified with Artemis, when nothing remained of the original animal-worship but name and ritual. The worship of Callisto being merged in that of the greater divinity, she became the handmaid and companion of Artemis. A stone figure of a bear found on the Acropolis seems to point to the worship of Artemis Brauronia. Her death at the hands of the latter was explained by the wrath of the goddess—in her later aspect as goddess of chastity—at Callisto's amour with Zeus (see A. Lang, *Myth, Ritual and Religion*, ii.; Farnell, *Cults*, ii. p. 437). The custom of flogging youths at the altar of Artemis Orthia[1] at Limnaeum in Laconia, and the legend of Iphigeneia (*q.v.*), herself another form of Artemis, connected with Artemis Taurica of the Tauric Chersonese, are usually supposed to point to early human sacrifice (but see Farnell). Various explanations have been given of the epithet *ὀρθία*: (1) that it refers to the primitive type of the "erect" wooden idol; (2) that it means "she who safely rears children after birth," or "heals the sick" (cf. *ὄρθιος* applied to Asclepius); (3) that it has a phallic significance (Schreiber in Roscher's *Lexikon*). Scholars differ as to whether Artemis Taurica is identical with Artemis Tauropolos, worshipped chiefly at Samos with a milder ritual, but it is more probable that *ταυροπόλος* simply means "protectress of bulls."

The protecting influence of Artemis was extended, like that of Apollo, to the highest animal, man. She was especially concerned in the bringing up of the young. Boys were brought by their nurses to the temple of Artemis *κορυθαλία* (=*κουροτρόφος*) and there consecrated to her; at the Apaturia, on the day called *κουρεῶτις*, boys cut off and dedicated their hair to her. Girls as well as boys were under her protection. Her function as a goddess of marriage is less certain, and the cult-titles adduced in support of it are hardly convincing; such are *ἡγεμόνη*, interpreted as "she who leads home the bride," *σελασφόρος*, "bearer of light," that is, of torches at the marriage procession. On the other hand, her connexion with childbirth is clearly shown: in many places she is even called Eilithyia, who in the earlier poets was regarded as distinct from her. In one version of the story of her birth she is said to have been born a day before Apollo, in order to assist Leto at his birth; women in childbirth invoked her aid, and after delivery offered up their clothes or a lock of hair. As already noticed, in Homer Artemis appears as a goddess of death; closely akin to this is the conception of her as a goddess of war. As such she is *νικηφόρος* ("bringer of victory"); the title *κολαινίς* is possibly connected with

[1] The site of the temple of Artemis Orthia was excavated by the British School of Archaeology at Athens (see *Annual*, 1906). The flogging (*διαμαστίγωσις*) is explained by R. C. Bosanquet as a late institution of decadent Sparta, an exaggeration of an old ritual practice of whipping away boys who tried to steal cheeses from the altar (see *The Year's Work in Classical Studies*, ed. W. H. D. Rouse, 1907).

κολεός ("sword-sheath"); and λαφρία (see above) may refer to the spoils of war as well as the chase.

The idea of Artemis as a virgin goddess, the "queen and huntress, chaste and fair," which obtained great prominence in early times, and seems inconsistent with her association with childbirth, is generally explained as due to her connexion with Apollo, but it is suggested by Farnell that παρθένος originally meant "unmarried," and that "Ἄρτεμις παρθένος may have been originally the goddess of a people who had not yet the advanced Hellenic institutions of settled marriage . . . and when society developed the later family system the goddess remained celibate, though not opposed to childbirth."

Another view of the original character of Artemis, which has found much support in modern times, is that she was a moon-goddess. But there is no trace of Artemis as such in the epic period, and the Homeric hymn knows nothing of her identification with Selene. The attribute of the torch will apply equally well to the goddess of the chase, and epithets such as φωσφόρος, σελασφόρος, αἰθοπία, although applicable, are by no means convincing. The idea dates from the 5th century, and was due to her connexion with Hecate and Apollo. When the latter came to be identified by philosophical speculation with the sun-god Helios, it was natural that his sister and counterpart should be identified with the moon-goddess Selene. But she is nowhere recognized in cult as such (see Gruppe, *Griechische Mythologie*, ii. p. 1297, note 2).

It has been mentioned that Callisto, Iphigeneia, Eilithyia, are only Artemis under different names; to these may be added Adrasteia, Atalanta, Helen, Leto and others (see Wernicke in Pauly-Wissowa's *Realencyclopädie*).

Again, various non-Hellenic divinities were identified with Artemis, and their cult gradually amalgamated with hers. The most important of these was Artemis of Ephesus, whose seat was in the marshy valley of the Caystrus. Like the Greek Artemis, she was essentially a nature goddess, the great foster-mother of the vegetable and animal kingdom. A number of officials were engaged in the performance of her temple service. Her eunuch priests, μεγάβυζοι (a name which points to a Persian origin), were under the control of a high priest called Essen (according to others, there was a body of priests called Essenes). There were also three classes of priestesses, Mellierae, Hierae, Parierae; there is no evidence that they were called Melissae ("bees"), although the bee is a frequent symbol on the coins of the city. Her chief festival, Ephesia or Artemisia, was held in the spring, at which games and various contests took place after the Greek fashion, although the ritual continued to be of a modified oriental, orgiastic type. This goddess is closely connected with the Amazons (*q.v.*), who are said to have built her temple and set up her image in the trunk of a tree. The Greeks of Ephesus identified her with their own Artemis, and claimed that her birthplace Ortygia was near Ephesus, not in Delos. She has much in common with the oriental prototype of Aphrodite, and the Cappadocian goddess Ma, another form of Cybele. The usual figure of the Ephesian Artemis, which was said in the first instance to have fallen from heaven, is in the form of a female with many breasts, the symbol of productivity or a token of her function as the all-nourishing mother. From the waist to the feet her image resembles a pillar, narrowing downwards and sculptured all round with rows of animals (lions, rams and bulls).

Mention may also be made of the following non-Hellenic representatives of Artemis. Leucophryne (or Leucophrys), whose worship was brought by emigrants from Magnesia in Thessaly to Magnesia on the Maeander, was a nature goddess, and her representation on coins exactly resembles that of the Ephesian Artemis. Her cult, however, from the little that is known of it appears to have been more Hellenic. There was an altar and temple of Artemis Pergaea at Perga in Pamphylia, where a yearly festival was held in her honour. As in the case of Cybele, mendicant priests were attached to her service. Similar figures were Artemis Coloënē, worshipped at Lake Coloë near Sardis; Artemis Cordax, celebrated in wanton dances on Mount Sipylus; the Persian Artemis, identical with Anaitis Bendis, was a Thracian goddess of war and the chase, whose cult was introduced into Attica in the middle of the 5th century B.C. by Thracian metics. At her festival called Bendidea, held at the Peiraeus, there was a procession of Thracians who were settled in the district, and a torch-race on horseback. (For Britomartis see separate article.)

Among the chief attributes of Artemis are: the hind, specially regarded as her sacred animal; the bear, the boar and the goat; the zebu (Artemis Leucophrys); the lion, one of her oldest animal symbols; bow and arrows, as goddess of the chase and death; a mural crown, as the protectress of cities; the torch, originally an attribute of the goddess of the chase or marriage, but, like the crescent (originally an attribute of the Asiatic nature goddesses), transferred to Artemis, when she came to be regarded as a moon-goddess. The Greek Artemis was usually represented as a huntress with bow and quiver, or torch in her hand, in face very like Apollo, her drapery flowing to her feet, or, more frequently, girt high for speed. She is accompanied often by a deer or a dog. Perhaps the finest existing statue of her is the Diana of Versailles from Hadrian's Villa (now in the Louvre), in which she wears a short tunic drawn in at the waist and sandals on her feet; her hair is bound up into a knot at the back of her head, with a band over the forehead. With her left hand she holds a stag, while drawing an arrow from the quiver on her shoulder with the right. Another famous statue is one from Gabii, in which she is finishing her toilet and fastening the chlamys over her tunic. In older times her figure is fuller and stronger, and the clothing more complete; certain statues discovered at Delos, imitated from wooden models (ξόανα), are supposed to represent Artemis; they are described as stiff and rigid, the limbs as it were glued to the body without life or movement, garments closely fitting, the folds of which fall in symmetrical parallel lines. As a goddess of the moon she wears a long robe, carries a torch, and her head is surmounted by a crescent. On the coins of Arcadia, Aetolia, Crete and Sicily, are to be seen varied and beautiful representations of her head as conceived by the Greek artists in the best times.

AUTHORITIES.—Articles in Pauly-Wissowa's *Realencyclopädie*; Roscher's *Lexikon der Mythologie*, and Daremberg and Saglio's *Dictionnaire des antiquités* (*s.v.* Diana, with well-arranged bibliography); L. Preller, *Griechische Mythologie* (4th ed. by C. Robert); L. R. Farnell, *The Cults of the Greek States*, ii. (1896); O. Gruppe, *Griechische Mythologie und Religions-Geschichte*, ii. (1906); A. Claus, *De Dianae antiquissima apud Graecos natura* (Breslau, 1880). In the article GREEK ART, fig. 11 (a gold ornament from Camirus) represents the Oriental goddess identified by the Greeks with Artemis.

For the Roman goddess identified with Artemis see DIANA.

(J. H. F.)

ARTEMISIA, daughter of Lygdamis, was queen of Halicarnassus and Cos about 480 B.C. Being a dependent of Persia, she took part in person in the expedition of Xerxes against the Greeks, and fitted out five ships, with which she distinguished herself in the sea-fight near Salamis (480). When closely pursued by the Athenians she escaped by the stratagem of attacking one of the Persian vessels, whereupon the Athenians concluded that she was an ally, and gave up the pursuit (Herod. vii. 99, viii. 68). After the battle Xerxes declared that the men had fought like women, and the women like men. By her advice he did not risk another battle, but at once retired from Greece. She is said to have loved a young man named Dardanus, of Abydos, and, enraged at his neglect of her, to have put out his eyes while he was asleep. The gods, as a punishment for this, ordered her, by an oracle, to take the famous but rather mythical *lover's leap* from the Leucadian promontory (Photius, *Cod.* 153*a*).

ARTEMISIA, the sister and wife of Mausolus (or Maussollus), king of Caria, was sole ruler from about 353 to 350 B.C. She has immortalized herself by the honours paid to the memory of her husband. She built for him, in Halicarnassus, a very magnificent tomb, called the Mausoleum, which was one of the seven wonders of the world, and from which the name mausoleum was afterwards given to all tombs remarkable for their grandeur. She appointed panegyrics to be composed in his honour, and offered valuable prizes for the best oratorical and tragic compositions. She also

erected a monument, or trophy, in Rhodes, to commemorate her conquest of that island. When the Rhodians regained their freedom they built round this trophy so as to render it inaccessible, whence it was known as the *Abaton*. There are statues of Mausolus and Artemisia in the British Museum.

Vitruvius ii. 8; Diodorus Siculus xvi. 36; Cicero, *Tusc.* iii. 31; Val. Max. iv. 6.

ARTEMON (fl. *c.* A.D. 230), a prominent Christian teacher at Rome, who held Adoptianist (see ADOPTIANISM), or humanitarian views, of the same type as his elder contemporaries the Theodotians, though perhaps asserting more definitely than they the superiority of Christ to the prophets in respect of His supernatural birth and sinlessness. He was excommunicated by Zephyrinus, despite his remarkable claim that all that bishop's predecessors in the see of Rome had held the humanitarian position. (See also MONARCHIANISM.)

ARTENA, a village of Italy, in the province of Rome, situated at the N.N.W. extremity of the Volscian Mountains; it is 36 m. S.E. by rail, and 24 m. direct from Rome. Pop. (1901) 5016. On the mountain above it (2073 ft.) are the fine remains of the fortifications of a city built in a very primitive style, in cyclopean blocks of local limestone; within the walls are traces of buildings, and a massive terrace which supported some edifice of importance. The name of this city is quite uncertain; Ecetra is a possible suggestion. The modern village, which was called Monte Fortino until 1870, owes its present name to an unwarrantable identification of the site with the ancient Volscian Artena, destroyed in 404 B.C. Another Artena, which belonged to the district of Caere, and lay between it and Veii, was destroyed in the period of the kings, and its site is quite unknown.

See T. Ashby and G. J. Pfeiffer in *Supplementary Papers of the American School in Rome*, i. 87 seq.

ARTERIES (Gr. *ἀρτηρία*, probably from *αἴρειν*, to raise, but popularly connected by the ancients with *ἀήρ*, air), in anatomy, the elastic tubes which carry the blood away from the heart to the tissues. As, after death, they are always found empty, the older anatomists believed that they contained air, and to this belief they owe the name, which was originally given to the windpipe (*trachea*). Two great trunks, the aorta and pulmonary artery, leave the heart and divide again and again until they become minute vessels to which the name of arterioles is given. The larger trunks are fairly constant in position and receive definite names, but as the smaller branches are reached there is an increasing inconstancy in their position, and anatomists are still undecided as to the normal, *i.e* most frequent, arrangement of many of the smaller arteries. From a common-sense point of view it is probably of greater importance to realize how variable the distribution of small arteries is than to remember the names of twigs which are of neither surgical nor morphological importance. Arteries adapt themselves more quickly than most other structures to any mechanical obstruction, and many of the differences between the arterial systems of Man and other animals are due to the assumption of the erect position. Many arteries are tortuous, especially when they supply movable parts such as the face or scalp, but when one or two sharp bends are found they are generally due to the artery going out of its way to give off a constant and important branch. Small arteries unite or anastomose with others near them very freely, so that when even a large artery is obliterated a collateral circulation is carried on by the rapid increase in size of the communications between the branches coming off above and below the point of obstruction. Some branches, however, such as those going to the basal ganglia of the brain and to the spleen, are known as "end arteries," and these do not anastomose with their neighbours at all; thus, if one is blocked, arterial blood is cut off from its area of supply. As a rule, there is little arterial anastomosis across the middle line of the body near the surface, though the scalp, lips and thyroid body are exceptions.

The distribution of the pulmonary artery is considered in connexion with the anatomy of the lungs (see RESPIRATORY SYSTEM). That of the aorta will now be briefly described.

The *Aorta* lies in the cavities of the thorax and abdomen, and arises from the base of the left ventricle of the heart. It ascends forward, upward, and to the right as far as the level of the second right costal cartilage, then runs backward, and to the left to reach the left side of the body of the 4th thoracic vertebra, and then descends almost vertically. It thus forms the *arch of the aorta*, which arches over the root of the left lung, and which has attached to its concave surface a fibrous cord, known as the obliterated *ductus arteriosus*, which connects it with the left branch of the pulmonary artery. The aorta continues its course downward in close relation to the bodies of the thoracic vertebrae, then passes through an opening in the diaphragm (*q.v.*), enters the abdomen, and descends in front of the bodies of the lumbar vertebrae as low as the 4th, where it usually divides into two terminal branches, the common iliac arteries. Above and behind the angle of bifurcation, however, a long slender artery, called the *middle sacral*, is prolonged downward in front of the sacrum to the end of the coccyx. ***Aorta.***

It will be convenient to describe the distribution of the arteries under the following headings:—(1) Branches for the head, neck and upper limbs; (2) branches for the viscera of the thorax and abdomen; (3) branches for the walls of the thorax and abdomen; (4) branches for the pelvis and lower limbs.

The branches for the head, neck and upper limbs arise as three large arteries from the transverse part of the aorta; they are named *innominate*, *left common carotid* and *left subclavian*. The innominate artery is the largest and passes upward and to the right, to the root of the neck, where it divides into the right common carotid and the right subclavian. The carotid arteries supply the two sides of the head and neck; the subclavian arteries the two upper extremities.

The *common carotid* artery runs up the neck by the side of the windpipe, and on a level with the upper border of the thyroid cartilage divides into the internal and external carotid arteries. ***Carotid system.***

The *internal carotid* artery ascends through the carotid canal in the temporal bone into the cranial cavity. It gives off an *ophthalmic* branch to the eyeball and other contents of the orbit, and then divides into the *anterior* and *middle cerebral* arteries. The middle cerebral artery extends outward into the Sylvian fissure of the brain, and supplies the island of Reil, the orbital part, and the outer face of the frontal lobe, the parietal lobe, and the temporo-sphenoidal lobe; it also gives a choroid branch to the choroid plexus of the velum interpositum. The anterior cerebral artery supplies the inner face of the hemisphere from the anterior end of the frontal lobe as far back as the internal parieto-occipital fissure. At the base of the brain not only do the two internal carotids anastomose with each other through the *anterior communicating* artery, which passes between their anterior cerebral branches, but the internal carotid on each side anastomoses with the posterior cerebral branch of the basilar, by a *posterior communicating* artery. In this manner a vascular circle, the *circle of Willis*, is formed, which permits of freedom of the arterial circulation by the anastomoses between arteries not only on the same side, but on opposite sides of the mesial plane. The vertebral and internal carotid arteries, which are the arteries of supply for the brain, are distinguished by lying at some depth from the surface in their course to the organ, by having curves or twists in their course, and by the absence of large collateral branches.

The *external carotid* artery ascends through the upper part of the side of the neck, and behind the lower jaw into the parotid gland, where it divides into the internal maxillary and superficial temporal branches. This artery gives off the following branches:—(*a*) *Superior thyroid* to the larynx and thyroid body; (*b*) *Lingual* to the tongue and sublingual gland; (*c*) *Facial* to the face, palate, tonsil and submaxillary gland; (*d*) *Occipital* to the sterno-mastoid muscle and back of the scalp; (*e*) *Posterior auricular* to the back of the ear and the adjacent part of the scalp; (*f*) *Superficial temporal* to the scalp in front of the ear, and by its *transverse facial* branch to the back part of the face; (*g*) *Internal maxillary*, giving *muscular* branches to the muscles of mastication, *meningeal* branches to the dura mater, *dental* branches to the teeth, and other branches to the nose, palate and tympanum; (*h*) *Ascending pharyngeal*, which gives branches to the pharynx, palate, tonsils and dura mater.

The *subclavian* artery is the commencement of the great arterial trunk for the upper limb. It passes across the root of the neck and behind the clavicle, where it enters the armpit, and becomes the *axillary* artery; by that name it extends as far as the posterior fold of the axilla, where it enters the upper arm, takes the name of *brachial*, and courses as far as the bend of the elbow; here it bifurcates into the *radial* and *ulnar* arteries. From the subclavian part of the trunk the following branches arise:—(*a*) *Vertebral*, which enters the foramen at the root of the transverse process of the 6th cervical vertebra, ascends through the corresponding foramina in the vertebrae above, lies in a groove on the arch of the atlas, and enters the skull through the foramen magnum, where it joins its fellow to form the *basilar* artery; it gives off *muscular* branches to the deep muscles of the neck, *spinal* branches to the spinal cord, *meningeal* branches to the dura mater, and an *inferior cerebellar* branch to the under surface of the cerebellum. The *basilar* artery, formed by the junction of the two vertebrals, extends from the lower to the upper border of the pons Varolii; it gives off *transverse* branches to the pons, *auditory* branches ***Subclavian system.***

to the internal ear, *inferior cerebellar* branches to the under surface of the cerebellum, whilst it breaks up into four terminal branches, viz. two *superior cerebellar* to the upper surface of the cerebellum, and two *posterior cerebral* which supply the tentorial and mesial aspects of the temporo-sphenoidal lobes, the occipital lobes, and the posterior convolutions of the parietal lobes. (*b*) *Thyroid axis*, which immediately divides into the *inferior thyroid*, the *supra-scapular*, and the *transverse cervical* branches; the *inferior thyroid* supplies the thyroid body, and gives off an *ascending cervical* branch to the muscles of the neck; the *supra-scapular* supplies the muscles on the dorsum scapulae; the *transverse cervical* supplies the trapezius and the muscles attached to the vertebral border of the scapula. (*c*) *Internal mammary* supplies the anterior surface of the walls of the chest and abdomen, and the upper surface of the diaphragm. (*d*) *Superior intercostal* supplies the first intercostal space, and by its deep *cervical* branch the deep muscles of the back of the neck.

The *axillary* artery supplies *thoracic* branches to the wall of the chest, the pectoral muscles, and the fat and glands of the axilla; an *acromio-thoracic* to the parts about the acromion; *anterior* and *posterior circumflex* branches to the shoulder joint and deltoid muscle; a *subscapular* branch to the muscles of the posterior fold of the axilla.

The *brachial* artery supplies *muscular* branches to the muscles of the upper arm; a *nutrient* branch to the humerus; *superior* and *inferior profunda* branches and an *anastomotic* to the muscles of the upper arm and the region of the elbow joint.

The *ulnar* artery extends down the ulnar side of the front of the fore-arm to the palm of the hand, where it curves outward toward the thumb, and anastomoses with the superficial volar or other branch of the radial artery to form the *superficial palmar arch*. In the fore-arm the ulnar gives off the *interosseous* arteries, which supply the muscles of the fore-arm and give *nutrient* branches to the bones; two *recurrent* branches to the region of the elbow; *carpal* branches to the wrist joint: in the hand it gives a *deep* branch to the deep muscles of the hand, and from the superficial arch arise *digital* branches to the sides of the little, ring, and middle fingers, and the ulnar border of the index finger.

The *radial* artery extends down the radial side of the front of the fore-arm, turns round the outer side of the wrist to the back of the hand, passes between the 1st and 2nd metacarpal bones to the palm, where it joins the deep branch of the ulnar, and forms the *deep palmar arch*. In the fore-arm it gives off a *recurrent* branch to the elbow joint; *carpal* branches to the wrist joint; and *muscular* branches, one of which, named superficial volar, supplies the muscle of the thumb and joins the ulnar artery: in the hand it gives off a branch to the thumb, and one to the radial side of the index, *interosseous* branches to the interosseous muscles, *perforating* branches to the back of the hand, and *recurrent* branches to the wrist.

The branches of the aorta which supply the viscera of the thorax are the coronary, the oesophageal, the bronchial and the pericardiac.

Visceral branches. The *coronary* arteries, two in number, are the first branches of the aorta, and arise opposite the anterior and left posterior segments of the semilunar valve, from the wall of the aorta, where it dilates into the sinuses of Valsalva. They supply the tissue of the heart.

The *oesophageal*, *bronchial* and *pericardiac* branches are sufficiently described by their names.

The branches of the aorta which supply the viscera of the abdomen arise either singly or in pairs. The single arteries are the coeliac axis, the superior mesenteric, and the inferior mesenteric, which arise from the front of the aorta; the pairs are the capsular, the two renal, and the two spermatic or ovarian, which arise from its sides. The single arteries supply viscera which are either completely or almost completely invested by the peritoneum, and the veins corresponding to them are the roots of the vena portae. The pairs of arteries supply viscera developed behind the peritoneum, and the veins corresponding to them are rootlets of the inferior vena cava.

The *coeliac axis* is a thick, short artery, which almost immediately divides into the gastric, hepatic and splenic branches. The *gastric* gives off oesophageal branches and then runs along the lesser curvature of the stomach. The *hepatic* artery ends in the substance of the liver; but gives off a *cystic* branch to the gall bladder, a *pyloric* branch to the stomach, a *gastro-duodenal* branch, which divides into a *superior pancreatico-duodenal* for the pancreas and duodenum, and a *right gastro-epiploic* for the stomach and omentum. The *splenic* artery ends in the substance of the spleen; but gives off *pancreatic* branches to the pancreas, *vasa brevia* to the left end of the stomach, and a *left gastro-epiploic* to the stomach and omentum.

The *superior mesenteric* artery gives off an *inferior pancreatico-duodenal* branch to the pancreas and duodenum; about twelve *intestinal* branches to the small intestines, which form in the substance of the mesentery a series of arches before they end in the wall of the intestines; an *ileocolic* branch to the end of the ileum, the caecum, and beginning of the colon; a *right colic* branch to the ascending colon; and a *middle colic* branch to the transverse colon.

The *inferior mesenteric* artery gives off a *left colic* branch to the descending colon, a *sigmoid* branch to the iliac and pelvic colon, and ends in the *superior haemorrhoidal* artery, which supplies the rectum. The arteries which supply the coats of the alimentary tube from the oesophagus to the rectum anastomose freely with each other in the wall of the tube, or in its mesenteric attachment, and the anastomoses are usually by the formation of arches or loops between adjacent branches.

The *capsular arteries*, small in size, run outward from the aorta to end in the supra-renal capsules.

The *renal* arteries pass one to each kidney, in which they for the most part end, but in the substance of the organ they give off small *perforating* branches, which pierce the capsule of the kidney, and are distributed in the surrounding fat. Additional renal arteries are fairly common.

The *spermatic* arteries are two long slender arteries, which descend, one in each spermatic cord, into the scrotum to supply the testicle. The corresponding ovarian arteries in the female do not leave the abdomen.

Parietal branches. The branches of the aorta which supply the walls of the thorax, abdomen and pelvis, are the intercostal, the lumbar, the phrenic, and the middle sacral.

The *intercostal* arteries arise from the back of the thoracic aorta, and are usually nine pairs. They run round the sides of the vertebral bodies as far as the commencement of the intercostal spaces, where each divides into a *dorsal* and a *proper intercostal* branch; the dorsal branch passes to the back of the thorax to supply the deep muscles of the spine; the proper intercostal branch (AB.) runs outward in the intercostal space to supply its muscles, and the lower pairs of intercostals also give branches to the diaphragm and wall of the abdomen. Below the last rib a subcostal artery runs.

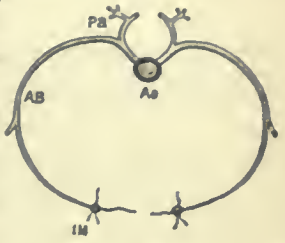


FIG. 1.—Diagram of a pair of intercostal arteries.
Ao, The aorta transversely divided, giving off at each side an intercostal artery.
PB, The posterior or dorsal branch.
AB, The anterior or proper intercostal branch.
IM, A transverse section through the internal mammary artery.

The *lumbar* arteries arise from the back of the abdominal aorta, and are usually four pairs. They run round the sides of the lumbar vertebrae, and divide into a *dorsal* branch which supplies the deep muscles of the back of the loins, and an *abdominal* branch which runs outward to supply the wall of the abdomen. The distribution of the lumbar and intercostal arteries exhibits a transversely segmented arrangement of the vascular system, like the transversely segmented arrangement of the bones, muscles and nerves met with in these localities, but more especially in the thoracic region.

The *phrenic* arteries, two in number, pass to supply the under surface of the diaphragm.

The *middle sacral* artery, as it runs down the front of the sacrum, gives branches to the back of the pelvic wall.

Injections made by Sir W. Turner have shown that, both in the thoracic and abdominal cavities, slender anastomosing communications exist between the visceral and parietal branches.

The arteries to the pelvis and hind limbs begin at the bifurcation of the aorta into the two common iliacs.

The *common iliac* artery, after a short course, divides into the internal and external iliac arteries. The *internal iliac* enters the pelvis and divides into branches for the supply of the pelvic walls and viscera, including the organs of generation, and for the great muscles of the buttock. The *external iliac* descends behind Poupart's ligament into the thigh, where it takes the name of *femoral* artery. The femoral descends along the front and inner surface of the thigh, gives off a *profunda* or deep branch, which, by its *circumflex* and *perforating* branches, supplies the numerous muscles of the thigh; most of these extend to the back of the limb to carry blood to the muscles situated there. The femoral artery then runs to the back of the limb in the ham, where it is called *popliteal* artery. The popliteal divides into two branches, of which one, called *anterior tibial*, passes between the bones to the front of the leg, and then downward to the upper surface of the foot; the other, *posterior tibial*, continues down the back of the leg to the sole of the foot, and divides into the *internal* and *external plantar* arteries; branches proceed from the external plantar artery to the sides of the toes, and constitute the *digital* arteries. From the large arterial trunks in the leg many branches proceed, to carry blood to the different structures in the limb.

Iliac system.

The wall of an artery consists of several coats (see fig. 2). The outermost is the *tunica adventitia*, composed of connective tissue; immediately internal to this is the *yellow elastic* coat; within this again the *muscular coat*, formed of involuntary muscular tissue, the contractile fibre-cells of which are for the most part arranged transversely to the long axis of the artery; in the larger arteries the elastic coat is much thicker than the muscular, but in the smaller the muscular coat is relatively strong; the vaso-motor nerves terminate in the muscular coat. In the first part of the aorta, pulmonary artery and arteries of the retina there is no muscular coat. Internal to the muscular coat is the *elastic fenestrated coat*, formed of a smooth elastic membrane

Structure of arteries.

perforated by small apertures. Most internal of all is a layer of *endothelial cells*, which form the free surface over which the blood flows. The arteries are not nourished by the blood which flows through them, but by minute vessels, *vasa vasorum*, distributed in their external, elastic and muscular coats.

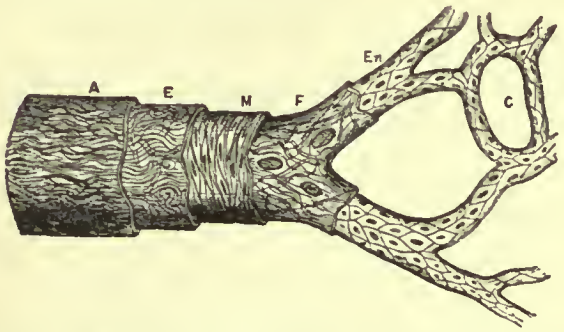


FIG. 2.—Diagram of the structure of an artery. A, tunica adventitia; E, elastic coat; M, muscular coat; F, fenestrated coat; En, endothelium continuous with the endothelial wall of C, the capillaries.

EMBRYOLOGY

The earliest appearance of the blood vessels is dealt with under VASCULAR SYSTEM. Here will be briefly described the fate of the main vessel which carries the blood away from the truncus arteriosus of the developing heart (*q.v.*). This ventral aorta, if traced forward, soon divides into two lateral parts, the explanation being that there were originally two vessels, side by side, which fused to form the heart, but continued separate anteriorly. The two parts run for a little distance toward the head of the embryo, ventral to the alimentary canal, and then turn toward the dorsum, passing one on either side of that tube to form the first aortic arch. Having reached the dorsum they turn backward toward the tail end and form the dorsal aortae; here, according to A. H. Young (*Studies in Anatomy*, Owens College, 1891 and 1900) they again turn toward the ventral side and become, after a transitional stage, the *hypogastric, placental, allantoic* or *umbilical* arteries. This authority does not believe that the middle sacral artery of the adult is the real continuation of the single median dorsal aorta into which the two parallel dorsal vessels just mentioned soon coalesce, though until recently it has always been so regarded. The anterior loop between the ventral and dorsal aortae already described as the first aortic arch is included in the *maxillary* or *first visceral arch* of the soft parts (see fig. 3, *1*). Later, four other well-marked aortic arches grow behind this in the more caudal visceral arches, so that there are altogether five arterial arches on each side of the pharynx, through which the blood can pass from the ventral to the dorsal aorta. Of these arches the first soon disappears, but is probably partly represented in the adult by the *internal maxillary* artery, one branch of which, the *infraorbital*, is enclosed in the upper jaw, while another, the *inferior dental*, is surrounded by the lower jaw. Possibly the ophthalmic artery also belongs to this arch. The second arch also disappears, but the *posterior auricular* and *occipital* arteries probably spring from it, and at an early period it passed through the stapes as the transitory stapedial artery. The third arch forms the beginning of the internal carotid. The fourth arch becomes the arch of the adult aorta, between the origins of the left carotid and left subclavian, on the left side, and the first part of the right subclavian artery on the right. The apparent fifth arch on the left side (fig. 3, *6*) remains all through foetal life as the *ductus arteriosus*, and, as the lungs develop, the *pulmonary* arteries are derived from it. J. E. V. Boas and W. Zimmermann have shown that this arch is in reality the sixth, and that there is a very transitory true fifth arch in front of it (fig. 3, *5*). The part of the ventral aorta from which this last arch rises is a single median vessel due to the same fusion of the two primitive ventral aortae which precedes the formation of the heart, but a spiral septum has appeared in it which divides it in such a way that while the anterior or cephalic arches communicate with the left ventricle of the heart, the last one communicates with the right (see HEART). The fate of the ventral and dorsal longitudinal vessels must now be followed. The fused part of the two ventral aortae, just in front of the heart, forms the ascending part of the adult aortic arch, and where this trunk divides between the fifth and fourth arches (strictly speaking, the sixth and fifth), the right one forms the *innominate* (fig. 3, In.) and the left one a very short part of the *transverse arch* of the aorta until the fourth arch comes off (see fig. 4). From this point to the origin of the third arch is *common carotid*, and after that, to the head, *external carotid* on each side. The *dorsal longitudinal* arteries on the head side of the junction with the third arch form the *internal carotids*. Between the third and fourth arches they are obliterated, while on the caudal side of this, until the point of fusion is reached on the dorsal side of the heart, the left artery forms the upper part of the dorsal aorta while the right entirely disappears. Below this point the *thoracic* and *abdominal aortae* are formed by the two *primitive dorsal aortae* which have fused to form a single median vessel. As the limbs are developed, vessels bud out in them. The *subclavian* for the arm comes from the fourth aortic arch on each side, while in the leg the main artery is a branch of the *caudal arch* which is curving ventralward to form the umbilical artery. From the convexity of this arch the internal iliac and sciatic at first carry the blood to the limb, as they do permanently in reptiles, but later the external iliac and femoral become developed, and, as they are on the concave side of the bend of the hip, while the sciatic is on the convex, they have a mechanical advantage and become the permanent main channel.

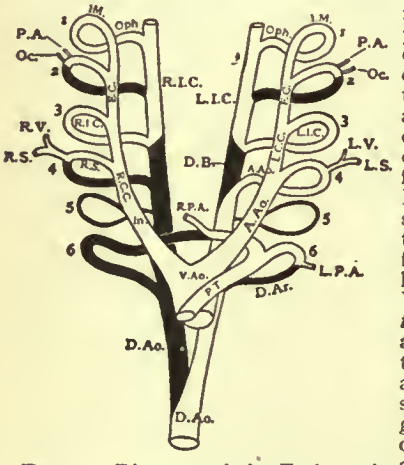


FIG. 3.—Diagram of the Embryonic Arterial Arches. 1, 2, 3, 4, 5, 6, point to the six arches. (The black parts are obliterated in the adult human subject.)

V.Ao. Ventral Aorta.
A.Ao. Arch of Aorta.
D.Ar. Ductus Arteriosus.
In. Innominate Artery.
R.I.C.-L.I.C. Right and Left Internal Carotid Arteries.
D.B. Duct of Botalli.
R.S.-L.S. Right and Left Subclavian Arteries.
R.V.-L.V. Right and Left Vertebral Arteries.
P.A. Posterior Auricular Artery.
Oph. Ophthalmic Artery.
D.Ao. Dorsal Aorta.
P.T. Pulmonary trunk.
R.P.A.-L.P.A. Right and Left Pulmonary Arteries.
R.C.C.-L.C.C. Right and Left Common Carotid Arteries.
E.C. External Carotid Artery.
Oc. Occipital Artery.
I.M. Internal Maxillary Artery.

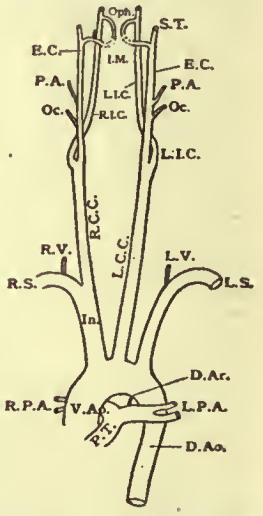


FIG. 4.—Diagram of the Human Aorta and its branches. S.T., Superficial Temporal Artery.

For further details see O. Hertwig, *Handbuch der vergleichenden und experimentellen Entwickelungslehre der Wirbeltiere* (Jena, 1905).

COMPARATIVE ANATOMY

In the Acrania the lancelet (Amphioxus) shows certain arrangements of its arteries which are suggestive of the embryonic stages of the higher vertebrates and Man. There is a median ventral aorta below the pharynx, from which branchial arteries run up on each side between the branchial clefts, where the blood is aerated, to join two dorsal aortae which run back side by side until the hind end of the pharynx is reached; here they fuse to form a median vessel from which branches are distributed to the straight intestine. There is no heart, but the ventral aorta is contractile, and the blood is driven forward in it and backward in the dorsal aortae. The branchial arteries are very numerous, and cannot be homologized closely with the five (originally six) pairs of aortic arches in Man.

In the fish the ventral aorta gives rise to five afferent branchial arteries carrying the blood to the gills, though these may not all come off as independent trunks from the aorta. From the gills the afferent branchials carry the blood to the median dorsal aorta. As pectoral and pelvic fins are now developed, subclavian and iliac arteries are found rising from the dorsal aorta, though the aorta itself is continued directly backward as the caudal artery into the tail. In the Dipnoi or mud fish, in which the swim bladder is converted into a functional lung, the hindmost afferent branchial artery, corresponding to the fifth (strictly speaking the sixth) aortic arch of the human embryo, gives off on each side a pulmonary artery to that structure.

The arrangement of the branchial aortic arches in the tailed Amphibia (Urodela), and in the tadpole stage of the tailless forms (Anura), makes it probable that the generalized vertebrate has six (if not more) pairs of these instead of the five which are evident in the human embryo. Four pairs of arches are present, the first of which is the carotid and corresponds to the third of Man; the second is the true aortic arch on each side; the third undergoes

great reduction or disappears when the gills atrophy, and is very transitory in the Mammalia (fig. 3, *5*), while the fourth is the one from which the pulmonary artery is developed when the lungs appear, and corresponds to the nominal fifth, though really the sixth arch, of the higher forms (fig. 3, *6*). The dorsal part of this sixth arch remains as a pervious vessel in the Urodela, joining the pulmonary arch to the dorsal aorta. In the ventral part of the carotid arch the vessel breaks up into a plexus, for a short distance forming the so-called carotid gland, which has an important effect upon the adult circulation of the Amphibia. In the Reptilia the great arteries are arranged on the same plan as in the adult Amphibia, but the carotid arch retains its dorsal communication with the systematic aortic arch on each side, and this communication is known as the duct of Botalli (fig. 3, D.B.). In this class, as in the Amphibia, one great artery, the coeliaco-mesenteric, usually supplies the liver, spleen, stomach and anterior part of the intestines; this is a point of some interest when it is noticed how very close together the coeliac axis and superior mesenteric arteries rise from the abdominal aorta in Man.

In the Birds the right fourth arch alone remains as the aorta, the dorsal part of the left corresponding arch being obliterated. From the arch of the aorta rise two symmetrical innominates, each of which divides later into a carotid and subclavian. The blood path from the aorta to the hind limb in the Amphibia, Reptilia and Aves, is a dorsal one, and passes through the internal iliac and sciatic to the back of the thigh, and so to the popliteal space; the external iliac is, if it is developed at all, only a small branch to the pelvis.

In the Mammalia the fourth left arch becomes the aorta, the corresponding right one being obliterated, but several cases have been recorded in Man in which both arches have persisted, as they do in the reptiles (H. Leboucq, *Ann. Sci. Med. Gand*, 1894, p. 7). Examples have also been found of a right aortic arch, as in birds, while a very common human abnormality is that in which the dorsal part of the fourth right arch persists, and from it the right subclavian artery arises (see fig. 3).

The commonest arrangement of the great branches of the aortic arch in Mammals is that in which the innominate and left carotid arise by a single short trunk, while the left subclavian comes off later; this is also Man's commonest abnormality. Sometimes, especially among the Ungulata, all the branches may rise from one common trunk; at other times two innominate arteries may be present; this is commonest in the Cheiroptera, Insectivora and Cetacea. It is extremely rare to find all four large arteries rising independently from the aorta, though it has been seen in the Koala (F. G. Parsons, "Mammalian Aortic Arch," *Journ. of Anat.* vol. xxxvi. p. 389). The human arrangement of the common iliacs is not constant among mammals, for in some the external and internal iliacs rise independently from the aorta, and this is probably the more primitive arrangement. The middle sacral artery has already been referred to. A. H. Young and A. Robinson believe, on embryological grounds, that this artery in mammals is not homologous with the caudal artery of the fish, and is not the direct continuation of the aorta; it is an artery which usually gives off two or more collateral branches, and sometimes, as in the Ornithorynchus and some edentates, breaks up into a network of branches which reunite and so form what is known as a *rete mirabile*. These retia mirabilia are often found in other parts of the mammalian body, though their function is still not satisfactorily explained. The way in which the blood is carried to the foot in the pronograde mammals differs from that of Man; a large branch called the internal saphenous comes off the common femoral in the lower third of the thigh, and this runs down the inner side of the leg to the foot. This arrangement is quite convenient as long as the knee is flexed, but when it comes to be extended, as in the erect posture, the artery is greatly stretched, and it is much easier for the blood to pass to the foot through the anterior and posterior tibials. A vestige of this saphenous artery, however, remains in Man as the anastomotica magna.

The literature of the Comparative Anatomy of the Arteries up to 1902 will be found in R. Wiedersheim's *Vergleichende Anatomie der Wirbeltiere* (Jena, 1902). The morphology of the Iliac Arteries is described by G. Levi, *Archivio Italiano di Anat. ed Embriol.*, vol. i. (1902). (F. G. P.)

ARTERN, a town of Germany, in Prussian Saxony, on the Unstrut, at the influx of the Helme, at the junction of railways to Erfurt, Naumburg and Sangerhausen, 8 m. S. of the last named. Pop. 5000. It has an Evangelical church, an agricultural college and some manufactures of machinery, sugar and boots. Its brine springs, known as early as the 15th century, are still frequented.

ARTESIAN WELLS, the name properly applied to water-springs rising above the surface of the ground by natural hydrostatic pressure, on boring a small hole down through a series of strata to a water-carrying bed enclosed between two impervious layers; the name is, however, sometimes loosely applied to any deep well, even when the water is obtained by pumping. In Europe this mode of well-boring was first practised in the French province of Artois, whence the name of Artesian is derived. At Aire, in that province, there is a well from which the water has continued steadily to flow to a height of 11 feet above the ground for more than a century; and there is, within the old Carthusian convent at Lillers, another which dates from the 12th century, and which still flows. But unmistakable traces of much more ancient bored springs appear in Lombardy, in Asia Minor, in Persia, in China, in Egypt, in Algeria, and even in the great desert of Sahara. (See WELL.)

ARTEVELDE, JACOB VAN (*c.* 1290–1345), Flemish statesman, was born at Ghent about 1290. He sprang from one of the wealthy commercial families of this great industrial city, his father's name being probably William van Artevelde. His brother John, a rich cloth merchant, took a leading part in public affairs during the first decades of the 14th century. Jacob, who according to tradition was a brewer by trade, spent three years in amassing quietly a large fortune. He was twice married, the second time to Catherine de Coster, whose family was of considerable influence in Ghent. Not till 1337, when the outbreak of hostilities between France and England threatened to injure seriously the industrial welfare of his native town, did Jacob van Artevelde make his first appearance as a political leader. As the Flemish cities depended upon England for the supply of the wool for their staple industry of weaving, he boldly came forward, as a tribune of the people, and at a great meeting at the monastery of Biloke unfolded his scheme of an alliance of the Flemish towns with those of Brabant, Holland and Hainaut, to maintain an armed neutrality in the dynastic struggle between Edward III. and Philip VI. of France. His efforts were successful. Bruges, Ypres and other towns formed a league with Ghent, in which town Artevelde, with the title of captain-general, henceforth until his death exercised almost dictatorial authority. His first step was to conclude a commercial treaty with England. The efforts of the count of Flanders to overthrow the power of Artevelde by force of arms completely failed, and he was compelled at Bruges to sign a treaty (June 21, 1338) sanctioning the federation of the three towns, Ghent, Bruges and Ypres, henceforth known as the "Three members of Flanders." This was the first of a series of treaties, made during the year 1339–1340, which gradually brought into the federation all the towns and provinces of the Netherlands. The policy of neutrality, however, proved impracticable, and the Flemish towns, under the leadership of Artevelde, openly took the side of the English king, with whom a close alliance was concluded. Artevelde now reached the height of his power, concluding alliances with kings, and publicly associating with them on equal terms. Under his able administration trade flourished, and Ghent rose rapidly in wealth and importance. His well-nigh despotic rule awoke at last among his compatriots jealousy and resentment. The proposal of Artevelde to disown the sovereignty of Louis, count of Flanders, and to recognize in its place that of Edward, prince of Wales (the Black Prince), gave rise to violent dissatisfaction. A popular insurrection broke out in Ghent, and Artevelde fell into the hands of the crowd and was murdered on the 24th of July 1345.

The great services that he rendered to Ghent and to his country have in later times been recognized. A statue was erected in his native town on the Marché du Vendredi, and was unveiled by Leopold I., king of the Belgians, on the 13th of September 1863.

See J. Hutten, *James and Philip van Artevelde* (London, 1882); W. J. Ashley, *James and Philip van Artevelde*, (London, 1883); P. Namèche, *Les van Artevelde et leur époque* (Louvain, 1887); L. Vanderkindere, *Le Siècle des Arteveldes* (Brussels, 1879).

ARTEVELDE, PHILIP VAN (*c.* 1340–1382), youngest son of the above, and godson of Queen Philippa of England, who held him in her arms at his baptism, lived in retirement until 1381. The Ghenters had in that year risen in revolt against the oppression of the count of Flanders, and Philip, now forty years of age, and without any military or political experience, was offered the supreme command. His name awakened general enthusiasm. At first his efforts were attended by considerable success. He defeated Louis de Mâle, count of Flanders, before Bruges, entered that city in triumph, and was soon master of all Flanders.

But France took up the cause of the Flemish count, and a splendid French army was led across the frontier by the young king Charles VI. in person. Artevelde advanced to meet the enemy at the head of a burgher army of some 50,000 Flemings. The armies met at Roosebeke near Courtrai, with the result that the Flemings were routed with terrible loss, Philip himself being among the slain. This happened on the 27th of November 1382.

The brief but stirring career of this popular leader is admirably treated in Sir Henry Taylor's drama, *Philip van Artevelde*.

ART GALLERIES. An art gallery (by which, as distinguished from more general MUSEUMS OF ART, *q.v.*, is here meant one specially for pictures) epitomizes so many phases of human thought and imagination that it connotes much more than a mere collection of paintings. In its technical and aesthetic aspect the gallery shows the treatment of colour, form and composition. In its historical aspect we find the true portraits of great men of the past; we can observe their habits of life, their manners, their dress, the architecture of their times, and the religious worship of the period in which they lived. Regarded collectively, the art of a country epitomizes the whole development of the people that produced it. Most important of all is the emotional aspect of painting, which must enter less or more into every picture worthy of notice. To take examples from the British National Gallery: pathos in its most intense degree will be found in Francia's "Pietà"; dignity in Velasquez' portrait of Admiral Pareja; homeliness in Van Eyck's portrait of Jan Arnolfini and his wife; the interpretation of the varying moods of nature in the work of Turner or Hobbema; nothing can be more devotional than the canvases of Bellini or his Umbrian contemporaries. So also the ruling sentiments of mankind—mysticism, drama and imagination—are the keynotes of other great conceptions of the artist. All this may be at the command of those who visit the art gallery; but without patience, care and study the higher meaning will be lost to the spectator. The picture which "tells its own story" is often the least didactic, for it has no inner or deeper lesson to reveal; it gives no stimulus or training to the eye, quick as that organ may be—*segnius irritant animos*—to translate sight into thought. In brief, the painter asks that his ἦθος may be shared as much as possible by the man who looks at the painting—the art above all others in which it is most needful to share the master's spirit if his work is to be fully appreciated. So, too, the art gallery, recalling the gentler associations of the past amidst surroundings of harmonious beauty and its attendant sense of comfort, is essentially a place of rest for the mind and eye. In the more famous galleries where the wealth of paintings allows a grouping of pictures according to their respective schools, one may choose the country, the epoch, the style or even the emotion best suited to one's taste.

According to this theory, though imperfectly realized owing to the paucity of examples, the philosophic influence of art galleries is becoming more widely extended; and in its further development will be found an ever-growing source of interest, instruction and scholarship to the community. The most suitable method of describing art galleries is to classify them by their types and contents rather than by the various countries to which they belong. Thus the great representative galleries of the world which possess works of every school are grouped together, followed by state galleries which are not remarkable for more than one school of national art. Municipal galleries are divided into those which have general collections, and those which are notable for special collections. Churches which have good paintings, together with those which are now secularized, are treated separately; while the collections in the Vatican and private houses are described together. The remaining galleries, such as the Salon or the Royal Academy, are periodical or commercial in character, and are important in the development of modern art.

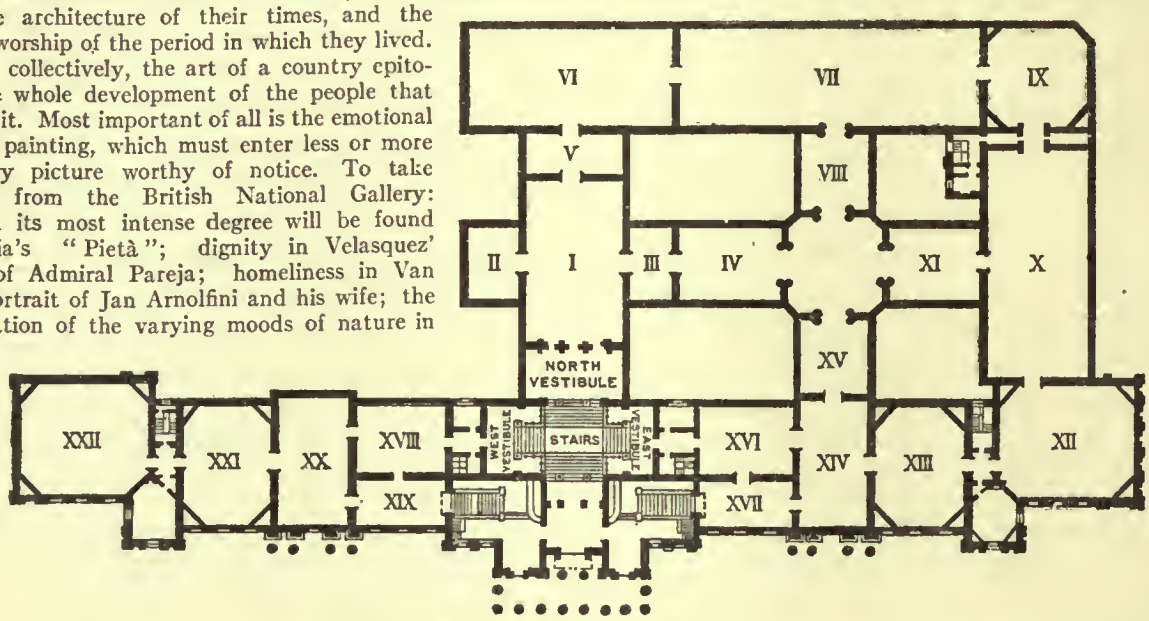


FIG. 1.—Plan of the National Gallery, London.

North Vestibule, Early Italian Schools:
I. Tuscan School (15th and 16th centuries).
II. Sienese School, &c.
III. Tuscan School.
IV. Lombard School.
V. Ferrarese and Bolognese Schools.
VI. Umbrian School, &c.
VII. Venetian and Brescian Schools.
VIII. Paduan and Early Venetian Schools.
IX. Later Venetian School.
X. Flemish School.
XI. Early Dutch and Flemish Schools.
XII. Dutch and Flemish Schools.
XIII. Flemish School.
XIV. Spanish School.
XV. German Schools.
XVI. French School.
XVII. French School.
XVIII. British School.
XIX. Old British School.
XX. British School.
XXI. British School.
XXII. Turner Collection.
Octagonal Hall: Miscellaneous.
East Vestibule: British School.
West Vestibule: Italian School.

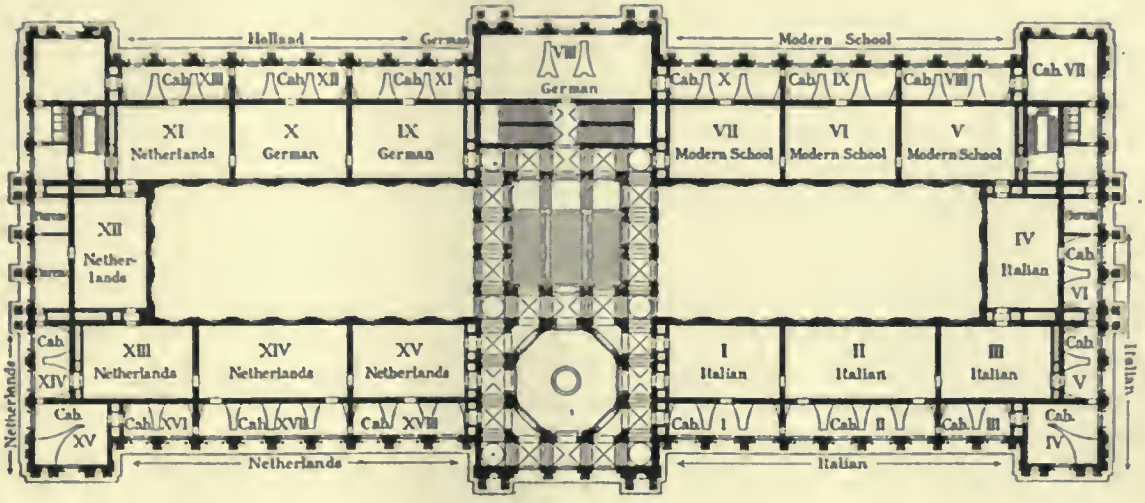
State galleries of international schools.

The collections most worthy of attention are the state galleries representative of international schools. Among these the British National Gallery holds a high place. The collection was founded in 1824 by the acquisition of the Angerstein pictures. Its accessions are mainly governed by the parliamentary grant of £5000 to £10,000 a year, a sum which has occasionally been enlarged to permit special purchases. Thus, in 1871, the Peel collection of seventy-seven pictures was bought for £75,000, and in 1885 the Ansidei Madonna (Raphael) and Van Dyck's portrait of Charles I. were bought, the one for £70,000 and the other for £17,500. In 1890 the government gave £25,000 to meet a gift of £30,000 made by three gentlemen to acquire three portraits by Moroni, Velazquez and Holbein. The most important private gifts were the Vernon gift in 1847, the Turner bequest in 1856 and the Wynne-Ellis legacy in 1876. Since 1905 the Art Collections Fund, a society of private subscribers, has also been responsible for important additions to the gallery, notably the Venus of Velazquez (1907). The gallery contains very few poor works and all schools are well

represented, with the sole exception of the French school. This, however, can be amply studied at Hertford House (Wallace Collection), which, besides Dutch, Spanish and British pictures of the highest value, contains twenty examples of Greuze, fifteen by Pater, nineteen by Boucher, eleven by Watteau and fifteen by Meissonier. The national gallery of pictures at Berlin (Kaiser Friedrich Museum), like the British National Gallery, is remarkable for its variety of schools and painters, and for the select type of pictures shown. During the last twenty-five years of the 19th century, the development of this collection was even more striking than that of the English gallery. Italian and Dutch examples are specially numerous, though every school but the British (here

It avoids the undue multiplication of canvases, and the overcrowding so noticeable in many Italian galleries where first-rate pictures hang too high to be examined. Thus the Viennese gallery, besides the intrinsic value of its pictures (Albert Dürer's chief work is there), is admirably adapted for study. The best gallery in Russia (St Petersburg, Hermitage) was made entirely by royal efforts, having been founded by Peter the Great, and much enlarged by the empress Catherine. It contains the collections of Crozat, Brühl and Walpole. There are about 1800 works, the schools of Flanders and Italy being of signal merit; and there are at least thirty-five genuine examples by Rembrandt. The French collection (Louvre Palace, Paris) is one

I.



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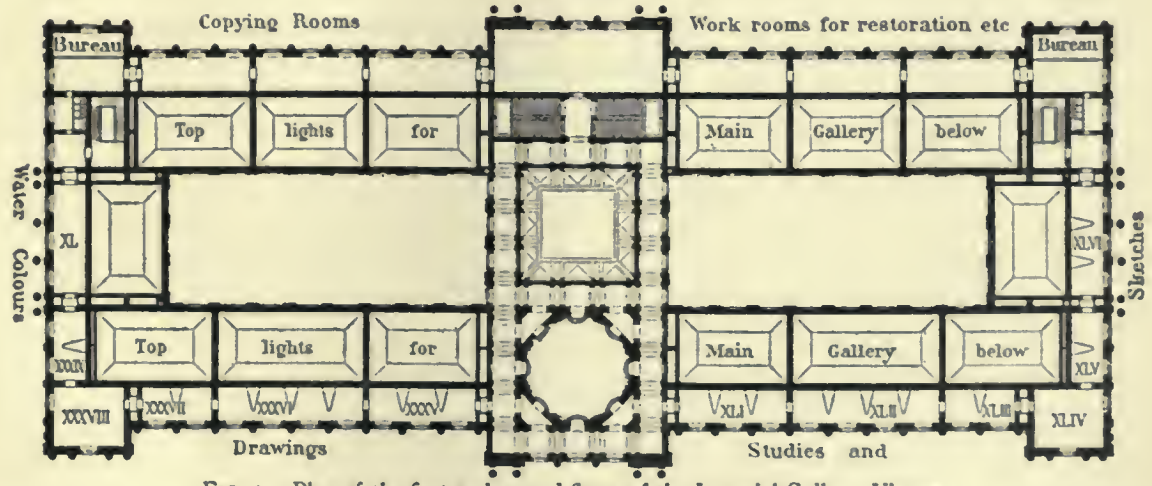


FIG. 2.—Plan of the first and second floors of the Imperial Gallery, Vienna.

as elsewhere) is really well seen. The purchase grant is considerable, and is well applied. Two other German capitals have collections of international importance—Dresden and Munich. The former is famous for the Sistine Madonna by Raphael, a work of such supreme excellence that there is a tendency to overlook other Italian pictures of celebrity by Titian, Giorgione and Correggio. Munich (Old Pinakothek) has examples of all the best masters, the South German school being particularly noticeable. The arrangement is good, and the methods of exhibition make this one of the most pleasant galleries on the continent. Vienna has the Imperial Gallery, a collection which in point of number cannot be considered large, as there are not more than 1700 pictures. This, however, is in itself a safeguard, like the wise provision in a statute of 1856 for enabling the English authorities to dispose of pictures "unfit for the collection, or not required."

of the most important of all. In 1880 it was undoubtedly the first gallery in Europe, but its supremacy has since been menaced by other establishments where acquisitions are made more frequently and with greater care, and where the system of classification is such that the value of the pictures is enhanced rather than diminished by their display. In 1900 it was partly rearranged with great effect. The feature of the Louvre is the Salon Carré, a room in which the supposed finest canvases in the collection are kept together, pictures of world-wide fame, representing all schools. It is now generally accepted that this system of selection not only lowers the standard of individual schools elsewhere by withdrawing their best pictures, but does not add to the aesthetic or educational value of the masterpieces themselves. In Florence the Tribuna room of the Uffizi gallery is a similar case in point. Probably the two most widely known

pictures in the Louvre are Watteau's second "Embarquement pour Cythère," and the "Monna Lisa," a portrait by Leonardo da Vinci, but each school has many unique examples. The original drawings should be noted, being of equal importance to the collection preserved at the British Museum. The last collection to be mentioned under this heading is that known as the Royal Galleries in Florence, housed in the Pitti and Uffizi palaces. In some ways this collection does not represent general painting sufficiently to justify its inclusion with the galleries of Berlin, Paris and London. On the other hand, the great number of Italian pictures of vital importance to the history of international art makes this one of the finest existing collections. The two great palaces, dating from the 15th and 16th centuries, are joined together and contain the Medici pictures. They form the largest gallery in the world, and though many of the rooms are small and badly lighted, and although many paintings have suffered from thoughtless restoration, they have a charm and attraction which certainly make them the most popular galleries in Europe. The Pitti has ten Raphaels and excellent examples of Andrea del Sarto, Giorgione and Perugino. The Uffizi is more representative of non-Italian schools, but is best known for its works by Botticelli, Leonardo da Vinci, Michelangelo and Sodoma, the schools of Tuscany and Umbria forming the bulk of both collections. Admission to the galleries is by payment, and the small income derived from this source is devoted to maintaining and enlarging the collections.

As to the ground plans of the National Gallery, London (fig. 1), and of the Imperial Gallery at Vienna (fig. 2), it will be observed that while the former has the advantage of uniform top-light, the galleries at Vienna possess the most ample facilities for minute classification, small rooms or "cabinets" opening from each large room. Special rooms are also provided for drawings and water-colours, while special ranges of rooms are used by copyists and those responsible for the repair and preservation of the pictures.

Though not so comprehensive as the great collections just described, the state galleries showing national schools of painting and little else are of striking interest. In England the National Gallery of British Art (known as the Tate Gallery) contains British pictures. The corresponding collection of modern French art is at Paris (Luxembourg Palace), Berlin, Rome, Dresden, Vienna and Madrid having analogous galleries. The Victoria and Albert Museum has also numerous British pictures, especially in water-colour, and the National Portrait Gallery, founded in 1856, and since 1896 housed in its permanent home, is instructive in this connexion, though many of its pictures are the work of foreign artists. The national collections at Dublin and Edinburgh may be mentioned here, though most schools are represented. Brussels and Antwerp are remarkable for fine examples of Flemish art—Matsys, Memlinc and Van Eyck of the primitive schools, Rubens and Van Dyck of the later period. The collections at Amsterdam (Ryks Museum) and the Hague (Mauritshuis) are a revelation to those who have only studied Rembrandt, Franz Hals, Van der Helst, and other Dutch portrait painters outside Holland; and in the former gallery especially, the pictures are arranged in a manner showing them to the best advantage. The Museo del Prado is even more noteworthy, for the fifty examples of Velasquez (outrivalling the Italian pictures, important as they are) make a visit to Madrid imperative to those who wish to realize the achievements of Spanish art. Christiania, Stockholm and Copenhagen have large collections of Scandinavian art, and the cities of Budapest and Basel have galleries of some importance. In Italy the state maintains twelve collections, mainly devoted to pictorial art. Of these the best are situated at Bologna, Lucca, Parma, Venice, Modena, Turin and Milan. In each case the local school of painting is fully represented. In Rome the Corsini and Borghese Galleries, the latter being the most catholic in the city, contain superb examples, some of them accepted masterpieces of Italian art; there are also good foreign pictures, but their number is limited. The Accademia at Florence should also be noted as the most important state gallery of early Italian art. The central Italian Renaissance can be more adequately studied here than in the Pitti. The "Primavera" of Botticelli, and the "Last Judgment" by Fra Angelico are perhaps the best-known works. The large statue of David by Michelangelo is also in this gallery, which, on the whole, is one of the most remarkable in Italy. Speaking broadly, these national galleries scattered throughout the country are not well arranged or classified; and though some are kept in fine old buildings, beautiful in themselves, the lighting is often indifferent, and it is with difficulty that the pictures can be seen. In nearly every case admission fees are charged every day, festivals and Sundays excepted; few pictures are bought, acquisitions being chiefly made by removing pictures from churches.

State galleries of national schools.

Many towns own collections of well-merited repute. In Italy such galleries are common, and among them may be noted Siena, with Sodoma and his school; Venice with Tintoretto (Doge's Palace); Genoa, with the great palaces Balbi and Rosso; Vicenza (Montagna and school), Ferrara (Dosso and school), Bergamo and Milan (north Italian schools). Other civic collections of Italian art are maintained at Verona, Pisa, Rome, Perugia and Padua. In Holland, Haarlem, Leiden, Rotterdam and the Hague have galleries supplemental to those of the state, and are remarkable in showing the brilliance of artists like Grebber, de Bray and Ravesteyn, who are usually ignored. Birmingham and Manchester have good examples of modern British art. Moscow (Tretiakoff collection) has modern Russian pictures, and contemporary German and French work will be found in all the galleries of these two countries included in the municipal group. Collections of French work are found at Amiens, Rouen, Nancy, Tours, Le Mans and Angers, but large as these civic collections are, sometimes containing six and eight hundred canvases, few of their pictures are really good, many being the enormous patriotic canvases marked "Don de l'État," which do not confer distinction on the galleries. Cologne has the central collection of the early Rhenish school; Nuremberg is remarkable for early German work (Wohlgemut, &c.). Stuttgart, Cassel (Dutch) and Hamburg (with a considerable number of British pictures) are also noteworthy, together with Brunswick, Hanover, Augsburg, Darmstadt and Düsseldorf, where German and Dutch art preponderate. Seville is famous for twenty-five examples of Murillo, and there are old Spanish paintings at Valencia, Cordova and Cadiz.

Municipal galleries of special schools.

In Great Britain the best of the municipal galleries of general schools are at Liverpool (early Flemish and British), and at Glasgow (Scottish painters, Rembrandt, Van der Goes and Venetian schools). In France there are very large galleries at Tours, Montpellier, Lyons (Perugino, Rubens), Dijon and Grenoble (Italian), Valenciennes (Watteau and school), while Rennes, Lille and Marseilles have first-rate collections. Nantes, Orleans, Besançon, Cherbourg and Caen have also many paintings, French for the most part, but with occasional foreign pictures of real importance, presented by the state during the Napoleonic conquests, and not returned on the declaration of peace as were the works of art amassed in Paris. Some of the American collections have in recent years made a great advance in their acquisition of good pictures. At Boston (Museum of Fine Arts) all schools are represented, so too at the Metropolitan Museum of Art in New York, which is strong in Italian and Dutch works. Modern French and Flemish art is a feature of the Academy at Philadelphia, at the Lenox Library (New York), and at Chicago, where there are good examples of Millet, Constable and Rembrandt. The Corcoran bequest at Washington is of minor importance. The best civic collection in Germany of this class is the Städel Institute at Frankfort (Van Eyck, Christus, early Flemish and Italian).

Municipal galleries of general schools.

As the great bulk of religious painting was executed for church decoration, there are still numberless churches which may be considered picture galleries. Thus at Antwerp cathedral the Rubens paintings are remarkable; at Ghent, Van Eyck; at Bruges (hospital of St John), Memlinc;

Churches.

at Pisa, the Campo Santo (early Tuscan schools); at Sant' Apollinare, Ravenna, primitive Italo-Byzantine mosaics; at Siena, Pinturichio. Examples could be multiplied indefinitely—in Italy alone there are 80,000 churches and chapels, in all of which pictorial art has been employed. In Italy, besides the church "galleries" still used for religious services, there are some which have been secularized and are now used as museums, *e.g.* Certosa at Pavia, and San Vitale at Ravenna (mosaics); at Florence, the Scalzo (Andrea del Sarto); San Marco (Fra Angelico); the Riccardi and Pazzi chapels (Gozzoli and Perugino); at Milan, in the Santa Maria delle Grazie, the "Last Supper," by Leonardo, and at Padua, the famous Arena chapel (Giotto).

Private and semi-private galleries.

The Vatican galleries, though best known for their statuary, have fine examples of painting, chiefly of the Italian school; the most famous easel picture is Raphael's "Transfiguration," but the Stanze, apartments entirely decorated by painting, are even more famous. In England three royal palaces are open to the public—Hampton Court (Mantegna), Windsor (Van Dyck, Zuccarelli), and Kensington (portraits). At Buckingham Palace the Dutch pictures are admirable, and Queen Victoria lent the celebrated Raphael cartoons to the Victoria and Albert Museum. Semi-private collections belong to Dulwich College (Velasquez and Watteau), Oxford University (Italian drawings), the Soane Museum (Hogarth and English school), and the Royal Academy (Leonardo). Among private collections the most important are the Harrach, and Prince Liechtenstein (Vienna), J. Pierpont Morgan (including miniatures), Mrs J. Gardner of Boston (Italian), Prince Corsini (Florence). In Great Britain there are immense riches in private houses, though many collections have been dispersed. The most noteworthy (1909) belong to the dukes of Devonshire and Westminster, Lord Ellesmere, Captain Holford (including the masterpiece of Cuyp), Ludwig Mond, Lord Lansdowne, Miss Rothschild. The finest private collection is at Panshanger, formerly the seat of Lord Cowper, the gallery of Van Dyck's work being quite the best in the world.

Periodical and commercial.

Many galleries are devoted to periodical exhibitions in London; the Royal Academy is the leading agency of this character, having held exhibitions since 1769. Its loan exhibitions of Old Masters are most important. Similar enterprises are the New Gallery, opened in 1888, the Grafton Gallery, and others. There are also old-established societies of etchers, water-colourists, &c. A feature common to these exhibitions is that the public always pays for admission, though they differ from the commercial exhibitions, becoming more common every year, in which the work of a single school or painter is shown for profit. But the annual exhibitions at the Guildhall, under the auspices of the corporation, are free. The great periodical exhibition of French art is known as the Salon, and for some years it has had a rival in the Champ de Mars exhibition. These two societies are now respectively housed in the Grand Palais and Petit Palais, in the Champs Elysées, which were erected in connexion with the Paris Exhibition of 1900, but with the ultimate object of being devoted to the service of the two Salons. Berlin, Rome, Vienna and other Continental towns have regular exhibitions of original work.

The best history of art galleries is found in their official and other catalogues, see article MUSEUMS. See also L. Viardot, *Les Musées d'Italie*, &c. (3 vols., Paris, 1842, 1843, 1844); Annual Reports, official, of National Portrait Gallery, National Galleries of England, Ireland and Scotland; Civil Service Estimates, class iv. official. See also the series edited by Lafenestre and E. Richtenberger: *Le Louvre, La Belgique, Le Hollande, Florence, Belgique*; A. Lavice, *Revue des musées de France, . . . d'Allemagne, . . . d'Angleterre, . . . d'Espagne, . . . d'Italie, . . . de Belgique, de Hollande et de Russie* (Paris, 1862–1872); E. Michel, *Les Musées d'Allemagne* (Paris, 1886); Kate Thompson, *Public Picture Galleries of Europe* (1880); C. L. Eastlake, *Notes on Foreign Picture Galleries*; Lord Ronald Gower, *Pocket Guide to Art Galleries (public and private) of Belgium and Holland* (1875); and many works, albums, and so forth, issued mainly for the sake of the illustrations. (B.)

ARTHRITIS (from Gr. ἄρθρον, a joint), inflammation of the joints, in various forms of what are generally called gout and rheumatism (*qq.v.*).

ARTHROPODA, a name, denoting the possession by certain animals of jointed limbs, now applied to one of the three sub-phyla into which one of the great phyla (or primary branches) of coelomocoelous animals—the Appendiculata—is divided; the other two being respectively the Chaetopoda and the Rotifera. The word "Arthropoda" was first used in classification by Siebold and Stannius (*Lehrbuch der vergleich. Anatomie*, Berlin, 1845) as that of a primary division of animals, the others recognized in that treatise being Protozoa, Zoophyta, Vermes, Mollusca and Vertebrata. The names Condylopoda and Gnathopoda have been subsequently proposed for the same group. The word refers to the jointing of the chitinized exo-skeleton of the limbs or lateral appendages of the animals included, which are, roughly speaking, the Crustacea, Arachnida, Hexapoda (so-called "true insects"), Centipedes and Millipedes. This primary group was set up to indicate the residuum of Cuvier's Articulata when his class Annélides (the modern Chaetopoda) was removed from that *embranchement*. At the same time C. T. E. von Siebold and H. Stannius renovated the group Vermes of Linnaeus, and placed in it the Chaetopods and the parasitic worms of Cuvier, besides the Rotifers and Turbellarian worms.[1]

The result of the knowledge gained in the last quarter of the 19th century has been to discredit altogether the group Vermes (see WORM), thus set up and so largely accepted by German writers even at the present day. We have, in fact, returned very nearly to Cuvier's conception of a great division or branch, which he called Articulata, including the Arthropoda and the Chaetopoda (Annélides of Lamarck, a name adopted by Cuvier), and differing from it only by the inclusion of the Rotifera. The name Articulata, introduced by Cuvier, has not been retained by subsequent writers. The same, or nearly the same, assemblage of animals has been called Entomozoaria by de Blainville (1822), Arthrozoa by Burmeister (1843), Entomozoa or Annellata by H. Milne-Edwards (1855), and Annulosa by Alexander M'Leay (1819), who was followed by Huxley (1856). The character pointed to by all these terms is that of a ring-like segmentation of the body. This, however, is not the character to which we now ascribe the chief weight as evidence of the genetic affinity and monophyletic (uni-ancestral) origin of the Chaetopods, Rotifers and Arthropods. It is the existence in each ring of the body of a pair of hollow *lateral appendages* or *parapodia*, moved by intrinsic muscles and penetrated by blood-spaces, which is the leading fact indicating the affinities of these great sub-phyla, and uniting them as blood-relations. The

[1] The group Arthropoda itself, thus constituted, was precisely identical in its area with the Insecta of Linnaeus, the Entoma of Aristotle. But the word "Insect" had become limited since the days of Linnaeus to the Hexapod Pterygote forms, to the exclusion of his Aptera. Lamarck's penetrating genius is chiefly responsible for the shrinkage of the word Insecta, since it was he who, forty years after Linnaeus's death, set up and named the two great classes Crustacea and Arachnida (included by Linnaeus under Insecta as the order "Aptera"), assigning to them equal rank with the remaining Insecta of Linnaeus, for which he proposed the very appropriate class-name "Hexapoda." Lamarck, however, appears not to have insisted on this name Hexapoda, and so the class of Pterygote Hexapods came to retain the group-name Insecta, which is, historically or etymologically, no more appropriate to them than it is to the classes Crustacea and Arachnida. The tendency to retain the original name of an old and comprehensive group for one of the fragments into which such group becomes divided by the advance of knowledge—instead of keeping the name for its logical use as a comprehensive term, including the new divisions, each duly provided with a new name—is most curiously illustrated in the history of the word physiology. Cicero says, "Physiologia naturae ratio," and such was the meaning of the name *Physiologus*, given to a cyclopaedia of what was known and imagined about earth, sea, sky, birds, beasts and fishes, which for a thousand years was the authoritative source of information on these matters, and was translated into every European tongue. With the revival of learning, however, first one and then another special study became recognized—anatomy, botany, zoology, mineralogy, until at last the great comprehensive term physiology was bereft of all its once-included subject-matter, excepting the study of vital processes pursued by the more learned members of the medical profession. Professional tradition and an astute perception on their part of the omniscience suggested by the terms, have left the medical men in English-speaking lands in undisturbed but illogical possession of the words physiology, physic and physician.

parapodia (fig. 8) of the marine branchiate worms are the same things genetically as the "legs" of Crustacea and Insects (figs. 10 and 11). Hence the term Appendiculata was introduced by Lankester (preface to the English edition of Gegenbaur's *Comparative Anatomy*, 1878) to indicate the group. The relationships of the Arthropoda thus stated are shown in the subjoined table:—

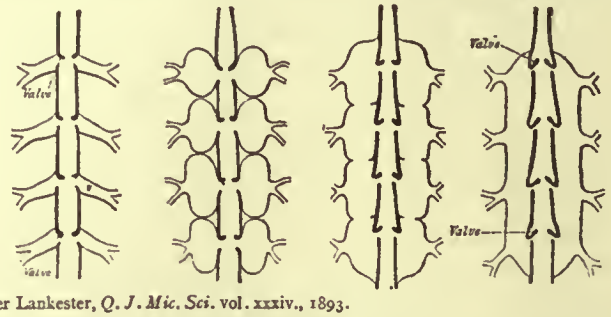
Phylum—Appendiculata . { Sub-phylum 1. Rotifera. " 2. Chaetopoda. " 3. Arthropoda.

The Rotifera are characterized by the retention of what appears in Molluscs and Chaetopods as an embryonic organ, the velum or ciliated prae-oral girdle, as a locomotor and food-seizing apparatus, and by the reduction of the muscular parapodia to a rudimentary or non-existent condition in all present surviving forms except *Pedalion*. In many important respects they are degenerate—reduced both in size and elaboration of structure.

The Chaetopoda are characterized by the possession of horny epidermic chaetae embedded in the integument and moved by muscles. Probably the chaetae preceded the development of parapodia, and by their concentration and that of the muscular bundles connected with them at the sides of each segment, led directly to the evolution of the parapodia. The parapodia of Chaetopoda are never coated with dense chitin, and are, therefore, never converted into jaws; the primitive "head-lobe" or prostomium persists, and frequently carries eyes and sensory tentacles. Further, in all members of the sub-phylum Chaetopoda the relative position of the prostomium, mouth and peristomium or first ring of the body, retains its primitive character. We do not find in Chaetopoda that parapodia, belonging to primitively post-oral rings or body-segments (called "somites," as proposed by H. Milne-Edwards), pass in front of the mouth by adaptational shifting of the oral aperture. (See, however, 8.)

The Arthropoda might be better called the "Gnathopoda," since their distinctive character is, that one or more pairs of appendages behind the mouth are densely chitinized and turned (fellow to fellow on opposite sides) towards one another so as to act as jaws. This is facilitated by an important general change in the position of the parapodia; their basal attachments are all more ventral in position than in the Chaetopoda, and tend to approach from the two sides towards the mid-ventral line. Very usually (but not in the Onychophora = *Peripatus*) all the parapodia are plated with chitin secreted by the epidermis, and divided into a series of joints—giving the "arthropodous" or hinged character.

There are other remarkable and distinctive features of structure which hold the Arthropoda together, and render it impossible to conceive of them as having a polyphyletic origin, that is to say, as having originated separately by two or three distinct lines of descent from lower animals; and, on the contrary, establish the view that they have been developed from a single line of primitive Gnathopods which arose by modification of parapodiate annulate worms not very unlike some of the existing Chaetopods. These additional features are the following—(1) All existing Arthropoda have an ostiate heart and have undergone "phlebocdesis," that is to say, the peripheral portions of the blood-vascular system are not fine tubes as they are in the Chaetopoda and as they were in the hypothetical ancestors of Arthropoda, but are swollen so as to obliterate to a large extent the coelom, whilst the separate veins entering the dorsal vessel or heart have coalesced, leaving valvate ostia (see fig. 1) by which the blood passes from a pericardial blood-sinus formed by the fused veins into the dorsal vessel or heart (see Lankester's *Zoology*, part ii., introductory chapter, 1900). The only exception to this is in the case of minute degenerate forms where the heart has disappeared altogether. The rigidity of the integument caused by the deposition of dense chitin upon it is intimately connected with the physiological activity and form of all the internal organs, and is undoubtedly correlated with the total disappearance of the circular muscular layer of the body-wall present in Chaetopods. (2) In all existing Arthropoda the region in front of the mouth is no longer formed by the primitive prostomium or head-lobe, but one or more segments, originally post-oral, with their appendages have passed in front of the mouth (prosthomeres). At the same time the prostomium and its appendages cease to be recognizable as distinct elements of the head. The brain no longer consists solely of the nerve-ganglion-mass proper to the prostomial lobe, as in Chaetopoda, but is a composite (syncerebrum) produced by the fusion of this and the nerve-ganglion-masses proper to the prosthomeres or segments which pass forwards, whilst their parapodia (=appendages) become converted into eye-stalks, and antennae, or more rarely grasping organs. (3) As in Chaetopoda, coelomic funnels (coelomoducts) *may* occur right and left



After Lankester, *Q. J. Mic. Sci.* vol. xxxiv., 1893.

Fig. 1.—Diagram to show the gradual formation of the Arthropod pericardial blood-sinus and "ostiate" heart by the swelling up (phlebocdesis) of the veins entering the dorsal vessel or heart of a Chaetopod-like ancestor. The figure on the left represents the condition in a Chaetopod, that on the right the condition in an Arthropod, the other two are hypothetical intermediate forms.

as pairs in each ring-like segment or somite of the body, and some of these are in all cases retained as gonoducts and often as renal excretory organs (green glands, coxal glands of Arachnida, *not* crural glands, which are epidermal in origin); but true nephridia, genetically identical with the nephridia of earthworms, do not occur (on the subject of coelom, coelomoducts and nephridia, see the introductory chapter of part ii. of Lankester's *Treatise on Zoology*).

Tabular Statement of the Grades, Classes and Sub-classes of the Arthropoda.—It will be convenient now to give in the clearest form a statement of the larger subdivisions of the Arthropoda which it seems necessary to recognize at the present day. The justification of the arrangement adopted will form the substance of the rest of the present article. The orders included in the various classes are not discussed here, but are treated of under the following titles:—Peripatus (Onychophora), Centipede and Millipede (Myriapoda), Hexapoda (Insecta), Arachnida and Crustacea.

Sub-Phylum ARTHROPODA (of the Phylum Appendiculata).

Grade A. **Hyparthropoda** (hypothetical forms connecting ancestors of Chaetopoda with those of Arthropoda).
Grade B. **Protarthropoda.**
  Class Onychophora.
    Ex.—*Peripatus.*
Grade C. **Euarthropoda.**
  Class 1. Diplopoda.
    Ex.—*Julus.*
  Class 2. Arachnida.
    Grade *a.* Anomomeristica.
      Ex.—*Phacops.*
    Grade *b.* Nomomeristica.
      (*a*) Pantopoda.
        Ex.—*Pycnogonum.*
      (*b*) Euarachnida.
        Ex.—*Limulus, Scorpio, Mygale, Acarus.*
  Class 3. Crustacea.
    Grade *a.* Entomostraca.
      Ex.—*Apus, Branchipus, Cyclops, Balanus.*
    Grade *b.* Malacostraca.
      Ex.—*Nebalia, Astacus, Oniscus, Gammarus.*
  Class 4. Chilopoda.
    Ex.—*Scolopendra.*
  Class 5. Hexapoda (syn. Insecta Pterygota).
    Ex.—*Locusta, Phryganea, Papilio, Apis, Musca, Cimex, Lucanus, Machilis.*
Incertae sedis—Tardigrada, Pentastomidae (degenerate forms).

The Segmentation of the Body of Arthropoda.—The body of the Arthropoda is more or less clearly divided into a series of rings,

segments, or somites which can be shown to be repetitions one of another, possessing identical parts and organs which may be larger or smaller, modified in shape or altogether suppressed in one somite as compared with another. A similar constitution of the body is more clearly seen in the Chaetopod worms. In the Vertebrata also a repetition of units of structure (myotomes, vertebrae, &c.)—which is essentially of the same nature as the repetition in Arthropods and Chaetopods, but in many respects subject to peculiar developments—is observed. The name "metamerism" has been given to this structural phenomenon because the "meres," or repeated units, follow one another in line. Each such "mere" is often called a "metamere." A satisfactory consideration of the structure of the Arthropods demands a knowledge of what may be called the laws of metamerism, and reference should be made to the article under that head.

The Theory of the Arthropod Head.—The Arthropod head is a tagma or group of somites which differ in number and in their relative position in regard to the mouth, in different classes. In a simple Chaetopod (fig. 2) the head consists of the first somite only; that somite is perforated by the mouth, and is provided with a prostomium or prae-oral lobe. The prostomium is essentially a part or outgrowth of the first somite, and cannot be regarded as itself a somite. It gives rise to a nerve-ganglion mass, the prostomial ganglion. In the marine Chaetopods (the Polychaeta) (fig. 3), we find the same essential structure, but the prostomium may give rise to two or more tactile tentacles, and to the vesicular eyes. The somites have well-marked parapodia, and the second and third, as well as the first, may give rise to tentacles which are directed forward, and thus contribute to form "the head." But the mouth remains as an inpushing of the wall of the first somite.

From Goodrich, *Q. J. Micr. Sci.* vol. xl. p. 247.

FIG. 2.—Diagram of the head and adjacent region of an Oligochaet Chaetopod.
Pr, The prostomium.
m, The mouth.
A, The prostomial ganglion-mass or archi-cerebrum.
I, II, III, coelom of the first, second and third somites.

The Arthropoda are all distinguished from the Chaetopoda by the fact that the head consists of one or more somites which lie *in front of the mouth* (now called prosthomeres), as well as of one or more somites behind it (opisthomeres). The first of the post-oral somites invariably has its parapodia modified so as to form a pair of hemignaths (mandibles). About 1870 the question arose for discussion whether the somites in front of the mouth are to be considered as derived from the prostomium of a Chaetopod-like ancestor. Milne-Edwards and Huxley had satisfied themselves with discussing and establishing, according to the data at their command, the number of somites in the Arthropod head, but had not considered the question of the *nature* of the prae-oral somites. Lankester (2) was the first to suggest that (as is actually the fact in the Nauplius larva of the Crustacea) the prae-oral somites or prosthomeres and their appendages were ancestrally post-oral, but have become prae-oral "by adaptational shifting of the oral aperture." This has proved to be a sound hypothesis and is now accepted as the basis upon which the Arthropod head must be interpreted (see Korschelt and Heider (3)). Further, the morphologists of the 'fifties appear, with few exceptions, to have accepted a preliminary scheme with regard to the Arthropod head and Arthropod segmentation generally, which was misleading and caused them to adopt forced conclusions and interpretations. It was conceived by Huxley, among others, that the same number of cephalic somites would be found to be characteristic of all the diverse classes of Arthropoda, and that the somites, not only of the head but of the various regions of the body, could be closely compared in their numerical sequence in classes so distinct as the Hexapods, Crustaceans and Arachnids.

FIG. 3.—Diagram of the head and adjacent region of a Polychaet Chaetopod. Letters as in fig. 1, with the addition of T, prostomial tentacle; *Pa*, parapodium. (From Goodrich.)

The view which it now appears necessary to take is, on the contrary, this—viz. that all the Arthropoda are to be traced to a common ancestor resembling a Chaetopod worm, but differing from it in having lost its chaetae and in having a prosthomere in front of the mouth (instead of prostomium only) and a pair of hemignaths (mandibles) on the parapodia of the buccal somite. From this ancestor Arthropods with heads of varying degrees of complexity have been developed characteristic of the different classes, whilst the parapodia and somites of the body have become variously modified and grouped in these different classes. The resemblances which the members of one class often present to the members of another class in regard to the form of the limb-branches (rami) of the parapodia, and the formation of tagmata (regions) are not hastily to be ascribed to common inheritance, but we must consider whether they are not due to homoplasy—that is, to the moulding of natural selection acting in the different classes upon fairly similar elements under like exigencies.

The structure of the head in Arthropods presents *three* profoundly separated grades of structure dependent upon the number of prosthomeres which have been assimilated by the prae-oral region. The classes presenting these distinct plans of head-structure cannot be closely associated in any scheme of classification professing to be natural. Peripatus, the type-genus of the class Onychophora, stands at the base of the series with only a single prosthomere (fig. 4). In Peripatus the prostomium of the Chaetopod-like ancestor is atrophied, but it is possible that two processes on the front of the head (FP) represent in the embryo the dwindled prostomial tentacles. The single prosthomere carries the retractile tentacles as its "parapodia." The second somite is the buccal somite (II, fig. 4); its parapodia have horny jaws on their ends, like the claws on the following legs (fig. 9), and act as hemignaths (mandibles). The study of sections of the embryo establishes these facts beyond doubt. It also shows us that the neuromeres, no less than the embryonic coelomic cavities, point to the existence of one, and only one, prosthomere in Peripatus, of which the "protocerebrum," P, is the neuromere, whilst the deuterocerebrum, D, is the neuromere of the second or buccal somite. A brief indication of these facts is given by saying that the Onychophora are "deuterognathous"—that is to say, that the buccal somite carrying the mandibular hemignaths is the second of the whole series.

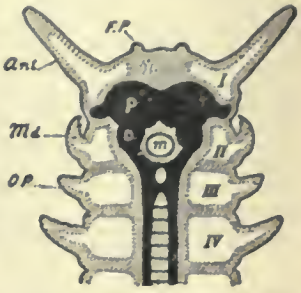


FIG 4.—Diagram of the head and adjacent region of *Peripatus*. Monoprosthomerous.
m, Mouth.
I, Coelom of the first somite which carries the antennae and is in front of the mouth.
II, Coelom of the second somite which carries the mandibles (hence deuterognathous).
III and IV, Coelom of the third and fourth somites.
FP, Rudimentary frontal processes perhaps representing the prostomial tentacles of Polychaeta.
Ant, Antenna or tactile tentacle.
Md, Mandible.
Op, Oral papilla.
P, Protocerebrum or foremost cerebral mass belonging to the first somite.
D, Deuterocerebrum, consisting of ganglion cells belonging to the second or mandibular somite.
(After Goodrich.)

What has become of the nerve-ganglion of the prostomial lobe of the Chaetopod in Peripatus is not clearly ascertained, nor is its fate indicated by the study of the embryonic head of other Arthropods so far. Probably it is fused with the protocerebrum, and may also be concerned in the history of the very peculiar paired eyes of Peripatus, which are like those of Chaetopods in structure—viz. vesicles with an intravesicular lens, whereas the eyes of all other Arthropods have essentially another structure, being "cups" of the epidermis, in which a knob-like or rod-like thickening of the cuticle is fitted as refractive medium.

In Diplopoda (*Julus*, &c.) the results of embryological study point to a composition of the front part of the head exactly similar to that which we find in Onychophora. They are deuterognathous.

The Arachnida present the first stage of progress. Here embryology shows that there are two prosthomeres (fig. 5), and that the gnathobases of the chelae which act as the first pair of hemignaths are carried by the third somite. The Arachnida are therefore tritognathous. The two prosthomeres are indicated by their coelomic cavities in the embryo (I and II, fig. 5), and by two neuromeres, the protocerebrum and the deuterocerebrum. The appendages of the first prosthomere are not present as tentacles, as in Peripatus and Diplopods, but are possibly represented by the eyes or possibly altogether aborted. The appendages of the second prosthomere are the well-known chelicerae of the Arachnids, rarely, if ever, antenniform, but modified as "retroverts" or clasp-knife fangs in spiders.

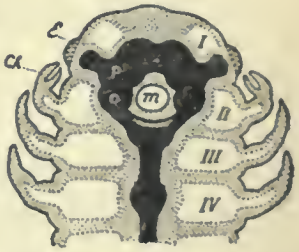


FIG. 5.—Diagram of the head and adjacent region of an Arachnid. Diprosthomerous in the adult condition, though embryologically the appendages of somite II and the somite itself are, as here drawn, not actually in front of the mouth.
E, Lateral eye.
Ch, Chelicera.
m, Mouth.
P, Protocerebrum.
D, Deuterocerebrum.
I, II, III, IV, Coelom of the first, second, third and fourth somites.
(After Goodrich.)

The Crustacea (fig. 6) and the Hexapoda (fig. 7) agree in having three somites in front of the mouth, and it is probable, though not ascertained, that the Chilopoda (Scolopendra, &c.) are in the same case. The three prosthomeres or prae-oral somites of Crustacea due to the sinking back of the mouth one somite farther than in Arachnida are not clearly indicated by coelomic cavities in the embryo, but their existence is clearly established by the development and position of the appendages and by the neuromeres.

The eyes in some Crustacea are mounted on articulated stalks, and from the fact that they can after injury be replaced by antenna-like appendages it is inferred that they represent the parapodia of the most anterior prosthomere. The second prosthomere carries the first pair of antennae and the third the second pair of antennae. Sometimes the pair of appendages has not a merely tactile jointed ramus, but is converted into a claw or clasper. Three neuromeres—a proto-, deutero-, and trito-cerebrum—corresponding to those three prosthomeres are sharply marked in the embryo. The fourth somite is that in which the mouth now opens, and which accordingly has its appendages converted into hemignathous mandibles. The Crustacea are tetartognathous.

The history of the development of the head has been carefully worked out in the Hexapod insects. As in Crustacea and Arachnida,

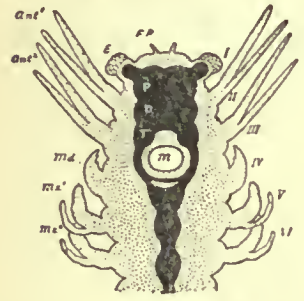


FIG. 6.—Diagram of the head of a Crustacean. Tri-prosthomerous.

FP, Frontal processes (observed in Cirrhiped nauplius-larvae) probably representing the prostomial tentacles of Chaetopods.
e, Eye.
*Ant*¹, First pair of antennae.
*Ant*², Second pair of antennae.
md, Mandible.
*mx*¹, *mx*², First and second pairs of maxillae.
m, Mouth.
I, II, and III, The three prosthomeres.
IV, V, VI, The three somites following the mouth.
P, Protocerebrum.
D, Deutocerebrum.
T, Tritocerebrum.
(After Goodrich.)

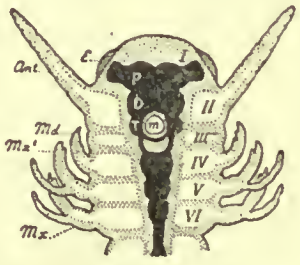


FIG. 7.—Diagram of the head of a Hexapod insect.

e, Eye.
ant, Antenna.
md, Mandible.
*mx*¹, First maxilla.
*mx*², Second maxilla.
m, Mouth.
I, Region of the first or eye-bearing prosthomere.
II, Coelom of the second antenna-bearing prosthomere.
III, Coelom of the third prosthomere devoid of appendages.
IV, V, and VI, Coelom of the fourth, fifth and sixth somites.
P, Protocerebrum belonging to the first prosthomere.
D, Deutocerebrum belonging to the second prosthomere.
T, Tritocerebrum belonging to the third prosthomere.
(After Goodrich.)

a first prosthomere is indicated by the paired eyes and the protocerebrum; the second prosthomere has a well-marked coelomic cavity, carries the antennae, and has the deuterocerebrum for its neuromere. The third prosthomere is represented by a well-marked pair of coelomic cavities and the tritocerebrum (III, fig. 7), but has no appendages. They appear to have aborted. The existence of this third prosthomere corresponding to the third prosthomere of the Crustacea is a strong argument for the derivation of the Hexapoda, and with them the Chilopoda, from some offshoot of the Crustacean stem or class. The buccal somite, with its mandibles, is in Hexapoda, as in Crustacea, the fourth: they are tetartognathous.

The adhesion of a greater or less number of somites to the buccal somite posteriorly (opisthomeres) is a matter of importance, but of minor importance, in the theory and history of the Arthropod head. In Peripatus no such adhesion or fusion occurs. In Diplopoda two opisthomeres—that is to say, one in addition to the buccal somite—are united by a fusion of their terga with the terga of the prosthomeres. Their appendages are respectively the mandibles and the gnathochilarium.

In Arachnida the highest forms exhibit a fusion of the tergites of five post-oral somites to form one continuous carapace united with the terga of the two prosthomeres. The five pairs of appendages of the post-oral somites of the head or prosoma thus constituted all primitively carry gnathobasic projections on their coxal joints, which act as hemignaths: in the more specialized forms the mandibular gnathobases cease to develop.

In Crustacea the fourth or mandibular somite never has less than the two following somites associated with it by the adaptation of their appendages as jaws, and the ankylosis of their terga with that of the prosthomeres. But in higher Crustacea the cephalic "tagma" is extended, and more somites are added to the fusion, and their appendages adapted as jaws of a kind.

The Hexapoda are not known to us in their earlier or more primitive manifestations; we only know them as possessed of a definite number of somites arranged in definite numbers in three great tagmata. The head shows two jaw-bearing somites besides the mandibular somite (V, VI, in fig. 7)—thus six in all (as in some Crustacea), including prosthomeres, all ankylosed by their terga to form a cephalic shield. There is, however, good embryological evidence in some Hexapods of the existence of a seventh somite, the supra-lingual, occurring between the somite of the mandibles and the somite of the first maxillae (4). This segment is indicated embryologically by its paired coelomic cavities. It is practically an excalated somite, having no existence in the adult. It is probably not a mere coincidence that the Hexapod, with its two rudimentary somites devoid of appendages, is thus found to possess twenty-one somites, including that which carries the anus, and that this is also the number present in the Malacostracous Crustacea.

The Segmental Lateral Appendages or Limbs of Arthropoda.—It has taken some time to obtain any general acceptance of the view that the parapodia of the Chaetopoda and the limbs of Arthropoda are genetically identical structures; yet if we compare the parapodium of Tomopteris or of Phyllodoce with one of the foliaceous limbs of Branchipus or Apus, the correspondences of the two are striking. An erroneous view of the fundamental morphology of the Crustacean limb, and consequently of that of other Arthropoda, came into favour owing to the acceptance of the highly modified limbs of Astacus as typical. Protopodite, endopodite, exopodite, and epipodite were considered to be the morphological units of the crustacean limb. Lankester (5) has shown (and his views have been accepted by Professors Korschelt and Heider in their treatise on *Embryology*) that the limb of the lowest Crustacea, such as Apus, consists of a corm or axis which may be jointed, and gives rise to outgrowths, either leaf-like or filiform, on its inner and outer margins (endites and exites). Such a corm (see figs. 10 and 11), with its outgrowths, may be compared to the simple parapodia of Chaetopoda with cirrhi and branchial lobe (fig. 8). It is by the specialization of two "endites" that the endopodite and exopodite of higher Crustacea are formed, whilst a flabelliform exite is the homogen or genetic equivalent of the epipodite (see Lankester, "Observations and Reflections on Apus Cancriformis," *Q. J. Micr. Sci.*). The reduction of the outgrowth-bearing "corm" of the parapodium of either a Chaetopod or an Arthropod to a simple cylindrical stump, devoid of outgrowths, is brought about when mechanical conditions favour such a shape. We see it in certain Chaetopods (*e.g.* Hesione) and in the Arthropod Peripatus (fig. 9). The conversion of the Arthropod's limb into a jaw, as a rule, is effected by the development of an endite near its base into a hard, chitinized, and often toothed gnathobase (see figs. 10 and 11, *en'*). It is not true that all the biting processes of the Arthropod limb are thus produced—for instance, the jaws of Peripatus are formed by the axis or corm itself, whilst the poison-jaws of Chilopods, as also their maxillae, appear to be formed rather by the apex or terminal region of the ramus of the limb; but the opposing jaws (=hemignaths) of Crustacea, Arachnida and Hexapoda are gnathobases, and not the axis or corm. The endopodite (corresponding to the fifth endite of the limb of Apus, see fig. 10) becomes in Crustacea the "walking leg" of the mid-region of the body; it becomes the palp or jointed process of anterior segments. A second ramus, the "exopodite," often is also retained in the form of a palp or feeler. In Apus, as the figure shows, there are four of these "antenna-like" palps or filaments on the first thoracic limb. A common modification of the chief ramus of the Arthropod parapodium is the chela or nipper formed by the elongation of the penultimate joint of the ramus, so that the last joint works on it—

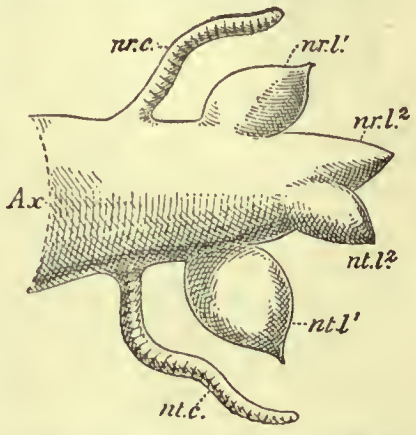


FIG. 8.—Diagram of the somite-appendage or parapodium of a Polychaet Chaetopod. The chaetae are omitted.

Ax, The axis.
nr.c, Neuropodial cirrhus.
*nr.l*¹, *nr.l*², Neuropodial lobes or endites.
nt.c. Notopodial cirrhus.
*nt.l*¹, *nt.l*², Notopodial lobes or exites.
The parapodium is represented with its neural or ventral surface uppermost. (Original).

as, for instance, in the lobster's claw. Such chelate rami or limb-branches are independently developed in Crustacea and in Arachnida, and are carried by somites of the body which do not correspond in position in the two groups. The range of modification of which the rami or limb-branches of the limbs of Arthropoda are capable is very large, and in allied orders or even families or genera we often find what is certainly the palp of the same appendage (as determined by numerical position of the segments) —in one case antenniform, in another chelate, in another pediform, and in another reduced to a mere stump or absent altogether. Very probably the power which the appendage of a given segment has of assuming the perfected form and proportions previously attained by the appendage of another segment must be classed as an instance of "homoeosis," not only where such a change is obviously due to abnormal development or injury, but also where it constitutes a difference permanently established between allied orders or smaller groups, or between the two sexes.

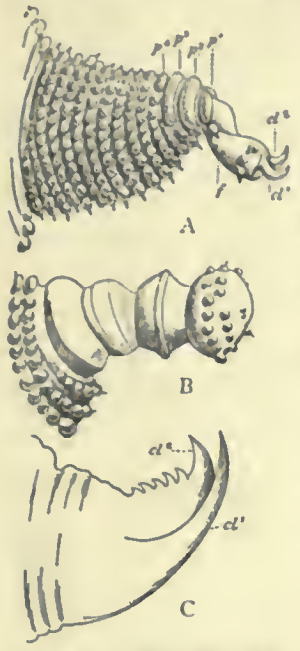


FIG. 9.—Three somite-appendages or parapodia of *Peripatus*.

A, A walking leg; p^1 to p^4, the characteristic "pads"; *f*, the foot; cl^1, cl^2, the two claws.

B, An oral papilla, one of the second pair of post-oral appendages.

C, One of the first post-oral pair of appendages or mandibles; cl^1, cl^2, the greatly enlarged claws. (Compare A.)

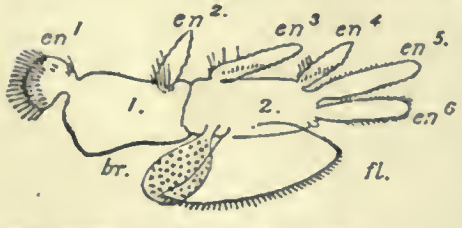
The appendages are represented with the neural or ventral surface uppermost. Original.

The most extreme disguise assumed by the Arthropod parapodium or appendage is that of becoming a mere stalk supporting an eye—a fact which did not obtain general credence until the experiments of Herbst in 1895, who found, on cutting off the eye-stalk of Palaemon, that a jointed antenna-like appendage was regenerated in its place. Since the eye-stalks of Podophthalmate Crustacea represent appendages, we are forced to the conclusion that the sessile eyes of other Crustacea, and of other Arthropoda generally, indicate the position of appendages which have atrophied.[1]

From what has been said, it is apparent that we cannot, in attempting to discover the affinities and divergences of the various forms of Arthropoda, attach a very high phylogenetic value to the coincidence or divergence in form of the appendages belonging to the somites compared with one another.

The principal forms assumed by the Arthropod parapodium and its rami may be thus enumerated:—

(1) Axial corm well developed, unsegmented or with two to four segments; lateral endites and exites (rami) numerous and of various lengths (certain limbs of lower Crustacea).



After Lankester, *Q. J. Mic. Sci.* vol. xxi., 1881.

FIG. 10.—The second thoracic (fifth post-oral) appendage of the left side of *Apus cancriformis*, placed with its ventral or neural surface uppermost to compare with figs. 8 and 9.

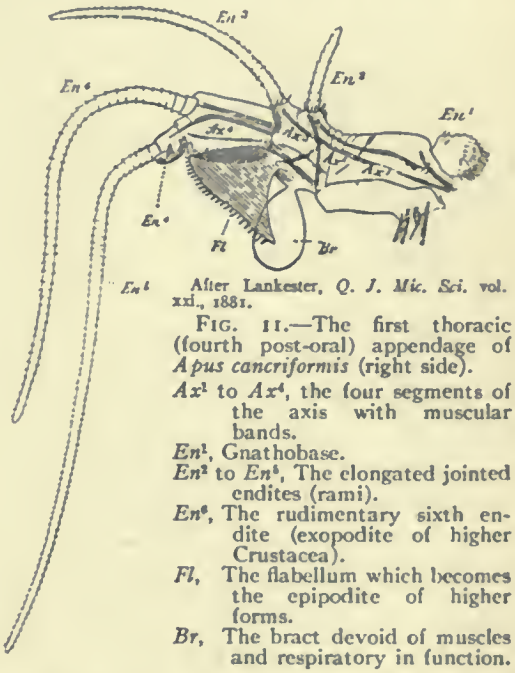
1, 2, The two segments of the axis.
en^1, The gnathobase.
en^2 to en^6, The five following "endites."
fl, The flabellum or anterior exite.
br, The bract or posterior exite.

(2) Corm, with short unsegmented rami, forming a flattened foliaceous appendage, adapted to swimming and respiration (trunk-limbs of Phyllopods).

(3) Corm alone developed; with no endites or exites, but provided with terminal chitinous claws (ordinary leg of Peripatus), with terminal jaw teeth (jaw of Peripatus), or with blunt extremity (oral papilla of same) (see fig. 9).

(4) Three of the rami of the primitive limb (endites 5 and 6, and exite 1) specially developed as endopodite, exopodite, and epipodite—the first two often as firm and strongly chitinized, segmented, leg-like structures; the original axis or corm reduced to a basal piece, with or without a distinct gnathobase (endite 1)—typical tri-ramose limb of higher Crustacea.

(5) One ramus (the endopodite) alone developed—the original axis or corm serving as its basal joint with or without gnathobase. This is the usual uni-ramose limb found in the various classes of Arthropoda. It varies as to the presence or absence of the jaw-process and as to the stoutness of the segments of the ramus, their number (frequently six, plus the basal corm), and the modification of the free end. This may be filiform or brush-like or lamellate when it is an antenna or palp; a simple spike (walking leg of Crustacea, of other aquatic forms, and of Chilopods and Diplopods); the terminal joint flattened (swimming leg of Crustacea and Gigantostraca); the terminal joint provided with two or with three recurved claws (walking leg of many terrestrial forms—*e.g.* Hexapoda and Arachnida); the penultimate joint with a process equal in length to the last joint, so as to form a nipping organ (chelae of Crustaceans and Arachnids); the last joint reflected and movable on the penultimate, as the blade of a clasp-knife on its handle (the retrovert, toothed so as to act as a biting jaw in the Hexapod *Mantis*, the Crustacean *Squilla* and others); with the last joint produced into a needle-like stabbing process in spiders.



After Lankester, *Q. J. Mic. Sci.* vol. xxi., 1881.

FIG. 11.—The first thoracic (fourth post-oral) appendage of *Apus cancriformis* (right side).

Ax^1 to Ax^4, the four segments of the axis with muscular bands.
En^1, Gnathobase.
En^2 to En^5, The elongated jointed endites (rami).
En^6, The rudimentary sixth endite (exopodite of higher Crustacea).
Fl, The flabellum which becomes the epipodite of higher forms.
Br, The bract devoid of muscles and respiratory in function.

(6) Two rami developed (usually, but perhaps not always, the equivalents of the endopodite and exopodite) supported on the somewhat elongated corm (basal segment). This is the typical "bi-ramose limb" often found in Crustacea. The rami may be flattened for swimming, when it is "a bi-ramose swimmeret," or both or only one may be filiform and finely annulate; this is the form often presented by the antennae of Crustacea, and rarely by prae-oral appendages in other Arthropods.

(7) The endopoditic ramus is greatly enlarged and flattened, without or with only one jointing, the corm (basal segment) is evanescent; often the plate-like endopodites of a pair of such appendages unite in the middle line with one another or by the intermediary of a sternal up-growth and form a single broad plate. These are the plate-like swimmerets and opercula of Gigantostraca and Limulus among Arachnids and of Isopod Crustaceans. They may have rudimentary exopodites, and may or may not have branchial filaments or lamellae developed on their posterior faces. The simplest form to which they may be reduced is seen in the genital operculum of the scorpion.

(8) The gnathobase becomes greatly enlarged and not separated by a joint from the corm; it acts as a hemignath or half jaw working against its fellow of the opposite side. The endopodite may be retained as a small segmented palp at the side of the gnathobase or disappear (mandible of Crustacea, Chilopoda and Hexapoda).

(9) The corm becomes the seat of a development of a special visual organ, the Arthropod eye (as opposed to the Chaetopod eye). Its jointing (segmentation) may be retained, but its rami disappear (Podophthalmous Crustacea). Usually it becomes atrophied, leaving the eye as a sessile organ upon the prae-oral region of the body

[1] H. Milne-Edwards, who was followed by Huxley, long ago formulated the conclusion that the eye-stalks of Crustacea are modified appendages, basing his argument on a specimen of Palinurus (figured in Bateson's book (1), in which the eye-stalk of one side is replaced by an antenniform palp. Hofer (6) in 1894 described a similar case in Astacus.

(the eye-stalk and sessile lateral eyes of Arthropoda generally, exclusive of Peripatus).

(10) The forms assumed by special modification of the elements of the parapodium in the maxillae, labium, &c., of Hexapods, Chilopods, Diplopods, and of various Crustacea, deserve special enumeration, but cannot be dealt with without ample space and illustration.

It may be pointed out that the most radical difference presented in this list is that between appendages consisting of the corm alone without rami (Onychophora) and those with more or less developed rami (the rest of the Arthropoda). In the latter class we should distinguish three phases: (*a*) those with numerous and comparatively undeveloped rami; (*b*) those with three, or two highly developed rami, or with only one—the corm being reduced to the dimensions of a mere basal segment; (*c*) those reduced to a secondary simplicity (degeneration) by overwhelming development of one segment (*e.g.* the isolated gnathobase often seen as "mandible" and the genital operculum).

There is no reason to suppose that any of the forms of limb observed in Arthropoda may not have been independently developed in two or more separate diverging lines of descent.

Branchiae.—In connexion with the discussion of the limbs of Arthropods, a few words should be devoted to the gill-processes. It seems probable that there are branchial plumes or filaments in some Arthropoda (some Crustacea) which can be identified with the distinct branchial organs of Chaetopoda, which lie dorsal of the parapodia and are not part of the parapodium. On the other hand, we cannot refuse to admit that any of the processes of an Arthropod parapodium may become modified as branchial organs, and that, as a rule, branchial out-growths are easily developed, *de novo*, in all the higher groups of animals. Therefore, it seems to be, with our present knowledge, a hopeless task to analyse the branchial organs of Arthropoda and to identify them genetically in groups.

A brief notice must suffice of the structure and history of the *Eyes*, the *Tracheae* and the so-called *Malpighian tubes* of Arthropoda, though special importance attaches to each in regard to the determination of the affinities of the various animals included in this great sub-phylum.

The Eyes.—The Arthropod eye appears to be an organ of special character developed in the common ancestor of the Euarthropoda, and distinct from the Chaetopod eye, which is found only in the Onychophora where the true Arthropod eye is absent. The essential difference between these two kinds of eye appears to be that the Chaetopod eye (in its higher developments) is a vesicle enclosing the lens, whereas the Arthropod eye is a pit or series of pits into which the heavy chitinous cuticle dips and enlarges knobwise as a lens. Two distinct forms of the Arthropod eye are observed—the monomeniscous (simple) and the polymeniscous (compound). The nerve-end-cells, which lie below the lens, are part of the general epidermis. They show in the monomeniscous eye (see article ARACHNIDA, fig. 26) a tendency to group themselves into "retinulae," consisting of five to twelve cells united by vertical deposits of chitin (rhabdoms). In the case of the polymeniscous eye (fig. 23, article ARACHNIDA) a single retinula or group of nerve-end-cells is grouped beneath each associated lens. A further complication occurs in each of these two classes of eye. The monomeniscous eye is rarely provided with a single layer of cells beneath its lens; when it is so, it is called monostichous (simple lateral eye of Scorpion, fig. 22, article ARACHNIDA). More usually, by an infolding of the layer of cells in development, we get three layers under the lens; the front layer is the corneagen layer, and is separated by a membrane from the other two which, more or less, fuse and contain the nerve-end-cells (retinal layer). These eyes are called diplostichous, and occur in Arachnida and Hexapoda (fig. 24, article ARACHNIDA).

On the other hand, the polymeniscous eye undergoes special elaboration on its lines. The retinulae become elongated as deep and very narrow pits (fig. 12 and explanation), and develop additional cells near the mouth of the narrow pit. Those nearest to the lens are the corneagen cells of this more elaborated eye, and those between the original retinula cells and the corneagen cells become firm and transparent. They are the crystalline cells or vitrella (see Watase, 7). Each such complex of cells underlying the lenticle of a compound eye is called an "ommatidium"; the entire mass of cells underlying a monomeniscous eye is an "ommataeum." The ommataeum, as already stated, tends to segregate into retinulae which correspond potentially each to an ommatidium of the compound eye. The ommatidium is from the first segregate and consists of few cells. The compound eye of the king-crab (Limulus) is the only recognized instance of ommatidia in their simplest state. Each can be readily compared with the single-layered lateral eye of the scorpion. In Crustacea and Hexapoda of all grades we find compound eyes with the more complicated ommatidia described above. We do not find them in any Arachnida.

It is difficult in the absence of more detailed knowledge as to the eyes of Chilopoda and Diplopoda to give full value to these facts in tracing the affinities of the various classes of Arthropods. But they seem to point to a community of origin of Hexapods and Crustacea in regard to the complicated ommatidia of the compound eye, and to a certain isolation of the Arachnida, which are, however, traceable, so far as the eyes are concerned, to a distant common origin with Crustacea and Hexapoda through the very simple compound eyes (monostichous, polymeniscous) of Limulus.

The Tracheae.—In regard to tracheae the very natural tendency of zoologists has been until lately to consider them as having once developed and once only, and therefore to hold that a group "Tracheata" should be recognized, including all tracheate Arthropods. We are driven by the conclusions arrived at as to the derivation of the Arachnida from branchiate ancestors, independently of the other tracheate Arthropods, to formulate the conclusion that tracheae have been independently developed in the Arachnidan class. We are also, by the isolation of Peripatus and the impossibility of tracing to it all other tracheate Arthropoda, or of regarding it as a degenerate offset from some one of the tracheate classes, forced to the conclusion that the tracheae of the Onychophora have been independently acquired. Having accepted these two conclusions, we formulate the generalization that tracheae can be independently acquired by various branches of Arthropod descent in adaptation to a terrestrial as opposed to an aquatic mode of life. A great point of interest therefore exists in the knowledge of the structure and embryology of tracheae in the different groups. It must be confessed that we have not such full knowledge on this head as could be wished for. Tracheae are essentially tubes like blood-vessels—apparently formed from the same tissue elements as blood-vessels—which contain air in place of blood, and usually communicate by definite orifices, the tracheal stigmata, with the atmosphere. They are lined internally by a cuticular deposit of chitin. In Peripatus and the Diplopods they consist of bunches of fine tubes which do not branch but diverge from one another; the chitinous lining is smooth. In the Hexapods and Chilopods, and the Arachnids (usually), they form tree-like branching structures, and their finest branches are finer than any blood-capillary, actually in some cases penetrating a single cell and supplying it with gaseous oxygen. In these forms the chitinous lining of the tubes is thickened by a close-set spiral ridge similar to the spiral thickening of the cellulose wall of the spiral vessels of plants. It is a noteworthy fact that other tubes in these same terrestrial Arthropoda—namely, the ducts of glands—are similarly strengthened by a chitinous cuticle, and that a spiral or annular thickening of the cuticle is developed in them also. Chitin is *not* exclusively an ectodermal product, but occurs also in cartilaginous skeletal plates of mesoblastic origin (connective tissue). The immediate cavities or pits into which the tracheal stigmata open appear to be in many cases ectodermic in sinkings, but there seems to be no reason (based on embryological observation) for regarding the tracheae as an ingrowth of the ectoderm. They appear, in fact, to be an air-holding modification of the vasifactive connective tissue. Tracheae are abundant just in proportion as blood-vessels become suppressed. They are reciprocally exclusive. It seems not improbable that they are two modifications of the same tissue-elements. In Peripatus the stigmatic pits at which the tracheae communicate with the atmosphere are scattered and not definite in their position. In other cases the stigmata are definitely paired and placed in a few segments or in several. It seems that we have to suppose that the vasifactive tissue of Arthropoda can readily take the form of air-holding instead of blood-holding tubes, and that this somewhat startling change in its character has taken place independently in several instances—viz. in the Onychophora, in more than one group of Arachnida, in Diplopoda, and again in the Hexapoda and Chilopoda.

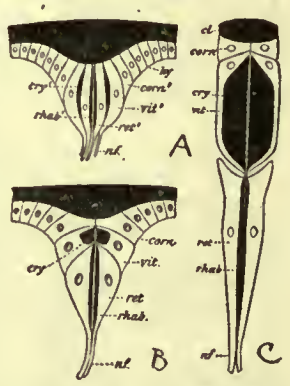


FIG. 12.—Diagram to show the derivation of the unit or "ommatidium" of the compound eye of Crustacea and Hexapoda, C, from a simple monomeniscous monostichous eye resembling the lateral eye of a scorpion, A, or the unit of the compound lateral eye of Limulus (see article ARACHNIDA, figs. 22 and 23). B represents an intermediate hypothetical form in which the cells beneath the lens are beginning to be superimposed as corneagen, vitrella and retinula, instead of standing side by side in horizontal series. The black represents the cuticular product of the epidermal cells of the ocular area, taking the form either of lens, *cl*, of crystalline body, *cry*, or of rhabdom, *rhab*; *hy*, hypodermis or epidermal cells; *corn*^{1}, laterally-placed cells in the simpler stage, A, which like the nerve-end cells, *vit*^{1} and *ret*^{1}, are corneagens or lens-producing; *corn*, specialized corneagen or lens-producing cells; *vit*^{1}, potential vitrella cells with *cry*^{1}, potential crystalline body now indistinguishable from retinula cells and rhabdomeres; *vit*, vitrella cell with *cry*, its contained cuticular product, the crystalline cone or body; *ret*^{1}, *rhab*^{1}, retinula cells and rhabdom of scorpion undifferentiated from adjacent cells, *vit*^{1}; *ret*, retinula cell; *rhab*, rhabdom; *nf*, optic nerve-fibres. (Modified from Watase.)

The Malpighian Tubes.—This name is applied to the numerous fine caecal tubes of noticeable length developed from the proctodaeal

invert of ectodermal origin in Hexapoda. These tubes are shown to excrete nitrogenous waste products similar to uric acid. Tubes of renal excretory function in a like position occur in most terrestrial Arthropoda—viz. in Chilopoda, Diplopoda and Arachnida. They are also found in some of the semi-terrestrial and purely aquatic Amphipod Crustaceans. But the conclusion that all such tubes are identical in essential character seems to be without foundation. The Malpighian tubes of Hexapods are outgrowths of the proctodaeum, but those of Scorpion and the Amphipod Crustacea are part of the metenteron or endodermal gut, though originating near its junction with the proctodaeum. Hence the presence or absence of such tubes cannot be used as an argument as to affinity without some discrimination. The Scorpion's so-called Malpighian tubes are *not* the same organs as those so named in the other Tracheata. Such renal caecal tubes seem to be readily evolved from either metenteron or proctodaeum when the conditions of the out-wash of nitrogenous waste-products are changed by the transference from aquatic to terrestrial life. The absence of such renal caeca in Limulus and their presence in the terrestrial Arachnida is precisely on a parallel with their absence in aquatic Crustacea and their presence in the feebly branchiate Amphipoda.

Group Characters.—We shall now pass the groups of the Arthropoda in review, attempting to characterize them in such a way as will indicate their probable affinities and genetic history.

Sub-Phylum ARTHROPODA.—The characters of the sub-phylum and those of the associated sub-phyla Chaetopoda and Rotifera have been given above, as well as the general characters of the phylum Appendiculata which comprises these great sub-phyla.

Grade A.—Hyparthropoda.

Hypothetical forms.

Grade B.—Protarthropoda.

(*a*) The integument is covered by a delicate soft cuticle (not firm or plated) which allows the body and its appendages great range of extension and contraction.

(*b*) The paired claws on the ends of the parapodia and the fang-like modifications of these on the first post-oral appendages (mandibles) are the only hard chitinous portions of the integument.

(*c*) The head is deuterognathous—that is to say, there is only one prosthomere, and accordingly the first and only pair of hemignaths is developed by adaptation of the appendages of the second somite.

(*d*) The appendages of the third somite (second post-oral) are clawless oral papillae.

(*e*) The rest of the somites carry equi-formal simple appendages, consisting of a corm or axis tipped with two chitinous claws and devoid of rami.

(*f*) The segmentation of the body is anomomeristic, there being no fixed number of somites characterizing all the forms included.

(*g*) The pair of eyes situated on the prosthomere are not of the Euarthropod type, but resemble those of Chaetopods (hence Nereid-ophthalmous).

(*h*) The muscles of the body-wall and gut do not consist of transversely-striped muscular fibre, but of the unstriped tissue observed also in Chaetopoda.

(*i*) A pair of coelomoducts is developed in every somite including the prosthomere, in which alone it atrophies in later development.

(*j*) The ventral nerve-cords are widely separated—in fact, lateral in position.

(*k*) There are no masses of nerve-cells forming a ganglion (neuro mere) in each somite. (In this respect the Protarthropoda are at a lower stage than most of the existing Chaetopoda.)

(*l*) The genital ducts are formed by the enlargement of the coelomoducts of the penultimate somite.

Class (Unica).—Onychophora.

With the characters of the grade: add the presence within the body of fine unbranched tracheal tubes, devoid of spiral thickening, opening to the exterior by numerous irregularly scattered tracheal pits.

Genera—Eoperipatus, Peripatopsis, Opisthopatus, &c. (See Peripatus.)

Grade C (of the Arthropoda).—Euarthropoda.

(*a*) Integument heavily plated with firm chitinous cuticle, allowing no expansion and retraction of regions of the body nor change of dimensions, except, in some cases, a dorso-ventral bellows movement. The separation of the heavier plates of chitin by grooves of delicate cuticle results in the hinging or jointing of the body and its appendages, and the consequent flexing and extending of the jointed pieces.

(*b*) Claws and fangs are developed on the branches or rami of the parapodia, not on the end of the axis or corm.

(*c*) The head is either deuterognathous, tritognathous, or tetartognathous.

(*d*) Rarely only one, and usually at least two, of the somites following the mandibular somite carry appendages modified as jaws (with exceptions of a secondary origin).

(*e*) The rest of the somites may all carry appendages, or only a limited number may carry appendages. In all cases the appendages primarily develop rami or branches which form the limbs, the primitive axis or corm being reduced and of insignificant size. In the most primitive stock all the post-oral appendages had gnathobasic outgrowths.

(*f*) The segmentation of the body is anomomeristic in the more archaic members of each class, nomomeristic in the higher members.

(*g*) The two eyes of Chaetopod structure have disappeared, and are replaced by the Euarthropod eyes.

(*h*) The muscles in all parts of the body consist of striped muscular fibre, never of unstriped muscular tissue.

(*i*) The coelomoducts are suppressed in most somites, and retained only as the single pair of genital ducts (very rarely more numerous) and in some also as the excretory glands (one or two pairs).

(*j*) The ventral nerve-cords approach one another in the mid-ventral line behind the mouth.

(*k*) The nerve-cells of the ventral nerve cords are segregated as paired ganglia in each somite, often united by meristic dislocation into composite ganglia.

(*l*) The genital ducts may be the coelomoducts of the penultimate or antepenultimate or adjacent somite, or of a somite placed near the middle of the series, or of a somite far forward in the series.

Class 1 (of the Euarthropoda).—Diplopoda.

The head has but one prosthomere (monoprosthomerous), and is accordingly deuterognathous. This carries short-jointed antennae (in one case bi-ramose) and eyes, the structure and development of which require further elucidation. Only one somite following the first post-oral or mandibular segment has its appendages modified as jaws.

The somites of the body, except in Pauropus, either fuse after early development and form double somites with two pairs of appendages (Julus, &c.), or present legless and leg-bearing somites alternating.

Somites, anomomeristic, from 12 to 150 in the post-cephalic series.

The genital ducts open in the fourth, or between the fourth and fifth post-oral somite.

Terrestrial forms with small-jointed legs formed by adaptation of a single ramus of the appendage. Tracheae are present.

Note.—The Diplopoda include the Juliformia, the Symphyla (Scolopendrella), and Pauropoda (Pauropus). They were until recently classified with the Chilopoda (Centipedes), with which they have no close affinity, but only a superficial resemblance. (Compare the definition of the class Chilopoda.)

The movement of the legs in Diplopoda is like that of those of Peripatus, of the Phyllopod Crustacea, and of the parapodia of Chaetopoda, symmetrical and identical on the two sides of the body. The legs of Chilopoda move in alternating groups on the two sides of the body. This implies a very much higher development of nerves and muscles in the latter. (See Millipede.)

Class 2 (of the Euarthropoda).—Arachnida.

Head tritognathous and diprosthomerous—that is to say, with two prosthomeres, the first bearing typical eyes, the second a pair of appendages reduced to a single ramus, which is in more primitive forms antenniform, in higher forms chelate or retrovert. The ancestral stock was pantognathobasic—*i.e.* had a gnathobase or jaw process on every parapodium. As many as six pairs of appendages following the mouth may have an enlarged gnathobase actually functional as a jaw or hemignath, but a ramus is well developed on each of these appendages either as a simple walking leg, a palp or a chela. In the more primitive forms the appendage of every post-oral somite has a gnathobase and two rami; in higher specialized forms the gnathobases may be atrophied in every appendage, even in the first post-oral.

The more primitive forms are anomomeristic; the higher forms nomomeristic, showing typically three groups or tagmata of six somites each.

The genital apertures are placed on the first somite of the second tagma or mesosoma. Their position is unknown in the more primitive forms. The more primitive forms have branchial respiratory processes developed on a ramus of each of the post-oral appendages. In higher specialized forms these branchial processes become first of all limited to five segments of the mesosoma, then sunk beneath the surface as pulmonary organs, and finally atrophied, their place being taken by a well-developed tracheal system.

A character of great diagnostic value in the more primitive Arachnida is the tendency of the chitinous investment of the tergal surface of the telson to unite during growth with that of the free somites in front of it, so as to form a pygidial shield or posterior carapace, often comprising as many as fifteen somites (Trilobites, Limulus).

A pair of central monomeniscous diplostichous eyes is often present on the head. Lateral eyes also are often present which are monostichous with aggregated lenses (*Limulus*) or with isolated lenses (Scorpio), or are diplostichous with simple lens (*Pedipalpi*, Araneae, &c.).

Class 3 (of the Euarthropoda).—Crustacea.

Head tetartognathous and triprosthomerous—that is to say, with three prosthomeres; the first bearing typical eyes, the second a pair of antenniform appendages (often bi-ramose), the third a pair of appendages usually antenniform, sometimes claw-like. The ancestral stock was (as in the Arachnida) pantognathobasic, that

is to say, had a gnathobase or jaw-process on the base of every post-oral appendage.

Besides the first post-oral or mandibular pair, at least two succeeding pairs of appendages are modified as jaws. These have small and insignificant rami, or none at all, a feature in which the Arachnida differ from them. The appendages of four or more additional following somites may be turned upwards towards the mouth and assist in the taking of food.

The more primitive forms (Entomostraca) are anomomeristic, presenting great variety as to number of somites, form of appendages, and tagmatic grouping; the higher forms (Malacostraca) are nomomeristic, showing in front of the telson twenty somites, of which the six hinder carry swimmerets and the five next in front ambulatory limbs. The genital apertures are neither far forward nor far backward in the series of somites, *e.g.* on the fourteenth post-oral in Apus, on the ninth post-oral in female Astacus and in Cyclops.

With rare exceptions, branchial plates are developed either by modification of a ramus of the limbs or as processes on a ramus, or upon the sides of the body. No tracheate Crustacea are known, but some terrestrial Isopoda develop pulmonary in-sinkings of the integument. A characteristic, comparable in value to that presented by the pygidial shield of Arachnida, is the frequent development of a pair of long appendages by the penultimate somite, which with the telson form a trifid, or, when that is small, a bifid termination to the body.

The lateral eyes of Crustacea are polymeniscous, with highly specialized retinulae like those of Hexapoda, and unlike the simpler compound lateral eyes of lower Arachnida. Monomeniscous eyes are rarely present, and when present, single, minute, and central in position.

Note.—The Crustacea exhibit a longer and more complete series of forms than any other class of Arthropoda, and may be regarded as preserving the most completely represented line of descent.

Class 4.—Chilopoda.

Head triprosthomerous [1] and tetartognathous. The two somites following the mandibular or first post-oral or buccal somite carry appendages modified as maxillae. The fourth post-oral somite has its appendages converted into very large and powerful hemignaths, which are provided with poison-glands. The remaining somites carry single-clawed walking legs, a single pair to each somite. The body is anomomeristic, showing in different genera from 17 (inclusive of the anal and genital) to 175 somites behind that which bears the poison jaws. No tagmata are developed. The genital ducts open on the penultimate somite.

Tracheae are developed which are dendriform and with spiral thickening of their lining. Their trunks open at paired stigmata placed laterally in each somite of the trunk or in alternate somites. Usually the tracheae open by paired stigmata placed upon the sides of a greater or less number of the somites, but never quite regularly on alternating somites. At most they are present on all the pedigerous somites excepting the first and the last. In *Scutigera* there are seven unpaired dorsal stigmata, each leading into a sac whence a number of air-holding tubes project into the pericardial blood-sinus.

Renal caecal tubes (Malpighian tubes) open into the proctodaeum. (See Centipede.)

Class 5.—Hexapoda.

Head shown by its early development to be triprosthomerous and consequently tetartognathous. The first prosthomere has its appendages represented by the compound eyes and a protocerebrum, the second has the antennae for its appendages and a deutocerebral neuromere, the third has suffered suppression of its appendages (which corresponded to the second pair of antennae of Crustacea), but has a tritocerebrum and coelomic chamber. The mandibular somite bears a pair of gnathobasic hemignaths without rami or palps, and is followed by two jaw-bearing somites (maxillary and labial). This enumeration would give six somites in all to the head —three prosthomeres and three opisthomeres. Recent investigations (Folsom, **4**) show the existence in the embryo of a prae-maxillary or supra-lingual somite which is suppressed during development. This gives seven somites to the Hexapod's head, the tergites of which are fused to form a cephalic carapace or box. The number is significant, since it agrees with that found in Edriophthalmous Crustacea, and assigns the labium of the Hexapod to the same somite numerically as that which carries the labium-like maxillipedes of those Crustacea.

The somites following the head are strictly nomomeristic and nomotagmic. The first three form the thorax, the appendages of which are the walking legs, tipped with paired claws or ungues (compare the homoplastic claws of Scorpio and Peripatus). Eleven somites follow these, forming the abdominal "tagma," giving thus twenty-one somites in all (as in the higher Crustacea). The somites of the abdomen all may carry rudimentary appendages in the embryo, and some of the hinder somites may retain their appendages in a modified form in adult life. Terminal telescoping of the abdominal somites and excalation may occur in the adult, reducing the obvious abdominal somites to as few as eight. The genital apertures are median and placed far back in the series of somites, viz. the female on the seventh abdominal (seventeenth of the whole series) and the male on the ninth or ante-penultimate abdominal (nineteenth of the whole series). The appendages of the eighth and tenth abdominal somites are modified as gonapophyses. The eleventh abdominal segment is the telson, usually small and soft; it carries the anus.

The Hexapoda are not only all confined to a very definite disposition of the somites, appendages and apertures, as thus indicated, but in other characters also they present the specialization of a narrowly-limited highly-developed *order* of such a *class* as the Crustacea rather than a range from lower more generalized to higher more specialized forms such as that group and also the Arachnida present. It seems to be a legitimate conclusion that the most primitive Hexapoda were provided with wings, and that the term Pterygota might be used as a synonym of Hexapoda. Many Hexapoda have lost either one pair or both pairs of wings; cases are common of wingless genera allied to ordinary Pterygote genera. Some Hexapods which are very primitive in other respects happen to be also Apterous, but this cannot be held to prove that the possession of wings is not a primitive character of Hexapods (compare the case of the Struthious Birds). The wings of Hexapoda are lateral expansions of the terga of the second and third thoracic somites. They appear to be serial equivalents (homogenous meromes) of the tracheal gills, which develop in a like position on the abdominal segments of some aquatic Hexapods.

The Hexapoda are all provided with a highly developed tracheal system, which presents considerable variation in regard to its stigmata or orifices of communication with the exterior. In some a serial arrangement of stigmata comparable to that observed in Chilopoda is found. In other cases (some larvae) stigmata are absent; in other cases again a single stigma is developed, as in the smaller Arachnida and Chilopoda, in the median dorsal line or other unexpected position. When the facile tendency of Arthropoda to develop tracheal air-tubes is admitted, it becomes probable that the tracheae of Hexapods do not all belong to one original system, but may be accounted for by new developments within the group. Whether the primitive tracheal system of Hexapoda was a closed one or open by serial stigmata in every somite remains at present doubtful, but the intimate relation of the system to the wings and tracheal gills cannot be overlooked.

The lateral eyes of Hexapoda, like those of Crustacea, belong to the most specialized type of "compound eye," found only in these two classes. Simple monomeniscous eyes are also present in many Hexapods.

Renal excretory caeca (Malpighian tubes) are developed from the proctodaeum (not from mesenteron as in scorpion and Amphipoda).

Concluding Remarks on the Relationships to one another of the Classes of the Arthropoda.—Our general conclusion from a survey of the Arthropoda amounts to this, that whilst Peripatus, the Diplopoda, and the Arachnida represent *terrestrial* offshoots from successive lower grades of primitive *aquatic* Arthropoda which are extinct, the Crustacea alone present a fairly full series of representatives leading upwards from unspecialized forms. The latter were not very far removed from the aquatic ancestors (Trilobites) of the Arachnida, but differed essentially from them by the higher specialization of the head. We can gather no indication of the forefathers of the Hexapoda or of the Chilopoda less specialized than they are, whilst possessing the essential characteristics of these classes. Neither embryology nor palaeontology assists us in this direction. On the other hand, the facts that the Hexapoda and the Chilopoda have triprosthomerous heads, that the Hexapoda have the same total number of somites as the nomomeristic Crustacea, and the same number of opisthomeres in the head as the more terrestrial Crustacea, together with the same adaptation of the form of important appendages in corresponding somites, and that the compound eyes of both Crustacea and Hexapoda are extremely specialized and elaborate in structure and identical in that structure, all lead to the suggestion that the Hexapoda, and with them, at no distant point, the Chilopoda, have branched off from the Crustacean main stem as specialized terrestrial lines of descent. And it seems probable that in the case of the Hexapoda, at any rate, the point of departure was subsequent to the attainment of the nomomeristic character presented by the higher grade of Crustacea. It is on the whole desirable to recognize such affinities in our schemes of classification.

We may tabulate the facts as to head-structure in Chaetopoda and Arthropoda as follows:—

Grade *x* (below the Arthropoda).—Agnatha, Aprosthomera.

Without parapodial jaws; without the addition of originally post-oral somites to the prae-oral region, which is a simple prostomial lobe of the first somite; the first somite is perforated by the mouth and its parapodia are not modified as jaws.

=Chaetopoda.

[1] Embryological evidence of this is still wanting. In the other classes of Arthropoda we have more or less complete embryological evidence on the subject. It appears from observation of the embryo that whilst the first prosthomere of Centipedes has its appendages reduced and represented only by eye-patches (as in Arachnida, Crustacea and Hexapoda), the second has a rudimentary antenna, which disappears, whilst the third carries the permanent antennae, which accordingly correspond to the second antennae of Crustacea, and are absent in Hexapoda.

Grade 1 (of the Arthropoda).—MONOGNATHA, MONOPROSTHOMERA.

With a single pair of parapodial jaws carried by the somite which is perforated by the mouth; this is not the first somite, but the second. The first somite has become a prosthomere, and carries a pair of extensile antennae.

=ONYCHOPHORA (*Peripatus*, &c.).

Grade 2 (of the Arthropoda).—DIGNATHA, MONOPROSTHOMERA.

The third somite as well as the second develops a pair of parapodial jaws; the first somite is a prosthomere carrying jointed antennae.

=DIPLOPODA.

Grade 3 (of the Arthropoda).—PANTOGNATHA, DIPROSTHOMERA.

A gnathobase is developed (in the primitive stock) on every pair of post-oral appendages; two prosthomeres present, the second somite as well as the first having passed in front of the mouth, but only the second has appendages.

=ARACHNIDA.

Grade 4 (of the Arthropoda).—PANTOGNATHA, TRIPROSTHOMERA.

The original stock, like that of the last grade, has a gnathobase on every post-oral appendage, but three prosthomeres are now present, in consequence of the movement of the oral aperture from the third to the fourth somite. The later eyes are polymeniscous, with specialized vitrellae and retinulae of a definite type peculiar to this grade.

=CRUSTACEA, CHILOPODA, HEXAPODA.

According to older views the increase of the number of somites in front of the mouth would have been regarded as a case of intercalation by new somite-budding of new prae-oral somites in the series. We are prohibited by a general consideration of metamerism in the Arthropoda from adopting the hypothesis of intercalation of somites. However strange it may seem, we have to suppose that one by one in the course of long historical evolution somites have passed forwards and the mouth has passed backwards. In fact, we have to suppose that the actual somite which in grades 1 and 2 bore the mandibles lost those mandibles, developed their rami as tactile organs, and came to occupy a position in front of the mouth, whilst its previous jaw-bearing function was taken up by the next somite in order, into which the oral aperture had passed. A similar history must have been slowly brought about when this second mandibulate somite in its turn became agnathous and passed in front of the mouth. The mandibular parapodia may be supposed during the successive stages of this history to have had, from the first, well-developed rami (one or two) of a palp-like form, so that the change required when the mouth passed away from them would merely consist in the suppression of the gnathobase. The solid palpless mandible such as we now see in some Arthropoda is, necessarily, a late specialization. Moreover, it appears probable that the first somite never had its parapodia modified as jaws, but became a prosthomere with tactile appendages before parapodial jaws were developed at all, or rather *pari passu* with their development on the second somite. It is worth while bearing in mind a second possibility as to the history of the prosthomeres, viz. that the buccal gnathobasic parapodia (the mandibles) were in each of the three grades of prosthomerism only developed after the recession of the mouth and the addition of one, of two, or of three post-oral somites to the prae-oral region had taken place. In fact, we may imagine that the characteristic adaptation of one or more pairs of post-oral parapodia to the purposes of the mouth as jaws did not occur until after ancestral forms with one, with two, and with three prosthomeres had come into existence. On the whole the facts seem to be against this supposition, though we need not suppose that the gnathobase was very large or the rami undeveloped in the buccal parapodia which were destined to lose their mandibular features and pass in front of the mouth.

REFERENCES.—1. Bateson, *Materials for the Study of Variation* (Macmillan, 1894), p. 85; 2. Lankester, "Primitive Cell-layers of the Embryo." *Annals and Mag. Nat. Hist.* (1873), p. 336; 3. Korschelt and Heider, *Entwickelungsgeschichte* (Jena, 1892), cap. xv. p. 389; 4. Folsom, "Development of the Mouth Parts of Anurida," *Bulletin Mus. Comp. Zool. Harvard College*, vol. xxxvi. No. 5 (1900), pp. 142-146; 5. Lankester, "Observations and Reflections on the Appendages and Nervous System of Apus Cancriformis," *Quart. Journ. Micr. Sci.* vol. xxi. (1881); 6. Hofer, "Ein Krebs mit einer Extremität statt eines Stielauges," *Verhandl. d. deutschen zool. Gesellsch.* (1894); 7. Watase, "On the Morphology of the Compound Eyes of Arthropods," *Studies from the Biol. Lab. of the Johns Hopkins University*, vol. iv. pp. 287-334; 8. Benham describes backward shifting of the oral aperture in certain Chaetopods, *Proc. Zoolog. Soc. London* (1900), No. lxiv. p. 976. *N. B.*—References to the early literature concerning the group Arthropoda will be found in Carus, *Geschichte der Zoologie*. The more important literature up to 1892 is given in the admirable treatise on Embryology by Professors Korschelt and Heider. Detailed references will be found under the articles on the separate groups of Arthropoda. (E. R. L.)

ARTHUR (Fr. *Artus*), the central hero of the cycle of romance known as the *Matière de Bretagne* (see ARTHURIAN LEGEND). Whether there was an historic Arthur has been much debated; undoubtedly for many centuries after the appearance of Geoffrey of Monmouth's *Historia Britonum* (circ. 1136), the statements therein recorded of a mighty monarch, who ruled over Britain in the 5th–6th centuries, and carried his conquests far afield, even to the gates of Rome, obtained general, though not universal, credence. Even in the 12th century there were some who detected, and derided, the fictitious character of Geoffrey's "History." As was naturally to be expected, the pendulum swung to the other extreme, and in a more critical age the existence of Arthur was roundly denied. The truth probably lies midway between the two. The words of Wace, the Norman poet who translated the *Historia* into verse, are here admirably to the point. Speaking of the tales told of Arthur, he says:—

"Ne tot mençunge, ne tot veir,
Ne tot fable, ne tot saveir,
Tant ont li contéor conté,
Et li fabléor tant fablé
Por lor contes embeleter
Que tout ont fait fable sembler."[1]

The opinion now generally accepted by scholars is that the evidence of Nennius, whose *Historia Britonum* preceded that of Geoffrey by some 400 years, is in the main to be relied on. He tells us that Arthur was *Dux bellorum*, and led the armies of the British kings against the Saxon invaders, whom he defeated in twelve great battles. *Tunc Arthur pugnabat cum regibus Britonum, sed ipse dux erat bellorum.*

The traditional site of these battles covers a very wide area, and it is supposed that Arthur held a post analogous to that of the general who, under the Roman occupation, was known as *Comes Britanniae*, and held a roving commission to defend the island wherever attacked, in contradistinction to the *Dux Britanniarum*, who had charge of the forces in the north, and the *Comes Litloris Saxonici*, whose task it was to defend the south-east line. The Welsh texts never call Arthur *gweledig* (prince), but *amheradaur* (Latin *imperator*) or emperor, a title which would be bestowed on the highest official in the island. The truth thus appears to be that, while there was never a *King* Arthur, there was a noted chieftain and general of that name. If we say that he carried on a successful war against the Saxons, was probably betrayed by his wife and a near kinsman, and fell in battle, we have stated all which can be claimed as an historical nucleus for his legend. It is now generally admitted that the representation of Arthur as world conqueror, *Welt-Kaiser*, is due to the influence of the Charlemagne cycle. In the 12th century the *Matière de France* was waning, the *Matière de Bretagne* waxing in popularity, and public opinion demanded that the central figure of the younger cycle (for whatever the date of the subject matter, as a literary cycle the Arthurian is the younger) should not be inferior in dignity and importance to that of the earlier. When we add to this the fact that the writers of the 12th century represented the personages and events of the 6th in the garb, and under the conditions, of their own time, we can understand the reason of the manifold difficulties which beset the study of the cycle.

But into the figure of Arthur as we know him, other elements have entered; he is not merely an historic personality, but at the same time a survival of pre-historic myth, a hero of romance, and a fairy king; and all these threads are woven together in one fascinating but bewildering web. It is only possible here to summarize the leading features which may be claimed as characteristic of each phase.

Mythic.—Certain elements of the story point to Arthur as a culture hero; as such his name has been identified with the *Mercurius Artaius* of the Gauls. In this rôle he slays monsters, the boar Twrch Trwyth, the giant of Mont St Michel and the Demon Cat of Losanne (André de Coutances tells us that Arthur was really vanquished and carried off by the Cat, but that one durst not tell that tale before Britons!). He never, it should be

[1] Nor all a lie, nor all true, nor all fable, nor all known, so much have the story-tellers told, and the fablers fabled, in order to embellish their tales, that they have made all seem fable.

noted, rides on purely chivalric ventures, such as aiding distressed damsels, seeking the Grail, &c. His expeditions are all more or less warlike. The story of his youth belongs, as Alfred Nutt (*Folk-lore*, vol. iv.) has shown, to the group of tales classified as the *Aryan Expulsion and Return* formula, found in all Aryan lands. Numerous parallels exist between the Arthurian and early Irish heroic cycles, notably the Fenian or Ossianic. This Fenian cycle is very closely connected with the Tuatha de Danaan, the Celtic deities of vegetation and increase; recent research has shown that two notable features of the Arthurian story, the Round Table and the Grail, can be most reasonably accounted for as survivals of this Nature worship, and were probably parts of the legend from the first.

Romantic.—The character of Arthur as a romantic hero is, in reality, very different from that which, mainly through the popularity of Tennyson's *Idylls*, English people are wont to suppose. In the earlier poems he is practically a lay figure, his court the point of departure and return for the knights whose adventures are related in detail, but he himself a passive spectator. In the prose romances he is a monarch, the splendour of whose court, whose riches and generosity, are the admiration of all; but morally he is no whit different from the knights who surround him; he takes advantage of his *bonnes fortunes* as do others. He has two sons, neither of them born in wedlock; one, Modred, is alike his son and his nephew. In certain romances, the *Perlesvaus* and *Diu Crône*, he is a veritable *roi fainéant*, overcome by sloth and luxury. Certain traits of his story appear to show the influence of Northern romance. Such is the story of his begetting, where Uther takes upon him the form of Gorlois to deceive Yguerne, even as Siegfried changed shapes with Gunther to the undoing of Brünnhilde. The sword in the perron (stone pillar or block), the withdrawal of which proves his right to the kingdom, is the sword of the Branstock. Morgain carries him off, mortally wounded, to Avalon, even as the Valkyr bears the Northern hero to Valhal. Morgain herself has many traits in common with the Valkyrie; she is one of nine sisters, she can fly through the air as a bird (Swan maiden); she possesses a marvellous ointment (as does Hilde, the typical Valkyr). The idea of a slumbering hero who shall awake at the hour of his country's greatest need is world-wide, but the most famous instances are Northern, *e.g.* Olger Danske and Barbarossa, and depend ultimately on an identification with the gods of the Northern Pantheon, notably Thor. W. Larminie cited an instance of a rhyme current in the Orkneys as a charm against nightmare, which confuses Arthur with Siegfried and his winning of the Valkyr.

Fairy.—We find that at Arthur's birth (according to Layamon, who here differs from Wace), three ladies appeared and prophesied his future greatness. This incident is also found in the first continuation to the *Perceval*, where the prediction is due to a lady met with beside a forest spring, clearly here a water fairy. In the late romance of *La Bataille de Loquifer* Avalon has become a purely fairy kingdom, where Arthur rules in conjunction with Morgain. In *Huon de Bordeaux* he is Oberon's heir and successor, while in the romance of *Brun de la Montagne*, preserved in a unique MS. of the Bibliothèque Nationale, we have the curious statement that all fairy-haunted places, wherever found, belong to Arthur:—

" Et touz ces lieux faés
Sont Artus de Bretagne."

This brief summary of the leading features of the Arthurian tradition will indicate with what confused and complex material we are here dealing. (See also ARTHURIAN LEGEND, GRAIL, MERLIN, ROUND TABLE; and CELT: *Celtic literature.*)

Texts. Historic:—Nennius, *Historia Britonum*; H. Zimmer, *Nennius Vindicatus* (Berlin, 1893), an examination into the credibility of Nennius; Geoffrey of Monmouth, *Historia Britonum* (translations of both histories are in Bohn's Library); Wace, the *Brut* (ed. by Leroux de Lincey); Layamon (ed. by Sir Fred. Madden).

Romantic:—*Merlin*—alike in the Ordinary, or Vulgate (ed. Sommer), the *Suite* or " Huth " *Merlin*, the 13th century *Merlin* (ed. by G. Paris and J. Ulrich), and the unpublished and unique version of *Bibl. nat. fonds français*, 337 (cf. Freymond's analysis in *Zeitschrift für franz. Sprache*, xxii.)—devotes considerable space to the elaboration of the material supplied by the chronicles, the beginning of Arthur's reign, his marriage and wars with the Saxons. The imitation of the Charlemagne romances is here evident; the Saxons bear names of Saracen origin, and camels and elephants appear on the scene. The *Morte Arthur*, or *Mort au roi Artus*, a metrical romance, of which a unique English version exists in the Thornton collection (ed. for Early English Text Society), gives an expanded account of the passing of Arthur; in the French prose form it is now always found incorporated with the *Lancelot*, of which it forms the concluding section. The remains of the Welsh tradition are to be found in the *Mabinogion* (cf. Nutt's edition, where the stories are correctly classified), and in the Triads. Professor Rhys' *Studies in the Arthurian Legend* are largely based on Welsh material, and may be consulted for details, though the conclusions drawn are not in harmony with recent research. These are the only texts in which Arthur is the central figure; in the great bulk of the romances his is but a subordinate rôle. (J. L. W.)

ARTHUR I. (1187–1203), duke of Brittany, was the posthumous son of Geoffrey, the fourth son of Henry II. of England, and Constance, heiress of Conan IV., duke of Brittany. The Bretons hoped that their young prince would uphold their independence, which was threatened by the English. Henry II. tried to seize Brittany, and in 1187 forced Constance to marry one of his favourites, Randulph de Blundevill, earl of Chester (d. 1232). Henry, however, died soon afterwards (1189). The new king of England, Richard Cœur de Lion, claimed the guardianship of the young Arthur, but in 1190 Richard left for the Crusade. Constance profited by his absence by governing the duchy, and in 1194 she had Arthur proclaimed duke of Brittany by an assembly of barons and bishops. Richard invaded Brittany in 1196, but was defeated in 1197 and became reconciled to Constance. On his death in 1189, the nobles of Anjou, Maine and Touraine refused to recognize John of England, and did homage to Arthur, who declared himself the vassal of Philip Augustus. In 1202 war was resumed between the king of England and the king of France. The king of France recognized Arthur's right to Brittany, Anjou, Maine and Poitou. While Philip Augustus was invading Normandy, Arthur tried to seize Poitou. But, surprised at Mirebeau, he fell into the hands of John, who sent him prisoner to Falaise. In the following year he was transferred to Rouen, and disappeared suddenly. It is thought that John killed him with his own hand. After this murder John was condemned by the court of peers of France, and stripped of the fiefs which he possessed in France.

See Ralph of Coggeshall, " Chronicon Anglicanum," in the *Monumenta Britanniae historica*; Dom Lobineau, *Histoire de Bretagne* (1702); Dom Morice, *Histoire de Bretagne* (1742–1756); A. de la Borderie, *Histoire de Bretagne*, vol. iii. (1899); Bémont, " De la condamnation de Jean-sans-Terre par la Cour des Pairs de France," in the *Revue historique* (1886), vol. xxxii.

ARTHUR III. (1393–1458), earl of Richmond, constable of France, and afterwards duke of Brittany, was the third son of John IV., duke of Brittany, and Joan of Navarre, afterwards the wife of Henry IV. of England. His brother, John V., gave him his earldom of Richmond in England. While still very young, he took part in the civil wars which desolated France during the reign of Charles VI. From 1410 to 1414 he served on the side of the Armagnacs, and afterwards entered the service of Louis the dauphin, whose intimate friend he became. He profited by his position at court to obtain the lieutenancy of the Bastille, the governorship of the duchy of Nemours, and the confiscated territories of Jean Larchevêque, seigneur of Parthenay. His efforts to reduce the latter were, however, interrupted by the necessity of marching against the English. At Agincourt he was wounded and captured, and remained a prisoner in England from 1415 to 1420. Released on parole, he gained the favour of King Henry V. by persuading his brother, the duke of Brittany, to conclude the treaty of Troyes, by which France was handed over to the English king. He was rewarded with the countship of Ivry.

In 1423 Arthur married Margaret of Burgundy, widow of the dauphin Louis, and became thus the brother-in-law of Philip the Good of Burgundy, and of the regent, the duke of Bedford. Offended, however, by Bedford's refusal to give him a high command, he severed his connexion with the English, and in March 1425 accepted the constable's sword from King Charles VII.

He now threw himself with ardour into the French cause, and persuaded his brother, John V. of Brittany, to conclude with Charles VII. the treaty of Saumur (October 7, 1425). But though he saw clearly enough the measures necessary for success, he lacked the means to carry them out. In the field he met with a whole series of reverses; and at court, where his rough and overbearing manners made him disliked, his influence was overshadowed by that of a series of incompetent favourites. The peace concluded between the duke of Brittany and the English in September 1427 led to his expulsion from the court, where Georges de la Trémoille, whom he himself had recommended to the king, remained supreme for six years, during which Richmond tried in vain to overthrow him. In the meantime, in June 1429, he joined Joan of Arc at Orleans, and fought in several battles under her banner, till the influence of La Trémoille forced his withdrawal from the army. On the 5th of March 1432 Charles VII. concluded with him and with Brittany the treaty of Rennes; but it was not until June of the following year that La Trémoille was overthrown. Arthur now resumed the war against the English, and at the same time took vigorous measures against the plundering bands of soldiers and peasants known as *routiers* or *écorcheurs*. On the 20th of September 1435, mainly as a result of his diplomacy, was signed the treaty of Arras between Charles VII. and the duke of Burgundy, to which France owed her salvation.

On the 13th of April 1436, Arthur took Paris from the English; but he was ill seconded by the king, and hampered by the necessity for leading frequent expeditions against the *écorcheurs*; it was not till May 1444 that the armistice of Tours gave him leisure to carry out the reorganization of the army which he had long projected. He now created the *compagnies d'ordonnance*, and endeavoured to organize the militia of the *francs archers*. This reform had its effect in the struggles that followed. In alliance with his nephew, the duke of Brittany, he reconquered, during September and October 1449, nearly all the Cotentin; on the 15th of April 1450 he gained over the English the battle of Formigny; and during the year he recovered for France the whole of Normandy, which for the next six or seven years it was his task to defend from English attacks. On the death of his nephew Peter II., on the 22nd of September 1457, he became duke of Brittany, and though retaining his office of constable of France, he refused, like his predecessors, to do homage to the French king for his duchy. He reigned little more than a year, dying on the 26th of December 1458, and was succeeded by his nephew Francis II., son of his brother Richard, count of Étampes.

Arthur was three times married: (1) to Margaret of Burgundy, duchess of Guienne (d. 1442); (2) to Jeanne d'Albret, daughter of Charles II. of Albret (d. 1444); (3) to Catherine of Luxemburg, daughter of Peter of Luxemburg, count of St Pol, who survived him. He left no legitimate children.

AUTHORITIES.—The main source for the life of Duke Arthur III. is the chronicle of Guillaume Gruel (*c.* 1410–1474–1482). Gruel entered the service of the earl of Richmond about 1425, shared in all his campaigns, and lived with him on intimate terms. The chronicle covers the whole period of the duke's life, but the earlier part, up to 1425, is much less full and important than the later, which is based on Gruel's personal knowledge and observation. In spite of a perhaps exaggerated admiration for his hero, Gruel displays in his work so much good faith, insight and originality that he is accepted as a thoroughly trustworthy authority. It was first published at Paris in 1622. Of the numerous later editions, the best is that of Achille le Vavasseur, *Chronique d'Arthur de Richemont* (Paris, 1890). See also E. Cosneau, *Le Connétable de Richemont* (Paris, 1886); G. du Fresne de Beaucourt, *Histoire de Charles VII.* (Paris, 1881, seq.).

ARTHUR, CHESTER ALAN (1830–1886), twenty-first president of the United States, was born in Fairfield, Vermont, on the 5th of October 1830. His father, William Arthur (1796–1875), when eighteen years of age, emigrated from Co. Antrim, Ireland, and, after teaching in various places in Vermont and Lower Canada, became a Baptist minister. William Arthur had married Malvina Stone, an American girl who lived at the time of the marriage in Canada, and the numerous changes of the family residence afforded a basis for allegations in 1880 that the son Chester was born not in Vermont, but in Canada, and was therefore ineligible for the presidency. Chester entered Union College as a sophomore, and graduated with honour in 1848. He then became a schoolmaster, at the same time studying law. In 1853 he entered a law office in New York city, and in the following year was admitted to the bar. His reputation as a lawyer began with his connexion with the famous "Lemmon slave case," in which, as one of the special counsel for the state, he secured a decision from the highest state courts that slaves brought into New York while in transit between two slave states were *ipso facto* free. In another noted case, in 1855, he obtained a decision that negroes were entitled to the same accommodations as whites on the street railways of New York city. In politics he was actively associated from the outset with the Republican party. When the Civil War began he held the position of engineer-in-chief on Governor Edwin D. Morgan's staff, and afterwards became successively acting quartermaster-general, inspector-general, and quartermaster-general of the state troops, in which capacities he showed much administrative efficiency. At the close of Governor Morgan's term, on the 31st of December 1862, General Arthur resumed the practice of his profession, remaining active, however, in party politics in New York city. In November 1871 he was appointed by President U. S. Grant collector of customs for the port of New York. The custom-house had long been conspicuous for the most flagrant abuses of the "spoils system"; and though General Arthur admitted that the evils existed and that they rendered efficient administration impossible, he made no extensive reforms. In 1877 President Rutherford B. Hayes began the reform of the civil service with the New York custom-house. A non-partisan commission, appointed by Secretary John Sherman, recommended sweeping changes. The president demanded the resignation of Arthur and his two principal subordinates, George H. Sharpe, the surveyor, and Alonzo B. Cornell, the naval officer, of the Port. General Arthur refused to resign on the ground that to retire "under fire" would be to acknowledge wrong-doing, and claimed that as the abuses were inherent in a widespread system he should not be made to bear the responsibility alone. His cause was espoused by Senator Roscoe Conkling, for a time successfully; but on the 11th of July 1878, during a recess of the Senate, the collector was removed, and in January 1879, after another severe struggle, this action received the approval of the Senate. In 1880 General Arthur was a delegate at large from New York to the Republican national convention. In common with the rest of the "Stalwarts," he worked hard for the nomination of Gen. U. S. Grant for a third term. Upon the triumph of James A. Garfield, the necessity of conciliating the defeated faction led to the hasty acceptance of Arthur for the second place on the ticket. His nomination was coldly received by the public; and when, after his election and accession, he actively engaged on behalf of Conkling in the great conflict with Garfield over the New York patronage, the impression was widespread that he was unworthy of his position. Upon the death of President Garfield, on the 19th of September 1881, Arthur took the oath as his successor. Contrary to the general expectation, his appointments were as a rule unexceptionable, and he earnestly promoted the Pendleton law for the reform of the civil service. His use of the veto in 1882 in the cases of a Chinese Immigration Bill (prohibiting immigration of Chinese for twenty years) and a River and Harbour Bill (appropriating over $18,000,000, to be expended on many insignificant as well as important streams) confirmed the favourable impression which had been made. The most important events of his administration were the passage of the Tariff Act of 1883 and of the "Edmunds Law" prohibiting polygamy in the territories, and the completion of three great trans-continental railways—the Southern Pacific, the Northern Pacific, and the Atchison, Topeka & Santa Fé. His administration was lacking in political situations of a dramatic character, but on all questions that arose his policy was sane and dignified. In 1884 he allowed his name to be presented for renomination in the Republican convention, but he was easily defeated by the friends of James G. Blaine.

At the expiration of his term he resumed his residence in New York city, where he died on the 18th of November 1886.

For an account of his administration see UNITED STATES: *History*.

ARTHURIAN LEGEND. By the "Arthurian legend," or *Matière de Bretagne*, we mean the subject-matter of that important body of medieval literature known as the Arthurian cycle (see ARTHUR). The period covered by the texts in their present form represents, roughly speaking, the century 1150–1250. The *History* of Nennius is, of course, considerably earlier, and that of Geoffrey of Monmouth somewhat antedates 1150 (1136), but with these exceptions the dates above given will be found to cover the composition of all our extant texts.

As to the origin of this *Matière de Bretagne*, and the circumstances under which it became a favourite theme for literary treatment, two diametrically opposite theories are held. One body of scholars, headed by Professor Wendelin Förster of Bonn, while admitting that, so far as any historic basis can be traced, the events recorded must have happened on insular ground, maintain that the knowledge of these events, and their romantic development, are due entirely to the Bretons of the continent. The British who fled before the Teutonic and Scandinavian invasions of the 6th and 8th centuries, had carried with them to Armorica, and fondly cherished, the remembrance of Arthur and his deeds, which in time had become interwoven with traditions of purely Breton origin. On the other side of the Channel, *i.e.* in Arthur's own land, these memories had died out, or at most survived only as the faint echo of historic tradition. Through the medium of French-speaking Bretons these tales came to the cognizance of Northern French poets, notably Chrétien de Troyes, who wove them into romances. According to Professor Förster there were no Arthurian romances previous to Chrétien, and equally, of course, no insular romantic tradition. This theory reposes mainly on the supposed absence of pre-Chrétien poems, and on the writings of Professor H. Zimmer, who derives the Arthurian names largely from Breton roots. This represents the prevailing standpoint of German scholars, and may be called the "continental" theory. In opposition to this the school of which the late Gaston Paris was the leading, and most brilliant, representative, maintains that the Arthurian tradition, romantic equally with historic, was preserved in Wales through the medium of the bards, was by them communicated to their Norman conquerors, worked up into poems by the Anglo-Normans, and by them transmitted to the continental poets. This, the "insular" theory, in spite of its inherent probability, has hitherto been at a disadvantage through lack of positive evidence, but in a recently acquired MS. of the British Museum, Add. 36614, we find the first continuator of the *Perceval*, Wauchier de Denain, quoting as authority for stories of Gawain a certain Bleheris, whom he states to have been "born and bred in Wales." The identity of this Bleheris with the Bledhericus mentioned by Giraldus Cambrensis as *Famosus ille fabulator*, living at a bygone and unspecified date, and with the Bréri quoted by Thomas as authority for the *Tristan* story, has been fully accepted by leading French scholars. Further, on the evidence of certain MSS. of the *Perceval*, notably the Paris MS. (Bibl. Nat. 1450), it is clear that Chrétien was using, and using freely, the work of a predecessor, large fragments of which have been preserved by the copyists who completed his unfinished work. The evidence of recent discoveries is all in favour of the insular, or French, view.

So far as the character, as distinguished from the *provenance*, of this subject-matter is concerned, it is largely of folk-lore origin, representing the working over of traditions, in some cases (as *e.g.* in the account of Arthur's birth and upbringing) common to all the Aryan peoples, in others specifically Celtic. Thus there are a number of parallels between the Arthurian and the Irish heroic cycles, the precise nature of which has yet to be determined. So far as Arthur himself is concerned these parallels are with the Fenian, or Ossianic, cycle, in the case of Gawain with the Ultonian.

In its literary form the cycle falls into three groups:—pseudo-historic: the *Histories* of Nennius and Geoffrey, the *Brut* of Wace and Layamon (see ARTHUR); poetic: the works of Chrétien de Troyes, Thomas, Raoul de Houdenc and others (see GAWAIN, PERCEVAL, TRISTAN, and the writers named above); prose: the largest and most important group (see GRAIL, LANCELOT, MERLIN, TRISTAN). Of these three branches the prose romances offer the most insuperable problems; none can be dated with any certainty; all are of enormous length; and all have undergone several redactions. Of not one do we as yet possess a critical and comparative text, and in the absence of such texts the publication of any definite and detailed theory as to the evolution and relative position of the separate branches of the Arthurian cycle is to be deprecated. The material is so vast in extent, and in so chaotic a condition, that the construction of any such theory is only calculated to invite refutation and discredit.

The best general study of the cycle is to be found in Gaston Paris's manual *La Littérature française au moyen âge* (new and revised edition, 1905). See also the introduction to vol. xxx. of *Histoire littéraire de la France*. For the theories as to origin, see the Introductions to Professor Förster's editions of the poems of Chrétien de Troyes, notably that to vol. iv., *Der Karrenritter*, which is a long and elaborate restating of his position. Also Professor H. Zimmer's articles in *Göttingische gelehrte Anzeigen*, 12 and 20. For the Insular view, Ferd. Lot's "Études sur la provenance du cycle arthurien," *Romania*, vols. xxiv.–xxviii., are very valuable. For a popular treatment of the subject, cf. Nos. i. and iv. of *Popular Studies in Romance and Folk-lore* (Nutt). Robert Huntington Fletcher's "The Arthurian Matter in the Chronicles" (vol. x. of *Harvard Studies and Notes in Philology and Literature*), is a most useful summary. (J. L. W.)

ARTICHOKE. The common artichoke, *Cynara*, *scolymus*, is a plant belonging to the natural order Compositae, having some resemblance to a large thistle. It has long been esteemed as a culinary vegetable; the parts chiefly employed being the immature receptacle or floret disk, with the lower part of the surrounding leaf-scales, which are known as "artichoke bottoms." In Italy the receptacles, dried, are largely used in soups; those of the cultivated plant as *Carciofo domestico*, and of the wild variety as *Carciofo spinoso*.

The Jerusalem artichoke, *Helianthus tuberosus*, is a distinct plant belonging to the same order, cultivated for its tubers. It closely resembles the sunflower, and its popular name is a corruption of the Italian *Girasole Articiocco*, the sunflower artichoke. It is a native of Canada and the north-eastern United States, and was cultivated by the aborigines. The tubers are rich in the carbohydrate inulin and in sugar.

The name is derived from the northern Italian *articiocco*, or *arciciocco*, modern *carciofo*; these words come, through the Spanish, from the Arabic *al-kharshūf*. False etymology has corrupted the word in many languages: it has been derived in English from "choke," and "heart," or the Latin *hortus*, a garden; and in French, the form *artichaut* has been connected with *chaud*, hot, and *chou*, a cabbage.

ARTICLE (from Lat. *articulus*, a joint), a term primarily for that which connects two parts together, and so transferred to the parts thus joined; thus the word is used of the separate clauses or heads in contracts, treaties or statutes and the like; of a literary composition on some specific subject in a periodical; or of particular commodities, as in "articles of trade and commerce." It appears also in the phrase "in the article of death" to translate *in articulo mortis*, at the moment of death. In grammar the term is used of the adjectives which state the extension of a substantive, *i.e.* the number of individuals to which a name applies; the indefinite article denoting one or any of a particular class, the definite denoting a particular member of a class.

ARTICLES OF ASSOCIATION, in English company law, the regulations for the internal management of a joint stock company registered under the Companies Acts. They are, in fact, the terms of the partnership agreed upon by the shareholders among themselves. They regulate such matters as the transfer and forfeiture of shares, calls upon shares, the appointment and qualification of directors, their powers and proceedings, general meetings of the shareholders, votes, dividends, the keeping and audit of accounts, and other such matters. In regard to these

internal regulations the legislature has left the company free to adopt whatever terms of association it chooses. It has furnished in the schedule to the Companies Act 1862 (Table A), a model or specimen set of regulations, but their adoption, wholly or in part, is optional; only if a company does not register articles of its own these statutory regulations are to apply. When, as is commonly the case, a company decides to have articles of its own framing, such articles must be expressed in separate paragraphs, numbered arithmetically, and signed by the subscribers of the memorandum of association. They must also be printed, stamped like a deed, and attested. When so perfected, they are to be delivered, with the memorandum of association, to the registrar of joint stock companies, who is to retain and register them. The articles of association thereupon become a public document, which any person may inspect on payment of a fee of one shilling. This has important consequences, because every person dealing with the company is presumed to be acquainted with its constitution, and to have read its articles. The articles, also, upon registration, bind the company and its members to the same extent as if each member had subscribed his name and affixed his seal to them. (See also MEMORANDUM OF ASSOCIATION; COMPANY; INCORPORATION.)

In the United States, articles of association are any instrument in writing which sets forth the purposes, the terms and conditions upon which a body of persons have united for the prosecution of a joint enterprise. When this instrument is duly executed and filed, the law gives it the force and effects of a charter of incorporation.

ARTICULATA, a zoological name now obsolete, applied by Cuvier to animals, such as insects and worms, in which the body displays a jointed structure. (See ARTHROPODA.)

ARTICULATION (from Lat. *articulare*, to divide into joints), the act of joining together; in anatomy the junction of the bones (see JOINTS); in botany the point of attachment and separation of the deciduous parts of a plant, such as a leaf. The word is also used for division into distinct parts, as of human speech by words or syllables.

ARTILLERY (the O. Fr. *artiller*, to equip with engines of war, probably comes from Late Lat. *articulum*, dim. of *ars*, art, cf. "engine" from *ingenium*, or of *artus*, joint), a term originally applied to all engines for discharging missiles, and in this sense used in English in the early 17th century. In a more restricted sense, artillery has come to mean all firearms not carried and used by hand, and also the *personnel* and organization by which the power of such weapons is wielded. It is, however, not usual to class *machine guns* (*q.v.*) as artillery. The present article deals with the development and contemporary state of the artillery arm in land warfare, in respect of its organization, *personnel* and special or "formal" employment. For the *matériel*—the guns, their carriages and their ammunition—see ORDNANCE and AMMUNITION. For *ballistics*, see that heading, and for the work of artillery in combination with the other arms, see TACTICS.

Artillery, as distinct from ordnance, is usually classified in accordance with the functions it has to perform. The simplest division is that into *mobile* and *immobile* artillery, the former being concerned with the handling of all weapons so mounted as to be capable of more or less easy movement from place to place, the latter with that of weapons which are installed in fixed positions. Mobile artillery is subdivided, again chiefly in respect of its employment, into *horse* and *field* batteries, *heavy field* or *position* artillery, *field howitzers*, *mountain artillery* and *siege trains*, adapted to every kind of terrain in which field troops may be employed, and work they may have to do. Immobile artillery is used in fixed positions of all kinds, and above all in permanent fortifications; it cannot, therefore, be classified as above, inasmuch as the *raison d'être*, and consequently the armament of one fort or battery may be totally distinct from that of another. "Fortress," "Garrison" and "Foot" artillery are the usual names for this branch. The dividing line, indeed, in the case of the heavier weapons, varies with circumstances; guns of position may remain on their ground while elaborate fortifications grow up around them, or the deficiencies of a field army in artillery may be made good from the *matériel*, more frequently still from the *personnel*, of the fortress artillery. Thus it may happen that mobile artillery becomes immobile and vice versa. But under normal circumstances the principle of classification indicated is maintained in all organized military forces.

HISTORICAL SKETCH

1. *Early Artillery.*—Mechanical appliances for throwing projectiles were produced early in the history of organized warfare, and "engines invented by cunning men to shoot arrows and great stones" are mentioned in the Old Testament. These were continually improved, and, under the various names of *catapulta*, *balista*, *onager*, *trébuchet*, &c., were employed throughout the ancient and medieval periods of warfare. The machines finally produced were very powerful, and, even when a propelling agent so strong as gunpowder was discovered and applied, the supersession of the older weapons was not effected suddenly nor without considerable opposition. The date of the first employment of cannon cannot be established with any certainty, but there is good evidence to show that the Germans used guns at the siege of Cividale in Italy (1331). The terms of a commission given (1414) by Henry V. to his *magister operationum, ingeniarum, et gunnarum ac aliarum ordinationum*, one Nicholas Merbury, show that the organization of artillery establishments was grafted upon that which was already in existence for the service of the old-fashioned machines. Previously to this it is recorded that of some 340 men forming the ordnance establishment of Edward III. in 1344 only 12 were artillerymen and gunners. Two years later, at Creçy, it is said, the English brought guns into the open field for the first time. At the siege of Harfleur (1415) the ordnance establishment included 25 "master gunners" and 50 "servitour gunners." The "gunner" appears to have been the captain of the gun, with general charge of the guns and stores, and the special duty of laying and firing the piece in action.

2. *The Beginnings of Field Artillery.*—It is clear, from such evidence as we possess, that the chief and almost the only use of guns at this time was to batter the walls of fortifications, and it is not until later in the 15th century that their employment in the field became general (see also CAVALRY). The introduction of field artillery may be attributed to John Žižka, and it was in his Hussite wars (1419–1424) that the *Wagenburg*, a term of more general application, but taken here as denoting a cart or vehicle armed with several small guns, came into prominence. This device allowed a relatively high manœuvring power to be attained, and it is found occasionally in European wars two centuries later, as for instance at Wimpfen in 1622 and Cropredy Bridge in 1644. In an act of attainder passed by the Lancastrian party against the Yorkists (1459), it is stated that the latter were "traiterously ranged in bataill . . . their cartes with gonnes set before their batailles" (Rot. Parl. 38 Henry VI., v. 348). In the London fighting of 1460, small guns were used to clear the streets, heavy ordnance to batter the walls of the Tower. The battle of Lose Coat Field (1469) was decided almost entirely by Edward IV.'s field guns, while at Blackheath (1497) "some cornets of horse, and bandes of foot, and good store of artillery wheeling about" were sent to "put themselves beyond" the rebel camp (Bacon, *Henry VII.*). The greatest example of artillery work in the 15th century was the siege of Constantinople in 1453, at which the Turks used a large force of artillery, and in particular some monster pieces, some of which survived to engage a British squadron in 1807, when a stone shot weighing some 700 lb cut the mainmast of Admiral (Sir) J. T. Duckworth's flagship in two, and another killed and wounded sixty men. For siege purposes the new weapon was indeed highly effective, and the castles of rebellious barons were easily knocked to pieces by the prince who owned, or succeeded in borrowing, a few pieces of ordnance (cf. Carlyle, *Frederick the Great*, book iii. chap. i.).

3. *The 16th Century.*—In the Italian wars waged by Charles

VIII., Louis XII. and Francis I. of France, artillery played a most conspicuous part, both in siege and field warfare. Indeed, cannon did excellent service in the field before hand firearms attained any considerable importance. At Ravenna (1512) and Marignan (1515) field artillery did great execution, and at the latter battle "the French artillery played a new and distinguished part, not only by protecting the centre of the army from the charges of the Swiss phalanxes, and causing them excessive loss, but also by rapidly taking up such positions from time to time . . . as enabled the guns to play upon the flanks of the attacking columns" (Chesney, *Observations on Firearms*, 1852). In this connexion it must, however, be observed that, when the arquebus and other small arms became really efficient (about 1525), less is heard of this small and handy field artillery, which had hitherto been the only means of breaking up the heavy masses of the hostile pikemen. We have seen that artillery was not ignored in England; but, in view of the splendid and unique efficiency of the archers, there was no great opportunity of developing the new arm. In the time of Henry VIII., the ordnance in use in the field consisted in the main of heavy *culverins* and other guns of position, and of lighter field pieces, termed *sakers*, *falcons*, &c. It is to be noticed that already the lightest pieces had disappeared, the smallest of the above being a 2-pounder. In the earlier days of field artillery, the artillery train was a miscellaneous congeries of pontoon, supply, baggage and tool wagons, heavy ordnance and light guns in carts. With the development of infantry fire the use of the last-named weapons died out, and it is largely due to this fact that "artillery" came to imply cumbrous and immobile guns of position. Little is, therefore, heard of smart manœuvring, such as that at Marignan, during the latter part of the 16th century. The guns now usually come into action in advance of the troops, but, from their want of mobility, could neither accompany a farther advance nor protect a retreat, and they were generally captured and recaptured with every changing phase of the fight. Great progress was in the meanwhile made in the adaptation of ordnance to the attack and defence of fortresses and, in particular, vertical fire came into vogue. A great Turkish gun, carrying a 600-lb stone shot, was used in the siege of Constantinople, apparently in this way, since Gibbon records that at the range of a mile the shot buried itself a fathom deep in earth, a fact which implies that a high angle of elevation was given. In the celebrated siege of Malta in 1565 artillery played a conspicuous part.

4. *The Thirty Years' War.*—Such, in its broadest outlines, is the history of artillery work during the first three centuries of its existence. Whilst the material had undergone a very considerable improvement, the organization remained almost unchanged, and the tactical employment of guns had become restricted, owing to their slowness and difficulty of movement on the march and immobility in action. In wars of the type of the War of Dutch Independence and the earlier part of the Thirty Years' War, this heavy artillery naturally remained useful enough, and the *Wagenburg* had given place to the musketry initiated by the Spaniards at Bicocca and Pavia, which since 1525 had steadily improved and developed. It is not, therefore, until the appearance of a captain whose secret of success was vigour and mobility that the first serious attempt was made to produce field artillery in the proper sense of the word, that is, a gun of good power, and at the same time so mounted as to be capable of rapid movement. The "carte with gonnes" had been, as is the modern machine gun, a mechanical concentration of musketry rather than a piece of artillery. Maurice of Nassau, indeed, helped to develop the field gun, and the French had invented the limber, but Gustavus Adolphus was the first to give artillery its true position on the battlefield. At the first battle of Breitenfeld (1631) Gustavus had twelve heavy and forty-two light guns engaged, as against Tilly's heavy 24-pounders, which were naturally far too cumbrous for field work. At the Lech (1632) Gustavus seems to have obtained a local superiority over his opponent owing to the handiness of his field artillery even more than by its fire-power. At Lützen (1632) he had sixty guns to Wallenstein's twenty-one. His field pieces were not the celebrated "leather" guns (which were indeed a mere makeshift used in Gustavus' Polish wars) but iron 4-pounders. These were distributed amongst the infantry units, and thus began the system of "battalion guns" which survived in the armies of Europe long after the conditions requiring it had vanished. The object of thus dispersing the guns was doubtless to ensure in the first place more certain co-operation between the two arms, and in the second to exercise a military supervision over the lighter and more useful field pieces which it was as yet impossible to exercise over the *personnel* of the heavy artillery.

5. *Personnel and Classification.*—More than 300 years after the first employment of ordnance, the men working the guns and the transport drivers were still civilians. The actual commander of the artillery was indeed, both in Germany and in England, usually a soldier, and Lennart Torstensson, the commander of Gustavus' artillery, became a brilliant and successful general. But the transport and the drivers were still hired, and even the gunners were chiefly concerned for the safety of their pieces, the latter being often the property, not of the king waging war, but of some "master gunner" whose services he had secured, and the latter's apprentices were usually in entire charge of the material. These civilian "artists," as they were termed, owed no more duty to the prince than any other employés, and even Gustavus, it would appear, made no great improvement in the matter of the reorganization of artillery trains. Soldiers as drivers do not appear until 150 years later, and in the meanwhile companies of "firelocks" and "fusiliers" (*q.v.*) came into existence, as much to prevent the gunners and drivers from running away as to protect them from the enemy. A further cause of difficulties, in England at any rate, was the age of the "gunners." In the reign of Elizabeth, some of the Tower gunners were over ninety years of age. Complaints as to the inefficiency of these men are frequent in the years preceding the English Civil War. Gustavus, however, has the merit of being the first to make the broad classification of artillery, as mobile or non-mobile, which has since been almost universally in force. In his time the 12-pounder was the heaviest gun classed as mobile, and the "feildpeece" *par excellence* was the 9-pounder or *demi-culverin*. After the death of Gustavus at Lützen (1632), his principles came universally into practice, and amongst them were those of the employment of field artillery.

6. *The English Civil War.*—Even in the English Civil War (Great Rebellion), in which artillery was hampered by the previous neglect of a century, its field work was not often contemptible, and on occasion the arm did excellent service. But in the campaigns of this war, fought out by men whose most ardent desire was to decide the quarrel swiftly, the marching and manœuvring were unusually rapid. The consequence of this was that the guns were sometimes either late in arriving, as at Edgehill, or absent altogether, as at Preston. The *rôle* of guns was further reduced by the fact that there were few fortresses to be reduced, and country houses, however strong, rarely required to be battered by a siege train. The New Model army usually sent for siege guns only when they were needed for particular service. On such occasions, indeed, the heavy ordnance did its work so quickly and effectually that the assault often took place one or two days after the guns had opened fire. Cromwell in his sieges made great use of shells, 12-inch and even larger mortars being employed. The castle of Devizes, which had successfully resisted the Parliamentary battering guns, succumbed at once to vertical fire. It does not, however, appear certain that there was any separation of field from siege ordnance, although the Swedish system was followed in almost all military matters.

7. *Artillery Progress, 1660–1740.*—Cromwell's practice of relegating heavy guns to the rear, except when a serious siege operation was in view, and in very rapid movements leaving even the field pieces far behind, was followed to some extent in the campaigns of the age of Louis XIV. The number of ammunition wagons, and above all of horses, required for each gun was four or five times as great as that required even for a modern quick-firer. In the days of Turenne heavy guns were much employed,

as the campaigns of the French were directed as a rule to the methodical conquest of territory and fortified towns. Similarly, Marlborough, working amidst the fortresses of the Netherlands in 1706, had over 100 pieces of artillery (of which 60 were mortars) to a force of some 11,000 men, or about 9 pieces per 1000 men. On the other hand, in his celebrated march to the Danube in 1704, he had but few guns, and the allied armies at Blenheim brought into the field only 1 piece per 1000 men. At Oudenarde "from the *rapidity of the march* . . . the battle was fought with little aid from artillery on either side" (Coxe, *Marlborough*). There was less need now than ever before for rapid manœuvres of mobile artillery, since the pike finally disappeared from the scene about 1700, and infantry fire-power had become the decisive factor in battles. In the meantime, artillery was gradually ceasing to be the province of the skilled workman, and assuming its position as an arm of the military service. In the 17th century, when armies were as a rule raised only "for the war," and disbanded at the conclusion of hostilities, there had been no very pressing need for the maintenance in peace of an expensive *personnel* and material. Gunners therefore remained, as civilians, outside the regular administration of the forces, until the general adoption of the "standing army" principle in the last years of the century (see ARMY). From this time steps were taken, in all countries, to organize the artillery as a military force. After various attempts had been made, the "Royal Regiment of Artillery" came into existence in England in 1716. It is, however, stated that the English artillery did not "begin to assume a military appearance until the Flanders campaigns" of the War of the Austrian Succession. Even in the War of American Independence a dispute arose as to whether a general officer, whose regimental service had been in the Royal Artillery, was entitled to command troops of all arms, and the artillery drivers were not actually soldiers until 1793 at the earliest. French artillery officers received military rank only in 1732.

8. *Artillery in the Wars of Frederick the Great.*—By the time of Frederick the Great's first wars, artillery had thus been divided into (*a*) those guns moving with an army in the field, and (*b*) those which were either wholly stationary or were called upon only when a siege was expected. The *personnel* was gradually becoming more efficient and more amenable to discipline; the transport arrangements, however, remained in a backward state. Siege and fortress artillery was now organized and employed in accordance with the system of the "formal attack" as finally developed by Vauban. For details of this, as involving the tactical procedure of artillery in the attack and defence of fortresses, the reader is referred to FORTIFICATION AND SIEGE-CRAFT. We are concerned here more especially with the progress of field artillery. The part played by this arm began now to vary according to the circumstances of each action, and the "moral" support of guns was calculated as a factor in the dispositions. In the early Silesian wars, heavy or reserve guns protected the deployment of the army and endeavoured to prepare for the subsequent advance by firing upon the hostile troops; the battalion guns remained close to the infantry, accompanied its movements and assisted in the fire fight. Their support was not without value, and the heavy guns often provoked the enemy into a premature advance, as at Mollwitz. But the infantry or the cavalry forced the decision. It has been mentioned that with the final disappearance of the pike, about 1700, infantry fire-power ruled the battlefield. Throughout the 18th century, it will be found, when the infantry is equal to its work the guns have only a subordinate part in the fighting of pitched battles. At Kunersdorf (1759) the first dashing charge of the Prussian grenadiers captured 72 guns from the Russian army. Later the total of captured ordnance reached 180, yet the Russians, then almost wholly in flight, were not cut to pieces, for only a few light guns of the Prussian army could get to the front; their heavy pieces, though twelve horses were harnessed to each, never came into action. This example will serve to illustrate the difference between the artillery of 1760 and that of fifty years later. According to Tempelhof, who was present, Kunersdorf was the finest opportunity for field artillery that he had ever seen. Yet the field artillery of the 18th century was, if anything, more powerful than that of Napoleon's time; it was the want of mobility alone which prevented the Prussians from turning to good account an opportunity fully as favourable as that of the German artillery at Sedan. That Frederick made more use of his guns in the later campaigns of the Seven Years' War is accounted for by the fact that his infantry and cavalry were no longer capable of forcing a decision, and also by changes in the general character of the operations. These were fought in and about broken country and entrenched positions, and the mobility of the other arms sank to that of the artillery. Thus power came to the front again, and the heavier weapons regained their former supremacy. In a *bataille rangée* in the open field the proportion of guns to men had been, in 1741, 2 per 1000. At Leuthen (1757) heavy fortress guns were brought to the front for a special purpose. At Kunersdorf the proportion was 4 and 5 per 1000 men, with what degree of effectiveness we have seen. In the later campaigns the Austrian artillery, which was, throughout the Seven Years' War, the best in Europe, placed its numerous and powerful ordnance (an "amphitheatre of 400 guns," as Frederick said) in long lines of field works. The combination of guns and obstacles was almost invariably too formidable to offer the slightest chance of a successful assault. It was at this stage that Frederick, in 1759, introduced horse artillery to keep pace with the movements of cavalry, a proof, if proof were needed, of the inability of the field artillery to manœuvre. The field howitzer, the weapon *par excellence* for the attack of field works, has never perhaps been more extensively employed than it was by the Prussians at that time. At Burkersdorf (1762) Frederick placed 45 howitzers in one battery. In those days the mobile artillery was always formed in groups or "batteries" of from 10 to 20 pieces. England too was certainly abreast of other countries in the organization of the field artillery arm. About the middle of the 18th century the guns in use consisted of 24-pounders, 12-pounders, 6-pounders and 3-pounders. The guns were divided into "brigades" of four, five and six guns respectively, and began to be separated into "heavy" and "light" brigades. Each field gun was drawn by four horses, the two leaders being ridden by artillerymen, and had 100 rounds of shot and 30 rounds of grape. The British artillery distinguished itself in the latter part of the Seven Years' War. Foreign critics praised its lightness, its elegance and the good quality of its materials. At Marburg (1760) "the English artillery could not have been better served; it followed the enemy with such vivacity, and maintained its fire so well, that it was impossible for the latter to re-form," says Tempelhof, the Prussian artillery officer who records the lost opportunity of Kunersdorf. The merits and the faults of the artillery had been made clear, and nowhere was the lesson taken to heart more than in France, where General Gribeauval, a French officer who had served in the war with the Austrian artillery, initiated reforms which in the end led to the artillery triumphs of the Napoleonic era. While Frederick had endeavoured to employ, as profitably as possible, the existing heavy equipments, Gribeauval sought improvement in other directions.

9. *Gribeauval's Reforms.*—At the commencement of the 18th century, French artillery had made but little progress. The carriages and wagons were driven by wagoners on foot, and on the field of battle the guns were dragged about by ropes or remained stationary. Towards the middle of the century some improvements were made. Field guns and carriages were lightened, and the guns separated into brigades. Siege carriages were introduced. From 1765 onwards, however, Gribeauval strove to build up a complete system both of *personnel* and *matériel*, creating a distinct *matériel* for field, siege, garrison and coast artillery. Alive to the vital importance of mobility for field artillery, he dismissed to other branches all pieces of greater calibre than 12-pounders, and reduced the weight of those retained. His reforms were resisted, and for a time successfully; but in 1776 he became first inspector-general of artillery, and was able to put his ideas into force. The field artillery of the new system included 4-pounder regimental guns,

and for the reserve 8- and 12-pounders, with 6-inch howitzers. For siege and garrison service Gribeauval adopted the 16-pounder and 12-pounder guns, 8-inch howitzer and 10-inch mortar, 12-, 10- and 8-inch mortars being introduced in 1785.

The carriages were constructed on a uniform model and technically improved. The horses were harnessed in pairs, instead of in file as formerly, but the manner in which the teams were driven remained much the same. The *prolong* (a sort of tow-rope) was introduced, to unite the trail of the gun and the limber in slow retiring movements. Siege carriages differed from those of field artillery only in details. Gribeauval also introduced new carriages for garrison and coast service. The great step made was in a uniform construction being adopted for all *matériel*, and in making the parts interchangeable so far as possible. In 1765 the *personnel* of the French artillery was reorganized. The corps or reserve artillery was organized in divisions of eight guns. The battery or division was thus made a unit, with guns, munitions and gunners complete, the horses and drivers being added at a later date. Horse artillery was introduced into the French army in 1791. The last step was made in 1800, when the establishment of a driver corps of soldiers put an end to the old system of horsing by contract.

10. *British Artillery, 1793–1815.*—Meanwhile the numbers of the English artillery had increased to nearly 4000 men. For some five centuries the word "artillery" in England meant entirely garrison artillery; the field artillery only existed in time of war. When war broke out, a train of artillery was organized, consisting of a certain number of field (or siege) guns, manned by garrison gunners; and when peace was proclaimed, the train was disbanded, the *matériel* being returned into store, and the gunners reverting to some fort or stronghold. In 1793 the British artillery was anything but efficient. Guns were still dispersed among the infantry, mobility had declined again since the Seven Years' War, and the American war had been fought out by the other arms. The drivers were mere carters on foot with long whips, and the whole field equipment was scarcely able to break from a foot-pace. Prior to the Peninsular War, however, the exertions of an able officer, Major Spearman, had done much to bring about improvement. Horse artillery had been introduced in 1793, and the driver corps established in 1794. Battalion guns were abolished in 1802, and field "brigades of six guns" were formed, horse artillery batteries being styled "troops." Military drivers were introduced, and the horses teamed in pairs. The drivers were mounted on the near horses, the gunners either rode the off horses or were carried on the limbers and wagons. The equipment was lightened, and a new system of manœuvres introduced. A troop of horse artillery and a field brigade each had five guns and one howitzer. The "driver corps," raised in 1794, was divided into troops, the addition of one of which to a company of foot artillery converted it into a field brigade. The horse artillery possessed both drivers and horses, and required very limited assistance from the driver corps.

11. *French Revolutionary Wars.*—During the long wars of the French Revolution and Empire the artillery of the field army by degrees became field artillery as we know it to-day. The development of musketry in the 16th century had taken the work of preparing an assault out of the hands of the gunners. *Per contra*, the decadence of infantry fire-power in the latter part of the Seven Years' War had reinstated the artillery arm. A similar decadence of the infantry arm was destined to produce, in 1807, artillery predominance, but this time with an important difference, viz. *mobility*, and when mobility is thus achieved we have the first modern field artillery. The new tactics of the French in the Revolutionary wars, forced upon them by circumstances, involved an almost complete abandonment of the fire-tactics of Frederick's day, and the need for artillery was, from the first fight at Valmy onwards, so obvious that its moral support was demanded even in the outpost line of the new French armies. St Cyr (*Armies of the Rhine*, p. 112) quotes a case in which "right in the very farthest outpost line" the original 4-pounder guns were replaced by 8-, 16-, and in the end by 24-pounders. The cardinal principle of massing batteries was not, indeed, forgotten, notwithstanding the weakness of raw levies. But though, as we have seen, the *matériel* had already been greatly improved, and the artillery was less affected by the Revolution than other arms of the service, circumstances were against it, and we rarely find examples of artillery work in the Revolutionary wars which show any great improvement upon older methods. The field guns were however, at last organized in batteries each complete in itself, as mentioned above. The battalion gun disappeared; it was a relic of days in which it was thought advisable, both for other reasons and also because the short range of guns forbade any attempt at concentration of fire from several positions at one target, to have some force of artillery at any point that might be threatened. Though it was officially retained in the regulations of the French army, "officers and men combined to reject it" (Rouquerol, *Q. F. Field Artillery*, p. 121), and its last appearances, in 1809 and in 1813, were due merely to an endeavour on the part of Napoleon to give cohesion thereby to the battalions of raw soldiers which then constituted his army. But, with the development of mobility, it was probably found that sufficient guns could be taken to any threatened point, and no one had ever denied the principle of massed batteries, although, in practice, dispersion had been thought to be unavoidable.

12. *Napoleon's Artillery Tactics.*—During the war the French artillery steadily improved in manœuvring power. But many years elapsed before perfection was attained. Meanwhile, the infantry, handled without regard to losses in every fight, had in consequence deteriorated. The final production of the field artillery battle, usually dated as from the battle of Friedland (June 14, 1807), therefore saved the situation for the French. Henceforward Napoleon's battles depend for their success on an "artillery preparation," the like of which had never been seen. Napoleon's own maxim illustrates the typical tactics of 1807–1815. "When once the *mêlée* has begun," he says, "the man who is clever enough to bring up an unexpected force of artillery, without the enemy knowing it, is sure to carry the day." The guns no longer "prepared" the infantry advance by slowly disintegrating the hostile forces. Still less was it their business merely to cover a deployment. On the contrary, they now went in to the closest ranges and, by actually *annihilating* a portion of the enemy's line with case-shot fire, "covered" the assault so effectively that columns of cavalry and infantry reached the gap thus created without striking a blow. It is unnecessary to give examples. Every one of Napoleon's later battles illustrates the principle. The most famous case is that of the great battery of 100 guns at Wagram (*q.v.*) which preceded the final attack of the centre. When Napoleon at Leipzig saw the allied guns forming up in long lines to prepare the assault, he exclaimed, "At last they have learned something." This "case-shot preparation," of course, involved a high degree of efficiency in manœuvre, as the guns had to gallop forward far in front of the infantry. The want of this quality had retarded the development of field artillery for 300 years, during which it had only been important relatively to the occasional inferiority of other troops. After Napoleon's time the art of tactics became the art of *combining the three arms*.

13. *Artillery, 1815–1865.*—Henceforward, therefore, the history of artillery becomes the history of its technical effectiveness, particularly in relation to infantry fire, and of improvements or modifications in the method of putting well-recognized principles into action. Infantry fire, however, being more variable in its effectiveness than that of artillery, the period 1815–1870 saw many changes in the relations of the two arms. In the time of Napoleon, infantry fire never equalled that of the Seven Years' War, and after the period of the great wars the musket was less and less effectively used. Economy was, however, practised to excess in every army of Europe during the period 1815–1850, and even if there had been great battles at this time, the artillery, which was maintained on a minimum strength of guns, men and horses, would not have repeated the exploits of Sénarmont and Drouot in the Napoleonic wars. The principle was well understood, but under such conditions the practice was impossible. It was at this stage that the general

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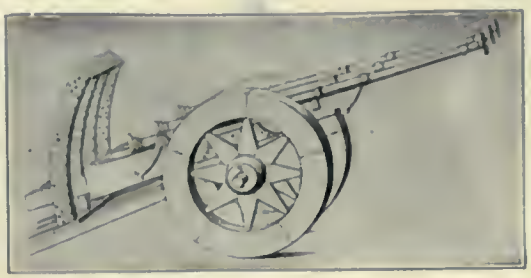
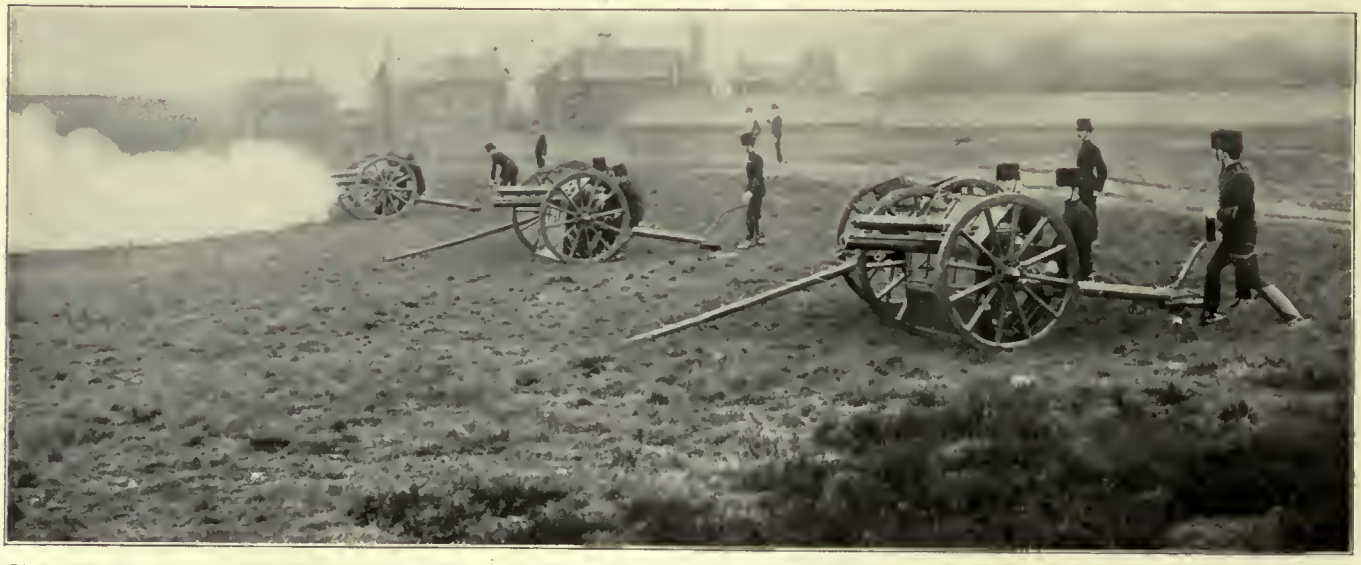


FIGS. 1 and 2.—15th Century Field Artillery (Napoleon III.). FIG. 3.—Field Artillery, 1525 (Napoleon III.). FIG. 4.—French Artillery, 1735 (*Journal d'Armée*, 1835). FIG. 5.—French Field Artillery, 1835 (*Journal d'Armée*, 1835). FIG. 6.—Artillery in Action, Roveredo, 1796 (C. Vernet).

ARTILLERY

Photo, Gale & Polden.

BREECH LOADING FIELD BATTERY (15-PR. B.L.).



Photo, Gale & Polden.

QUICK-FIRING HORSE ARTILLERY (ROYAL HORSE ARTILLERY, 13-PR. Q.F.).

Photo, Gale & Polden.

Q.F. FIELD ARTILLERY (18-PR. Q.F., R.F.A.).

Photo, Topical Press.

FRENCH (75-MM. Q.F.) FIELD ARTILLERY MANŒUVRING.

introduction of the rifled musket put an end, once for all, to the artillery tactics of the smooth-bore days. Infantry, armed with a far-ranging rifle, as in the American Civil War, kept the guns beyond case-shot range, compelling them to use only round shot or common shell. In that war, therefore, attacking infantry met, on reaching close quarters, not regiments already broken by a *feu d'enfer*, but the full force of the defenders' artillery and infantry, both arms fresh and unshaken, and the full volume of their case shot and musketry. At Fredericksburg the Federal infantry attacked, unsupported by a single field piece; at Gettysburg the Federal artillery general Hunt was able to reserve his ammunition to meet Lee's assault, although the infantry of his own side was meanwhile subjected to the fire of 137 Confederate guns. Thus, in both these cases the assault became one of infantry against unshaken infantry and artillery. On many occasions, indeed, the batteries on either side went into close ranges, as the traditions of the old United States army dictated, but their losses were then totally out of proportion to their effectiveness. Indeed, the increased range at which battles were now fought, and the ineffectiveness of the projectiles necessarily used by the artillery at these ranges, so far neutralized even rifled guns that artillery generals could speak of "idle cannonades" as the "besetting sin" of some commanders.

14. *The Franco-German War, 1870–71.*—In the next great war, that of 1866 (Bohemia), guns were present on both sides in great numbers, the average for both sides being three guns per 1000 men. Artillery, however, played but a small part in the Prussian attacks, this being due to the inadequate training then afforded, and also to the mixture of rifled guns and smooth-bores in their armament. In Prussia, however, the exertions of General v. Hindersin, the improvement of the *matériel*, and above all the better tactical training of the batteries, were rewarded four years later by success on the battlefield almost as decisive as Napoleon's. In 1870 the French artillery was invariably defeated by that of the Germans, who were then free to turn their attention to the hostile infantry. At first, indeed, the German infantry was too impatient to wait until the victorious artillery had prepared the way for them by disintegrating the opposing line of riflemen. Thus the attack of the Prussian Guards at St Privat (August 18, 1870) melted away before the unbroken fire-power of the French, as had that of the Federals at Fredericksburg and that of the Confederates at Gettysburg. But such experiences taught the German infantry commanders the necessity of patience, and at Sedan the French army was enveloped by the fire of nearly 600 guns, which did their work so thoroughly that the Germans annihilated the Imperial army at the cost of only 5 % of casualties.

15. *Results of the War.*—The tactical lessons of the war, so far as field artillery is concerned, may be briefly summarized as (*a*) employment of great masses of guns; (*b*) forward position of guns in the order of march, in order to bring them into action as quickly as possible; (*c*) the so-called "artillery duel," in which the assailant subdues the enemy's artillery fire; and (*d*) when this is achieved, and not before, the thorough preparation of all infantry attacks by artillery bombardment. This theory of field artillery action has not, even with the almost revolutionary improvements of the present period, entirely lost its value, and it may be studied in detail in the well-known work of von Schell, *Taktik der Feldartillerie* (1877), later translated into English by Major-General Sir A. E. Turner (*Tactics of Field Artillery*, 1900). In one important matter, however, the precepts of Schell and his contemporaries no longer hold good. "It is absolutely necessary that the object of the infantry's attack should be cannonaded before it advances. To accomplish this, sufficient time should be given to the artillery, and on no account should the infantry be ordered to advance until the fire of the guns has produced the desired effect." This, the direct outcome of the slaughter at St Privat, represents the best possibilities of breechloading guns with common shell—no more than a slow disintegration of the enemy's power of resistance by a thorough and lengthy "artillery preparation." Against troops sheltered behind works (as in the Russo-Turkish War of 1877–78) the common shell usually failed to give satisfactory results, if for no other reason, because the "preparation" consumed an inordinate time, and in any case the hostile artillery had first of all to be subdued in the artillery duel.

16. *Quick-firing Field Guns.*—In 1891, a work by General Wille of the German army (*The Field Gun of the Future*) and in 1892 another by Colonel Langlois of the French service (*Field Artillery with the other Arms*) foreshadowed many revolutionary changes in *matériel* and tactics which have now taken place. The new ideas spread rapidly, and the quick-firing gun came by degrees to be used in every army. The original designs have been greatly improved upon (see ORDNANCE: *Field artillery equipments*), but the principles of these designs have not undergone serious modification. These are, briefly, the mechanical absorption of the recoil, by means of brakes or buffers, and the development of "time shrapnel" as the projectile of field artillery. The absorption of recoil of itself permits of a higher rate of fire, since the gun does not require to be run up and relaid after every shot. Formerly such an advantage was illusory (since aim could not be taken through the thick bank of smoke produced by rapid fire), but the introduction of smokeless powder removed this objection. Artillerists, no longer handicapped, at once turned their attention to the increase of the rate of fire. At the same time a shield was applied to the gun, for the protection of the detachment. This advantage is solely the result of the non-recoiling carriage. The gunners had formerly to stand clear of the recoiling gun, and a shield was therefore of but slight value.

17. *Time Shrapnel.*—The power of modern artillery owes even more to the improvement of the projectile than to that of the gun (see AMMUNITION). The French, always in the forefront of artillery progress, were the first nation to realize the new significance of the time-fuze and the shrapnel shell. These had been in existence for many years; to the British army are due both the invention and the development of the shrapnel, which made its first appearance in European warfare at Vimeira in 1808. But, up to the introduction of rifled pieces, the Napoleonic case-shot attack was universally and justly considered the best method of fighting, and in the transition stage of the *matériel* many soldiers continued to put faith in the old method,—hence the Prussian artillery in 1866 had many smooth-bore batteries in the field,—and between 1860 and 1870 gunners, now convinced of the superiority of the new equipments, undoubtedly sought to turn to account the minute accuracy of the rifled weapons in unnecessarily fine shooting. Thus, in 1870 the French time-fuze was only graduated for two ranges, and the Germans used percussion fuzes only. But this phase has passed, and General Langlois has summarized the tactics of the newest field artillery in one phrase: "It results in transferring to 3000 yds. the point-blank and case-shot fire of the smooth-bore." The meaning of this will be discussed later; here it will be sufficient to say that it is claimed for the modern gun and the modern shell that the Napoleonic method[1] of annihilating by a rain of bullets has been revived, with the distinction that the shell, and not the gun, fires the bullets close up to the enemy. In the Boer War, Pieter's Hill furnished a notable example of this "covering," as distinct from "preparation," of an assault by artillery fire.

18. *Heavy Field, Siege and Garrison Artillery.*—Amongst other results of this war was a recrudescence of the idea of "dispersion." This will be noticed later; the more material result of the Boer War, and of the generally increasing specialization in the various functions of the artillery arm, has been the reintroduction of heavy ordnance into field armies. The field howitzer reappeared some time before the outbreak of that war, and the British howitzers had illustrated their shell-power in the Sudan campaign of 1898. During the latter part of the 19th century, siege and fortress artillery underwent a development hardly less remarkable than that of field artillery in the same time. Rifled guns, "long" and "short" for direct and curved fire, formed the siege artillery of the Germans in 1870–71, and

[1] Napoleon's maxim, quoted above, reappears in spirit in the British *F. A. Training* of 1906 (p. 225).

with the reduction of the old-fashioned fortresses of France began a new era in siegecraft (see FORTIFICATION AND SIEGECRAFT). At the present time howitzers[1] (B.L. rifled) are the principal siege weapons, while heavy direct-fire guns (see ORDNANCE *passim*) still retain a part of the work formerly assigned to the artillery of the attack. For an account of a siege with modern artillery see Macalik and Länger, *Kampf um eine Festung*, which describes an imaginary siege of Königgrätz. On the whole, it may be said that modern artillery has caused a revolution in methods of fortification and siegecraft, which is little less far-reaching than the original change from the trébuchet to the bombard.

ORGANIZATION

19. *Field Artillery Organization.*—A *battery* of field artillery comprises three elements, viz. *matériel*,—guns, carriages, ammunition and stores; *personnel*,—officers, non-commissioned officers, gunners, drivers and artificers; and *transport*,—almost invariably horses, though other animals, and also motor and mechanical transport, are used under special circumstances. As for the *matériel*, the guns used by field artillery in almost all countries are quick-firers, throwing shells of 13 to 18 pounds; details of these will be found in the article ORDNANCE. The number of guns in a battery varies in different countries between four and eight; by far the most usual number is six. With the introduction of the quick-firing gun, the tendency towards small batteries (of four guns) has become very pronounced, the ruling motives being (*a*) better control of fire in action, and (*b*) more horses available to draw the increased number of ammunition wagons required. "Mixed" batteries of guns and howitzers were formerly employed on occasion, and were supposed to be adapted to every kind of work. However, the difference between the gun and the howitzer was so great that at all times one part of the armament was idle, while the general increase in the artillery arm has permitted batteries and brigades of howitzers to be formed, separately, as required. Machine guns (*q.v.*) are not treated in Great Britain as being artillery weapons, though abroad they are often organized in batteries. During, and subsequent to the Boer War, heavier machine guns, called pompoms, came into use. The rocket (*q.v.*), formerly a common weapon of the artillery, is now used, if at all, only for mountain and forest warfare against savages.

20. *Ammunition.*—The vehicles of a battery include (besides guns and limbers) ammunition wagons, store and provision carts or wagons and forage wagons. On the amount of ammunition that should be carried with a field battery there was formerly a considerable diversity of opinion. The greater the amount a battery carries with it, the more independent it is; on the other hand, every additional wagon makes the battery more cumbrous and, by lengthening out the column, keeps back the combatant troops marching in rear. But since the introduction of the Q.F. gun it has been universally recognized that the gun must have a very liberal supply of ammunition present with it in action, and the old standard allowance of one wagon per gun has been increased to that of two and even three. Formerly batteries were further hampered by having to carry the reserve of small-arm ammunition for infantry and cavalry. But the greater distances of modern warfare accentuate the difficulties of such a system, and the reserve ammunition for all arms is now carried in special "ammunition columns" (see AMMUNITION), the *personnel* and transport of which is furnished by the artillery.

21. *Interior Economy.*—The organization and interior economy of a battery is much the same in all field artillery. In England the command is held by a major, the second in command is a captain. The battery is divided into three "sections" of two guns each, each under a subaltern officer, who is responsible for everything connected with his section—men, horses, guns, carriages, ammunition and stores. Each section again consists of two sub-sections, each comprising one gun and its wagons, men and horses, and at the head of each is the "No. 1" of the gun detachment—usually a sergeant—who is immediately responsible to the section commander for his sub-section.

The No. 1 rides with the gun, there is also another mounted non-commissioned officer who rides with the first wagon, and the gunners are seated on the gun-carriage, wagon and limbers. The increased number of wagons now accompanying the gun has, however, given more seating accommodation to the detachment, and this distribution has in some cases been altered. The three drivers ride the near horses of their respective pairs, each gun and each wagon being drawn by six horses. On the march, the gun is attached to the limber, a two-wheeled carriage drawn by the gun team; the wagon consists likewise of a "body" and a limber. A battery has also a number of non-combatant carriages, such as forge and baggage wagons. In addition to the gunners and drivers, there are men specially trained in range-taking, signalling, &c., in all batteries.

22. *Special Natures of Field Artillery.—Horse Artillery* differs from field in that the whole gun detachment is mounted, and the gun and wagon therefore are freed from the load of men and their equipment. The organization of a battery of horse artillery differs but slightly from that of a field battery; it is somewhat stronger in rank and file, as horse-holders have to be provided for the gunners in action. Horse artillery is often lightened, moreover, by sacrificing power (see ORDNANCE). The essential feature of *Mountain Artillery* in general is the carrying of the whole equipment on the backs of mules or other animals. The total weight is usually distributed in four or five mule-loads. For action the loads are lifted off the saddles and "assembled," and the time required to do this is, in well-trained batteries, only one minute. For the technical questions connected with the gun and its carriage, see ORDNANCE. The weight of a shell in a mountain gun rarely exceeds 12 lb., and is usually less. In most armies the *field howitzer* has, after an eclipse of many years, reasserted its place. The weapons used are B.L. or Q.F. howitzers on field carriages; the calibre varies from about 4 to 5 in. In Great Britain the field howitzer batteries are organized as, and form part of, the Royal Field Artillery, two batteries of six howitzers each forming a brigade.

23. *Heavy Ordnance.—Heavy Field Artillery*, officially defined as "all artillery equipped with mobile guns of 4-in. calibre and upwards," is usually composed, in Great Britain, of 5-in. or 4·7-in. Q.F. guns on field carriages. 6-in. Q.F. guns have also been used. A battery (4 guns) is attached to the divisional artillery of each division, a company of the Royal Garrison Artillery furnishing the *personnel*. The four guns are divided into two sections, each section under an officer and each sub-section under a non-commissioned officer, as in the horse and field batteries. *Siege* and *garrison artillery* have not usually the complete and permanent organization that distinguishes field artillery. For siege trains the *matériel* is usually kept in store, and the *personnel* and transport are supplied from other sources according to requirement. In garrison artillery, the guns mounted in fortresses and batteries, or stored in arsenals for the purpose, furnish the *matériel*, and the companies of garrison artillery the *personnel*. In Great Britain, the Royal Garrison Artillery finds the mountain batteries and the heavy field artillery in addition to its own units. The siege trains are, as has been said, organized *ad hoc* on each particular occasion (see FORTIFICATION AND SIEGECRAFT). In Great Britain, the guns and howitzers manned by the R.G.A. would be 6-in. and 8-in. howitzers, 4·7-in. and 6-in. guns, and still heavier howitzers, as well as the field and heavy batteries belonging to the divisions making the siege.

24. *Higher Organization of Artillery.*—The higher units, in almost every country except Great Britain, are the regiment, and, sometimes, the brigade of two or more regiments. These units are distributed to army corps, divisions and districts, in the same way as units of other arms (see ARMY). In Great Britain the Royal Regiment of Artillery still comprises the whole *personnel* of the arm, being divided into the Royal Horse, Royal Field and Royal Garrison Artillery; to each branch Special

[1] The old smooth-bore mortar for high-angle fire has of course disappeared, but the name "mortar" is still applied in some countries to short rifled howitzers.

Reserve and Territorial artillery are affiliated. Over and above the military command of these higher units, provision is usually made for technical control of the *matériel*, and a variety of training and experimental establishments, such as schools of gunnery, are maintained in all countries. The more special unit of organization in mobile artillery is the *brigade*, formerly called brigade-division (German, *Abteilung*; French *groupe*). The brigade is in Great Britain the administrative and tactical unit. Mountain artillery is not organized in brigades in the British empire. The unit consists, in the case of guns, of three batteries (18 guns, heavy artillery 12), in the case of field howitzers of two batteries (12 howitzers), and in the horse artillery of two batteries (12 guns), and is commanded by a lieutenant-colonel. To each brigade is allotted an ammunition column. The necessity for such a grouping of batteries will be apparent if the reader notes that 54 field guns, 12 howitzers and 4 heavy field guns form the artillery of a single British division of about 15,000 combatants.

25. *Grouping of the Artillery.*—The "corps artillery" (formerly the "reserve artillery") now consists only of the howitzer and heavy brigades, with a brigade of horse artillery. The latter is held at the disposal of the corps commander for the swift reinforcement of a threatened point; the howitzers and the heavy guns have, of course, functions widely different from those of the mass of guns. As the field artillery is required to come into action at the earliest possible moment, it has now been distributed amongst the infantry divisions, and marches almost at the head of the various combatant columns, instead of being relegated perhaps to the tail of the centre column. The redistribution of the British army (1907) on a divisional basis is a remarkable example of this; even the special natures of artillery (except horse artillery) are distributed amongst the divisions. In Germany two "regiments" (each of 2 *Abteilungen* = 6 batteries) form a brigade, under an artillery general in each division who thus disposes of 72 field guns, and the howitzers, with such horse artillery batteries as remain over after the cavalry has been supplied, still form a corps or reserve artillery. In 1903 the French, after long hesitation, assigned the whole of the field artillery to the various divisions, but later (for reasons stated in the article TACTICS) arranged to reconstitute the old-fashioned corps artillery in war. (See also ARMY, § 49).

TACTICAL WORK

26. *General Characteristics of Field Artillery Action.*—The duty of field artillery in action is to fire with the greatest effect on the target which is for the moment of the greatest tactical importance. This definition of field artillery tactics brings the student at once to questions of combined tactics, for which consult the article TACTICS. The purpose of the present article is to indicate the methods employed by the gunners to give effect to their fire at the targets mentioned. For this purpose the artillery has at its disposal two types of projectile, common (or rather, high explosive) shell and shrapnel, and two fuzes, "time" and "percussion" (see AMMUNITION). The actual process of coming into action may be described in a few words. The gun is, at or near its position in action, "unlimbered" and the gun limber and team sent back under cover. Ammunition for the gun is first taken from the wagon that accompanies it, as it is very desirable to keep the limbers full as long as possible, in case of emergencies such as that of a temporary separation from the wagon. Limber supply is, however, allowed in certain circumstances. The wagon is now placed as a rule by the side of the gun, an arrangement which immensely simplifies the supply of ammunition, this being done under cover of the armour on the wagon and of the gun-shield and also without fatigue to the men. The older method of placing the wagon at some distance behind the gun is still occasionally used, especially in the case of unshielded equipments. No horses are allowed, in any case, to be actually with the line of guns. According to the British *Field Artillery Training* of 1906, a battery in action would be thus distributed: first, the "fighting battery" consisting of the six guns, each with its wagon alongside, and the limbers of the two flank guns; then, under cover in rear, the "first line of wagons" comprising the teams of the fighting battery, the four remaining gun limbers, and six more wagons. The non-combatant vehicles form the "second line of wagons."

27. *Occupation of a Position.*—This depends primarily upon considerations of tactics, for the accurate co-operation of the guns is the first essential to success in the general task. In details, however, the choice of position varies to some extent with the nature of the equipment: for instance, an elevated position is better adapted than a low one for high velocity guns firing over the heads of their own infantry, and again, the "spade" with which nearly all equipments are furnished (see ORDNANCE) should have soil in which it can find a hold. Cover for the gun and its detachment cannot well be obtained from the configuration of the ground, because, if the gun can shoot over the covering mass of earth, the hostile shells can of course do likewise. Sufficient protection is given by the shield, and thus "cover" for field-guns simply means concealment. Cover for the "first line of wagons" is, however, a very serious consideration. As to concealment, it is stated that "the broad white flash from a gun firing smokeless powder is visible" to an enemy "unless the muzzle is at least 10 ft. below the covering crest" (Bethell, *Modern Guns and Gunnery*, 1907, p. 147). Concealment therefore, means only the skilful use of ground in such a way as to make the enemy's ranging difficult. This frequently involves the use of retired positions, on reverse slopes, in low ground, &c., and in all modern artillery the greatest stress is laid on practice in firing by indirect means. Controversy has, however, arisen as to whether inability to see the foreground is not a drawback so serious that direct fire from a crest position, in spite of its exposure, must be taken as the normal method. The latter is of course immensely facilitated by the introduction of the shield. A great advantage of retired positions is that, provided unity of direction is kept, an overwhelming artillery surprise (see *F. A. Training*, 1906, p. 225) is carried out more easily than from a visible position. The extent of *front* of a battery in action is governed by the rule that no two gun detachments should be exposed to being hit by the bullets of one shell, and also by the necessity of having as many guns as possible at work. These two conditions are met by the adoption of a 20-yards interval between the muzzles of the guns. At the present time the gun and its wagon are placed as close together as possible, to obtain the full advantage of the armoured equipment. The *shield*, behind which the detachments remain at all times covered from rifle (except at very short range) and shrapnel bullets,[1] enables the artillery commander to handle his batteries far more boldly than formerly was the case. General Langlois says "the shield-protected carriage is the corollary to the quick-firing gun." Armour on the wagon, enabling ammunition supply as well as the service of the gun, to be carried on under cover, soon followed the introduction of the shield. The disadvantage of extra weight and consequently increased difficulty of "man-handling" the equipment is held to be of far less importance than the advantages obtained by the use of armour.

28. *Laying.*—"Elevation" may be defined as the vertical inclination of the gun, "direction" as the horizontal inclination to the right or left, necessary to direct the path of the projectile to the object aimed at. "Laying" the gun, in the case of most modern equipments, is divided, by means of the device called the independent line of sight (see ORDNANCE), into two processes, performed simultaneously by different men, the adjustment of the sights and that of the gun. The first is the act of finding the "line of sight," or line joining the sights and the point aimed at; for this the equipment has to be "traversed" right or left so as to point in the proper direction, and also adjusted in the vertical plane. The simplest form of laying for direction, or "line," is called the "direct" method. If the point aimed at is the target, and it can be seen by the layer, he has merely to look over the "open" sights. But the point aimed at is rarely the target itself. In war, the target, even if visible, is often indistinct,

[1] Though not of course against the direct impact of shrapnel or H.E. shells.

and in this case, as also when the guns are under cover or engaging a target under cover, an "aiming point" or "auxiliary mark," a conspicuous point quite apart and distinct from the target, has to be employed ("indirect" method). In the Russo-Japanese War the sun was sometimes used as an aiming point. When the guns are behind cover and the foreground cannot be seen, an artificial aiming point is often made by placing a line of "aiming posts" in the ground. If an aiming point can be found which is in line with the target, as would be the case when aiming posts are laid out, the laying is simple, but it is as often as not out of the line. Finding the "line" in this case involves the calculation, from a distant observing point, of the angle at which the guns must be laid in order that, when the sights are directed upon the aiming point, the shell will strike the target. It is further necessary to find the "angle of sight" or inclination of the line of sight to the horizontal plane. If aim be taken over the open sights at the target, the line of sight naturally passes through the target, but in any other case it may be above or below it. Then the point where the projectile will meet the line of sight, which should coincide with the target, is beyond it if the line of sight is below or angle of sight is too small, and short of it if the line of sight is too high—that is, range and fuze will be wrong. The process of indirect laying for elevation therefore is, first, the measurement of the angle of sight, and secondly, the setting of the sights to that angle by means of a clinometer; this is called clinometer laying. In all cases the actual elevation of the gun to enable the shell to strike the target is a purely mechanical adjustment, performed independently; the gun is moved relatively to the sights, which have been previously set as described. Frequently the battery commander directs the guns from a point at some distance, communication being maintained by signallers or by field telephone. This is the normal procedure when the guns are firing from cover. Instruments of precision and careful calculations are, of course, required to fight a battery in this manner, many allowances having to be made for the differences in height, distance and angle between the position of the battery commander and that of the guns.

29. *Ranging*[1] (except on the French system alluded to below) is, first, finding the range (*i.e.* elevation required), and secondly, correcting the standard length of fuze for that range in accordance with the circumstances of each case. To find the elevation required, it is necessary to observe the bursts of shells "on graze" with reference to the target. The battery commander orders two elevations differing by 300 yds., *e.g.* "2500, 2800," and tells off a "ranging section" of two guns. These proceed to fire percussion shrapnel at the two different elevations, in order to obtain bursts "over" (+) and "short" (−). When it is certain that this "long bracket" is obtained, the "100 yds. bracket" is found, the elevations in the given case being, perhaps, 2600 and 2700 yds. "Verifying" rounds are then fired, to make certain of the 100 yds. bracket. The old "short bracket" (50 yds.) is not now required except at standing targets. Circumstances may, of course, shorten the process; for instance, a hit upon the target itself could be "verified" at once. The determination of the fuze (by time shrapnel) follows. The fuze has a standard length for the ascertained range, but the proper correction of this standard length to suit the atmospheric conditions has to be made. The commander has therefore already given out a series of corrector[2] lengths, his object being to secure bursts both in air and on graze. When he is finally satisfied he opens fire "for effect."

30. An example of the ordinary method of ranging, adapted from *Field Artillery Training*, 1906, is given below.

Battery commander gives target, &c., and orders: "Right section ranging section; remainder corrector 150 increase 10, 4400–4700," for the long bracket.

No. 1 gun fires, elevation 4400 yds., P.S., round observed —
No. 2 „ „ „ 4700 „ „ „ „ +
B.C. orders "4500–4600."
No. 1 gun fires, elevation 4500 yds., P.S., round observed —
No. 2 „ „ „ 4600 „ „ „ „ +

The 100 yds. bracket appears to be 4500–4600. B.C. orders: "Remainder 4500 time shrapnel," and gives the ranging section 4500–4600 to "verify." Guns 3, 4, 5, 6 set fuzes for 4500 with correctors 150, 160, 170, 180.

No. 1 gun fires, elevation 4500 yds., P.S., round observed —
No. 2 „ „ „ 4600 „ „ „ „ +

B.C. orders: "Remainder 4500, one round gun fire, 3 seconds."

No. 3 elevation 4500 yds. T. S. corrector 150 air
No. 4 „ „ „ „ „ 160 air
No. 5 „ „ „ „ „ 170 graze
No. 6 „ „ „ „ „ 180 „

B.C. selects corrector 160 and goes to "section fire."
The battery now begins to fire "for effect."

No. 1 elevation 4500 yds. T.S. corrector 160 air
No. 3 „ „ „ „ „ „ „
followed by Nos. 5, 2, 4 and 6.

There is another method of ranging, viz. with time shrapnel only. In this the principle is that several shells, fired with the same corrector setting, but at different elevations, will burst in air at different points along one line. Bursts high in the air cannot be judged, and it is therefore necessary to bring down the line of bursts to the target, so that the bursts in air appear directly in front or directly in rear of it. Rounds are therefore fired (in pairs owing to possible imperfections in the fuzes) to ascertain the corrector which gives the best line of observation. This found, the target is bracketed by bursts low in the air observed + and −, as in the ordinary method with percussion shrapnel.

The operations of finding the "line of fire" and the proper elevation may be combined, as the shells in ranging can be made to "bracket" for direction as well as for elevation. The line can be changed towards a new target in any kind of direct and indirect laying, in the latter case by observing the angle made with it by the original line of fire and giving deflection to the guns accordingly. Further, the fire of several dispersed batteries may be concentrated, distributed, or "switched" from one target to another on a wide front, at the will of the commander.

31. *Observation of Fire*, on the accuracy of which depends the success of ranging, may be done either by the battery commander himself or by a special "observing" party. In either case the shooting is carefully observed throughout, and corrections ordered at any time, whether during the process of ranging or during fire for effect. The difficulties of observation vary considerably with the ground, &c., for instance, the light may be so bad that the target can hardly be seen, or again, if there be a hollow in front of the target, a shell may burst in it so far below that the smoke appears thin, the round being then judged "over" instead of "short." On the other hand, a hollow behind the target may cause a round to be lost altogether. Ranging with time shrapnel has the merit of avoiding most of these "traps." The "French system of fire discipline," referred to below, has this method as the usual procedure.

32. *Fire.*—Field Artillery ranges are classed in the British service as: "distant," 6000 to 4500 yds.; "long," 4500 to 3500; "effective," 3500 to 2000; and "decisive," 2000 and

[1] Finding the line is also an integral part of ranging. When an aiming point is used, the angle at which the guns must be laid with reference to it is calculated and given out by the battery commander. The modern goniometric sight permits of a wide angle (in England 180° right or left) being given. "Deflection" is a small angular correction applied to individual guns.

[2] The "corrector" is an adjustment on the sights of the gun used to determine the correct fuze. In the British Q.F. equipment, a graduated dial or drum shows the elevation of the gun above the line of sight. The fuze lengths are marked on a movable scale opposite the range graduations to which they apply, and the "corrector" moves this fuze scale so as to bring different fuze lengths opposite the range graduation. For example, a certain corrector setting gives 11½ on the fuze scale opposite 4000 yds. on the range scale, and if the shells set to 11½ burst too high, a new corrector setting is taken, the fuze length 12 is now opposite to the 4000 range graduation, and this length gives bursts closer up and lower. In the German service a corrector (*Aufsatzschieber*) alters the real elevation given to the gun, so that while throughout the battery all guns have the same (nominal or ordered) elevation shown on the sights, the real elevations of individual guns vary according to the different corrector settings. Thus bursts at different heights and distances from the target are obtained by shifting the trajectory of the shell. The fuze, being set for the nominal elevation common to all the guns, burns for the same time in each case, and thus the burst will be lower and closer to the target with a less (real) elevation, and higher and farther from it with a greater.

under. The actual methods of fire employed are matters of detail; it will be sufficient to say that "section fire," in which the two guns of a section are fired alternately at a named interval, usually 30 seconds, and "rapid fire," in which two, three or more rounds as ordered are fired by each gun as quickly as possible, are the normal methods. Each battery usually engages a portion of the objective equal in length to its own front, owing to the spread of the cone of shrapnel bullets (see below). The fire is, of course, almost always frontal, though enfilade and oblique fire, when opportunities occur for their employment, are more deadly than ever, because of the depth of the cone. As for the general conduct of an artillery action, accurate fire for effect, at a medium rate, is used in most armies, but in the French and, since 1906, in the British services a new method has arisen, in consequence of the introduction of the modern quick-firer and the perfection of the time shrapnel. The French battery (1900 Q.F. equipment) consists of four guns and twelve wagons. The gun is shielded, as also are the wagons; the high velocity and flat trajectory give a maximum depth to the cone of shrapnel bullets. In the hope of obtaining a rapid and overwhelming fire, the French artillery ranges only for a long bracket, and once this bracket is found, the ground within its limits is swept from end to end in a burst of rapid fire. This is termed a *rafale* (squall or gust), and technically signifies "a series of eight rounds per gun, each two rounds being laid with 100 metres more elevation than the last pair, the whole fired off as rapidly as possible." The cone of time shrapnel being assumed as 300 yds. (or metres), it is clear that four pairs of rounds, bursting, say, at 1000, 1100, 1200 and 1300 yds. (adding, for the last, 300 yds. for its forward effect), sweep the whole ground between 1000 and 1600 yds. from the guns. The maximum depth would, of course, be obtained with four elevations differing by the depth of the cone; in such a case the space from 1000 to 2200 yds. would be covered, though much less effectively, since the same number of bullets are distributed over a larger area. On the other hand, the *rafale*, at a minimum, covers 300 yds., all the guns in this case being laid at the same elevation throughout. Here the maximum number of bullets is obtained for every square yard attacked. Between these extremes, a skilful artillery officer can vary the *rafale* to the needs of each several case almost indefinitely. "Sweeping" fire is a series of three rounds per gun, one in the original line, one to the right and one to the left of it; this is significantly called "mowing" (*tir fauchant*). A further refinement in both services is the combined "search and sweep." Forty-eight rounds, constituting in the French army a series of this last kind, can, it is said, be fired in 1 minute and 15 seconds, without setting fuzes beforehand, to cover an area of 600 × 200 metres. The result of such a series, worked out mathematically, is that 19 % of all men and 75 % of all horses, in the area and not under cover, should be hit by separate bullets (Bethell, *Modern Guns and Gunnery*, 1907). Even allowing a liberal deduction for imperfect distribution of bullets, we may feel certain that nothing but shielded guns could live long in the fire-swept zone. This is, of course, a rate of fire which could not be kept up for any length of time by the same battery. A French battery, firing at the maximum rate, would expend every available round in 13 minutes.

33. *Projectiles Employed.*—"Time shrapnel," say the German Field Artillery regulations, "is the projectile *par excellence* . . . against all animate targets which are not under cover." It achieves its purpose, as has been said, by sending a shower of bullets over an area of ground in such quantity that this is swept from end to end. These bullets are propelled, in a cone, forward from the point of burst of the shell, and the effective depth of this cone at medium ranges with a fairly high velocity gun may be taken at 300 yds. Further, the corrector enables the artillery commander to burst his shells at any desired point; for example, a long fuze may be given, to burst them close up when firing upon a deep target (such as troops in several lines, one behind the other), and thereby to obtain the maximum searching effect, or to obtain direct hits on shielded guns, while a short corrector, bursting the shell well in front of the enemy, allows the maximum lateral spread of the bullets, and therefore sweeps the greatest front. The number of bullets in the shell is such that troops in the open under effective shrapnel fire must suffer very heavily, and may be almost annihilated. If the enemy is close behind good cover, the bullets, indeed, pass harmlessly overhead. This, however, leads to a very important fact, viz. that artillery can keep down the fire of hostile infantry, "blind" the enemy, in Langlois' phrase, by *pinning it down* to cover. Under cover the men are safe, but if they raise their heads to take careful aim, they will almost certainly be hit. Their fire under such conditions is therefore unaimed and wild at the best, and may be wholly ineffective. *Common* shell and *high-explosive* shell (see AMMUNITION) belong to another class of projectile. The former is now not often used, but a certain proportion of H.E. shell is carried by the field artillery in many armies (see table in ORDNANCE: *Field Equipments*). This has a very violent local effect within a radius of 20 to 25 yds. of the point of burst (see AMMUNITION, fig. 10). It therefore covers far less ground than shrapnel, and is naturally used either (*a*) against troops under substantial cover or (*b*) to wreck cover and buildings. In the former case the shell is supposed to send a rain of splinters vertically downwards. This it will do, provided the fuze is minutely accurate, and a burst is thus obtained exactly over the heads of the enemy, but this is now generally held to be unlikely, and in so far as effect against *personnel* is concerned the H.E. shell is not thought to be of much value. Indeed, in the British and several other services, no H.E. shells at all are carried by field batteries, reliance being placed upon percussion shrapnel in attacking localities, buildings, &c., and for ranging. Experiments have been made towards producing a "H.E. shrapnel," which combines the characteristics of both types (see, for a description, AMMUNITION). For the projectiles used in attacking shielded guns, see section on "field howitzers" below. *Case shot* is now rarely employed. In the war of 1870–71 Prince Kraft von Hohenlohe-Ingelfingen, who commanded the Prussian Guard artillery, reported the expenditure of only one round of case, and even that was merely "broken in transport." The close-quarters projectile of to-day is more usually shrapnel with the fuze set at zero. Langlois, however, calls case shot "the true projectile for critical moments, which nothing can replace."

34. *Tactics of Field Artillery.*—On the march, the position and movement of the guns are regulated by the necessity of coming quickly into action; the usual place for the arm is at or near the heads of the combatant columns, *i.e.* as far forward as is consistent with safety. Safety is further provided for by an "escort," or, if such be not detailed, by the nearest infantry or cavalry. In attack, the rôle of the field artillery is usually (1) to assist if necessary the advanced guard in the preliminary fighting—for this purpose a battery is usually assigned to that corps of troops, other batteries also being sent up to the front as required, (2) to prepare, and (3) to support or cover the infantry attack. "Preparation" consists chiefly in engaging and subduing the hostile artillery. This is often spoken of as the "artillery duel," and is not a meaningless bombardment, but an essential preliminary to the advance. Massed guns with modern shrapnel would, if allowed to play freely upon the attack, infallibly stop, and probably annihilate, the troops making it. The task of the guns, then, is to destroy the opposing guns and artillerymen, a task which will engage almost all the resources of the assailant's artillery in the struggle for artillery superiority. Shielded guns, enhanced rate of fire, perfection in indirect laying apparatus, and many other factors, have modified the lessons of 1870, and complicated the work of achieving victory in the artillery duel so far that the simple "hard pounding" of former days has given way to a variety of expedients for inflicting the desired loss and damage, as to which opinions differ in and within every army. One point is, however, clear and meets with universal acceptance. "The whole object of the duel is to enable the artillery subsequently to devote all available resources to its principal task, which is the material and moral support of the infantry during each succeeding stage of the fight" (French regulations). One side must be victorious in the end, and when, and not until, the hostile artillery is beaten out of action, the

victor has acquired the power of pressing home the attack. The British regulations (1906), indeed, deal with the steps to be taken when, though the artillery of the attack is beaten, the infantry advance is continued, but only so as to order the guns to "reopen at all costs," in other words, as a forlorn hope. The second part of the preparation, the gradual disintegration of the opposing line of infantry, has practically disappeared from the drill books. The next task of the guns, and that in which modern artillery asserts its power to the utmost, is the *support* of the infantry attack. The artillery and infantry co-operate, "the former by firing rapidly when they see their own infantry . . . press forward, and the latter by making full use of the periods of intense artillery fire to gain ground" (British *F.A. Training*, 1906). Thus aided, the infantry closes in to decisive ranges, and as it gains ground to the front, every gun "must be at once turned upon the points selected . . . the most effective support afforded to the attacking infantry by the concentrated fire of guns and field howitzers. The former tie the defenders to their entrenchments (for retreat is practically impossible over ground swept by shrapnel bullets), distract their attention and tend to make them keep their heads down, while the shell from the field howitzers searches out the interior of the trenches, the reverse slopes of the position, and checks the movement of reinforcements towards the threatened point." In these words the British Field Artillery drill-book of 1902 summarizes the act of "covering" the infantry advance. Unofficial publications are still more emphatic. The advance of the infantry to decisive range would often be covered by a mass of one hundred or more field guns, firing shrapnel at the rate of ten rounds per gun per minute at the critical moment. Against such a storm of fire the defending infantry, even supposing that its own guns had refitted and were again in action, would be powerless. It is in recognition of the appalling power of field artillery (which has increased in a ratio out of all proportion to the improvements of modern rifles) that the French system has been elaborated to the perfection which it has now attained.

With modern guns and modern tactics artillery almost invariably fires over the heads of its own infantry. The German regulations indeed say that it should be avoided as far as possible, but, as a matter of fact, if the numerous guns of a modern army (at Königgrätz there were 1550 guns on the field, at Gravelotte 1252, at Mukden 3000) were to be given a clear front, there would be no room for deploying the infantry. Consequently the French regulations, in which the power of the artillery is given the greatest possible scope, say that "it almost always fires over the heads of its own infantry." With field guns and on level ground it is considered dangerous that infantry in front of the guns should be less than 600 yds. distant—not for fear of the shells striking the infantry, but because the fragments resulting from a "premature" burst are dangerous up to that distance. The question of distance is more important in connexion with the "covering" of the assault. Up to a point, the artillery enables the attacking infantry to advance with a minimum of loss and exhaustion, and thus to close with the enemy at least on equal terms, if not with a serious advantage, for the fire of the guns may shake, perhaps almost destroy the enemy's power of resistance. But when the infantry approaches the enemy the guns can no longer fire upon the latter's front line without risk of injuring their friends. All that they can do, when the opposing infantries can see the whites of each other's eyes, is to lengthen the fuze, raise the trajectory and sweep the ground where the enemy's supports are posted. Under these circumstances it is practically agreed that the risk should be taken without hesitation at so critical a moment as that of a decisive infantry assault which must be pushed home at whatever cost. "It will be better for the infantry to chance a few friendly shells than to be received at short range with a fresh outburst of hostile rifle fire" (Rouquerol, *Tactical Employment of Quick-firing Field Artillery*). Thus, the distance at which direct support ceases, formerly 600 yds., has been diminished to 100, and even to 50 yds. Howitzers can, of course, maintain their fire almost up to the very last stage, and, in general, high-explosive shell, owing to its purely local effect, may be employed for some time after it has become unsafe to use shrapnel.

35. Field artillery in *defence*, which would presumably be inferior to that of the attack, must, of course, act according to circumstances. We are here concerned not with the absolute strength or weakness of the passive defensive, which is a matter of tactics (*q.v.*), but with the tactical procedure of artillery, which, relatively to other methods, is held to offer the best chance of success, so far as success is attainable. On the defensive in a prepared position, which in European warfare at any rate will be an unusually favourable case for the defender—the guns have two functions, that of engaging and holding the hostile artillery, and that of meeting the infantry assault. The dilemma is this, that on the one hand a position in rear of the line of battle, with modern improvements in communicating and indirect laying apparatus, is well suited for engaging the hostile guns, but not for meeting the assault; and on the other, guns on the forward slope of the defender's ridge or hill can fire direct, but are quickly located and overwhelmed, for they can hardly remain silent while their own infantry bears the fire of the assailant's shrapnel. Thus the defender's guns would, as a rule, have to be divided. One portion would seek to fight from rearward concealed positions, and use every device to delay the victory of the enemy's guns and the development of the battle until it is too late in the day for a serious infantry attack. Further, the enemy's mistakes and the "fortune of war" may give opportunities of inflicting severe losses; such opportunities have always occurred and will do so again. In the possible (though very far from probable) case of the defender not merely baffling, but crushing his opponent in the artillery duel, he may, if he so desires, himself assume the rôle of assailant, and at any rate he places a veto on the enemy's attack.

The portion told off to meet the infantry assault would be entrenched on the forward slope and would take no part in the artillery duel. Very exceptionally, this advanced artillery might fire upon favourable targets, but its paramount duty is to remain intact for the decisive moment. Here again the defender is confronted with grave difficulties. It is true that his advanced batteries may be of the greatest possible assistance at the crisis of the infantry assault, yet even so the covering fire of the hostile guns, as soon as the hostile infantry had found them their target, may be absolutely overwhelming; moreover, once the fight has begun, the guns cannot be withdrawn, nor can their positions easily be modified to meet unexpected developments. The proportion of the whole artillery force which should be committed to the forward position is disputed. Colonel Bethell (*Journal Royal Artillery*, vol. xxxiii. p. 67) holds that all the mountain guns, and two-thirds of the field guns, should be in the forward, all the howitzers and heavy guns and one-third of the field guns in the retired position. But in view of the facts that if once the advanced guns are submerged in the tide of the enemy's assault, they will be irrecoverable, and that a modern Q.F. gun, with plenty of ammunition at hand, may use "rapid fire" freely, artillery opinion, as a whole, is in favour of having fewer guns and an abnormal ammunition supply in the forward entrenchments, and the bulk of the artillery (with the ammunition columns at hand) in rear. But the purely passive defensive is usually but a preliminary to an active counter-stroke. This counter-attack would naturally be supported to the utmost by the offensive tactics of the artillery, which might thus at the end of a battle achieve far greater results than it could have done at the beginning of the day. In *pursuit*, it is universally agreed that the action of the artillery may be bold to the verge of rashness. The employment of field artillery in *advanced* and *rear guard actions* varies almost indefinitely according to circumstances; with *outposts*, guns would only be employed exceptionally.

36. *Marches.*—The importance of having the artillery well up at the front of a marching column is perhaps best expressed in the phrase of Prince Kraft von Hohenlohe-Ingelfingen, "save hours and not minutes." The Germans in 1870 so far acted up to the principle that Prince Hohenlohe, when asked, at the beginning

of the battle of Sedan, for a couple of guns, was able to reply, "You shall have ninety" (see, for details of the march of the Guard artillery, his *Letters on Artillery*, 6th letter). The German regulations for field service say, very plainly, "the horses have not done their work until they have got the guns into action, even at the cost of utter exhaustion." A notable march was made by the 62nd battery, R.F.A., in the South African War. On the day of the battle of Modder River, the battery marched 32 m. (mostly through deep sand) arriving in time to take part in the action. Such forced marches, if rare, are nowadays expected to be within the power of field artillery to accomplish. Horse artillery is capable of more than this, and as to pace, manœuvring at the cavalry rate. Heavy guns are the least mobile, and would rarely be able to keep pace with infantry in a forced march. Field artillery walks 4, trots 9, and gallops at the rate of 15 m. an hour. A fair marching pace (trot and walk) is 4 m. an hour for field, 5 for horse batteries. A march of 14 m. would, according to the German regulations, be performed by

a field battery in 5 hours,
a horse battery in 4 hours,

under favourable circumstances (Bronsart von Schellendorf).

37. *Power and Mobility.*—It will have been made clear that every gun represents a compromise between these two requirements, and that each type of artillery has been evolved in accordance with the relative requirements of these conditions in respect of the work to be performed. The classification which has been followed in this article represents the practically unanimous decision of every important military state. Still, there has always been controversy between the individual adherents of each side, and the Boer War experiences raised the question as to whether field artillery, as the term is usually understood, should not be abolished, with a view to having only heavy guns and horse artillery with a field army.

38. *Concentration and Dispersion.*—The use of their artillery made by the Boers in the South African War led to the revival of the idea of "dispersing" guns instead of "concentrating" them. It would be more accurate to say that military thinkers had, after the introduction of the quick-firing gun, challenged every received principle, and amongst others the employment of artillery in masses, which, as a result of the war of 1870, "had become almost an article of faith." The idea was to make use of the increased power of the guns to gain equally great results with the employment of less material than formerly. Thus the dispersion of guns is bound up with the passive defensive. The first editions of the British *Field Artillery Training* and *Combined Training*, strongly influenced as they were by South African experience, did not legislate, even in dealing with defence, for "dispersion" in the Boer manner, but only for adaptability (see *Field Artillery Training*, 1902, p. 15). In the Boer War, whilst the Boers nearly always scattered their guns, almost the only occasion upon which their artillery played a decisive part was at Spion Kop, where its fire was concentrated upon the point of assault. At Pieter's Hill, the fire of seventy guns covered the British infantry assault in the Napoleonic manner. On the whole it may be accepted as a general truth that guns are safe, and may be locally effective, when dispersed, but that they cannot produce decisive effect except when used in masses. It must, however, be clearly understood that a "mass" in this sense means a large number of guns, under one command, and susceptible of being handled as a unit, so far as the direction and effectiveness of their fire is concerned. *This being secured*, and on that condition only, it does not matter whether the actual gun positions are scattered over a few square miles, or are closed in one long line and using direct fire—they are still a mass, and capable of acting effectively as such. While there are undoubtedly grave dangers in using the indirect method too freely, technical improvements in laying, telephones, &c., have had much to do with the possibility, at any rate under favourable circumstances, of a concentration which may be described as one of shells rather than of guns, and the reader is reminded in this connexion that the work formerly done by the gun is now performed by the shell.

39. *Horse Artillery* is to be regarded as field artillery of great mobility and manœuvring power. Its value may be said, in general terms, to lie in augmenting the weak fire-power of the mounted troops, and in facilitating their work as much as possible. Thus, when cavalry meets serious opposition in reconnoitring, the guns may be able to break down the enemy's resistance without calling for assistance from the main body of the cavalry, and, in the action of cavalry *versus* cavalry, the "paramount duty of the horse artillery is to shatter the enemy's cavalry" (*Field Artillery Training*, 1906), *i.e.* to "prepare" the success of the cavalry charge by breaking up as far as possible the enemy's power of meeting it. In the cavalry battle, covering fire is practically impossible, owing both to the short distances separating the combatants and to the rapidity of their movements, but steps are taken "to enable all the guns to bear on the enemy's cavalry at the points of collision." The ideal position for the horse artillery is out to a flank, the cavalry manœuvring so as to draw the enemy's cavalry under enfilade fire, and at the same time to force them to mask the fire of their own horse artillery. Another and a most important function of the horse batteries is to reinforce, with the greatest possible speed, any point in the general line of battle which is in need of artillery support. For this reason the corps artillery generally includes horse batteries.

40. *Field Howitzers* are somewhat less mobile than field guns; they have, however, far greater shell power. The special features of the weapon are, of course, the product of the special requirements which have called it into existence. These are, briefly (*a*) the necessity of being able to "search" the interior of earthworks, a task which, as has been said, is beyond the power of high-velocity field guns, and (*b*) demolition work, which is equally beyond the power of even a H.E. shell of field-gun calibre. The first of these conditions implies a steep "angle of descent," which again implies a high angle of elevation. The second requires great shell power but does not call for high velocity. The howitzer, therefore, is a short gun, firing a heavy shell at high angles of elevation. Howitzers almost always are laid by the indirect method of fire from under cover, since it is clear that, with high angles of elevation, the gun may be brought close up to the covering mass, and still fire over it. Ranging must be done very accurately and yet economically, as but few of their heavy shells can be carried in the wagons and limbers, and the shells descending upon an enemy almost vertically lose the long sweeping effect of the field shrapnel which neutralizes minor errors of ranging. The projectiles employed are high explosive and shrapnel, the latter for use against *personnel* under cover, the former for demolition of field works, casemates or buildings. It is very generally held that howitzer time shrapnel is the best form of projectile for the attack of shielded guns. Here it may be said that no completely satisfactory method of dealing with these has yet been discovered. The best procedure with field guns is said to be lengthening the fuze to obtain a high percentage of bursts on graze. A shell striking the face of the shield will penetrate it, and should kill some at least of the gun detachment behind. The high-explosive shrapnel alluded to above is designed primarily for the attack of shielded guns.

41. *Heavy Field Artillery*, alternatively called *Artillery of Position*, as has been said, includes all guns of 4-in. calibre and upwards, mounted on travelling carriages. In South Africa, where firm soil was usually to be found, 6-in. guns were employed as heavy field guns, but in Europe even the 5-in. (British Service) is liable to sink into the ground. In Great Britain, guns only are used by this branch; abroad, the "heavy artillery of the field army," the "light siege train," &c., as it is variously called, is as a rule composed of howitzers of a heavier calibre than the field howitzer, the 15-cm. (6-in.) howitzer being most commonly met with. This artillery has, however, a different tactical rôle from the heavy field artillery of the British service; and it is always with a view to the attack of permanent or semi-permanent fortifications that the *matériel* is organized. In Great Britain, heavy batteries armed with the 5-in. gun are considered as "an auxiliary to the horse and field artillery" (*Heavy Artillery Training*). Ranging is conducted with greater

deliberation than ranging with the lighter guns, though upon the same general lines. Parts of the process may, however, be omitted in certain circumstances. Heavy guns use high-explosive (lyddite) shells and time shrapnel, the former for ranging and for demolishing cover, the latter against *personnel*. Laying is usually indirect. The tactical principles upon which heavy artillery does its work are based, in the main, on the long range (up to 10,000 yds.) and great shell-power of the guns. This power enables the artillery to reach with effect targets which are beyond the range of lighter ordnance, and it is, therefore, considered possible to disperse the guns in batteries, and even in sections of two guns, along the front of the army, without forfeiting the power of concentrating their fire on any point—a power which otherwise they would not possess owing to their want of mobility. At the same time it is not forbidden to bring them into line with the rest of the artillery, in order to achieve a decisive result. In the *attack*, beside the general task of supplementing the effect of other natures of ordnance, heavy artillery may demolish cover, buildings, &c., held by the enemy, and during the infantry assault they may do excellent service in sweeping a great depth of ground, their smaller angle of descent, and the greater remaining velocity and heavier driving charge of their shrapnel, as compared with field guns, enabling them to do this effectively. In the *defence*, long-range fire has great value, especially in sweeping approaches which the enemy must use. In *pursuit*, the heavy artillery may be able to shell the main body of the enemy during its retreat, even if it has left a rear-guard. In *retreat*, the want of mobility of these guns militates against their employment in exposed positions, such as rearguards usually have to take up.

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A complete bibliography and criticism of the artillery works of the 14th, 15th and 16th centuries will be found in Max Jähns, *Geschichte der Kriegswissenschaften*, pp. 221-236, 382-424, 621, 658 and 747-752. For the early 17th century, Diego Ufano, *Tratado de la Artilleria* (1613) is a standard treatise of the time, but the mystery preserved by artillerists in regard to their arm is responsible for an astonishing dearth of artillery literature even in the time of the Thirty Years' War. In 1650 appeared Casimir Simienowicz' *Ars magnae artilleriae*, an English translation of which was published in London in 1729, and in 1683 Michael Mieth published *Artilleriae Recentior Praxis*. The first edition of Surirey de S. Remy, *Mémoires d'Artillerie*, appeared in Paris in 1697. 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[1] Most of the works named deal with technical questions of equipment, ammunition, ballistics, &c.

ARTIODACTYLA (from Gr. ἄρτιος, even, and δάκτυλος, a finger or toe, "even-toed"), the suborder of ungulate mammals in which the central (and in some cases the only) pair of toes in each foot are arranged symmetrically on each side of a vertical line running through the axes of the limbs. As contrasted with the Perissodactyla living, and in a great degree extinct, Artiodactyla are characterized by the following structural features. The upper premolar and molar teeth are not alike, the former being single and the latter two-lobed; and the last lower molar of both first and second dentition is almost invariably three-lobed. Nasal bones not expanded posteriorly. No alisphenoid canal. Dorsal and lumbar vertebrae together always nineteen, though the former may vary from twelve to fifteen. Femur without third trochanter. Third and fourth digits of both feet almost equally developed, and their terminal phalanges flattened on their inner or contiguous surfaces, so that each is not symmetrical in itself, but when the two are placed together they form a figure symmetrically disposed to a line drawn between them. Or, in other words, the axis or median line of the whole foot is a line drawn between the third and fourth digits (fig. 1). Lower articular surface of the astragalus divided into two nearly equal facets, one for the navicular and a second for the cuboid bone. The calcaneum with an articular facet for the lower end of the fibula. Stomach almost always more or less complex. Colon convoluted. Caecum small. Placenta diffused or cotyledonary. Teats either few and inguinal, or numerous and abdominal.

Artiodactyla date from the Eocene period, when they appear to have been less numerous than the Perissodactyla, although at the present day they are immeasurably ahead of that group, and form indeed the dominant ungulates. As regards the gradual specialization and development of the modern types, the following features are noteworthy.

1. As regards the teeth, we have the passage of a simply tubercular, or bunodont (βουνός, a hillock) type of molar into one in which the four main tubercles, or columns, have assumed a crescentic form, whence this type is termed selenodont (σελήνη, the new moon). Further, there is the modification of the latter from a short-crowned, or brachyodont type, to one in which the columns are tall, constituting the hypsodont, or hypsiselenodont, type. It is noteworthy, however, that in some instances there appears to have been a retrograde modification from the selenodont towards the bunodont type, the hippopotamus being a case in point. Other modifications are the loss of the upper incisors;

the development of the canines into projecting tusks; and the loss of the anterior premolars.

2. As regards the limbs. Reduction of the ulna from a complete and distinct bone to a comparatively rudimentary state in which it coalesces more or less firmly with the radius. Reduction of the fibula till nothing but its lower extremity remains. Reduction and final loss of outer pair of digits (second and fifth), with coalescence of the metacarpal and metatarsal bones of the two middle digits to form a cannon-bone. Union of the navicular and cuboid, and sometimes the ectocuneiform bone, of the tarsus.

3. Change of form of the odontoid process of the second or axis vertebrae from a cone to a hollow half-cylinder.

4. Development of horns or antlers on the frontal bones, and gradual complication of form of antlers.

5. By inference only, increasing complication of stomach with ruminating function superadded. Modification of placenta from simple diffused to cotyledonary form.

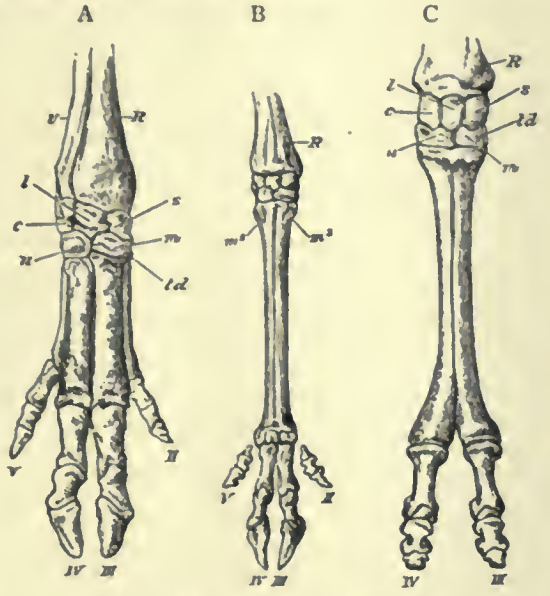

FIG. 1.—Bones of Right Fore Feet of existing Artiodactyla.

A, Pig (*Sus scrofa*), ×½. B, Red deer (*Cervus elaphus*), ×½. C, Camel (*Camelus bactrianus*), ×½.

U, Ulna. R, Radius. c, Cuneiform. l, Lunar. s, Scaphoid. u, Unciform. m, Magnum. td, Trapezoid.

In the Sheep and the Camel the long compound bone, supporting the two main (or only) toes is the cannon-bone.

The primitive Artiodactyla thus probably had the typical number (44) of incisor, canine and molar teeth, brachyodont molars, conical odontoid process, four distinct toes on each foot, with metacarpal, metatarsal and all the tarsal bones distinct, and no frontal appendages.

As regards classification, the first group is that of the Pecora, or Cotylophora, in which the cheek-teeth are selenodont, but there are no upper incisors or canine-like premolars, while upper canines are generally absent, though sometimes largely developed. Inferior incisors, three on each side with an incisiform canine in contact with them. Cheek-teeth consisting of $p.\frac{3}{3}$, $m.\frac{3}{3}$, in continuous series. Auditory bulla simple and hollow within. Odontoid process of second vertebra in the form of a crescent, hollow above. Lower extremity of the fibula represented by a distinct malleolar bone articulating with the outer surface of the lower end of the tibia. Third and fourth metacarpals and metatarsals confluent into cannon-bones (fig. 1 B), and the toes enclosed in hoofs. Outer toes small and rudimentary, or in some cases entirely suppressed; their metacarpal or metatarsal bones never complete. Navicular and cuboid bones of tarsus united. The skull generally lacks a sagittal crest; and the condyle of the lower jaw is transversely elongated. Horns or antlers usually present, at least in the male sex. Left brachial artery arising from a common innominate trunk, instead of coming off separately from the aortic arch. Stomach with four complete cavities. Placenta cotyledonous. Teats 2 or 4.

Pecora.

The group at the present day is divided into *Giraffidae* (giraffe and okapi), *Cervidae* (deer), *Antilocapridae* (prongbuck), and *Bovidae* (oxen, sheep, goats, antelopes, &c.). (See PECORA.)

The second group is represented at the present day by the camels (*Camelus*) of the Old, and the llamas (*Lama*) of the New World, collectively constituting the family *Camelidae*. They derive their name of Tylopoda (" boss-footed ") from the circumstance that the feet form large cushion-like pads, supporting the weight of the body, while the toes have broad nails on their upper surface only, instead of being encased in hoofs. The cheek-teeth are selenodont, and one pair of upper incisors is retained, while some of the anterior premolars assume a canine-like shape, and are separated from the rest of the cheek-series. Auditory bulla filled with honeycombed bony tissue. Odontoid process of second vertebra semi-cylindrical; skull with a sagittal crest; and the condyle of the lower jaw rounded. Third and fourth metacarpals and metatarsals (which are alone present) fused into cannon-bones for the greater part of their length, but diverging inferiorly (fig. 1, C) and with their articular surfaces for the toes smooth, instead of ridged as in the Pecora. Navicular and cuboid bones of tarsus distinct. No horns or antlers. Stomach, although complex, differing essentially from that of the Pecora. Placenta diffuse, without cotyledons. Teats few. (See TYLOPODA.)

Tylopoda.

In the same sectional group is included the North American family of oreodonts (*Oreodontidae*), which are much more primitive ruminants, with shorter necks and limbs, the full series of 44 teeth, all in apposition, and the metacarpal and metatarsal bones separate, and the toes generally of more normal type, although sometimes claw-like. (See OREODON.) The Eocene American genus *Homacodon* is regarded as representing a third family group, the *Homacodontidae* (= *Pantolestidae*), in which the molars were of a bunodont type, and approximate to those of the Condylarthra from which this family appears to have sprung, and to have given origin on the one hand to the *Oreodontidae*, and on the other to the *Camelidae*. The family is represented in the Lower, or Wasatch, Eocene by *Trigonolestes*, in the Middle (Bridger) Eocene by *Homacodon* (Pantolestes), and in the Upper (Uinta) Eocene by *Bunomeryx*.

The third group is that represented by the chevrotains or mouse-deer, forming the family *Tragulidae*, with *Tragulus* in south-eastern Asia and *Dorcatherium* (or *Hyomoschus*) in equatorial Africa. The cheek-teeth are selenodont, as in the two preceding groups; there are no upper incisors, but there are long, narrow and pointed upper canines, which attain a large size in the males; the lower canines are incisor-like, as in the Pecora, and there are no caniniform premolars in either jaw. Cheek-teeth in a continuous series consisting of $p.\frac{3}{3}$, $m.\frac{3}{3}$. Odontoid process of axis conical. Fibula complete. Four complete toes on each foot. The middle metacarpals and metatarsals generally confluent, the outer ones (second and fifth) slender but complete, *i.e.* extending from the carpus or tarsus to the digit. Navicular, cuboid and ectocuneiform bones of tarsus united. Auditory bulla of skull filled with cancellar tissue. No frontal appendages. Ruminating, but the stomach with only three distinct compartments, the maniplies or third cavity of the stomach of the Pecora being rudimentary. Placenta diffused. (See CHEVROTAIN.)

Tragulina.

In this place must be mentioned the extinct Oligocene European group typified by the well-known genus *Anoplotherium* of the Paris gypsum-quarries, and hence termed Anoplotherina, although the alternative title Dichobunoidea has been suggested. It includes the two families *Anoplotheriidae* and *Dichobunidae*, of which the first died out with the Oligocene, while the second may have given origin to the Tragulina and perhaps the Pecora. There is the full series of 44 teeth, generally without any gaps, and most of the bones of the skeleton are separate and complete; while, in many instances at any rate, the tail was much longer than in any existing ungulates, and the whole bodily form

Anoplotherina.

approximated to that of a carnivore. The upper molars, which may be either selenodont or buno-selenodont, carry five cusps each, instead of the four characteristic of all the preceding groups; and they are all very low-crowned, so as to expose the whole of the valleys between the cusps. In *Anoplotherium*, some of the species of which were larger than tapirs, there were either two or three toes, the latter number being almost unique among the Artiodactyla. Allied genera are *Diplobune* and *Dacrytherium*.

The *Dichobunidae* include the genus *Dichobune*, of which the species were small animals with buno-selenodont molars. *Xiphodon* and *Dichodon* represent another type with cutting premolars and selenodont molars; while *Caenotherium* and *Plesiomeryx* form yet another branch, with resemblances to the ruminants. The most interesting genera are, however, the Upper Oligocene and Lower Miocene *Gelocus* and *Prodremotherium*, which have perfectly selenodont teeth, and the third and fourth metacarpal and metatarsal bones respectively fused into an imperfect cannon-bone, with the reduction of the lateral metacarpals and metatarsals to mere remnants of their upper and lower extremities. While *Gelocus* exhibits a marked approximation to the *Tragulidae*, *Prodremotherium* comes nearer to the

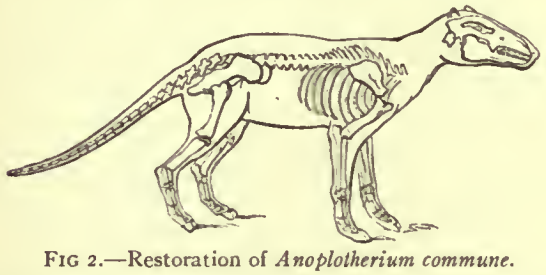

FIG 2.—Restoration of *Anoplotherium commune*.

Cervidae, of which it not improbably indicates the ancestral type. The *Dichobunidae* may be regarded as occupying a position analogous to that of the *Homacodontidae* in the Tylopoda, and like the latter, are probably the direct descendants of Condylarthra.

The last section of the Artiodactyla is that of the Suina, represented at the present day by the pigs (*Suidae*), and the hippopotamuses (*Hippopotamidae*), and in past times by the *Anthracotheriidae*, in which may probably be included the *Elotheriidae*. In the existing members of the group the cheek-teeth approximate to the bunodont type, although showing signs of being degenerate modifications of the selenodont modification. There is at least one pair of upper incisors, while the full series of 44 teeth may be present. The metacarpals and metatarsals are generally distinct (fig. 1 A), and never fuse into a complete cannon-bone; and the navicular and cuboid bones of the tarsus are separate. The odontoid process of the second vertebra is pig-like: and the tibia and fibula and radius and ulna are severally distinct. The stomach is simple or somewhat complex, and the placenta diffused. The *Suidae* include the Old World pigs (*Suinae*) and the American peccaries (*Dicotylinae*), and are characterized by the snout terminating in a fleshy disk-like expansion, in the midst of which are perforated the nostrils; while the toes are enclosed in sharp hoofs, of which the lateral ones do not touch the ground. There is a caecum. The *Dicotylinae* differ from the *Suinae* in that the upper canines are directed downwards (instead of curving upwards) and have sharp cutting-edges, while the toes are four in front and three behind (instead of four on each foot), and the stomach is complex instead of simple. In the Old World a large number of fossil forms are known, of which the earliest is the Egyptian Eocene *Geniohyus*. Originally the family was an Old World type, but in the Miocene it gained access into North America, where the earliest form is *Bothriolabis*, an ancestral peccary showing signs of affinity with the European Miocene genus *Palaeochoerus*. (See SWINE and PECCARY.)

Suina.

The *Hippopotamidae* are an exclusively Old World group, in which the muzzle is broad and rounded and quite unlike that of the *Suidae*, while the crowns of the cheek-teeth form a distinctly trefoil pattern, when partially worn, which is only foreshadowed in those of the latter. The short and broad teeth terminate in four subequal toes, protected by short rounded hoofs, and all reaching the ground. The hinder end of the lower jaw is provided with a deep descending flange. Both incisors and canines are devoid of roots and grow throughout life, the canines, and in the typical species one pair of lower incisors, growing to an immense size. The stomach is complex; but there is no caecum. Although now exclusively African, the family (of which all the representatives may be included in the single genus *Hippopotamus*, with several subgeneric groups) is represented in the Pliocene of Europe and the Lower Pliocene of northern India. Its place of origin cannot yet be determined.

The extinct *Anthracotheriidae* were evidently nearly allied to the *Hippopotamidae*, of which they are in all probability the ancestral stock. They agree, for instance, with that family in the presence of a descending flange at the hinder end of each side of the lower jaw; but their dentition is of a more generalized type, comprising the full series of 44 teeth, among which the incisors and canines are of normal form, but specially enlarged, and developing roots in the usual manner. The molars are partially selenodont in the typical genus *Anthracotherium*, with five cusps, or columns, on the crowns of those of the upper jaw, which are nearly square. The genus has a very wide distribution, extending from Europe through Asia to North America, and occurring in strata which are of Oligocene and Miocene age. In *Ancodon* (*Hyopotamus*) the cusps on the molars are taller, so that the dentition is more decidedly selenodont; the distribution of this genus includes not only Europe, Asia and North Africa, but also Egypt where it occurs in Upper Eocene beds in company with the European genus *Rhagatherium*, which is nearer *Anthracotherium*. On the other hand, in *Merycopotamus*, of the Lower Pliocene of India and Burma, the upper molars have lost the fifth intermediate cusp of *Ancodon*; and thus, although highly selenodont, might be easily modified, by a kind of retrograde development, into the trefoil-columned molars of *Hippopotamus*. In the above genera, so far as is known, the feet were four-toed, although with the lateral digits relatively small; but in *Elotherium* (or *Entelodon*), from the Lower Miocene of Europe and the Oligocene of North America, the two lateral digits in each foot had disappeared. This is the more remarkable seeing that *Elotherium* may be regarded as a kind of bunodont *Anthracotherium*. It shows the characteristic hippopotamus-flange to the lower jaw, but has also a large descending process from the jugal bone of the zygomatic arch of the skull. Finally, we have in the Pliocene of India the genus *Tetraconodon*, remarkable for the enormous size attained by the bluntly conical premolars; as the molars are purely bunodont, this genus seems to be a late and specialized survivor of a primitive type. (R. L.*)

ARTISAN, or ARTIZAN, a mechanic; a handicraftsman in distinction to an artist. The English word (from Late Lat. *artitianus*, instructed in arts) at one time meant "artist," but has been restricted to signify the operative workman only.

ARTOIS, an ancient province of the north of France, corresponding to the present department of Pas de Calais, with the exclusion of the arrondissements of Boulogne and Montreuil, which belonged to Picardy. It is a rich and well-watered country, producing abundance of grain and hops, and yielding excellent pasture for cattle. The capital of the province was Arras, and the other important places were Saint-Omer, Béthune, Aire, Hesdin, Bapaume, Lens, Lillers, Saint-Pol and Saint-Venant. The name Artois (still more corrupted in "Arras") is derived from the Atrebates, who possessed the district in the time of Caesar. From the 9th to the 12th century Artois belonged to the counts of Flanders. It was bestowed in 1180 on Philip Augustus of France by Philip of Alsace, as the dowry of his niece Isabella of Hainaut. At her death in 1190, Baldwin IX., count of Flanders (d. 1206), and then his son-in-law, Ferrand (Ferdinand) of Portugal, count of Flanders, disputed the possession of the country with the king of France, Ferrand being in the coalition which was overthrown by Philip Augustus at Bouvines (1214). In 1237 Artois, which was raised to a countship the following year, was conferred as an appanage by Saint Louis on his brother

Robert, who died on crusade in 1250. His son, Robert II., took part in the wars in Navarre, Sicily, Guienne and Flanders, and was killed at the battle of Courtrai in 1302. After his death, his son Philip having predeceased him (1298), Artois was adjudged to his daughter Mahaut, or Matilda, as against her nephew Robert, son of Philip, who attempted to support his claim to the countship by forged titles. Banished from France for this crime (1322), Robert of Artois took refuge in England, where he became earl of Richmond, and incited Edward III. to make war upon Philip of Valois. His descendants, the counts of Eu (*q.v.*), continued to style themselves counts of Artois. By the marriage of Mahaut (d. 1329) with Otto IV., Artois passed to the house of Burgundy, in whose possession it remained till the marriage of Mary, the daughter of Charles the Bold, to the archduke Maximilian brought it to the house of Austria. Louis XI., however, occupied portions of Artois, and the claims of Austria were contested by France until the treaty of Senlis (1493). The emperor Charles V. established the council of Artois, with sovereign authority. At the end of the Thirty Years' War Artois was again conquered by the French, and the conquest was ratified in the treaty of the Pyrenees (1659) by Spain, to whom the province had fallen in 1634. During the war between France and Holland (1672–77) and that of the Spanish Succession, Artois was invaded again, but the treaties of Nijmwegen (1678) and of Utrecht (1713) confirmed the sovereignty of France. The title of count of Artois was borne by Charles X. of France before his accession to the throne. This new creation became extinct on the death of the comte de Chambord in 1883.

ART SALES. The practice of selling objects of art by auction in England dates from the latter part of the 17th century, when in most cases the names of the auctioneers were suppressed. Evelyn (under date June 21, 1693) mentions a "great auction of pictures (*Lord Melford's*) in the Banquetting House, Whitehall," and the practice is frequently referred to by other contemporary and later writers. Before the introduction of regular auctions the practice was, as in the case of the famous collection formed by Charles I., to price each object and invite purchasers, just as in other departments of commerce. But this was a slow process, especially in the case of pictures, and lacked the incentive of excitement. The first really important art collection to come under the hammer was that of Edward, earl of Oxford, dispersed by Cock, under the Piazza, Covent Garden, on 8th March 1741/2 and the five following days, six more days being required by the coins. Nearly all the leading men of the day, including Horace Walpole, attended or were represented at this sale, and the prices varied from five shillings for an anonymous bishop's "head" to 165 guineas for Vandyck's group of "Sir Kenelm Digby, lady, and son." The next great dispersal was Dr Richard Mead's extensive collection, of which the pictures, coins and gems, &c., were sold by Langford in February and March 1754, the sale realizing the total, unprecedented up to that time, of £16,069. The thirty-eight days' sale (1786) of the Duchess of Portland's collection is very noteworthy, from the fact that it included the celebrated Portland vase, now in the British Museum. Many other interesting and important 18th-century sales might be mentioned. High prices did not become general until the Calonne, Trumbull (both 1795) and Bryan (1798) sales. As to the quality of the pictures which had been sold by auction up to the latter part of the 18th century, it may be assumed that this was not high. The importation of pictures and other objects of art had assumed extensive proportions by the end of the 18th century, but the genuine examples of the Old Masters probably fell far short of 1%. England was felt to be the only safe asylum for valuable articles, but the home which was intended to be temporary often became permanent. Had it not been for the political convulsions on the continent, England, instead of being one of the richest countries in the world in art treasures, would have been one of the poorest. This fortuitous circumstance had, moreover, another effect, in that it greatly raised the critical knowledge of pictures. Genuine works realized high prices, as, for example, at Sir William Hamilton's sale (1801), when Beckford paid 1300 guineas for the little picture of "A Laughing Boy" by Leonardo da Vinci; and when at the Lafontaine sales (1807 and 1811) two Rembrandts each realized 5000 guineas, "The Woman taken in Adultery," now in the National Gallery, and "The Master Shipbuilder," now at Buckingham Palace. The Beckford sale of 1823 (41 days, £43,869) was the forerunner of the great art dispersal of the 19th century; Horace Walpole's accumulation at Strawberry Hill, 1842 (24 days, £33,450), and the Stowe collection, 1848 (41 days, £75,562), were also celebrated. They comprised every phase of art work, and in all the quality was of a very high order. They acted as a most healthy stimulus to art collecting, a stimulus which was further nourished by the sales of the superb collection of Ralph Bernal in 1855 (32 days, £62,690), and of the almost equally fine but not so comprehensive collection of Samuel Rogers, 1856 (18 days, £42,367). Three years later came the dispersal of the 1500 pictures which formed Lord Northwick's gallery at Cheltenham (pictures and works of art, 18 days, £94,722).

Towards the latter part of the first half of the 19th century an entirely new race of collectors gradually came into existence; they were for the most part men who had made, or were making, large fortunes in the various industries of the midlands and north of England and other centres. They were untrammelled by "collecting" traditions, and their patronage was almost exclusively extended to the artists of the day. The dispersals of these collections began in 1863 with the Bicknell Gallery, and continued at irregular intervals for many years, *e.g.* Gillott (1872), Mendel (1875), Wynn Ellis and Albert Levy (1876), Albert Grant (1877) and Munro of Novar (1878). These patrons purchased at munificent prices either direct from the easel or from the exhibitions not only pictures in oils but also water-colour drawings. As a matter of investment their purchases frequently realized far more than the original outlay; sometimes, however, the reverse happened, as, for instance, in the case of Landseer's "Otter Hunt," for which Baron Grant is said to have paid £10,000 and which realized shortly afterwards only 5650 guineas. One of the features of the sales of the 'seventies was the high appreciation of water-colour drawings. At the Gillott sale (1872) 160 examples realized £27,423, Turner's "Bamborough Castle" fetching 3150 gns.; at the Quilter sale (1875) David Cox's "Hayfield," for which a dealer paid him 50 gns. in 1850, brought 2810 gns. The following are the most remarkable prices of later years. In 1895 Cox's "Welsh Funeral" (which cost about £20) sold for 2400 gns., and Burne-Jones's "Hesperides" for 2460 gns. In 1908, 13 Turner drawings fetched £12,415 (Acland-Hood sale) and 7 brought £11,077 (Holland sale), the "Heidelberg" reaching 4200 gns. For Fred Walker's "Harbour of Refuge" 2580 gns. were paid (Tatham sale) and 2700 gns. for his "Marlow Ferry" (Holland). The demand for pictures by modern artists, whose works sold at almost fabulous prices in the 'seventies, has somewhat declined; but during all its *furore* there was still a small band of collectors to whom the works of the Old Masters more especially appealed. The dispersal of such collections as the Bredel (1875), Watts Russell (1875), Foster of Clewer Manor (1876), the Hamilton Palace (17 days, £397,562)—the greatest art sale in the annals of Great Britain—Bale (1882), Leigh Court (1884), and Dudley (1892) resulted, as did the sale of many minor collections each season, in many very fine works of the Old Masters finding eager purchasers at high prices. A striking example of the high prices given was the £24,250 realized by the pair of Vandyck portraits of a Genoese senator and his wife in the Peel sale, 1900.

Since the last quarter of the 19th century the chief feature in art sales has been the demand for works, particularly female portraits, by Reynolds, his contemporaries and successors. This may be traced to the South Kensington Exhibitions of 1867 and 1868 and the annual winter exhibitions at Burlington House, which revealed an unsuspected wealth and charm in the works of many English artists who had almost fallen into oblivion. A few of the most remarkable prices for such pictures may be quoted: Reynolds's "Lady Betty Delmé" (1894), 11,000 gns.; Romney's "The Ladies Spencer" (1896), 10,500 gns.;

Gainsborough's "Duchess of Devonshire" (1876), 10,100 gns. (for the history of its disappearance see GAINSBOROUGH, THOMAS), "Maria Walpole," 12,100 gns. (Duke of Cambridge's sale, 1904); Constable's "Stratford Mill" (1895), 8500 gns.; Hoppner's "Lady Waldegrave" (1906), 6000 gns.; Lawrence's "Childhood's Innocence" (1907), 8000 gns.; Raeburn's "Lady Raeburn" (1905), 8500 gns. Here may also be mentioned the 12,600 gns. paid for Turner's "Mortlake Terrace" in 1908 (Holland sale).

The "appreciation" of the modern continental schools, particularly the French, has been marked since 1880; of high prices paid may be mentioned Corot's "Danse des Amours" (1898), £7200; Rosa Bonheur's "Denizens of the Highlands" (1888), 5550 gns.; Jules Breton's "First Communion," £9100 in New York (1886); Meissonier's "Napoleon I. in the Campaign of Paris," 12¼ in. by 9¼ in. (1882), 5800 gns., and "The Sign Painter" (1891), 6450 gns. High prices are also fetched by pictures of Daubigny, Fortuny, Gallait, Gérôme, Troyon and Israëls. The most marked feature of late has been the demand for the 18th-century painters Watteau, Boucher, Fragonard, Pater and Lancret; thus "La Ronde Champêtre" of the last named brought £11,200 at the Say Sale in 1908, and Fragonard's "Le Reveil de Vénus" £5520 at the Sedelmeyer sale, 1907.

"Specialism" is the one important development in art collecting which has manifested itself since the middle of the 19th century. This accounts for and explains the high average quality of the Wellesley (1866), the Buccleuch (1888) and the Holford (1893) collections of drawings by the Old Masters; for the Sibson Wedgwood (1877), the Duc de Forli Dresden (1877), the Shuldham blue and white porcelain (1880), the Benson collection of antique coins (1909), and for the objects of art at the Massey-Mainwaring and Lewis-Hill sales of 1907. Very many other illustrations in nearly every department of art collecting might be quoted—the superb series of Marlborough gems (1875 and 1899) might be included in this category but for the fact that it was formed chiefly in the 18th century. The appreciation —commercially at all events—of mezzotint portraits and of portraits printed in colours, after masters of the early English school, was one of the most remarkable features in art sales during the last years of the 19th century. The shillings of fifty years before were then represented by pounds. The Fraser collection (December 4 to 6, 1900) realized about ten times the original outlay, the mezzotint of the "Sisters Frankland," after Hoppner, by W. Ward, selling for 290 guineas as against 10 guineas paid for it about thirty years previously. The H. A. Blyth sale (March 11 to 13, 1901, 346 lots, £21,717: 10s.) of mezzotint portraits was even more remarkable, and as a collection it was the choicest sold within recent times, the engravings being mostly in the first state. The record prices were numerous, and, in many cases, far surpassed the prices which Sir Joshua Reynolds received for the original pictures; *e.g.* the exceptionally fine example of the first state of the "Duchess of Rutland," after Reynolds, by V. Green, realized 1000 guineas, whereas the artist received only £150 for the painting itself. Even this unprecedented price for a mezzotint portrait was exceeded on the 30th of April 1901, when an example of the first published state of "Mrs Carnac," after Reynolds, by J. R. Smith, sold for 1160 guineas. At the Louis Huth sale (1905) 83 lots brought nearly £10,000, Reynolds's "Lady Bampfylde" by T. Watson, first state before letters, unpublished, fetching 1200 guineas. Such prices as these and many others which might be quoted are exceptional, but they were paid for objects of exceptional rarity or quality.

It is not necessary to pursue the chronicle of recent sales, which have become a feature of every season. It is worth mentioning, however, that the Holland sale, in June 1908, realized £138,118 (432 lots), a "record" sum for a collection of pictures mainly by modern artists; and that for the Rodolphe Kann collection (Paris) of pictures and objects of art, including 11 magnificent Rembrandts, Messrs Duveen paid £1,000,000 in 1907. In every direction there has been a tendency to increase prices for really great artistic pieces, even to a sensational extent. The competition has become acute, largely owing to American and German acquisitiveness. The demand for the finest works of art of all descriptions is much greater than the supply. As an illustration of the magnitude of the art sale business it may be mentioned that the "turnover" of one firm in London alone has occasionally exceeded £1,000,000 annually.

BIBLIOGRAPHY.—The chief compilations dealing with art sales in Great Britain are: G. Redford, *Art Sales* (1888); and W. Roberts, *Memorials of Christie's* (1897); whilst other books containing much important matter are W. Buchanan, *Memoirs of Painting*; *The Year's Art* (1880 and each succeeding year); F. S. Robinson, *The Connoisseur*; and L. Soullié, *Les Ventes de tableaux, dessins et objets d'art au XIXe siècle* (chiefly French).

ARTS AND CRAFTS, a comprehensive title for the arts of decorative design and handicraft—all those which, in association with the mother-craft of building (or architecture), go to the making of the house beautiful. Accounts of these will be found under separate headings. "Arts and crafts" are also associated with the movement generally understood as the English revival of decorative art, which began about 1875. The title itself only came into general use when the Arts and Crafts Exhibition Society was founded, and held its first exhibition at the New Gallery, London, in the autumn of 1888, since which time arts and crafts exhibitions have been common all over Great Britain. The idea of forming a society for the purpose of showing contemporary work in design and handicraft really arose out of a movement of revolt or protest against the exclusive view of art encouraged by the Royal Academy exhibitions, in which oil paintings in gilt frames claimed almost exclusive attention—sculpture, architecture and the arts of decorative design being relegated to quite subordinate positions. In 1886, out of a feeling of discontent among artists as to the inadequacy of the Royal Academy exhibitions, considered as representing the art of Great Britain, a demand arose for a national exhibition to include all the arts of design. One of the points of this demand was for the annual election of the hanging committee by the whole body of artists. After many meetings the group representing the arts and crafts (who belonged to a larger body of artists and craftsmen called the Art-workers' Guild, founded in 1884),[1] perceiving that the painters, especially the leading group of a school not hitherto well represented in the Academy exhibitions, only cherished the hope of forcing certain reforms on the Academy, and were by no means prepared to lose their chances of admission to its privileges, still less to run any risk in the establishment of a really comprehensive national exhibition of art, decided to organize an exhibition themselves in which artists and craftsmen might show their productions, so that contemporary work in decorative art should be displayed to the public on the same footing, and with the same advantages as had hitherto been monopolized by pictorial art. For many years previously there had been great activity in the study and revival in the practice of many of the neglected decorative handicrafts. Amateur societies and classes were in existence, like the Home Arts and Industries Association, which had established village classes in wood-carving, metal work, spinning and weaving, needlework, pottery and basket-work, and the public interest in handicraft was steadily growing. The machine production of an industrial century had laid its iron hands upon what had formerly been the exclusive province of the handicraftsman, who only lingered on in a few obscure trades and in forgotten corners of England for the most part. The ideal of mechanical perfection dominated British workmen, and the factory system, first by extreme division of labour, and then by the further specialization of the workman under machine production, left no room for individual artistic feeling among craftsmen trained and working under such conditions. The demand of the world-market ruled the character and quality of production, and to the few who would seek some humanity, simplicity of construction or artistic feeling in their domestic decorations and furniture, the only choice was that of the tradesman or salesman, or a plunge into costly and doubtful experiments in original design. From the 'forties onward there had

[1] Whose members, comprehending as they do the principal living designers, architects, painters and craftsmen of all kinds, have played no inconsiderable part in the English revival.

been much research and study of medieval art in England; there had been many able designers, architects and antiquaries, such as the Pugins and Henry Shaw (1800–1873) and later William Burges (1827–1881), William Butterfield (1814–1900) and G. E. Street and others. The school of pre-Raphaelite painters, by their careful and thorough methods, and their sympathy with medieval design, were among the first to turn attention to beauty of design, colour and significance in the accessories of daily life, and artists like D. G. Rossetti, Ford Madox Brown, and W. Holman Hunt themselves designed and painted furniture. The most successful and most practical effort indeed towards the revival of sounder ideas of construction and workmanship may be said to have arisen out of the work of this group of artists, and may be traced to the workshop of William Morris and his associates in Queen Square, London. William Morris, whose name covers so large a field of artistic as well as literary and social work, came well equipped to his task of raising the arts of design and handicraft, of changing the taste of his countrymen from the corrupt and vulgar ostentation of the Second Empire, and its cheap imitations, which prevailed in the 'fifties and 'sixties, and of winning them back, for a time at least, to the massive simplicity of plain oak furniture, or the delicate beauty of inlays of choice woods, or the charm of painted work, the richness and frank colour of formal floral and heraldic pattern in silk textiles and wall-hangings and carpets, the gaiety and freshness of printed cotton, or the romantic splendour of arras tapestry. Both William Morris and his artistic comrade and life-long friend, Edward Burne-Jones, were no doubt much influenced at the outset by the imaginative insight, the passionate artistic feeling, and the love of medieval romance and colour of Dante Gabriel Rossetti, who remains so remarkable a figure in the great artistic and poetic revival of the latter half of the 19th century. To William Morris himself, in his artistic career, it was no small advantage to gain the ear of the English public first by his poetry. His verse-craft helped his handicraft, but both lived side by side. The secret of Morris's great influence in the revival was no doubt to be attributed to his way of personally mastering the working details and handling of each craft he took up in turn, as well as to his power of inspiring his helpers and followers. He was painter, designer, scribe, illuminator, wood-engraver, dyer, weaver and finally printer and papermaker, and having mastered these crafts he could effectively direct and criticize the work of others. His own work and that of Burne-Jones were well known to the public, and in high favour long before the Arts and Crafts Exhibition Society was formed, and though largely helped and inspired by the work of these two artists, the aims and objects of the society rather represented those of a younger generation, and were in some measure a fresh development both of the social and the artistic ideas which were represented by Ruskin, Rossetti and Morris, though the society includes men of different schools. Other sources of influence might be named, such as the work of Norman Shaw and Philip Webb in architecture and decoration, of Lewis Day in surface pattern, and William de Morgan in pottery. The demand for the acknowledgment of the personality of each responsible craftsman in a co-operative work was new, and it had direct bearing upon the social and economic conditions of artistic production. The principle, too, of regarding the material, object, method and purpose of a work as essential conditions of its artistic expression, the form and character of which must always be controlled by such conditions, had never before been so emphatically stated, though it practically endorsed the somewhat vague aspirations current for the unity of beauty with utility. Again, a very notable return to extreme simplicity of design in furniture and surface decoration may be remarked; and a certain reserve in the use of colour and ornament, and a love of abstract forms in decoration generally, which are characteristic of later taste. Not less remarkable has been the new development in the design and workmanship of jewelry, gold- and silversmiths' work, and enamels, with which the names of Alexander Fisher, Henry Wilson, Nelson Dawson and C. R. Ashbee are associated. Among the arts and crafts of design which have blossomed into new life in recent years—and there is hardly one which has not been touched by the new spirit—book-binding must be named as having attained a fresh and tasteful development through the work of Mr Cobden-Sanderson and his pupils. The art and craft of the needle also must not be forgotten, and its progress is a good criterion of taste in design, choice of colour and treatment. The work of Mrs Morris, of Miss Burden (sometime instructress at the Royal School of Art Needlework, which has carried on its work from 1875), of Miss May Morris, of Miss Una Taylor, of Miss Buckle, of Mrs Walter Crane, of Mrs Newbery, besides many other skilled needlewomen, has been frequently exhibited. Good work is often seen in the national competition works of the students of the English art schools, shown at South Kensington in July. The increase of late years in these exhibitions of designs worked out in the actual material for which they were intended is very remarkable, and is an evidence of the spread of the arts and crafts movement (fostered no doubt by the increase of technical schools, especially of the type of the Central School of Arts and Crafts under the Technical Education Board of the London County Council), of which it may be said that if it has not turned all British craftsmen into artists or all British artists into craftsmen, it had done not a little to expand and socialize the idea of art, and (perhaps it is not too much to say) has made the tasteful English house with its furniture and decorations a model for the civilized world. (W. Cr.)

ART SOCIETIES. In banding themselves into societies and associations artists have always been especially remarkable. The fundamental motive of such leaguing together is apparent, for, by the establishment of societies, it becomes possible for the working members of these to hold exhibitions and thereby to obtain some compensation or reward for their labours. With the growth of artistic practice and public interest, however, art societies have been instituted where this primary object is either absent or is allied to others of more general scope. The furtherance of a cult and the specializing of work have also given rise to many new associations in Great Britain, besides the Royal Academy (see Academy, Royal). At the outset, therefore, it will be well to mention the leading art societies thus described. The (now Royal) Society of Painters in Water Colours, founded in 1804, and the (now Royal) Society of British Artists (1823), are typical of those societies which exist merely for purposes of holding exhibitions and conferring diplomas of membership. The British Institution (for the encouragement of British artists) was started in 1806 on a plan formed by Sir Thomas Bernard; and in the gallery, erected by Alderman Boydell to exhibit the paintings executed for his edition of Shakespeare, were from time to time exhibited pictures by the old masters, deceased British artists and others, till 1867, when the lease of the premises expired. A fund of £16,200, then in the hands of trustees, had accumulated to £24,610 in 1884. The Artists' Society, formed in 1830, has for its object the providing of facilities to enable its members to perfect themselves in their art. To this end there is a good library of works on art, and abundant opportunities are afforded for general study from the life. In the furtherance of a cult the Japan Society, devoted to the encouragement of the study of the arts and industries of Japan, is a typical example; and the Society of Mezzotint Engravers is representative of those bodies formed in the interests of particular groups of workers. One of the remarkable features in the history of art in Great Britain has been the rapid increase of the artistic rank and file. Taking the number of exhibitors at the principal London and provincial exhibitions, it is found that in the period 1885–1900 the ranks were doubled. At the end of the 19th century it was estimated that there were quite 7000 practising artists. Coincident with this astonishing development there has been a corresponding addition of new art societies and the enlargement of older bodies. For instance, the membership of the Royal Society of British Artists advanced in the period mentioned from 80 to 150. Similar extensions can be noted in other societies, or in such a case as that of the Royal Institute of Painters in Water Colours, where the membership is limited to 100,

it is to be noticed that more space is given to the works of outsiders. But the expansion of older exhibiting societies has not proved sufficient. Portrait painters, pastellists, designers, miniaturists and women artists have felt the necessity of forming separate coteries. Interesting though these movements from within may be, the growth of societies originating in the spirit of altruism associated with such names as Ruskin and Kyrle is equally instructive. Nearly all these are the products of the last quarter of the 19th century, and include the Sunday Society, which in 1896 secured the Sunday opening of the national museums and galleries in the metropolis.

The specializing of study and work has also given rise to much artistic endeavour. For a long time archaeology—British and Egyptian—claimed almost exclusive attention. Latterly the arts of India and Japan have engaged much notice, and societies have been organized to further their study. Finally, bands of workers in particular branches of art have felt the need of clubbing together in order to protect their special interests. A slight suspicion of trade-unionism is attached to some of these; but on the whole the establishment of such bodies as the Society of Illustrators, the Society of Designers, and the Society of Mezzotint Engravers has been with a view to advancing the public knowledge of the merits of these branches of artistic enterprise.

Exhibiting Societies.—(*a*) Old Established.—These in London are: The Royal Academy, the Royal Water Colour Society, the Royal Institute of Painters in Water Colours, the Society of Oil Painters, and the Royal Society of British Artists. In the provinces, the Birmingham Royal Society of Artists has been in existence since 1825, and has a life academy with professors attached. (*b*) Modern.—In this category are many which reflect the new spirit which came into artistic life in the last quarter of the 19th century. The New English Art Club, founded in 1885 as a protest against academic art, achieves its purpose by exhibition only. The International Society of Painters and Engravers, again, represents the wider ideas of the 20th century. The Royal Society of Painter-Etchers and Engravers, consisting of fellows and associates, not exceeding 150 in all, conserves the interests of a numerous body of workers, and, in addition to holding exhibitions, confers diplomas (R.E. and A.R.E.) on the exhibitors of meritorious etchings or engravings. The Society of Women Artists (formerly the Society of Lady Artists) is wholly devoted to the display of works by female artists, and in 1891 the Society of Portrait Painters was formed to carry out the object conveyed in its title. Two associations advance the art of the miniature-painter, and the Pastel Society, formed in 1898, holds displays of members' work at the Royal Institute Galleries. In Scotland there is the Royal Scottish Academy. The Royal Scottish Society of Painters in Water Colours (Glasgow) grants the title R.S.W. to its members, and the Society of Scottish Artists (Edinburgh), founded in 1891, has a membership of nearly 500 young artists. Other exhibiting societies which call for mention are: The Yorkshire Union of Artists (Leeds), which consolidates many local societies; the Nottingham Society of Artists, which also encourages drawing from the living model; and the Liverpool Sketching Club, founded in 1870, which holds an annual exhibition.

Societies of Instruction and Popular Encouragement.—It is under this head that the chief evidence of the modern art revival will be found. First it should be noted that there are very few societies designed for the artistic improvement of artists. The Artists' Society has already been mentioned; and the Art Workers' Guild, which meets at Clifford's Inn Hall, provides meetings, from which the public is excluded, where profitable discussions take place on questions of craft and design. But, as a rule, the art society, of which only artists are members, is organized for exhibition purposes or for the protection of interests. With regard to those societies of popular and educational intention the old Society of Arts in the Adelphi, founded in 1754, enjoys a good record. Numerous lectures on art subjects have from time to time been given, and in 1887 a scheme was devised by which awards are made to student-workers in design. The Society for the Encouragement of the Fine Arts (Conduit Street) has also laboured since its foundation in 1858 to increase a technical knowledge, its members holding conversazioni at various picture galleries. The Artists' and Amateurs' Conversazione, instituted in 1831, which used to meet at the Piccadilly Galleries and is now defunct, carried out a similar plan. Two other societies, now obsolete, should be mentioned whose methods were directly educational. The Arundel Society, which for many years promoted the knowledge of art by copying and publishing important works of ancient masters, issued to its members on payment of annual subscriptions, was eventually wound up on the last day of 1897. The Arundel Club, founded in 1904, continues the aim, but with a wider scope, reproducing works of art rendered somewhat inaccessible by being in private collections. The International Chalcographical Society, formed for the study of the early history of engraving, also did useful work. Another association of painters, sculptors, architects and engravers, the Graphic Society, ceased on the 29th of October 1890. This was one of the most interesting of societies, rare works of art being exhibited and discussed at its meetings. A very active educational body, originated in 1888, namely the Royal Drawing Society, has for its definite object the teaching of drawing as a means of education. The methods of instruction are based on the facts that very young children try to draw before they can write, and that they have very keen perception and retentive memory. The society aims, therefore, at using drawing as a means of developing these innate characteristics of the young, and already nearly 300 important schools follow out its system. Lord Leighton, Sir John Millais, and Sir Edward Burne-Jones took an active part in the society's labours. The Art for Schools Association, founded in 1883, has also done steady work in endeavouring to provide schools with works of art. These are chiefly reproductions of standard works of art or of historical and natural subjects. The wave of enthusiasm aroused by Mr Ruskin's teachings caused Societies of the Rose to be founded in London, Manchester, Sheffield, Birmingham, Aberdeen and Glasgow; but some of these eventually ceased active work, to be revived again, however, by the Ruskin Union, formed in the year of the great writer's death (1900). Most of these societies were formed in 1879; but it should not be forgotten that two years earlier the Kyrle Society was started with the object of bringing the refining and cheering influences of natural and artistic beauty to the homes of the people. Under the presidency of Earl Brownlow, the Home Arts and Industries Association continues a work which was started in 1884, and anticipated much of the present system of technical education. Voluntary teachers organize classes for working people, at which a practical knowledge of art handiwork is taught. Training classes for voluntary teachers are held at the studios at the Albert Hall, as well as an annual exhibition. An interesting type of society has been established in Bolton, Lancashire. Under the title of an Arts Guild the members, numbering over 200, devote themselves to the advancement of taste in municipal improvements.

Societies of Special Study, Practice and Protection.—Under this head should be placed those associations which affect a cult, or are composed of particular workers, or which protect public or private interests. Perhaps the chief of the first kind is the Japan Society, which, since its inception in 1892, has been joined by over 1350 members interested in matters relating to Japanese art and industries. The Dürer Society, formed in 1897, has for its main object the reproduction of works by Albrecht Dürer, and his German and Italian contemporaries. The Vasari Society, founded in 1905, works in harmony with the Arundel Club and the Dürer Society, reproducing drawings by the Old Masters. In this category of special study may also be placed the Society for the Encouragement and Preservation of Indian Art, the Egypt Exploration Fund, and the Society for the Promotion of Hellenic Studies. Of the societies of special practice it has already been noticed that some are purely exhibiting associations, such as the Portrait Painters, the Pastel Society, and the two miniature bodies. The formation of the Society of Mezzotint

Engravers in 1898 is an example of the leaguing together of particular workers to call attention to their interests. Original and translator engravers, together with collectors and connoisseurs, comprise the membership. The decaying art of wood engraving is also fostered by the International Society of Wood Engravers, and the Society of Designers, founded in 1896, safeguards the interests of professional designers for applied art, without holding exhibitions. Special practice and protection are also considered by the Society of Illustrators, composed of artists who work in black and white for the illustrated press. This society was inaugurated in 1894, and fifteen of the members of the committee must be active workers in illustration. As an instance of the tendency of art workers to combine, the Society of Art Masters is a good illustration. This is an association of teachers of art schools, controlled by the art branch of the Board of Education, and has a membership of over 300. Good work of another kind occupies the National Trust for Places of Historic Interest or Natural Beauty. The council of the Trust includes representatives of such bodies as the National Gallery, the Royal Academy, the Royal Society of Painters in Water Colours, the Society of Antiquaries, the Royal Institute of British Architects, the Universities, Kyrle Society, Society for the Protection of Ancient Buildings and the Selborne Society.

FOREIGN ART SOCIETIES.—The following are brief particulars of the chief art societies elsewhere than in Great Britain:—

AUSTRIA.—Vienna, *Vereinigung bildender Künstler Österreichs* (Society of Austrian Painters) and the *Wiener Künstlergenossenschaft* (Association of Viennese Artists).

BELGIUM.—Brussels, *Société des beaux-arts*, the *Libre Esthétique*, *Société des aquarellistes et pastellistes*, *Société royale belge des aquarellistes*, and numerous private societies (*cercles*) in Brussels, Antwerp, Liége, Ghent and other cities.

FRANCE.—Paris, the *Société des artistes français* (The Salon), *Société nationale des beaux-arts* (The New Salon), *Société des aquarellistes*. Exhibiting societies are the *Société des artistes indépendants*, *Société des orientalistes*, and *Salon des pastellistes*.

GERMANY.—The small local societies are affiliated to one large parent body, the *Deutsche Künstlergenossenschaft*, in Berlin under the presidency of Anton von Werner. The *Deutsche Illustratorenverband* watches over the interests of illustrators and designers. In Munich there are two bodies—the *Künstlergenossenschaft* (old society of artists), holding its exhibitions in the Glaspalast, and the *Verein bildender Künstler*, the Secessionists.

ITALY.—Four exhibiting societies: Rome, *Società in Arte Libertas*, *Scuola degli Aquarellisti*; Milan, *Famiglia Artistica*, *Società degli Artiste*; Florence, *Circolo Artistico*; Naples, *Instituti di Belli Arti*.

PORTUGAL.—*Sociedade promotora das Bellas-Artes* and *Gremio Artistico*.

RUSSIA.—There is no exclusively art society of importance, but there is at St Petersburg the *Société littéraire et artistique*.

SPAIN.—Madrid, *L'Association des artistes espagnols*.

SWEDEN.—Stockholm, *Svenska Konstuareruas Forening*.

SWITZERLAND.—Berne, *La Société des peintres et sculpteurs suisses*.

UNITED STATES.—New York, National Academy of Design, American Water Color Society, and National Sculpture Society.

(A. C. R. C.)

ART TEACHING. It is the tendency of all departments of the human mind to outgrow their original limits. Traditions of teaching are long-lived, especially in art, and new ideas only slowly displace the old, so that art teaching as a whole is seldom abreast of the ideas and practice of the more advanced artists. The old academic system adapted to the methods and aims in art in the 18th century, which has been carried on in the principal art schools of Great Britain with but slight changes of method, consisted chiefly of a course of drawing from casts of antique statues in outline, and in light and shade without backgrounds, of anatomical drawings, perspective, and drawing and painting from the living model. Such a training seems to be more or less a response to Lessing's definition of painting as "the imitation of solid bodies upon a plane surface." It seems to have been influenced more by the sculptor's art than any other. Indeed, the academic teaching from the time of the Italian Renaissance was no doubt principally derived from the study of antique sculpture; the proportions of the figure, the style, pose, and sentiment being all taken from Graeco-Roman and Roman sculptures, discovered so abundantly in Italy from the 16th century onwards. As British ideas of art were principally derived from Italy, British academics endeavoured to follow the methods of teaching in vogue there in later times, and so the art student in Great Britain has had his intention and efforts directed almost exclusively to the representations of the abstract human form in abstract relief. Traditions in art, however, may sometimes prove helpful and beneficial, and preservative of beauty and character, as in the case of certain decorative and constructive arts and handicrafts in common use, such as those of the rural waggon-maker and wheelwright, and horse-harness maker.

Some schools of painting, sculpture and architecture have preserved fine and noble traditions which yet allowed for individuality. Such traditions may be said to have been characteristic of the art of the middle ages. It often happens, too, when many streams of artistic influence meet, there may be a certain domination or ascendancy of the traditions of one art over the others, which is injurious in its effects on those arts and diverts them from their true path. The domination of individualistic painting and sculpture over the arts of design during the last century or two is a case in point.

With the awakening of interest in industrial art—sharply separated by pedantic classification from fine art—which began in England about the middle of the 19th century, schools of design were established which included more varied studies. Even as early as 1836 a government grant was made towards the opening of public galleries and the establishment of a normal school of design with a museum and lectures, and in 1837 the first school of design was opened at Somerset House. In 1840 grants were made to establish schools of the same kind in provincial towns, such as Manchester, Birmingham, Glasgow, Leeds and Paisley. The names of G. Wallis in 1847, and Ambrose Poynter in 1850, are associated with schemes of art instruction adopted in the government art schools, and the year 1851, the year of the Great Exhibition, was also marked by the first public exhibition of students' works, and the first institution of prizes and scholarships. In 1852 "the Department of Practical Art" was constituted, and a museum of objects collected at Marlborough House which afterwards formed the nucleus of the future museum at South Kensington. In 1853 "the Department of Science and Art" was established, and in 1857, under the auspices of Henry Cole, the offices of the department and the National Art Training School were removed from Marlborough House to South Kensington. Classes for instruction in various crafts had been carried on both at Somerset House and Marlborough House, and the whole object of the government schools of design was to give an artistic training to the designer and craftsman, so that he could carry back to his trade or craft improved taste and skill. The schools, however, became largely filled by students of another type—leisured amateurs who sought to acquire some artistic accomplishment, and even in the case of genuine designers and craftsmen who developed pictorial skill in their studies, the attraction and superior social distinction and possibility of superior commercial value accruing to the career of a painter of easel pictures diverted the schools from their original purpose.

For some time after the removal to South Kensington, during the progress of the new buildings, and under the direction of Godfrey Sykes and F. W. Moody, practical decorative work both in modelling and painting was carried out in the National Art Training School; but on the completion of these works, the school relapsed into a more or less academic school on the ordinary lines, and was regarded chiefly as a school for the training of art teachers and masters who were required to pass through certain stereotyped courses and execute a certain series of drawings in order to obtain their certificates. Thus model-drawing, freehand outline, plant-drawing in outline, outline from the cast, light and shade from the cast, drawing of the antique figure, still life, anatomical drawings, drawing and painting from the life, ornamental design, historic studies of ornament, perspective and geometry, were all taken up in a cut-and-dried way, as isolated studies, and with a view solely to obtaining the certificate or passing an examination. This theoretic kind of training, though still in force, and though it

enabled the department to turn out certificated teachers for the schools of the country of a certain standard, and to give to students a general theoretic idea of art, has been found wanting, since, in practice, when the student in design leaves his school and desires to take up practical work as a designer or craftsman, he requires *special* knowledge, and specialized skill in design for his work to be of use; and though he may be able to impart to others what he himself has laboriously acquired, the theoretic and general character of his training proves of little or no use, face to face with the ever shifting and changing demands of the modern manufacturer and the modern market.

A growing conviction of the inadequacy of the schools of the Science and Art Department (now the Board of Education), considered as training grounds for practical designers and craftsmen, led to the establishment of new technical schools in the principal towns of Great Britain. The circumstance of certain large sums, diverted from their original purpose of compensation to brewers, being available for educational purposes and at the disposal of the county councils and municipal bodies, provided the means for the building and equipment of these new technical schools, which in many cases are under the same roof as the art school in the provincial towns, and, since the Education Act of 1902, are generally rate-supported. The art schools formerly managed by private committees and supported by private donors, assisted by the government grants, are now, in the principal industrial towns of Great Britain, taken over by the municipality. Birmingham is singularly well organized in this respect, and its art school has long held a leading position. The school is well housed in a new building with class-rooms with every appliance, not only for the drawing, designing and modelling side, but also for the practice of artistic handicrafts such as metal repoussé, enamelling, wood-carving, embroidery, &c. The municipality have also established a jewelry school, so as to associate the practical study of art with local industry. Manchester and other cities are also equipped with well-organized art schools.

The important change involved in the incorporation of the Science and Art Department with the Board of Education also led to a reorganization of the Royal College of Art. A special council of advice on art matters was appointed, consisting of representatives of painting, sculpture, architecture and design, who deal with the Royal College of Art, and appoint the professors who control the teaching in the classes for architecture, design and handicraft, decorative painting and sculpture, modelling and carving. The council decide upon the curriculum, and examine and criticize the work of the college from time to time. They also advise the board in regard to the syllabus issued to the art schools of the country, and act as referees in regard to purchases for the museum.

Of other institutions for the teaching of art, the following may be named: The Royal Drawing Society of Great Britain and Ireland, which was formed principally to promote the teaching of drawing in schools as a means of education. The system therein adopted differs from the ordinary drawing courses, and favours the use of the brush. Brushwork has generally been adopted for elementary work, too, by London County Council teachers, drawing being now a compulsory subject. Remarkable results have been obtained by the Alma Road Council schools in the teaching of boys from eight to twelve by giving them spaces to fill with given forms—leaf shapes—from which patterns are constructed to fill the spaces, brush and water-colour being the means employed. At the Royal Female School of Art in Queen Square, London, classes in drawing and painting from life are held, and decorative design is also studied. There are also the Royal School of Art Needlework and the School of Art Wood-carving, all aided by the London County Council. The City and Guilds of London Institute has two departments for what is termed "applied" art, one at the South London School of Technical Art, and the other at the Art Department in the Technical College, Finsbury. The Slade School of Drawing, Painting and Sculpture, University College, Gower Street, confines itself to drawing and painting from the antique and life, and exercise in pictorial composition. There are also lectures on anatomy and perspective. The Slade professorships at Oxford and Cambridge universities are concerned with the teaching and literature of art, but they do not concern themselves with the practice. There are also, in addition to the schools of art named and those in connexion with the Board of Education and the London County Council in the various districts of London, many and various private clubs and schools, such as the Langham and "Heatherley's," chiefly concerned in encouraging drawing and painting from the life, and for the study of art from the pictorial point of view, or for the preparation of candidates for the Royal Academy or other schools. The polytechnics and technical institutes also provide instruction in a great variety of artistic crafts.

A general survey, therefore, of the various institutions which are established for the teaching of art in Great Britain gives the impression that the study of art is not neglected, although, perhaps, further inquiry might show that, compared with the great educational establishments, the proportion is not excessive. Now that the Education Act 1902 has given the county councils control of elementary and secondary education and charged them with the task of promoting the co-ordination of all forms of education in consultation with the Board of Education, it is probable that an elementary scholar who shows artistic ability will be enabled to pass on from the elementary classes in one school to the higher art and technical schools, secondary and advanced, without retracing his steps, thus escaping the depression of going over old ground.

The general movement of revival of interest in the arts of decorative design and the allied handicrafts, with the desire to re-establish their influence in art-teaching, has been due to many causes, among which the work of the Arts and Crafts Exhibition Society may count as important. From the leading members of this body the London County Council Technical Educational Board, when it was face to face with the problem of organizing its new schools and its technical classes, sought advice and aid. Success has attended their schools, especially the Central School of Arts and Crafts at Morley Hall, Regent Street. The object of the school is to provide the craftsman in the various branches of decorative design with such means of improving his taste and skill as the workshop does not afford. It does not concern itself with the amateur or with theoretic drawing. The main difference in principle adopted in this school in the teaching of design is the absence of teaching design *apart from handicraft*. It is considered that a craftsman thoroughly acquainted with the natural capacities of his material and strictly understanding the conditions of his work, would be able, if he had any feeling or invention, to design appropriately in that material, and no designing can be good apart from a knowledge of the material in which it is intended to be carried out. It should be remembered, too, that graphic skill in representing the appearances of natural objects is one sort of skill, and the executive skill of the craftsman in working out his design, say in wood or metal, is quite another. It follows that the works of drawing or design made by the craftsman would be of quite a different character from a pictorial drawing, and might be quite simple and abstract, while clear and accurate. The training for the pictorial artist and for the craftsman would, therefore, naturally be different.

The character of the art-teaching adopted in any country must of course depend upon the dominant conception of art and its function and purpose. If we regard it as an idle accomplishment for the leisured few, its methods will be amateurish and superficial. If we regard art as an important factor in education, as a language of the intelligence, as an indispensable companion to literature, we shall favour systematic study and a training in the power of direct expression by means of line. We shall value the symbolic drawing of early civilizations like the Egyptian, and symbolic art generally, and in the history of decorative art we shall find the true accompaniment and illustration of human history itself. From this point of view we shall value the acquisition of the power of drawing for the purpose of presenting and explaining the facts and forms of nature. Drawing will be the

most direct means at the command of the teacher to explain, to expound, to demonstrate where mere words are not sufficiently definite or explicit. Drawing in this sense is taking a more important place in education, especially in primary education, though there is no need for it to stop there, and one feels it may be destined to take a more important position both as a training for the eye and hand and an aid to the teacher. Then, again, we may regard art more from its social aspect as an essential accompaniment of human life, not only for its illustrative and depicting powers, but also and no less for its pleasure-giving properties, its power of awakening and stimulating the observation and sympathy with the moods of nature, its power of touching the emotions, and above all of appealing to our sense of beauty. We shall regard the study of art from this point of view as the greatest civilizer, the most permeating of social and human forces. Such ideas as these, shared no doubt by all who take pleasure and interest in art, or feel it to be an important element in their lives, are crossed and often obscured by a multitude of mundane considerations, and it is probably out of the struggle for ascendancy between these that our systems of art teaching are evolved. There is the demand of the right to live on the part of the artist and the teacher of art. There is the demand on the part of the manufacturer and salesman for such art as will help him to dispose of his goods. In the present commercial rivalry between nations this latter demand is brought into prominent relief, and art is apt to be made a minister, or perhaps a slave to the market. These are but accidental relationships with art. All who care for art value it as a means of expression, and for the pleasure and beauty it infuses into all it touches, or as essential and inseparable from life itself. Seeing then the importance of art from any point of view, individual, social, commercial, intellectual, emotional, economic, it should be important to us in our systems of art-teaching not to lose sight of the end in arranging the means—not to allow our teaching to be dominated by either dilettantism or commercialism, neither to be feeble for want of technical skill, nor to sacrifice everything to technique. The true object of art-teaching is very much like that of all education—to inform the mind, while you give skill to the hand—not to impose certain rigid rules, or fixed recipes and methods of work, but while giving instruction in definite methods and the use of materials, to allow for the individual development of the student and enable him to acquire the power to express himself through different media without forgetting the grammar and alphabet of design. Practice may vary, but principles remain, and there is a certain logic in art, as well as in reasoning. All art is conditioned in the mode of its expression by its material, and even the most individual kind of art has a convention of its own by the very necessities and means of its existence. Methods of expression, conventions alter as each artist, each age seeks some new interpretation of nature and the imagination—the well-springs of artistic life, and from these reviving streams continually flow new harmonies, new inventions and recombinations, taking form and colour according to the temperaments which give them birth. (W. Cr.)

ARTUSI, GIOVANNI MARIA, Italian composer and musical theorist, was born in Bologna, and died on the 18th of August 1613. He was *canonico regulare* at the church of San Salvatore in his native city. He is chiefly famous in the history of music for his attacks upon Monteverde (*q.v.*) embodied in his *L'Artusi overo d. imp.* (1600). For an exhaustive explanation and a translation of excerpts from these the studies of Dr G. Vogel and O. Riemann should be consulted. These will be found in the *Vierteljahrsschrift für Musikwissenschaft*, Leipzig, vol. 3, pp. 326, 380 and 426.

ARU ISLANDS (Dutch *Aroe*), a group in the residency of Amboyna, Dutch East Indies; between 5° 18′ and 7° 5′ S., and 134° and 135° E.; the member nearest to the south-west coast of New Guinea lying about 70 m. from it. The larger islands (Wokan, Kobrur, Maikor and Trangan), and certain of the lesser ones, are regarded by the Malays as one land mass which they call *tana besar* (" great land "). This is justified inasmuch as its parts are only isolated by narrow creeks of curious form, having the character of rivers. The smaller islands number some eighty; the total land area is 3244 sq. m.; and the population about 22,000. The islands are low, but it is only on the coast that the ground is swampy. The principal formation is coralline limestone; the eastern coast is defended by coral reefs, and the neighbouring sea (extending as far as New Guinea, and thus demonstrating a physical connexion with that land) is shallow, and abounds in coral in full growth. A large part of the surface is covered with virgin forest, consisting of screw-pines, palm trees, tree ferns, canariums, &c. The fauna is altogether Papuan. The natives are also Papuans, but of mixed blood. They are divided into two confederations, the Uli-luna and the Uli-sawa, which are hostile to each other. The houses are remarkable as being built on piles sunk in the solid rock and having two rooms, the one surrounding the other. The people are in manners complete savages. The natives are governed by rajas (*orang kajas*), the Dutch government being represented by a *posthouder*. In the interior is said to exist a tribe—the Korongocis—with white skins and fair hair, but it has never been seen by travellers. A few villages are nominally Christian, and the Malays have introduced Mahommedanism, but most of the natives have no religion. Dobbo, on a small western island, is the chief place; its resident population is reinforced annually, at the time of the west monsoon, by traders from that quarter, who deal in the tripang, pearl shell, tortoise-shell, and other produce of the islands.

ARUNDEL, EARLDOM OF. This historic dignity, the premier earldom of England, is popularly but erroneously supposed to be annexed to the possession of Arundel Castle. Norman earls were earls of counties, though sometimes styled from their chief residence or from the county town, and Mr J.H.Round has shown that the earldom of " Arundel " was really that of Sussex. Its origin was the grant by Henry I. to his second wife, in dower, of the forfeited " honour " of Arundel, of which the castle was the head, and which comprised a large portion of Sussex. After his death she married William " de Albini " (*i.e.* d'Aubigny), who from about the year 1141 is variously styled earl of Sussex, of Chichester, or of Arundel, or even Earl William " de Albini." His first known appearance as earl is at Christmas 1141, and it has been ascertained that, after acquiring the castle by marriage, he had not thereby become an earl. Henry II., on his accession, " gave " him the castle and honour of Arundel, in fee, together with " the third penny of the pleas of Sussex, of which he is earl." His male line of heirs became extinct on the death of Hugh " de Albini," earl of Arundel, in 1243, who had four sisters and co-heirs. In the partition of his estates, the castle and honour of Arundel were assigned to his second sister's son, John Fitzalan of a Breton house, from which sprang also the royal house of Stuart. It is proved, however, by record evidence, that neither John nor his son and successor were ever earls; but from about the end of 1289, when his grandson Richard came of age, he is styled earl of Arundel. Richard's son Edmund was forfeited and beheaded in 1326, and Arundel was out of possession of the family till 1331, when his son was restored, and regained the castle and also the earldom by separate grants. Both were again lost in 1397 on his son being beheaded and attainted. But the latter's son was restored to both the earldom and the estates by Henry IV. in 1400. He died without issue in 1415.

The castle and estates now passed to the late earl's cousin and heir-male under a family entail, but the representation in blood of the late earl passed to his sisters and co-heirs, of whom the eldest had married Thomas Mowbray, duke of Norfolk. The descent of the earldom remained in doubt, till the heir-male's son and heir successfully claimed it in 1433, in virtue of his tenure of the castle, alleging that it was " a dignity or name united and annexed to the castle and lordship of Arundel for time whereof memory of man was not to the contrary." His claim was opposed on behalf of the Mowbrays, and the allegation on which it was based is discussed and refuted at great length in the *Lords' Reports on the Dignity of a Peer* (i. 404-429). In the descendants of his brother the earldom remained vested

till 1580, when the last Fitzalan earl died, leaving as his sole heir his daughter's son Philip Howard, whose father Thomas, duke of Norfolk, had been beheaded and attainted in 1572.

Philip, who was through his father senior representative of the earls of Arundel down to 1415, and through his mother sole representative of the subsequent earls, was summoned to parliament as earl in January 1581, but was attainted in 1589. His son Thomas was restored to the earldom and certain other honours in 1604, and, in 1627, obtained an act of parliament "concerning the title, name and dignity of Earl of Arundel, and for the annexing of the Castle, Honour, Manor and Lordship of Arundel . . . with the titles and dignities of the Baronies of Fitzalan, Clun and Oswaldestre, and Maltravers, . . . to the same title, name and dignity of Earl of Arundel." This act, which was based on the earl's allegation that the title had been "invariably used and enjoyed" by the owners of the castle, "and by reason of the said inheritance and seisin," has been much discussed, especially in the *Lords' Reports* (i. 430-434). There is no doubt that the earl's object was to entail the earldom and the castle strictly on a certain line of heirs, and this was effected by elaborate remainders (passing over the Howards, earls of Suffolk). It is under this act of parliament that the earldom has been held ever since, and that it passed with the castle in 1777 to the heir-male of the Howards, although the representation in blood then passed to heirs general. Thus the castle and the earldom cannot be alienated from the line of heirs on whom it is entailed by the act of 1627; while the heirship in blood of the earlier earls (to 1415) is vested in Lords Mowbray and Petre and the Baroness Berkeley, and that of the later earls (to 1777) in Lords Mowbray and Petre.

The precedence of the earldom was challenged in 1446 by Thomas Courtenay, earl of Devon, owing to the question as to its descent spoken of above, but the king in council confirmed to the earl the precedence of his ancestors "by reason of the Castle, Honour and Lordship of Arundel." In the act of 1627 the "places" and "pre-eminences" belonging to the earldom were secured to it. It would appear, however, that the decision of the dispute with the earl of Devon in 1446 restricts that precedency to such as the earl's ancestors had enjoyed, if indeed it goes farther than to guarantee his precedence over the earl of Devon. But as there is no other existing earldom older than that of Shrewsbury (1442), the present position of Arundel as the premier earldom is beyond dispute.

See *Lords' Reports on the Dignity of a Peer*; Dugdale's *Baronage*; Tierney's *History of Arundel*; G. E. C[okayne]'s *Complete Peerage*; Round's *Geoffrey de Mandeville*; Pike's *Constitutional History of the House of Lords*. (J. H. R.)

ARUNDEL, EARLS OF. According to Cokayne (*Complete Peerage*, i. p. 138, note *a*) there is an old Sussex tradition to the effect that

> "Since William rose and Harold fell
> There have been earls of Arundel."

This, he adds, "is the case if for 'of' we read 'at.'" The questions involved in this distinction are discussed in the preceding article on the earldom of Arundel, now held by the duke of Norfolk. The present article is confined to a biographical sketch of the more conspicuous earls of Arundel, first in the Fitzalan line, and then in the Howard line.

Richard Fitzalan (1267–1302), earl of Arundel, was a son of John, lord of Arundel (1246–1272), and a grandson of another John, lord of Arundel, Clun and Oswaldestre (Oswestry), who took a prominent, if somewhat wavering, part in the troubles during the reign of Henry III., and who died in November 1267. Richard, who was called earl of Arundel about 1289, fought for Edward I. in France and in Scotland, and died on the 9th of March 1302.

He was succeeded by his son, Edmund (1285–1326), who married Alice, sister of John, earl de Warenne. A bitter enemy of Piers Gaveston, Arundel was one of the ordainers appointed in 1310; he declined to march with Edward II. to Bannockburn, and after the king's humiliation he was closely associated with Thomas, earl of Lancaster, until about 1321, when he became connected with the Despensers and sided with the king. He was faithful to Edward to the last, and was executed at Hereford by the partisans of Queen Isabella on the 17th of November 1326.

His son, Richard (*c.* 1307–1376), who obtained his father's earldom and lands in 1331, was a soldier of renown and a faithful servant of Edward III. He was present at the battle of Sluys and at the siege of Tournai in 1340; he led one of the divisions of the English army at Creçy and took part in the siege of Calais; and he fought in the naval battle with the Spaniards off Winchelsea in August 1350. Moreover, he was often employed by Edward on diplomatic business. Soon after 1347 Arundel inherited the estates of his uncle John, earl de Warenne, and in 1361 he assumed the title of earl de Warenne or earl of Surrey. He was regent of England in 1355, and died on the 24th of January 1376, leaving three sons, the youngest of whom, Thomas, became archbishop of Canterbury.

Richard's eldest son, Richard, earl of Arundel and Surrey (*c.* 1346–1397), was a member of the royal council during the minority of Richard II., and about 1381 was made one of the young king's governors. As admiral of the west and south he saw a good deal of service on the sea, but without earning any marked distinction except in 1387 when he gained a victory over the French and their allies off Margate. About 1385 the earl joined the baronial party led by the king's uncle, Thomas of Woodstock, duke of Gloucester, and in 1386 was a member of the commission appointed to regulate the kingdom and the royal household. Then came Richard's rash but futile attempt to arrest Arundel, which was the signal for the outbreak of hostilities. The Gloucester faction quickly gained the upper hand, and the earl was one, and perhaps the most bitter, of the lords appellant. He was again a member of the royal council, and was involved in a quarrel with John of Gaunt, duke of Lancaster, whom he accused in the parliament of 1394. After a personal altercation with the king at Westminster in the same year Arundel underwent a short imprisonment, and in 1397 came the final episode of his life. Suspicious of Richard he refused the royal invitation to a banquet, but his party had broken up, and he was persuaded by his brother, Thomas Arundel, archbishop of Canterbury, to surrender himself and to trust to the king's clemency. At once he was tried, was attainted and sentenced to death, and, bearing himself with great intrepidity, was beheaded on the 21st of September 1397. He was twice married and had three sons and four daughters. The earl founded a hospital at Arundel, and his tomb in the church of the Augustinian Friars, Broad Street, London, was long a place of pilgrimage.

His only surviving son, Thomas (1381–1415), was a ward of John Holand, duke of Exeter, from whose keeping he escaped about 1398 and joined his uncle, Archbishop Thomas Arundel, at Utrecht, returning to England with Henry of Lancaster, afterwards King Henry IV., in 1399. After Henry's coronation he was restored to his father's titles and estates, and was employed in fighting against various rebels in Wales and in the north of England. Having left the side of his uncle, the archbishop, Arundel joined the party of the Beauforts, and was one of the leaders of the English army which went to France in 1411; then after a period of retirement he became lord treasurer on the accession of Henry V. From the siege of Harfleur he returned ill to England and died on the 13th of October 1415. His wife was Beatrix (d. 1439), a natural daughter of John I., king of Portugal, but he left no children, and the lordship of Arundel passed to a kinsman, John Fitzalan, Lord Maltravers (1385–1421), who was summoned as earl of Arundel in 1416.

John's son, John (1408–1435), did not secure the earldom until 1433, when as the "English Achilles" he had already won great distinction in the French wars. He was created duke of Touraine, and continued to serve Henry VI. in the field until his death at Beauvais from the effects of a wound on the 12th of June 1435. The earl's only son, Humphrey, died in April 1438, when the earldom passed to John's brother, William (1417–1488).

Henry Fitzalan, 12th earl of Arundel (*c.* 1517–1580), son of William, 11th earl, by Anne, daughter of Henry Percy, 4th earl

of Northumberland, was born about 1517. He entered King Henry's household, attending the latter to Calais in 1532. In 1533 he was summoned to parliament in his father's barony of Maltravers, and in 1540 he was made deputy of Calais, where his vigorous administration was much praised. He returned to England in April 1544 after the death of his father, and was made a knight of the Garter. In July of the same year he commanded with Suffolk the English expedition to France as lord marshal, and besieged and took Boulogne. On his return to England he was made lord chamberlain, an office which he retained after the accession in 1547 of Edward VI., at whose coronation he acted as high constable. He was one of the twelve counsellors nominated in Henry VIII.'s will to assist the executors, but he had little power during the protectorship of Somerset or the ascendancy of Warwick (afterwards duke of Northumberland), and in 1550 by the latter's device he was accused of embezzlement, removed from the council, confined to his house, and fined £12,000—£8000 of this sum being afterwards remitted and the charges never being proved. Subsequently he allied himself with Somerset, and was implicated in 1551 in the latter's plot against Northumberland, being imprisoned in the Tower in November. On the 3rd of December 1552, though he had never been brought to trial, he signed a submission and confession before the privy council, and was liberated after having been again heavily fined. As Edward's reign drew to its close, Arundel's support was desired by Northumberland to further his designs on the throne for his family, and he was accordingly reinstated in the council and discharged of his fine. In June 1553 he opposed Edward's "device" for the succession, which passed over his sisters Mary and Elizabeth as illegitimate, and left the crown to the children of the duchess of Suffolk, and alone of the council refused the "engagement" to support it, though he signed the letters patent. On the death of Edward (July 6, 1553) he ostensibly joined in furthering the duke's plans, but secretly took measures to destroy them, and according to some accounts sent a letter to Mary the same evening informing her of Edward's death and advising her to retreat to a place of security. Meanwhile he continued to attend the meetings of the council, signed the letter to Mary declaring her illegitimacy and Lady Jane Grey's right to the throne, accompanied Northumberland to announce to Jane her accession, and urged Northumberland to leave London and place himself at the head of the forces to attack Mary, wishing him God-speed on his departure. In Northumberland's absence, he gained over his fellow-councillors, and having succeeded with them in getting out of the Tower, called an assembly of the corporation and chief men of the city, denounced Northumberland, and had Mary proclaimed queen, subsequently riding off to join her with the Great Seal at Framlingham. On the 20th of July he secured Northumberland at Cambridge, and returned in triumph with Mary to London on the 3rd of August, riding before her with the sword of state. He was now made a privy councillor and lord steward, and was granted several favours and privileges, acting as high constable at the coronation, and obtaining the right to create sixty knights. He took a prominent part in various public acts of the reign, was a commissioner to treat for the queen's marriage, presided at the trial of the duke of Suffolk, assisted in suppressing Wyatt's rebellion in 1554, was despatched on foreign missions, and in September 1555 accompanied Philip to Brussels. The same year he received, together with other persons, a charter under the name of the Merchant Adventurers of England, for the discovery of unknown lands, and was made high steward of Oxford University, being chosen chancellor in 1559, but resigning his office in the same year. In 1557, on the prospect of the war with France, he was appointed lieutenant-general of the forces for the defence of the country, and in 1558 attended the conference at the abbey of Cercamp for the negotiation of a peace. He returned to England on the death of Mary in November 1558, and is described to Philip II. at that time as "going about in high glee, very smart" and with hopes of marrying the queen, but as "flighty" and of "small ability." He was reinstated in all his offices by Elizabeth, served as high constable at her coronation, and was visited several times by the queen at Nonsuch in Surrey. As a Roman Catholic he violently opposed the arrest of his co-religionists and the war with Scotland, and in 1560 came to blows with Lord Clinton in the queen's presence on a dispute arising on those questions. He incurred the queen's displeasure in 1562 by holding a meeting at his house during her illness to consider the question of the succession and promote the claims of Lady Catherine Grey. In 1564, being suspected of intrigues against the government, he was dismissed from the lord-stewardship and confined to his house, but was restored to favour in December. In March 1566 he went to Padua, but being summoned back by the queen he returned to London accompanied by a large cavalcade on the 17th of April 1567. Next year he served on the commission of inquiry into the charges against Mary, queen of Scots. Subsequently he furthered the marriage of Mary with the duke of Norfolk, his son-in-law, together with the restoration of the Roman Catholic religion and government, and deposition of Elizabeth, in collusion with Spain. He made use of the incident in 1568, of the seizure of treasure at Southampton intended for Philip, as a means of effecting Cecil's overthrow, and urged upon the Spanish government the stoppage of trade. He is described in 1569 to Philip as having "good intentions," "whilst benefiting himself as he was very needy." In January he alarmed Elizabeth by communicating to her a supposed Spanish project for aiding Mary and replacing her on her throne, and put before the queen in writing his own objections to the adoption of extreme measures against her. In June he received with Norfolk and Lumley 6000 crowns from Philip. In September, on the discovery of Norfolk's plot, he was arrested, but not having committed himself sufficiently to incur the charge of treason in the northern rebellion he escaped punishment, was released in March 1570, and was recalled by Leicester to the council with the aim of embarrassing Cecil. He again renewed his treasonable intrigues, which were at length to some extent exposed by the discovery of the Ridolfi plot in September 1571. He was once more arrested, and not liberated till December 1572 after Norfolk's execution. He died on the 24th of February 1580, and was buried in the chapel at Arundel, where a monument was erected to his memory.

He married (1) Catherine, daughter of Thomas Grey, 2nd marquess of Dorset, by whom he had Henry, who predeceased him, and two daughters, of whom Mary married Thomas Howard, 4th duke of Norfolk; and (2) Mary, daughter of Sir John Arundell and dowager countess of Sussex, by whom he had no children. Arundel was the last earl of his family, the title at his death passing through his daughter Mary to the Howards.

AUTHORITIES.—MS. Life by a contemporary in *Royal MSS.*, British Museum, 17 A ix., printed with notes in *Gent. Mag.* (1833)(ii.). pp. 11, 118, 210, 490; M. A. Tierney, *Hist. of Arundel*, p. 319; *Chronicle of Queen Jane* (Camden Soc. 1850); *Literary Remains of Edward VI.* (Roxburghe Club, 1857); J. Nichols, *Progresses of Queen Elizabeth* (1823), i. 74; Wood, *Fasti Oxon.* (Bliss), i. 153, 156; *Cal. State Papers, Simancas*, i. 18, ii. 152, &c., *Notes and Queries*, 2 Ser. iv. 84, &c.

PHILIP HOWARD, 1st earl[1] of Arundel (1557–1595), eldest son of Thomas Howard, 4th duke of Norfolk, executed for high treason in 1572, and of Lady Mary, daughter and heiress of Henry Fitzalan, 12th earl of Arundel, was born on the 28th of June 1557. He was married in 1571 to Anne, daughter and co-heiress of Thomas Dacre, Lord Dacre (1566), and was educated at Cambridge, being accorded the degree of M.A. in 1576. Subsequently Lord Surrey, as he was styled, came to court, partook in its extravagant gaieties and dissipations, and kept his wife in the background; but he nevertheless failed to secure the favour of Elizabeth, who suspected the Howards generally. On the death of his maternal grandfather in February 1580 he became earl of Arundel and retired from the court. In 1582 his wife joined the church of Rome, and was committed to the charge of Sir Thomas Shirley by the queen. He was himself suspected of disloyalty, and was regarded by the discontented Roman Catholics as the centre of the plots against the queen's government, and even as a possible successor. In 1583 he was

[1] *i.e.* in the Howard line.

with some reason suspected of complicity in Throgmorton's plot and prepared to escape to Flanders, but his plans were interrupted by a visit from Elizabeth at his house in London, and by her order subsequently to confine himself there. In September 1584 he became a Roman Catholic, dissembling his conversion and attempting next year once more to escape abroad; but having been brought back he was placed in the Tower on the 25th of April 1585, and charged before the Star Chamber with being a Romanist, with quitting England without leave, sharing in Jesuit plots, and claiming the dukedom of Norfolk. He was sentenced to pay £10,000 and to be imprisoned during the queen's pleasure. In July 1586 his liberty was offered to him if he would carry the sword of state before the queen to church. In 1588 he was accused of praying, together with other Romanists, for the success of the Spanish Armada. He was tried for high treason on the 14th of April 1589, found guilty and condemned to death; but lingered in confinement under his sentence, which was never executed, till his death on the 19th of October 1595. He was buried in the Tower, whence his remains were removed in 1624 to Arundel. His career, his later religious constancy and his tragic end have evoked general sympathy, but his conduct gave rise to grave suspicions, and the punishment inflicted upon him was not unwarranted; while the account of the severity of his imprisonment given by his anonymous and contemporary biographer should be compared with his own letters expressing gratitude for favours allowed.[1] There appears no foundation for the belief that he was poisoned, and according to Camden his death was caused by his religious austerities.[2] He was the author of a translation of *An Epistle of Jesus Christ to the Faithful Soule* by Johann Justus (1595, reprinted 1871) and of three MS. treatises *On the Excellence and Utility of Virtue.* Inscriptions carved by his hand are still to be seen in the Tower. He had two children, Elizabeth, who died young, and Thomas, who (restored in blood) succeeded him as 2nd earl of Arundel, and was created earl of Norfolk in 1644.

Authorities.—Article in the *Dict. of Nat. Biography* and authorities there collected; the contemporary *Lives of Philip Howard, Earl of Arundel and of Anne Dacre his Wife*, ed. by the duke of Norfolk (1857); M. Tierney, *History of Arundel* (1834), p. 357; C. H. Cooper, *Athenae Cantabrigenses* (1861), with bibliography, ii. 187 and 547; H. Howard, *Memoirs of the Howard Family* (1824).

Thomas Howard, 2nd earl of Arundel, and earl of Surrey and of Norfolk (*c.* 1585–1646), son of Philip, 1st earl of Arundel and of Lady Anne Dacre, was born in 1585 or 1586 and educated at Westminster school and at Trinity College, Cambridge. Owing to the attainder of his father he was styled Lord Maltravers, but at the accession of James I. he was restored to his father's earldoms of Arundel and Surrey, and to the baronies of his grandfather, Thomas, 4th duke of Norfolk. He came to court, travelled subsequently abroad, acquiring a taste for art, and was created K.G. on his return in May 1611. In 1613 he escorted Elizabeth, the electress palatine, to Heidelberg, and again visited Italy. On Christmas day 1615 Arundel joined the Church of England, and took office, being appointed a privy councillor in 1616. He supported Raleigh's expedition in 1617, became a member of the New England Plantations Committee in 1620 and planned the colonization of Madagascar. He presided over the House of Lords Committee in April 1621 for investigating the charges against Bacon, whom he defended from degradation from the peerage, and at whose fall he was appointed a commissioner of the great seal. On the 16th of May he was sent to the Tower by the Lords on account of violent and insulting language used by him to Lord Spencer. He incurred Prince Charles's and Buckingham's anger by his opposition to the war with Spain in 1624, and by his share in the duke's impeachment, and on the occasion of his son's marriage to Lady Elizabeth Stewart without the king's approval he was imprisoned in the Tower by Charles I., shortly after his accession, but was released at the instance of the Lords in June 1626, being again confined to his house till March 1628, when he was once more liberated by the Lords. In the debates on the Petition of Right, while approving its essential demands, he supported the retention of some discretionary power by the king in committing to prison. The same year he was reconciled to the king and again made a privy councillor. On the 29th of August 1621 he had been appointed earl marshal, and in 1623 constable of England, in 1630 reviving the earl marshal's court. In 1625 he was made lord-lieutenant of Sussex and in 1635 of Surrey. He was sent to the Hague in 1632 on a mission of condolence to the queen of Bohemia on her husband's death. In 1634 he was made chief justice in eyre of the forests north of the Trent; he accompanied Charles the same year to Scotland on the occasion of his coronation, and in 1636 undertook an unsuccessful mission to the emperor to procure the restitution of the Palatinate to the young elector. In 1638 he supported the king's exactions from the vintners, was entrusted with the charge of the Border forts, and, supporting alone amongst the peers the war against the Scots, was made general of the king's forces in the first Bishops' War, though according to Clarendon "he had nothing martial about him but his presence and looks." He was not employed in the second Bishops' War, but in August 1640 was nominated captain-general south of the Trent. In April he was appointed lord steward of the royal household, and in 1641 as lord high steward presided at the trial of Strafford. This closed his public career. He became again estranged from the court, and in 1641 he escorted home Marie de' Medici, remaining abroad, with the exception of a short visit to England in 1642, for the rest of his life, and taking up permanent residence at Padua. He contributed a sum of £34,000 to the king's cause, and suffered severe losses in the war. On the 6th of June 1644 he was created earl of Norfolk. He died at Padua, when on the point of returning home, on the 14th of September 1646, and was buried at Arundel.

Lord Arundel was a man of high character, an exemplary husband and parent, but reserved and unpopular, and Clarendon ridicules his family pride. His claim to fame rests upon his patronage of arts and learning and his magnificent collections. He employed Hollar, Oughtred, Francis Junius and Inigo Jones; included among his friends Sir Robert Cotton, Spelman, Camden, Selden and John Evelyn, and his portrait was painted by Rubens and Vandyck. He is called the "Father of vertu in England," and was admired by a contemporary as the person to whom "this angle of the world oweth the first sight of Greek and Roman statues."[3] He was the first to form any considerable collection of art in Great Britain. His acquisitions, obtained while on his travels or through agents, and including inscribed marbles, statues, fragments, pictures, gems, coins, books and manuscripts, were deposited at Arundel House, and suffered considerable damage during the Civil War; and, owing to the carelessness and want of appreciation of his successors, nearly half of the marbles were destroyed. After his death the treasures were dispersed. The marbles and many of the statues were given by his grandson, Henry, 6th duke of Norfolk, to the university of Oxford in 1667, became known as the *Arundel* (or Oxford) *Marbles*, and included the famous *Parian Chronicle*, or *Marmor Chronicon*, a marble slab on which are recorded in Greek events in Grecian history from 1582 B.C. to 354 B.C., said to have been executed in the island of Paros about 263 B.C. Its narration of events differs in some respects from the most trustworthy historical accounts, but its genuineness, challenged by some writers, has been strongly supported by Porson and others, and is considered fairly established. Other statues were presented to the university by Henrietta Louisa, countess of Pomfret, in 1755. The cabinets and gems were removed by the wife of Henry, 7th duke of Norfolk, in 1685, and after her death found their way into the Marlborough collection. The pictures and drawings were sold in 1685 and 1691, and Lord Stafford's moiety of the collection in 1720. The coins and medals were bought by Heneage Finch, 2nd earl of Winchelsea, and dispersed in 1696; the library, at the instance of John Evelyn, who feared its total loss, was given to the Royal Society, and a part,

[1] See *Cal. of St. Pap. Dom. 1581–1590*, 611; and *Hist. MSS. Comm. Marq. of Salisbury's MSS.* iii. 253, 414.

[2] Camden's *Elizabeth* in *Hist. of England* (1706), 587.

[3] Peacham in the *Compleat Gentleman* (1634), p. 107, and *Secret Hist. of James I.* (1811), i. 199.

consisting of genealogical and heraldic collections, to the College of Heralds, the manuscript portion of the Royal Society's moiety being transferred to the British Museum in 1831 and forming the present Arundel Collection. The famous bust of Homer reached the British Museum after passing through various hands.

Lord Arundel married in 1606 Lady Alethea, daughter and heir of Gilbert Talbot, 7th earl of Shrewsbury, by whom, besides three sons who died young and one daughter, he had John, who predeceased him, Henry Frederick, who succeeded him as 3rd earl of Arundel and earl of Surrey and of Norfolk, and William, Viscount Stafford, executed in 1680. In 1849 the Arundel Society for promoting artistic knowledge was founded in his memory. Henry Frederick's grandson Thomas, by the reversal (1660) of the attainder of 1572, succeeded to the dukedom of Norfolk, in which the earldom has since then been merged.

AUTHORITIES.—See the article in the *Dict. of Nat. Biography*, and authorities there collected; D. Lloyd, *Memoires* (1668), p. 284; Sir E. Walker, *Historical Discourses* (1705), p. 209 (MS. in Harleian, 6272 f. 152); M. Tierney, *History of Arundel* (1834), p. 414; Sir Thomas Roe's *Negotiations* (1740: letters relating to his collections), 334, 444, 495; W. Crowne, *A True Relation of all the Remarkable Places . . . in the Travels of . . . Thomas, Earl of Arundell: A.D. 1636* (1637); *Die englische Mission des Grafen v. Arundel in Nürnberg* (*archivalische Zeitschrift*: neue Folge, Bd. xi., 1904); H. Howard, *Memorials of the Howard Family* (1834), p. 31; H. K. S. Causton, *The Howard Papers* (1862); *Preface to Catalogue of Arundel MSS.*, Brit. Museum (1840), &c. For publications relating to the Parian Chronicle see *Marmora Arundelliana*, publ. J. Selden (1628); Prideaux's *Marmora Oxoniensia* (1676); Maittaire's variorum edition (1732); Chandler's *Marmora Oxoniensia* (1763 and 1791), G. Roberts; J. Robertson, *The Parian Chronicle* (1788); J. Hewlett, *A Vindication* (1789); R. Porson, "The Parian Chronicle," in *Tracts*, ed. by T. Kidd (1815); *Chronicon Parium*, ed. by C. F. C. Wagner (1832–1833); C. Müller's *Fragmenta Historicorum Graecorum* (1841), i. 533; F. Jacoby, *Das Marmor Parium* (1904).

ARUNDEL, THOMAS (1353–1414), archbishop of Canterbury, was the third son of Richard Fitzalan, earl of Arundel and Warenne, by his second wife, Eleanor, daughter of Henry Plantagenet, earl of Lancaster. His family was an old and influential one, and when Thomas entered the church his preferment was rapid. In 1373 he became archdeacon of Taunton, and in April 1374 was consecrated bishop of Ely. During the early years of the reign of King Richard II. he was associated with the party led by Thomas, duke of Gloucester, Henry, earl of Derby, afterwards King Henry IV., and his own brother Richard, earl of Arundel, and in 1386 he was sent with Gloucester to Eltham to persuade Richard to return to parliament. This mission was successful, and Arundel was made lord chancellor in place of Michael de la Pole, duke of Suffolk, and assisted to make peace between the king and the supporters of the commission of regency. In April 1388 he was made archbishop of York, and, when Richard declared himself of age in 1389, he gave up the office of chancellor, to which, however, he returned in 1391. During his second tenure of this office he removed the courts of justice from London to York, but they were soon brought back to the metropolis. In September 1396 he was translated from York to Canterbury, and again resigned the office of chancellor. He began his new rule by a vigorous attempt to assert his rights, warned the citizens of London not to withhold tithes, and decided appeals from the judgments of his suffragans during a thorough visitation of his province. In November 1396 he had officiated at the marriage of Richard and Isabella, daughter of Charles VI., king of France, and his fall was the sequel of the king's sudden attack upon the lords appellant in 1397. After the arrest of Gloucester, Warwick and Arundel, the archbishop was impeached by the Commons with the king's consent, although Richard, who had not yet revealed his hostility, held out hopes of safety to him. He was charged with assisting to procure the commission of regency in derogation of the royal authority, and sentence of banishment was passed, forty days being given him during which to leave the realm. Towards the end of 1397 he started for Rome, and Pope Boniface IX., at the urgent request of the king, translated him to the see of St Andrews, a step which the pope afterwards confessed he repented bitterly. This translation virtually deprived Arundel of all authority, as St Andrews did not acknowledge Boniface. He then became associated with Henry of Lancaster, but did not return to England before 1399, and the account which Froissart gives telling how he was sent by the Londoners to urge Henry to come and assume the crown is thought to refer to his nephew and namesake, Thomas, earl of Arundel. Landing with Henry at Ravenspur, he accompanied him to the west. He took his place at once as archbishop of Canterbury, witnessed the abdication of Richard in the Tower of London, led the new king, Henry IV., to his throne in presence of the peers, and crowned him on the 13th of October 1399.

The main work of his later years was the defence of the church, and the suppression of heresy. To put down the Lollards, he called a meeting of the clergy, pressed on the statute *de haeretico comburendo*, and passed sentence of degradation upon William Sawtrey. He resisted the attempt of the parliament of 1404 to disendow the church, but failed to induce Henry to pardon Archbishop Scrope in 1405. In 1407 he became chancellor for the fourth time, and in 1408 summoned a council at Oxford, which drew up constitutions against the Lollards. These be published in January 1409, and among them was one forbidding the translation of the Bible into English without the consent of the bishop of the diocese, or of a provincial synod. In 1411 he went on an embassy abroad, and in 1412 became chancellor again, his return to power being accompanied by a change in the foreign policy of Henry IV. In 1397 he had sought to vindicate his right of visitation over the university of Oxford, but the dispute remained unsettled until 1411 when a bull was issued by Pope John XXIII. recalling one issued by Pope Boniface IX., which had exempted the university from the archbishop's authority. In 1413 he took a leading part in the proceedings against Sir John Oldcastle, Lord Cobham, and in the following year he died on the 19th of February, and was buried at Canterbury. A legend of a later age tells how, just before his death, he was struck dumb for preventing the preaching of the word of God.

The chief authorities are T. Walsingham, *Historia Anglicana*, ed. by H. T. Riley (London, 1863–1864); *Eulogium historiarum sive temporis*, ed. by F. S. Haydon (London, 1858–1863); the Monk of Evesham, *Historia vitae et regni Ricardi II.*, ed. by T. Hearne (Oxford, 1729); W. F. Hook, *Lives of the Archbishops of Canterbury*, vol. iv. (London, 1860–1876).

ARUNDEL, a market town and municipal borough in the Chichester parliamentary division of Sussex, England, 58 m. S.S.W. from London by the London, Brighton & South Coast railway. Pop. (1901) 2739. It is pleasantly situated on the slope of a hill above the river Arun, which is navigable for small vessels to Littlehampton at the mouth, 6 m. south. From the summit of the hill rises Arundel Castle, which guarded the passage along the river through the hills. For its connexion with the title of earl of Arundel see ARUNDEL, EARLDOM OF. A castle existed in the time of King Alfred, and at the time of the Conquest it was rebuilt by Roger de Montgomerie, but it was taken from his son, who rebelled against the reigning monarch, Henry I. In 1397 it was the scene of a conspiracy organized by the earl of Arundel, archbishop of Canterbury and duke of Gloucester, to dethrone Richard II. and murder the lords of his council, a plot which was discovered before it could be carried into execution. During the civil wars of the 17th century, the stronghold was frequently assaulted by the contending parties, and consequently greatly damaged; but it was restored by Charles, 11th duke of Norfolk (d. 1815), who made it what it now is, one of the most splendid baronial mansions in England. Extensive reconstruction, in the style of the 13th century, was undertaken towards the close of the 19th century. The town, according to the whimsical etymology shown on the corporation seal, takes its name from *hirondelle* (a swallow). The town hall is a castellated building, presented to the corporation by the duke of Norfolk. The church of St Nicholas, founded about 1375, is Perpendicular with a low tower rising from the centre. In the north aisle of the chancel there are several ancient monuments of the earls of Arundel. The church is otherwise remarkable for its reredos and iron work. The chancel is the property of the duke of Norfolk and is screened from the rest of the building,

although in 1880 this exercise of right by the owner was made the subject of an action at law and subsequent appeal. The Roman Catholic church of St Philip Neri was built by the duke of Norfolk (1873). Some remains of a *Maison Dieu*, or hospital, erected in the time of Richard II., still exist. The borough is under a mayor, 4 aldermen and 12 councillors. Area, 2053 acres.

The first mention of Arundel (Harundell) comes as early as 877, when it was left by King Alfred in his will to his nephew Æthelm. In the time of Edward the Confessor the town seems to have consisted of the mill and a fortification or earthwork which was probably thrown up by Alfred as a defence against the Danes; but it had increased in importance before the Conquest, and appears in Domesday as a thriving borough and port. It was granted by the Conqueror to Roger de Montgomery, who built the castle on the site of the ancient earthwork. From very early times markets were held within the borough on Thursday and Saturday, and in 1285 Richard Fitzalan, earl of Arundel, obtained a grant of two annual fairs on the 14th of May and the 17th of December. The borough returned two members to parliament from 1302 to 1832 when the Reform Act reduced the membership to one; in 1868 it was disfranchised altogether. There are no early charters extant, but in 1586 Elizabeth acknowledged the right of the mayor and burgesses to be a body corporate and to hold a court for pleas under forty shillings, two weekly markets and four annual fairs—which rights they claimed to have exercised from time immemorial. James II. confirmed in 1688 a charter given two years before, and incorporated the borough under the title of a mayor, 4 aldermen and 12 burgesses. The town was half destroyed by fire in 1338, but was soon rebuilt. Arundel was formerly a thriving seaport, and in 1813 was connected by canal with London.

See M. A. Tierney, *The History and Antiquities of the Castle and Town of Arundel* (London, 1834); *Victoria County History—Sussex*.

ARUNDELL OF WARDOUR, THOMAS ARUNDELL, 1ST BARON (*c.* 1562–1639), son of Sir Mathew Arundell of Wardour Castle in Wiltshire, a member of the ancient family of Arundells of Lanherne in Cornwall, and of Margaret, daughter of Sir Henry Willoughby, was born about 1562. In 1579 he was personally recommended by Queen Elizabeth to the emperor Rudolph II. He greatly distinguished himself while serving with the imperial troops against the Turks in Hungary, and at the siege of Gran or Esztergom on the 13th of August 1595, he captured the enemy's banner with his own hand. He was created by Rudolph II. a count of the Holy Roman Empire in December 1595, and returned to England after suffering shipwreck and barely preserving his life in January 1596. His assumption of the foreign title created great jealousy among the English peers, who were wont to give a precedence by courtesy to foreign nobles, and he incurred the resentment of his father, who objected to his superior rank and promptly disinherited him. The queen, moreover, was seriously displeased, declared that "as chaste wives should have no glances but for their own spouses, so should faithful subjects keep their eyes at home and not gaze upon foreign crowns," and committed him to the Fleet immediately on his arrival, while she addressed a long letter of remonstrance on the subject to the emperor. Arundell remained under arrest till April, when he was liberated after an examination. In April 1597, however, he was again confined, but declared innocent of any charge save that of "practising to contrive the justification of his vain title with Ministers beyond the seas." In December he was liberated and placed under the care of his father, but next year he was again arrested and accused of a conspiracy against the government. His petitions for a licence to undertake an expedition by sea, wherein he declared "his end was honour which some base minds call ambition," were refused, but in 1599 he was apparently again restored to favour. On the 4th of May 1605 he was created by James I. Baron Arundell of Wardour, but fell again under temporary suspicion at the time of the Gunpowder Plot. In 1623 he once more got into trouble by championing the cause of the recusants, of whom he was himself one, on the occasion of the visit of the Spanish envoys, and he was committed to custody, and in 1625 all the arms were removed by the government from Wardour Castle. After the accession of Charles I. he was pardoned, and attended the sittings of the House of Lords. He was indicted in the king's bench about the year 1627 for not paying some contribution, and in 1632 he was accused of harbouring a priest. In 1637 he was declared exempt from the recusancy laws by the king's order, but in 1639 he again petitioned for relief. The same year he paid £500 in lieu of attending the king at York. He died on the 7th of November 1639. Arundell was an earnest Roman Catholic, but the suspicions of the government as to his loyalty were probably unfounded and stifled a career destined by nature for successful adventure. He married (1) Mary, daughter of Henry Wriothesley, 2nd earl of Southampton, by whom besides other children he had Thomas, who succeeded him as 2nd baron; and (2) Anne, daughter of Miles Philipson, by whom he had several daughters.

HENRY ARUNDELL, 3rd Baron Arundell of Wardour (*c.* 1607–1694), son of Thomas, 2nd baron, and of Blanche, daughter of Edward, earl of Worcester, was born on the 21st of July 1607, and succeeded on his father's death in 1643 to the family title and estates. A strong royalist and Roman Catholic, he supported the king's cause, and distinguished himself in 1644 by the recapture of his castle at Wardour from the parliamentarians, who had taken it in the previous year in spite of his mother's brave defence of the place. In 1648 he was one of the delinquents exempted from pardon in the proposals sent to Charles in the Isle of Wight. His estates had been confiscated, but he was permitted about 1653 to compound for them in the sum of £35,000. In 1652, in consequence of his being second at a duel in which one of the combatants was killed, he was arrested, and tried in 1653; he pleaded his peerage, but the privilege was disallowed as the House of Lords had been abolished. At the Restoration he regained possession of the family estates, and in 1663 was made master of the horse to Henrietta Maria. He was one of the few admitted to the king's confidence concerning the projects for the restoration of the Roman Catholic religion and the alliance with France. In 1669 he took part in the secret council assembled by Charles II., and in October was sent to France, ostensibly for the funeral of Henrietta Maria, but in reality to negotiate with Louis XIV. the agreement which took shape in 1670 in the treaties of Dover (see CHARLES II.). In 1676 he was privy to James's negotiations with Rome through Coleman. He was accused in 1678 by Titus Oates of participation in the popish plot, and was one of the five Roman Catholic peers arrested and imprisoned in the Tower in October, found guilty by the Middlesex grand jury of high treason, and impeached subsequently by the parliament. Lord Stafford was found guilty and executed in December 1680, but after the perpetration of this injustice the proceedings were interrupted, and the three surviving peers were released on bail on the 12th of February 1684. On the 22nd of May 1685, after James II.'s accession, the charge was annulled, and on the 1st of June 1685 they obtained their full liberty. In February 1686, with other Roman Catholics, Arundell urged upon the king the removal of his mistress, Lady Dorchester, on account of her strong Protestantism. In spite of his religion he was made a privy councillor in August 1686, and keeper of the privy seal in 1687, being excused from taking the oaths by the king's dispensation. He presented the thanks of the Roman Catholics to James in June 1687 for the declaration of indulgence. His public career ended with the abdication of the king, and he retired to Breamore, the family residence since the destruction of Wardour Castle. He died on the 28th of December 1694. He was the author of five religious poems said to be composed during his confinement in the Tower in 1679, published the same year and reprinted in *A Collection of Eighty-six Loyal Poems* in 1685. His piety and benevolence to his unfortunate co-religionists were conspicuous. Evelyn calls him "very good company" and he was a noted sportsman, the Quorn pack being descended from his pack of hounds at Breamore. He married Cecily, daughter of Sir Henry Compton, by whom besides other children he had Thomas, who succeeded him as 4th baron.

The barony is still held in the Arundell family, which has never ceased to be Roman Catholic. The 14th baron (b. 1859) was a direct descendent of the 6th.

ARUSIANUS MESSIUS, or MESSUS, Latin grammarian, flourished in the 4th century A.D. He was the author of a small extant work *Exempla Elocutionum*, dedicated to Olybrius and Probinus, consuls for the year 395. It contains an alphabetical

list, chiefly of verbs admitting more than one construction, with examples from each of the four writers, Virgil, Sallust, Terence and Cicero. Cassiodorus, the only writer who mentions Arusianus, refers to it by the term Quadriga.

See Keil, *Grammatici Latini*, vii.; Suringar, *Historia Critica Scholiastarum Latinorum* (1834–1835); Van der Hoeven, *Specimen Literarium* (1845).

ARVAL BROTHERS (Fratres Arvales), in Roman antiquities, a college or priesthood, consisting of twelve members, elected for life from the highest ranks in Rome, and always apparently, during the empire, including the emperor. Their chief duty was to offer annually public sacrifice for the fertility of the fields (Varro, *L. L.* v. 85). It is generally held that the college was founded by Romulus (see ACCA LARENTIA). This legend probably arose from the connexion of Acca Larentia, as *mater Larum*, with the Lares who had a part in the religious ceremonies of the Arvales. But apart from this, there is proof of the high antiquity of the college, which was said to have been older than Rome itself, in the verbal forms of the song with which, down to late times, a part of the ceremonies was accompanied, and which is still preserved. It is clear also that, while the members were themselves always persons of distinction, the duties of their office were held in high respect. And yet it is singular that no mention of them occurs in Cicero or Livy, and that altogether literary allusions to them are very scarce. On the other hand, we possess a long series of the *acta* or minutes of their proceedings, drawn up by themselves, and inscribed on stone. Excavations, commenced in the 16th century and continued to the 19th, in the grove of the Dea Dia about 5 m. from Rome, have yielded 96 of these records from A.D. 14 to 241. The brotherhood appears to have languished in obscurity during the republic, and to have been revived by Augustus. In his time the college consisted of a master (*magister*), a vice-master (*promagister*), a *flamen*, and a *praetor*, with eight ordinary members, attended by various servants, and in particular by four chorus boys, sons of senators, having both parents alive. Each wore a wreath of corn, a white fillet and the praetexta. The election of members was by co-optation on the motion of the president, who, with a flamen, was himself elected for one year. The great annual festival which they had to conduct was held in honour of the anonymous Dea Dia, who was probably identical with Ceres. It occupied three days in May. The ceremony of the first day took place in Rome itself, in the house of the magister or his deputy, or on the Palatine in the temple of the emperors, where at sunrise fruits and incense were offered to the goddess. A sumptuous banquet took place, followed by a distribution of doles and garlands. On the second and principal day of the festival the ceremonies were conducted in the grove of the Dea Dia. They included a dance in the temple of the goddess, at which the song of the brotherhood was sung, in language so antiquated that it was hardly intelligible (see the text and translation in Mommsen, *Hist. of Rome*, bk. i. ch. xv.) even to Romans of the time of Augustus, who regarded it as the oldest existing document in their mother-tongue. Especial mention should be made of the ceremony of purifying the grove, which was held to be defiled by the felling of trees, the breaking of a bough or the presence of any iron tools, such as those used by the lapidary who engraved the records of the proceedings on stone. The song and dance were followed by the election of officers for the next year, a banquet and races. On the third day the sacrifice took place in Rome, and was of the same nature as that offered on the first day. The Arvales also offered sacrifice and solemn vows on behalf of the imperial family on the 3rd of January and on other extraordinary occasions. The brotherhood is said to have lasted till the time of Theodosius. The British Museum contains a bust of Marcus Aurelius in the dress of a Frater Arvalis.

Marini, *Atti e Monumenti de' Fratri Arvali* (1795); Hoffmann, *Die A.*] (1858); Oldenberg, *De Sacris Fratrum A.* (1875); Bergk, *Das Lied der Arvalbrüder* (1856); Bréal, "Le Chant des Arvals" in *Mém. de la Soc. de Linguistique* (1881); Edon, *Nouvelle Étude sur le Chant Lémural* (1884); *Corpus Inscriptionum Latinarum*, vi. 2023-2119; Henzen, *Acta Fratrum Arvalium* (1874).

ARVALS, AAVELS or ARTHELS (O. Norse *Arfr*, inheritance, and *öl*, A.S. Ale, a banquet), primarily the funeral dinner, and later, especially in the north of England, a thin, light, sweet cake, spiced with cinnamon and nutmeg, served to the poor at such feasts. The funeral meal was called the Arvel-dinner. The custom seems to have been to hold on such occasions an informal inquest, when the corpse was publicly exposed, to exculpate the heir and those entitled to the property of the dead from all accusations of foul play.

ARVERNI, the name of an ancient Gaulish tribe in the Auvergne, which still bears its name. It resisted Caesar longer than most of Gaul; when once vanquished it adopted Roman civilization readily. Its tribal deity, the god of the mountain, the Puy de Dôme, rechristened in Roman phrase Mercurius Dumias, was famous far beyond its territory. Part of his temple has been excavated recently.

ARYAN, a term which has been used in a confusing variety of significations by different philologists. By Max Müller especially it was employed as a convenient short term for the whole body of languages more commonly known as Indo-European (*q.v.*) or Indo-Germanic. In the same way Max Müller used Aryas as a general term for the speakers of such languages, as in his book published in 1888, *Biographies of Words and the Home of the Aryas*. "Aryas are those who speak Aryan languages, whatever their colour, whatever their blood. In calling them Aryas we predicate nothing of them except that the grammar of their language is Aryan" (p. 245). It is to be observed, therefore, that Max Müller is careful to avoid any ethnological signification. The Aryas are those who speak Aryan without regard to the question whether Aryan is their *hereditary* language or not. As he says still more definitely elsewhere in the same work (p. 120), "I have declared again and again that if I say Aryas, I mean neither blood nor bones, nor hair nor skull; I mean simply those who speak an Aryan language. The same applies to Hindus, Greeks, Romans Germans, Celts and Slaves. When I speak of them I commit myself to no anatomical characteristics. The blue-eyed and fair-haired Scandinavians may have been conquerors or conquered, they may have adopted the language of their darker lords or their subjects, or vice versa. I assert nothing beyond their language when I call them Hindus, Greeks, Romans, Germans, Celts and Slaves; and in that sense, and in that sense only, do I say that even the blackest Hindus represent an earlier stage of Aryan speech and thought than the fairest Scandinavians . . . To me an ethnologist who speaks of Aryan race, Aryan blood, Aryan eyes and hair, is as great a sinner as a linguist who speaks of a dolichocephalic dictionary or a brachycephalic grammar."

From the popularity of Max Müller's works on comparative philology this is the use of the word which is most familiar to the general public. The arguments in support of this use are set forth by him in the latter part of lecture vi. of the *Lectures on the Science of Language* (first series) and as an appendix to chap. vii. of the final edition (i. pp. 291 ff.). The Sanskrit usage of the word is fully illustrated by him from the early Sanskrit writings in the article "Aryan" in the ninth edition of this encyclopaedia. From the earliest occurrences of the word it is clear that it was used as a national name not only in India but also in Bactria and Persia (in Sanskrit *ārya-* and *ārya-*, in Zend *airya-*, in Old Persian *ariya-*). That it is in any way connected with a Sanskrit word for earth, *ira*, as Max Müller asserts, is far from certain. As Spiegel remarks (*Die arische Periode*, p. 105), though it is easy enough to connect the word with a root *ar-*, there are several roots of that form which have different meanings, and there is no certain criterion whereby to decide to which of them it is related. Nor are the other connexions for the word outside this group free from doubt. It is, however, certain that the connexion with *Erin* (Ireland), which Pictet in his article "Iren and Arier" (Kuhn and Schleicher's *Beiträge*, i. 1858, pp. 81 ff.) sought to establish, is impossible (Whitley Stokes in Max Müller's *Lectures*, 1891, i. pp. 299 f.), though the word may have the same origin as the *Ario-* of names like *Ariovistus*,

which is found in both Celtic and Germanic words (Uhlenbeck, *Kurzgefasstes etymologisches Wörterbuch der altindischen Sprache*, s.v.). The name of Armenia (Old Persian *Armina-*), which has often been connected, is of uncertain origin. Within Sanskrit itself probably two words have to be distinguished: (1) *árya*, the origin of Aryan, from which the usual term *ārya* is a derivative; (2) *aryá*, which frequently appears in the *Rig Veda* as an epithet of deities. In many passages, however, *aryás* may equally well be the genitive of *arí*, which is explained as "active, devoted, pious." Even in this word probably two originally separate words have to be distinguished, for the further meanings which Grassmann in his dictionary to the *Rig Veda* attaches to it, viz. "greedy" (for treasure and for battle), "godless," "enemy," seem more appropriately to be derived from the same source as the Greek ἔρι-ς, "strife." The word *árya-* is not found as a national name in the *Rig Veda*, but appears in the *Vājasaneyi-sainhita*, where it is explained by Mahīdhara as *Vaiśya-*, a cultivator or a man of the third among the original four classes of the population. So in the *Atharva Veda* (iv. 20. 4; xix. 62. 1) it is contrasted with the Śudra or fourth class (Spiegel, *Arische Periode*, p. 102). In the *Avesta*, *airya-* is found both as adjective and substantive in the sense of Aryan, but no light is thrown upon the history of the word. Darius describes himself in an inscription as of Aryan stock, *Dārayaʰvaʰuš ariyaʰčiθraʰ*. In the *Avesta* the derivative *airyana-* is also found in the sense of Aryan. In both India and Persia a word is found (Skt. *aryaman-*; Zend *airyaman-*) which is apparently of the same origin. In both Sanskrit and Zend it means something like "comrade" or "bosom friend," but in Zend is used of the priestly or highest class. In Sanskrit, besides this use in which it is contrasted with the *Dāsa* or *Dāsyu*, the enemies, the earlier inhabitants, the word is often used for the bridegroom's spokesman, and in both languages is also employed as the name of a divine being. In the *Rig Veda*, *Aryaman-* as a deity is most frequently coupled with Mitra and Varuna (Grassmann, *Wörterbuch*, s.v.); in Zend, according to Bartholomae (*Altiranisches Wörterbuch*, s.v.), from the earliest literature, the Gathas, there is nothing definite to be learnt regarding *Airyaman*.

Whatever the origin of *arya-*, however, it is clear that it is a word with dignified associations, by which the peoples belonging to the Eastern section of the Indo-Europeans were proud to call themselves. It is now used uniformly by scholars to indicate the Eastern branch as a whole, a compound, *Indo-Aryan*, being employed for that part of the Eastern branch which settled in India to distinguish them from the Iranians (*Iran* is of the same origin), who remained in Bactria and Persia, while *Aryo-Indian* is sometimes employed to distinguish the Indian people of this stock from the Dravidian and other stocks which also inhabit parts of the Indian peninsula. Of the stages in the occupation of the Iranian table-land by the Aryan people nothing is known, the people themselves having apparently no tradition of a time when they did not hold these territories (Spiegel, *Arische Periode*, p. 319). Though the Hindus have no tradition of their invasion of India, it is certain that they are not an indigenous people, and, if they are not, it is clear that they could have come in no other direction save from the other side of the Hindu Kush. At the period of their earliest literature, which may be assigned roughly to about 1000 B.C., they were still settled in the valley of the Indus, and at this time the separation probably had not long taken place, the Eastern portion of the stock having pushed their way along the Kabul valley into the open country of the Indus. According to Professor E. W. Hopkins (*India Old and New*, 1901, p. 31) the *Rig Veda* was composed in the district about Umballa. He argues that the people must have been then to the west of the great rivers, otherwise the dawn could not be addressed as one who "in shining light, before the wind arises, comes gleaming over the waters, making good paths." The vocabulary is still largely the same; whole sentences can be transliterated from one language to the other merely by making regular phonetic changes and without the variation of a single word (for examples see Bartholomae, *Handbuch der altiranischen Dialekte*, 1883, p. v.; Williams Jackson, *Avesta Grammar*, 1892, pp. xxxi. f.; *Grundriss der iranischen Philologie*, 1895, i. p. 1). It is noteworthy that it is those who remain behind whose language has undergone most change.

By four well-marked characteristics the Aryan group is easily distinguishable from the other Indo-European languages. (1) By the confusion of original *e* and *o*, both long and short, with the original long and short *a* sound; (2) the short schwa-sound *ə* is represented here, and in this group only, by *i* (*pita*, "father," as compared with πατήρ, &c.); (3) original *s* after *i*, *u* and some consonants becomes *ṣ*; (4) the genitive plural of stems ending in a vowel has a suffix *-nām* borrowed by analogy from the stems ending in *-n* (Skt. *áśvānām*, "of horses"; Zend *aspānām*; Old Persian *aspānām*). The distinctions between Sanskrit and Iranian are also clear. (1) The Aryan voiced aspirates *gh*, *dh*, *bh*, which survive in Sanskrit, are confused in Iranian with original *g*, *d*, *b*, and further changes take place in the language of the later parts of the Avesta; (2) the Aryan breathed aspirates *kh*, *th*, *ph*, except in combination with certain consonants, become spirants in Iranian; (3) Aryan *s* becomes *h* initially before vowels in Iranian and also in certain cases medially, Iranian in these respects resembling Greek (cf. Skt. *saptá*; Zend *hapta*; Gr. ἑπτά, "seven"); (4) in Zend there are many vowel changes which it does not share with Old Persian. Some of these arise from the umlaut or epenthesis which is so prevalent, and which we have already seen in *airya-* as compared with the Skt. *árya*. In other respects the languages are remarkably alike, the only striking difference being in the numeral "one"—Skt. *eka-*; Zend *aeva-*; Old Persian *aiva-*, where the Iranian group has the same stem as that seen in the Greek οἶ(ϝ)ο-ς, "alone."

For the subdivisions of the two groups see the articles on PERSIA: *Language*, and INDO-ARYAN LANGUAGES. Dr Grierson has shown in his monograph on "The Piśaca Languages of North-Western India" (Royal Asiatic Society, 1906) that there is good reason for regarding various dialects of the north-western frontier (Kafiristan, Chitral, Gilgit, Dardistan) as a separate group descended from Aryan but independent of either Sanskrit or Iranian.

The history of the separation of the Aryan from the other Indo-European languages is not yet clear (see INDO-EUROPEAN LANGUAGES). Various attempts have been made, with little success, to identify fragments of unknown languages in cuneiform inscriptions with members of this group. The investigation has entered a new and more favourable stage as the result of the discoveries made by German excavators at Boghaz Keui (said to be identical with Herodotus' Pteria in Cappadocia), where treaties between the king of the Hittites and the king of Mitanni, in the beginning of the 14th century B.C., seem almost certainly to contain the names of the gods Mitra, Varuna and Indra, which belong to the early Aryan mythology (H. Winckler, *Mitteilungen der deutschen Orientgesellschaft*, No. 35; E. Meyer, *Sitzungsberichte der Berliner Akademie*, 1908, pp. 14 ff.; *Zeitschrift für vergleichende Sprachforschung*, 42, 1908, pp. 24 ff.). Still further light is to be expected when the vast collections of the German expedition to Turfan (Turkestan) have been sifted. Up to 1909 only a preliminary account had been given of Tocharish, a hitherto unknown Indo-European language, which is reported to be in some respects more akin to the Western groups than to Aryan. But further investigation is still required (see E. Sieg and W. Siegling, "Tocharisch, die Sprache der Indoskythen," in *Sitzungsberichte der Berl. Akad.* (July 1908, pp. 915 ff.). (P. Gi.)

ARYA SAMAJ, a Hindu religious association with reforming tendencies, which was founded by a Guzerati Brahman named Dayanand Saraswati. This man was born of a Saivite family about 1825, but in early manhood grew dissatisfied with idol-worship. He undertook many pilgrimages and studied the Vedic philosophy in the hope of solving the old problem of the Buddha,—how to alleviate human misery and attain final liberation. About 1866, when he had begun to teach and to gather disciples, he first saw the Christian scriptures, which he vehemently assailed, and the *Rig Veda*, which he correspondingly exalted, though in the conception which he ultimately formed of God the former was much more influential than the latter. Dayanand's

treatment of the Vedas was peculiar, and consisted of reading into them his own beliefs and modern scientific discoveries. Thus he explains the *Yajna* (sacrificial cult) as "the entertainment of the learned in proportion to their worth, the business of manufacture, the experiment and application of chemistry, physics and the arts of peace; the instruction of the people, the purification of the air, the nourishment of vegetables by the employment of the principles of meteorology, called *Agni-Notri* in Sanskrit." He denied that the *Vedas* warranted the caste system, but wished to retain the four grades as orders of learning to which admission should be won by examination.

These views naturally met with scanty acceptance among the Brahmans to whom he introduced them, and Dayanand turned to the masses and established *Samajes* in various parts of India, the first being at Bombay in 1875. He chose the epithet Arya as being more dignified than the slightly contemptuous term Hindu. After a successful series of tours, during which he debated publicly with orthodox pundits and with Christian missionaries, he died at Ajmere in 1883.

The Arya Samaj is not an eclectic system like the Brahma Samaj, which strives to find the common basis underlying all the great religions, and its narrower scope and corresponding intensity of conviction have won it a greater strength. It seemed to meet the feeling of many educated natives whose faith in current Hinduism was undermined, but who were predisposed against any foreign religious influence. Their patriotic ardour gladly seized on "a view of the original faith of India that seemed to harmonize with all the discoveries of modern science and the ethics of European civilization," and they cheerfully supported their leader's strange polemic with the agnostic and rationalist literature of Europe. By 1890 their numbers had increased to 40,000, by 1900 to over 92,000. Divisions had, however, set in, especially a cleavage into the *Ghasi* or vegetarian, and the *Mansi* or flesh-eating sections. To the latter belong those Rajputs who though generally in sympathy with the movement declined to adhere to the tenet of the *Samaj* which forbade the destruction of animal life and the consumption of animal food. The age of admission to the Samaj is eighteen, and members are expected to contribute to its funds at least 1% of their income.

The ten articles of their creed may be summarized thus:—

1. The source of all true knowledge is God.
2. God is "all truth, all knowledge, all bliss, boundless, almighty, just, merciful, unbegotten, without a beginning, incomparable, the support and Lord of all, all-pervading, omniscient, imperishable, immortal, eternal, holy, and the cause of the universe; worship is due to him alone.
3. The medium of true knowledge is the *Vedas*.
4. and 5. The truth is to be accepted and to become the guiding principle.
6. The object of the Samaj is to benefit the world by improving its physical, social, intellectual and moral conditions.
7. Love and justice are the right guides of conduct.
8. Knowledge must be spread.
9. The good of others must be sought.
10. In general interests members must subordinate themselves to the good of others; in personal interests they should retain independence.

The sixth clause comprehends a wide programme of reform, including abstinence from spirituous liquors and animal food, physical cleanliness and exercise, marriage reform, the promotion of female education, the abolition of caste and of idolatry.

ARYTENOID (or *arytaenoid*; from Gr. ἀρύταινα, a funnel or pitcher), a term, meaning funnel-shaped, applied to cartilages such as those of the larynx.

ARZAMAS, a town of Russia, in the government of, and 76 m. by rail S. of the town of, Nizhniy-Novgorod, on the Tesha river, at its junction with the Arsha. It is an important centre of trade, and has tanneries, oil, flour, tallow, dye, soap and iron works; knitting is an important domestic industry. Sheepskins and sail-cloth are articles of trade. The town has several churches. Pop. (1897) 10,591.

AS, the Roman unit of weight and measure, divided into 12 *unciae* (whence both "ounce" and "inch"); its fractions being deunx $\frac{11}{12}$, dextans $\frac{10}{12}$, dodrans $\frac{9}{12}$, bes $\frac{8}{12}$, septunx $\frac{7}{12}$, semis $\frac{6}{12}$, quincunx $\frac{5}{12}$, triens $\frac{4}{12}$, quadrans $\frac{3}{12}$, sextans $\frac{2}{12}$, sescuncia $\frac{1}{12}$, uncia $\frac{1}{12}$. *As* really denoted any integer or whole; whence the English word "ace." The unit or *as* of weight was the *libra* (pound: =about 11⅔ oz. avoirdupois); of length, *pes* (foot: =about 11⅔ in.); of surface, *jugerum* (=about ⅔ acre); of measure, liquid *amphora* (about 5⅞ gal.), dry *modius* (about $\frac{5}{6}$ peck). In the same way *as* signified a whole inheritance; whence *heres ex asse*, the heir to the whole estate, *heres ex semisse*, heir to half the estate. It was also used in the calculation of rates of interest.

As was also the name of a Roman coin, which was of different weight and value at different periods (see NUMISMATICS, § *Roman*). The first introduction of coined money is ascribed to Servius Tullius. The old *as* was composed of the mixed metal *aes*, an alloy of copper, tin and lead, and was called *as libralis*, because it nominally weighed 1 lb or 12 ounces (actually 10). Its original shape seems to have been an irregular oblong bar, which was stamped with the figure of a sheep, ox or sow. This, as well as the word *pecunia* for money (*pecus*, cattle), indicates the fact of cattle having been the earliest Italian medium of exchange. The value was indicated by little points or globules, or other marks. After the round shape was introduced, the one side was always inscribed with the figure of a ship's prow, and the other with the double head of Janus. The subdivisions of the *as* had also the ship's prow on one side, and on the other the head of some deity. The First Punic War having exhausted the treasury, the *as* was reduced to 2 oz. In the Second Punic War it was again reduced to half this weight, viz. to 1 oz. And lastly, by the Papirian law (89 B.C.) it was further reduced to the diminutive weight of half an ounce. It appears to have been still more reduced under Octavian, Lepidus and Antony, when its value was $\frac{1}{8}$ of an ounce. Before silver coinage was introduced (269 B.C.) the value of the *as* was about 6d., in the time of Cicero less than a halfpenny. In the time of the emperor Severus it was again lowered to about $\frac{5}{24}$ of an ounce. During the commonwealth and empire *aes grave* was used to denote the old *as* in contradistinction to the existing depreciated coin; while *aes rude* was applied to the original oblong coinage of primitive times.

ASA, in the Bible, son (or, perhaps, rather brother) of Abijah, the son of Rehoboam and king of Judah (1 Kings xv. 9-24). Of his long reign, during which he was a contemporary of Baasha, Zimri and Omri of Israel, little is recorded with the exception of some religious reforms and conflicts with the first-named. Baasha succeeded in fortifying Ramah (*er-Rām*), 5 m. north of Jerusalem, and Asa was compelled to use the residue of the temple-funds (cf. 1 Kings xiv. 26) to bribe the king of Damascus to renounce his league with Baasha and attack Israel. Galilee was invaded and Baasha was forced to return; the building material which he had collected at Ramah being used by Asa to fortify Geba, and Mizpah to the immediate north of Jerusalem. The Book of Chronicles relates a story of a sensational defeat of Zerah the "Cushite," and a great religious revival in which Judah and Israel took part (2 Chron. xiv.–xv. 15) (see CHRONICLES). Asa was succeeded by his son Jehoshaphat.

"Cushite" may designate an Ethiopian or, more probably, an Arabian (Cush, the "father" of the Sabaeans, Gen. x. 7). "If by Zerah the Ethiopian or Sabaean prince be meant, the only real difficulty of the narrative is removed. No king Zerah of Ethiopia is known at this period, nor does there seem to be room for such a person" (W. E. Barnes, *Cambridge Bible*, Chronicles, p. xxxi.). The identification with Osorkon I. or II. is scarcely tenable considering Asa's weakness; but inroads by desert hordes frequently troubled Judah, and if the tradition be correct in locating the battle at Mareshah it is probable that the invaders were in league with the Philistine towns. Similar situations recur in the reigns of Ahaz and Jehoram.

See also Wellhausen, *Prolegomena*, 208; S. A. Cook, *Expositor* (June 1906), p. 540 sq. (S. A. C.)

ASAFETIDA (*asa*, Lat. form of Persian *aza*=mastic, and *fetidus*, stinking, so called in distinction to *asa dulcis*, which was a drug highly esteemed among the ancients as *laser cyrenaicum*,

and is supposed to have been a gummy exudation from *Thapsis garganica*), a gum-resin obtained principally from the root of *Ferula fetida*, and probably also from one or two other closely allied species of umbelliferous plants. It is produced in eastern Persia and Afghanistan, Herat and Kandahar being centres of the trade. *Ferula fetida* grows to a height of from 5 to 6 ft., and when the plant has attained the age of four years it is ready for yielding asafetida. The stems are cut down close to the root, and the juice flows out, at first of a milky appearance, but quickly setting into a solid resinous mass. Fresh incisions are made as long as the sap continues to flow, a period which varies according to the size and strength of the plant. A freshly-exposed surface of asafetida has a translucent, pearly-white appearance, but it soon darkens in the air, becoming first pink and finally reddish-brown. In taste it is acrid and bitter; but what peculiarly characterizes it is the strong alliaceous odour it emits, from which it has obtained the name asafetida, as well as its German name *Teufelsdreck* (devil's dung). Its odour is due to the presence of organic sulphur compounds. Asafetida is found in commerce in "lump" or in "tear," the latter being the purer form. Medicinally, asafetida is given in doses of 5 to 15 grains and acts as a stimulant to the intestinal and respiratory tracts and to the nervous system. An enema containing it is useful in relieving flatus. It is sometimes useful in hysteria, which is essentially a lack of inhibitory power, as its nasty properties induce sufficient inhibitory power to render its readministration superfluous. It may also be used in an effervescing draught in cases of malingering, the drug "repeating" in the mouth and making the malingering not worth while. The gum-resin is relished as a condiment in India and Persia, and is in demand in France for use in cookery. In the regions of its growth the whole plant is used as a fresh vegetable, the inner portion of the full-grown stem being regarded as a luxury.

ASAF-UD-DOWLAH, nawab wazir of Oudh from 1775 to 1797, was the son of Shuja-ud-Dowlah, his mother and grandmother being the begums of Oudh, whose spoliation formed one of the chief counts in the charges against Warren Hastings. When Shuja-ud-Dowlah died he left two million pounds sterling buried in the vaults of the zenana. The widow and mother of the deceased prince claimed the whole of this treasure under the terms of a will which was never produced. When Warren Hastings pressed the nawab for the payment of debt due to the Company, he obtained from his mother a loan of 26 lakhs of rupees, for which he gave her a *jagir* of four times the value; he subsequently obtained 30 lakhs more in return for a full acquittal, and the recognition of her *jagirs* without interference for life by the Company. These *jagirs* were afterwards confiscated on the ground of the begum's complicity in the rising of Chai Singh, which was attested by documentary evidence. The evidence now available seems to show that Warren Hastings did his best throughout to rescue the nawab from his own incapacity, and was inclined to be lenient to the begums.

See *The Administration of Warren Hastings, 1772–1785*, by G. W. Forrest (1892).

ASAPH, the eponym of the Asaphite gild of singers, one of the hereditary choirs that superintended the musical services of the temple at Jerusalem in post-exilic times. The names occur in the titles of certain Psalms, and the writer of the Book of Chronicles makes Asaph a seer (2 Chron. xxix. 30), contemporary with David and Solomon, and chief of the singers of his time.

ASBESTOS, a fibrous mineral from Gr. ἄσβεστος, unquenchable, by transference, incombustible, in allusion to its power of resisting the action of fire. The word was applied by Dioscorides and other Greek authors to quicklime, but Pliny evidently used it in its modern sense. It was occasionally woven by the ancients into handkerchiefs, and, it has been said, into shrouds which were used in cremation to prevent the ashes of the corpse from mingling with the wood-ashes of the pyre.

In different varieties of asbestos the fibres vary greatly in character. When silky and flexible they are sometimes known as mountain flax. The finer kinds are often termed amianthus (*q.v.*). When the fibres are naturally interwoven, so as to form a felted mass, the mineral passes under such trivial names as mountain leather, mountain cork, mountain paper, &c. The asbestos formerly used in the arts was generally a fibrous form of some kind of amphibole, like tremolite, or anthophyllite, though occasionally perhaps a pyroxene. In recent years, however, most of the asbestos in the market is a fibrous variety of serpentine, known mineralogically as chrysotile, and probably some of the ancient asbestos was of this character (see Amianthus). Both minerals possess similar properties, so far as resistance to heat is concerned. The amphibole-asbestos, or hornblende-asbestos, is usually white or grey in colour, and may present great length of fibre, some of the Italian asbestos reaching exceptionally a length of 5 or 6 ft., but it is often harsh and brittle. The serpentine-asbestos occurs in narrow veins, yielding fibres of only 2 or 3 in. in length, but of great tensile strength: they are usually of a delicate silky lustre, very flexible and elastic, and of yellowish or greenish colour.

The Canadian asbestos, which of all kinds is at present the most important industrially, occurs in a small belt of serpentine in the province of Quebec, principally near Black Lake and Thetford, where it was first recognized as commercially valuable about 1877. The rock is generally quarried, cobbed by hand, dried if necessary, crushed in rock-breakers, and then passed between rollers; it is reduced to a finer state of division by so-called fiberizers, and graded on a shaking screen, where the loosened fibres are sorted. The process varies in different mills.

In the United States asbestos is worked only to a very limited extent. An amphibole-asbestos is obtained from Sall Mountain, Georgia; and asbestos has also been worked in the serpentine of Vermont. It occurs also in South Carolina, Virginia, Massachusetts, Arizona and elsewhere. Dr G. P. Merrill has shown that some asbestos results from a process of shearing in the rocks.

Formerly asbestos was obtained almost exclusively from Italy and Corsica, and a large quantity is still yielded by Italian workings. This is mostly an amphibole. It is in some cases associated with nodules of green garnet known as "seeds"—*Semenze dell' amianto*. Asbestos is widely distributed, but only in a few localities does it occur in sufficient abundance and purity to be worked commercially; it is found, for example, to a limited extent, at many localities in Tirol, Hungary and Russia; Queensland, New South Wales and New Zealand. In the British Isles it is not unknown, being found among the old rocks of North Wales and in parts of Ireland. Byssolite or asbestoid is a blue or green fibrous amphibole from Dauphiny.

The Asbestos Mountains in Griqualand West, Cape Colony, yield a blue fibrous mineral which is worked under the name of Cape asbestos. This is referable to the variety of amphibole called crocidolite (*q.v.*). It occurs in veins in slaty rocks, associated with jaspers and quartzites rich in magnetite and brown iron-ore. Their geological position is in the Griqua Town series, belonging to what are known in South Africa as the Pre-Cape rocks.

Asbestos was formerly spun and woven into fabrics as a rare curiosity. Charlemagne is said to have possessed a tablecloth of this material, which when soiled was purified by being thrown into the fire. At a meeting of the Royal Society in 1676 a merchant from China exhibited a handkerchief of "salamander's wool," or *linum asbesti*. By the Eskimos of Labrador asbestos has been used as a lamp-wick, and it received a similar application in some of the sacred lamps of antiquity. In recent times asbestos has been applied to a great variety of uses in the industrial arts, and its applications are constantly increasing. Its economic value depends not only on its power of withstanding a high temperature, but also on its low thermal conductivity and its partial resistance to the attack of acids: hence it is used for jacketing boilers and steam-pipes, and as a filtering medium for corrosive liquids. It has also come into use as an electric insulator. It is made into yarn, felt, millboard, &c., and is largely employed as packing for joints, glands and stopcocks in machinery. Fire-proof sheathing and felt are used for flooring and roofing; fire-proof curtains have been made for the stage, and even clothing for firemen. Asbestos enters into the

composition of fire-proof cements, plasters and paints: it is used for packing safes; and is made into balls with fire-clay for gas-stoves. Various preparations of asbestos with other materials pass in trade under such names as uralite, salamandrite, asbestolith, gypsine, &c. "Asbestic" is the name given to a Canadian product formed by crushing the serpentine rock containing thin seams of asbestos, and mixing the result with lime so as to form a plaster.

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ASBJÖRNSEN, PETER CHRISTEN (1812–1885), and **MOE, JÖRGEN ENGEBRETSEN** (1813–1882), collectors of Norwegian folklore, so closely united in their life's work that it is unusual to name them apart. Asbjörnsen was born in Christiania on the 15th of January 1812; he belonged to an ancient family of the Gudbrandsdal, which is believed to have died with him. He became a student at the university in 1833, but as early as 1832, in his twentieth year, he had begun to collect and write down all the fairy stories and legends which he could meet with. Later he began to wander on foot through the length and breadth of Norway, adding to his stores. Moe, who was born at Mo i Hole parsonage, in Sigdal Ringerike, on the 22nd of April 1813, met Asbjörnsen first when he was fourteen years of age. A close friendship began between them, and lasted to the end of their lives. In 1834 Asbjörnsen discovered that Moe had started independently on a search for the relics of national folklore; the friends eagerly compared results, and determined for the future to work in concert. By this time, Asbjörnsen had become by profession a zoologist, and with the aid of the university made a series of investigating voyages along the coasts of Norway, particularly in the Hardanger fjord. Moe, meanwhile, having left Christiania University in 1839, had devoted himself to the study of theology, and was making a living as a tutor in Christiania. In his holidays he wandered through the mountains, in the most remote districts, collecting stories. In 1842–1843 appeared the first instalment of the great work of the two friends, under the title of *Norwegian Popular Stories* (*Norske Folkeeventyr*), which was received at once all over Europe as a most valuable contribution to comparative mythology as well as literature. A second volume was published in 1844, and a new collection in 1871. Many of the *Folkeeventyr* were translated into English by Sir George Dasent in 1859. In 1845 Asbjörnsen published, without help from Moe, a collection of Norwegian fairy tales (*huldreeventyr og folkesagn*). In 1856 the attention of Asbjörnsen was called to the deforestation of Norway, and he induced the government to take up this important question. He was appointed forest-master, and was sent by Norway to examine in various countries of the north of Europe the methods observed for the preservation of timber. From these duties, in 1876, he withdrew with a pension; he died in Christiania on the 6th of January 1885. From 1841 to 1852 Moe travelled almost every summer through the southern parts of Norway, collecting traditions in the mountains. In 1845 he was appointed professor of theology in the Military School of Norway. He had, however, long intended to take holy orders, and in 1853 he did so, becoming for ten years a resident chaplain in Sigdal, and then (1863) parish priest of Bragernes. He was moved in 1870 to the parish of Vestre Aker, near Christiania, and in 1875 he was appointed bishop of Christiansand. In January 1882 he resigned his diocese on account of failing health, and died on the following 27th of March. Moe has a special claim on critical attention in regard to his lyrical poems, of which a small collection appeared in 1850. He wrote little original verse, but in his slender volume are to be found many pieces of exquisite delicacy and freshness. Moe also published a delightful collection of prose stories for children, *In the Well and the Churn* (*I Bronde og i Kjærnet*), 1851; and *A Little Christmas Present* (*En liden Julegave*), 1860. Asbjörnsen and Moe had the advantage of an admirable style in narrative prose. It was usually said that the vigour came from Asbjörnsen and the charm from Moe, but the fact seems to be that from the long habit of writing in unison they had come to adopt almost precisely identical modes of literary expression. (E. G.)

ASBURY, FRANCIS (1745–1816), American clergyman, was born at Hamstead Bridge in the parish of Handsworth, near Birmingham, in Staffordshire, England, on the 20th of August 1745. His parents were poor, and after a brief period of study in the village school of Barre, he was apprenticed at the age of fourteen to a maker of "buckle chapes," or tongues. It seems probable that his parents were among the early converts of Wesley; at any rate, Francis became converted to Methodism in his thirteenth year, and at sixteen became a local preacher. He was a simple, fluent speaker, and was so successful that in 1767 he was enrolled, by John Wesley himself, as a regular itinerant minister. In 1771 he volunteered for missionary work in the American colonies. When he landed in Philadelphia in October 1771, the converts to Methodism, which had been introduced into the colonies only three years before, numbered scarcely 300. Asbury infused new life into the movement, and within a year the membership of the several congregations was more than doubled. In 1772 he was appointed by Wesley "general assistant" in charge of the work in America, and although superseded by an older preacher, Thomas Rankin (1738–1810), in 1773, he remained practically in control. After the outbreak of the War of Independence, the Methodists, who then numbered several thousands, fell, unjustly, under suspicion of Loyalism, principally because of their refusal to take the prescribed oath; and many of their ministers, including Rankin, returned to England. Asbury, however, feeling his sympathies and duties to be with the colonies, remained at his post, and although often threatened, and once arrested, continued his itinerant preaching. The hostility of the Maryland authorities, however, eventually drove him into exile in Delaware, where he remained quietly, but not in idleness, for two years. In 1782 he was reappointed to supervise the affairs of the Methodist congregations in America. In 1784 John Wesley, in disregard of the authority of the Established Church, took the radical step of appointing the Rev. Thomas Coke (1747–1814) and Francis Asbury superintendents or "bishops" of the church in the United States. Dr Coke was ordained at Bristol, England, in September, and in the following December, in a conference of the churches in America at Baltimore, he ordained and consecrated Asbury, who refused to accept the position until Wesley's choice had been ratified by the conference. From this conference dates the actual beginning of the "Methodist Episcopal Church of the United States of America." To the upbuilding of this church Asbury gave the rest of his life, working with tireless devotion and wonderful energy. In 1785, at Abingdon, Maryland, he laid the corner-stone of Cokesbury College, the project of Dr Coke and the first Methodist Episcopal college in America; the college building was burned in 1795, and the college was then removed to Baltimore, where in 1796, after another fire, it closed, and in 1816 was succeeded by Asbury College, which lived for about fifteen years. Every year Asbury traversed a large area, mostly on horseback. The greatest testimony to the work that earned for him the title of the "Father of American Methodism" was the growth of the denomination from a few scattered bands of about 300 converts and 4 preachers in 1771, to a thoroughly organized church of 214,000 members and more than 2000 ministers at his death, which occurred at Spottsylvania, Virginia, on the 31st of March 1816.

His *Journals* (3 vols., New York, 1852), apart from their importance as a history of his life work, constitute a valuable commentary on the social and industrial history of the United States during the first forty years of their existence. Consult also F. W. Briggs, *Bishop Asbury* (London, 1874); W. P. Strickland, *The Pioneer Bishop; or, The Life and Times of Francis Asbury* (NewYork, 1858); J. B. Wakeley, *Heroes of Methodism* (New York, 1856); W. C. Larrabee, *Asbury and His Co-Laborers* (2 vols., Cincinnati, 1853); H. M. Du Bose, *Francis Asbury* (Nashville, Tenn., 1909); see also under METHODISM.

ASBURY PARK, a city of Monmouth county, New Jersey, U.S.A., on the Atlantic Ocean, about 35 m. S. of New York City (50 m. by rail). Pop. (1900) 4148; (1905) 4526; (1910) 10,150.

It is served by the Central of New Jersey and the Pennsylvania railways, and by electric railway lines connecting it with other New Jersey coast resorts both north and south. Fresh-water lakes, one of which, Deal Lake, extends for some distance into the wooded country, form the northern and southern boundaries. It is one of the most popular seaside resorts on the Atlantic coast, its numerous hotels and cottages accommodating a summer population that approximates 50,000, and a large transient population in the autumn and winter months. There is an excellent beach, along which extends a board-walk about 1 m. long; the beach is owned and controlled by the municipality. The municipality owns and operates its water-works, water being obtained from artesian wells. Asbury Park was founded in 1869, was named in honour of the Rev. Francis Asbury, was incorporated as a borough in 1874, and was chartered as a city in 1897. In 1906 territory to the west with a population estimated at 6000 was annexed.

ASCALON, now ʿAsḳalān, one of the five chief cities of the Philistines, on the coast of the Mediterranean, 12 m. N. of Gaza. The place is mentioned several times in the Tell el-Amarna correspondence. It revolted from Egypt on two occasions, but was reconquered, and a sculpture at Thebes depicts the storming of the city. Ascalon was a well-fortified town, and the seat of the worship of the fish-goddess Derketo. Though situated in the nominal territory of the tribe of Judah, it was never for any length of time in the possession of the Israelites. The only incident in its history recorded in the Bible (the spoliation by Samson, Judg. xiv. 19) may possibly have actually occurred at another place of the same name, in the hill country of Judaea. Sennacherib took it in 701 B.C. The conquest of Alexander hellenized its civilization, and after his time it became tributary alternately to Syria and Egypt. Herod the Great was a native of the city, and added greatly to its beauty; but it suffered severely in the later wars of the Romans and Jews. In the 4th century it again rose to importance; and till the 7th century, when it was conquered by the Moslems, it was the seat of a bishopric and a centre of learning. During the first crusade a signal victory was gained by the Christians in the neighbouring plain on the 15th of August 1099; but the city remained in the hands of the caliphs till 1157, when it was taken by Baldwin III., king of Jerusalem, after a siege of five months. By Baldwin IV. it was given to his sister Sibylla, on her marriage with William of Montferrat in 1178. When Saladin (1187) had almost annihilated the Christian army in the plain of Tiberias, Ascalon offered but a feeble resistance to the victor. At first he repaired and strengthened its fortifications, but afterwards, alarmed at the capture of St Jean d'Acre (Acre) by Richard Cœur de Lion in 1191, he caused it to be dismantled. It was restored in the following year by the English king, but only to be again abandoned. From this time Ascalon lost much of its importance, and at length, in 1270, its fortifications were almost totally destroyed by Sultan Bibars, and its port was filled up with stones. The place is now a desolate heap of ruins, with remains of its walls and fragments of granite pillars. The surrounding country is well watered and very fertile.

See a paper by Guthe, "Die Ruinen Ascalons," in the *Zeitschrift* of the Deutsche Palästina-Verein, ii. 164 (translated in Palestine Exploration Fund *Quarterly Statement*, 1880, p. 182). See also C. R. Conder in the latter journal, 1875, p. 152. (R. A. S. M.)

ASCANIUS, in Roman legend, the son of Aeneas by Creüsa or Lavinia. From Livy it would appear that tradition recognized two sons of Aeneas called by this name, the one the son of his Trojan, the other of his Latin wife. According to the usual account, he accompanied his father to Italy on his flight from Troy. On the death of Aeneas, the government of Latium was left in the hands of Lavinia, Ascanius being too young to undertake it. After thirty years he left Lavinium, and founded Alba Longa. Ascanius was also called Ilus and Iulus, and the Julian gens claimed to be descended from him. Several more or less contradictory traditions may be found in Dionysius of Halicarnassus, Strabo and other writers.

Virg. *Aen.* ii. 666; Livy i. 3; see also Klausen, *Aeneas und die Penaten* (1840).

ASCENSION, an island in the Atlantic Ocean, between 7° 53′ and 8° S., and 14° 18′ and 14°26′ W., 800 m. N.W. of St Helena, about 7½ m. in length and 6 in breadth, with an area of 38 sq. m. and a circumference of about 22 m. The island lies within the immediate influence of the south-east trade-wind. The lee side of the island is subject to the visitation of "rollers," which break on the shore with very great violence. Ascension is a volcanic mass erected on a submarine platform. Numerous cones exist. Green Mountain, the principal elevation, is a huge elliptical crater, rising 2820 ft. above the sea, while the plains or table-lands surrounding it vary in height from 1200 to 2000 ft. On the north side they sweep gradually down towards the shore, but on the south they terminate in bold and lofty precipices. Steep and rugged ravines intersect the plains, opening into small bays or coves on the shore, fenced with masses of compact and cellular lava; and all over the island are found products of volcanic action. Ascension was originally destitute of vegetation save on the summit of Green Mountain, which owes its verdure to the mists which frequently enshroud it, but the lower hills have been planted with grasses and shrubs. The air is clear and light, and the climate remarkably healthy, notwithstanding the high temperature—the average day temperature on the shore being 85° F., on Green Mountain 75° F. The average rainfall is about 20 in., March and April being the rainy months. Ascension is noted for the number of turtles and turtle eggs found on its shores, the season lasting from December to May or June. The turtles are caught and kept in large ponds. The coasts abound with a variety of fish of excellent quality, of which the most important are the rock-cod, the cavalli, the conger-eel and the "soldier." Numbers of sheep are bred on the island, and there are a few cattle and deer, besides goats and wild cats. Feathered game is abundant. Like St Helena, the island does not possess any indigenous vertebrate land fauna. The "wideawake" birds frequent the island in large numbers, and their eggs are collected and eaten. Beetles and land-shells are well represented. Flies, ants, mosquitoes, scorpions, centipedes and crickets abound. The flora includes purslane, rock roses and several species of ferns and mosses.

The island was discovered by the Portuguese navigator, João da Nova, on Ascension Day 1501, and was occasionally visited thereafter by ships. In 1701 William Dampier was wrecked on its coast, and during his detention discovered the only spring of fresh water the island contains. Ascension remained uninhabited till after the arrival of Napoleon at St Helena (1815), when it was taken possession of by the British government, who sent a small garrison thither. A settlement, named George Town (locally known as Garrison), was made on the north-west coast, water being obtained from "Dampier's" springs in the Green Mountain, 6 m. distant. The island is under the rule of the admiralty, and was likened by Darwin to "a huge ship kept in first-rate order." It is governed by a naval captain borne on the books of the flagship of the admiral superintendent at Gibraltar. A depot of stores for the navy is maintained, but the island is used chiefly as a sanatorium. Ascension is connected by cable with Europe and Africa, and is visited once a month by mail steamers from the Cape. Formerly letters were left by passing ships in a crevice in one of the rocks. The population, about 300, consists of seamen, marines, and Krumen from Liberia.

See *Africa Pilot*, part ii., 5th ed. (London, 1901); C. Darwin, *Geological Observations on the Volcanic Islands visited during the Voyage of H.M.S. "Beagle"* (London, 1844); *Report of the Scientific Results of the Voyage of the "Challenger,"* vol. i. part 2 (London, 1885); and *Six Months in Ascension*, by Mrs Gill (London, 1878), an excellent sketch of the island and its inhabitants. It was at Ascension that Mr, afterwards Sir, David Gill determined, in 1877, the solar parallax.

ASCENSION, FEAST OF THE, one of the oecumenical festivals of the Christian Church, ranking in solemnity with those of Christmas, of Easter and of Pentecost. It is held forty days after Easter, or ten days before Whitsunday, in celebration of Christ's ascension into heaven forty days after the resurrection. It always falls on a Thursday, and the day is known as Ascension Day, or Holy Thursday. The festival is of great antiquity; and

though there is no discoverable trace of it before the middle of the 4th century, subsequent references to it assume its long establishment. Thus St Augustine (*Ep.* 54 *ad Januar.*) mentions it as having been kept from time immemorial and as probably instituted by the apostles Chrysostom, in his homily on the ascension, mentions a celebration of the festival in the church of Romanesia outside Antioch, and Socrates (*Hist. eccles.* vii. 26) records that in the year 390 the people of Constantinople "of old custom" (ἐξ ἔθους) celebrated the feast in a suburb of the city. As these two references suggest, the festival was associated with a professional pilgrimage, in commemoration of the passing of Christ and his apostles to the Mount of Olives; such a procession is described by Adamnan, abbot of Iona, as taking place at Jerusalem in the 7th century, when the feast was celebrated in the church on Mount Olivet (*de loc. sanct.* i. 22). The *Peregrinatio* of Etheria (Silvia), which dates from *c.* A.D. 385, says that the festival was held in the Church of the Nativity at Bethlehem (Duchesne, *Chr. Worship*, p. 515). In the West, however, in the middle ages, the procession with candles and banners outside the church was taken as symbolical of Christ's triumphant entry into heaven.

In the East the festival is known as the ἀνάληψις, "taking up," or ἐπισωζομένη, a term first used in the Cappadocian church, and of which the meaning has been disputed, but which probably signifies the feast "of completed salvation." The word *ascensio*, adopted in the West, implies the ascension of Christ by his own power, in contradistinction to the *assumptio*, or taking up into heaven of the Virgin Mary by the power of God.

In the Roman Catholic Church the most characteristic ritual feature of the festival is now the solemn extinction of the paschal candle after the Gospel at high mass. This candle, lighted at every mass for the forty days after Easter, symbolizes the presence of Christ with his disciples, and its extinction his parting from them. The custom dates from 1263, and was formerly confined to the Franciscans; it was prescribed for the universal church by the Congregation of Rites on the 19th of May 1697. Other customs, now obsolete, were formerly associated with the liturgy of this feast; *e.g.* the blessing of the new beans after the Commemoration of the Dead in the canon of the mass (Duchesne, p. 183). In some churches, during the middle ages, an image of Christ was raised from the altar through a hole in the roof, through which a burning straw figure representing Satan was immediately thrown down.

In the Anglican Church Ascension Day and its octave continue to be observed as a great festival, for which a special préface to the consecration prayer in the communion service is provided, as in the case of Christmas, Easter, Whitsunday, and Trinity Sunday. The celebration of the Feast of the Ascension was also retained in the Lutheran churches as warranted by Holy Scripture.

See Herzog-Hauck, *Realencyklopädie* (1900), s. "*Himmelfahrtsfest*"; L. Duchesne, *Christian Worship* (2nd Eng. ed., London, 1904); *The Catholic Encyclopaedia* (London and New York, 1907).

ASCETICISM, the theory and practice of bodily abstinence and self-mortification, generally religious. The word is derived from the Gr. verb ἀσκέω, "I practise," whence the noun ἄσκησις and the adjective ἀσκητικός; and it embodies a metaphor taken from the ancient wrestling-place or palaestra, where victory rewarded those who had best trained their bodies. Not a few other technical terms of Greek philosophic asceticism, used in the first instance by Cynics and Neo-pythagoreans, and then continued among the Greek Jews and Christians, were metaphors taken from athletic contests—but only metaphors, for all asceticism, worthy of the name, has a moral purport, and is based on the eternal contrast of the proposition, "This is right," with the proposition, "That is pleasant." The ascetic instinct is probably as old as humanity, yet we must not forget that early religious practices are apt to be deficient in lofty spiritual meaning, many things being esteemed holy that are from a modern point of view trifling and even obscene. We may therefore expect in primitive asceticism to find many abstentions and much self-torture apparently valueless for the training of character and discipline of the feelings, which are the essence of any healthy asceticism. Nevertheless these non-moral *taboos* or restraints may have played a part in building up in us that faculty of preferring the larger good to the impulse of the moment which is the note of real civilization. Aristotle in his *Ethics* defines, as the barbarian's ideal of life, "the living as one likes." Yet nothing is less true; for the savage, more than the civilized man, is tied down at every step with superstitious scruples and restrictions barely traceable in higher civilizations except as primitive survivals. It is not that savages are devoid of the ascetic instinct. It is on the contrary over-developed in them, but ill-informed and working in ways unessential or even morally harmful. It is the note of every great religious reformer, Moses, Buddha, Paul, Mani, Mahomet, St Francis, Luther, to enlighten and direct it to higher aims, substituting a true personal holiness for a ritual purity or *taboo*, which at the best was viewed as a kind of physical condition and contagion, inherent as well in things and animals as in man.

It is useful, therefore, in a summary sketch of asceticism, to begin with the facts as they can be observed among less advanced races, or as mere survivals among people who have reached the level of genuine moral reflection; and from this basis to proceed to a consideration of self-denial consciously pursued as a method of ethical perfection. The latter is as a rule less cruel and rigorous than primitive forms of asceticism. Under this head fall the following:—Fasting, or abstention from certain meats and drinks; denial of sexual instinct; subjection of the body to physical discomforts, such as nakedness, vigils, sleeping on the bare ground, tattooing, deformation of skull, teeth, feet, &c., vows of silence to be observed throughout life or during pilgrimages, avoidance of baths, of hair-cutting and of clean raiment, living in a cave; actual self-infliction of pain, by scourging, branding, cutting with knives, wearing of hair shirts, fire-walking, burial alive, hanging up of oneself by hooks plunged into the skin, suspension of weights by such hooks to the tenderer parts of the body, self-mutilation and numerous other, often ingenious, modes of torture. Such customs repose on various superstitions; for example, the self-mutilation of the Galli or priests of Cybele was probably a magical ceremony intended to fertilize the soil and stimulate the crops. Others of the practices enumerated, probably the greater part of them, spring from demonological beliefs.

Fasting (*q.v.*) is used in primitive asceticism for a variety of reasons, among which the following deserve notice. Certain animals and vegetables are *taboo*, *i.e.* too holy, or—what among Semites and others was the same thing—too defiling and unclean, to be eaten. Thus in Leviticus xi. the Jews are forbidden to eat animals other than cloven-footed ruminants; thus the camel, coney, hare and swine were forbidden; so also any water organisms that had not fins and scales, and a large choice of birds, including swan, pelican, stork, heron and hoopoe. All winged creeping things that have four feet were equally abominable. Lastly, the weasel, mouse and most lizards were *taboo*. All or nearly all of these were at one time totem animals among one or another of the Semitic tribes, and were not eaten because primitive men will not eat animals between which and themselves and their gods they believe a peculiar tie of kinship to exist. Men do not eat an animal for which they have a reverential dread, or if they eat it at all, it is only in a sacramental feast and in order to absorb into themselves its life and holy properties. Such abstinences as the above, though based on *taboo*, that is, on a reluctance to eat the totem or sacred animal, are yet ascetic in so far as they involve much self-denial. No flesh is more wholesome or succulent than beef, yet the Egyptians and Phoenicians, says Porphyry (*de Abst.* ii. 11), would rather eat human flesh than that of the cow, and so would two hundred and fifty millions of modern Hindus. The privation involved in abstention from the flesh of the swine, a *taboo* hardly less widespread, is obvious.

Similar prohibitions are common in Africa, where fetish priests are often reduced to a diet of herbs and roots. That such dietary restrictions were merely ceremonial and superstitious, and not

intended to prevent the consumption of meats which would revolt modern tastes, is certain from the fact that the Levitical law freely allowed the eating of locusts, grasshoppers, crickets and cockroaches, while forbidding the consumption of rabbits, hares, storks, swine, &c. The Pythagoreans were forbidden to eat beans.

Another widespread reason for avoiding flesh diet altogether was the fear of absorbing the irrational soul of the animal, which especially resided in the blood. Hence the rule not to eat meats strangled, except in sacramental meals when the god inherent in the animal was partaken of. It is equally a soul or spirit in wine which inspires the intoxicated; the old Egyptian kings avoided wine at table and in libations, because it was the blood of rebels who had fought with the gods, and out of whose rotting bodies grew the vines; to drink the blood was to imbibe the soul of these rebels, and the frenzy of intoxication which followed was held to be possession by their spirits. The medieval Jews also held that there is a cardiac demon in wine which takes possession of drunken men; and the Mahommedan prohibition of wine-drinking is based on a similar superstition. The avoidance of wine, therefore, by Rechabites, Nazirites, Arab dervishes and Pythagoreans, and also of leaven in bread, is parallel to and explicable in the same way as abstention from flesh. Porphyry (*de Abst.* i. 19) acquaints us with another widespread scruple against flesh diet. It was this, that the souls of men transmigrated into animals, so that if you ate these, you might consume your own kind, cannibal-wise. Contemporary meat-eaters set themselves to combat this prejudice, and argued that it was a pious duty to kill animals and so release the human souls imprisoned. In the same tract Porphyry relates (ii. 48) how wizards acquired the mantic powers of certain birds, such as ravens and hawks, by swallowing their hearts. The soul of the bird, he explains, enters them with its flesh, and endows them with power of divination. The lover of wisdom, who is priest of the universal God, rather than risk the taking into himself of inferior souls and polluting demons, will abstain from eating animals. Such is Porphyry's argument.

The same fear of imbibing the irrational soul of animals, and thereby reinforcing the lower appetites and instincts of the human being, inspired the vegetarianism of Apollonius of Tyana and of the Jewish Therapeutae, who in their sacred meals were careful to have a table free from blood-containing meats; and the fear of absorbing the animal's psychic qualities equally motived the Jewish and early Christian rule against eating things strangled. It was an early belief, which long survived among the Manichaean sects, that fish, being born in and of the waters, and without any sexual connexion on the part of other fishes are free from the taint which pollutes all animals *quae copulatione generantur*. Fish, therefore, unlike flesh, could be safely eaten. Here we have the origin of the Catholic rule of fasting, seldom understood by those who observe it. The same scruple against flesh-eating is conveyed in the beautiful confession, in the *Cretans* of Euripides, of one who had been initiated in the mysteries of Orpheus and became a "Bacchos." The last lines of this, as rendered by Dr Gilbert Murray, are as follows:—

> "Robed in pure white, I have borne me clean
> From man's vile birth and coffined clay,
> And exiled from my lips alway
> Touch of all meat where life hath been."

This Orphic fast from meat was only broken by an annual sacramental banquet, originally, perhaps, of human, but later of raw bovine flesh.

The Manichaeans held that in every act of begetting, human or otherwise, a soul is condemned afresh to a cycle of misery by imprisonment in flesh—a thoroughly Indian notion, under the influence of which their perfect or elect ones scrupulously abstained from flesh. The prohibition of taking life, which they took over from the Farther East, in itself entailed fasting from flesh. A fully initiated Manichaean would not even cut his own salad, but employed a catechumen to commit on his behalf this act of murder, for which he subsequently shrived him.

We come to a third widespread reason for fasting, common among savages. Famished persons are liable to morbid excitement, and fall into imaginative ecstasies, in the course of which they see visions and spectres, converse with gods and angels, and are the recipients of supernatural revelations. Accordingly King Saul "ate no bread all the day nor all the night" in which the witch of Endor revealed to him the ghost of Samuel. Weak and famished, he hardly wanted to eat the fatted calf when the vision was over. Among the North American Indians ecstatic fasting is regularly practised. A faster writes down his visions and revelations for a whole season. They are then examined by the elders of the tribe, and if events have verified them, he is recognized as a supernaturally gifted being, and rewarded with chieftaincy. All over the world fasting is a recognized mode of evoking, consulting and also of overcoming the spirit world. This is why the Zulus and other primitive races distrust a medicine man who is not an ascetic and lean with fasting. In the Semitic East it is an old belief that a successful fast in the wilderness of forty days and nights gives power over the Djinns. The Indian *yogi* fasts till he sees face to face all the gods of his Pantheon; the Indian magician fasts twelve days before producing rain or working any cure. The Bogomils fasted till they saw the Trinity face to face. From the first, fasting was practised in the church for similar reason. In the *Shepherd of Hermas* a vision of the church rewards frequent fasts and prayer; and it is related in extra-canonical sources that James the Less vowed that he would fast until he too was vouchsafed a vision of the risen Lord. After a long and rigorous fast the Lord appeared to him. Not a few saints were rewarded for their fasting by glimpses of the beatific vision. Dr Tylor writes on this point as follows (*Prim. Cult.* ii. 415): "Bread and meat would have robbed the ascetic of many an angel's visit: the opening of the refectory door must many a time have closed the gates of heaven to his gaze."

Among the Semites and Tatars worshippers lacerate themselves before the god. So in 1 Kings xviii. 28 the priests of Baal engaged in a rain-making ceremony, gashed themselves with knives and lances till the blood gushed out upon them. The Syriac word *ethkashshaph*, which means literally to "cut oneself," is the regular equivalent of to "make supplication." Among Greeks and Arabs, mourners also cut themselves with knives and scratched their faces; the Hebrew law forbade such mourning, and we find the prohibition repeated in many canons of the Eastern churches. At first sight these rites seem intended to call down the pity of heaven on man, but as Robertson Smith points out, their real import was by shedding blood on a holy stone or in a holy place to tie or renew a blood-bond between the God and his faithful ones. We have no clear information about the mind of the Flagellants, who in 1259, and again in 1349, swarmed through the streets of European cities, naked and thrashing themselves, till the blood ran, with leather thongs and iron whips. They were penitents, and no doubt imbued with the ancient belief that without the shedding of blood there is no remission of sins.

Asceticism then in its origin was usually not ascetic in a modern sense, that is, not ethical. It was rather of the nature of the savage *taboo* (*q.v.*), the outcome of totemistic beliefs or a mode of averting the contaminating presence of djinns and demons. Above all, fasting was a mode of preparing oneself for the sacramental eating of a sacred animal, and as such often assisted by use of purgatives and aperients. It was essential in the old Greek rites of averting the *Kêres* or djinns, the ill regulated ghosts who return to earth and molest the living, to abstain from flesh. The Pythagoreans and Orphic *mystae* so abstained all their life long, and Porphyry eloquently insists on such a discipline for all who "are not content merely to talk about Reason, but are really intent on casting aside the body and living through Reason with Truth. Naked and without the tunic of the flesh these will enter the arena and strive in the Olympic contest of the soul."

It is time to pass on to Buddhist asceticism, in its essence a more ethical and philosophical product than some of the forms so far considered. The keynote of Buddhist asceticism is deliverance from life and its inevitable suffering. Once at a

village where he rested the Blessed One (Buddha) addressed his brethren and said: "It is through not understanding and grasping four Noble Truths, O brethren, that we have had to run so long, to wander so long in this weary path of transmigration, both you and I." These noble truths were about sorrow, its cause, its cessation and the path which leads to that cessation. Once they are grasped the craving for existence is rooted out, that which leads to renewed existence is destroyed, and there is no more birth. The Buddha believed he had a way of Truth, which if an elect disciple possessed he might say of himself, "Hell is destroyed for me, and rebirth as an animal, or a ghost, or in any place of woe. I am converted, I am no longer liable to be reborn in a state of suffering, and am assured of final salvation."

Suffering, said the sage in his great sermon at Benares, is inseparable from birth and old age. Sickness is suffering, so is death, so is union with the unloved, and separation from the loved; not to obtain what one desires is suffering; the entire fivefold clinging to the earthly is suffering. Its origin is the thirst for being which leads from birth to birth, together with lust and desire, which find gratification here and there; the thirst for pleasures, for being, for power. This thirst must be extinguished by complete annihilation of desire, by letting it go, expelling it, separating oneself from it, giving it no room. This extinction is achieved in eight ways, namely rectitude of faith, resolve, speech, action, living, effort, thought, self-concentration.

In this gospel we must be done with the outer world, participation in which is not the self, yet means for the self birth and death, appetites, longings, emotions, change and suffering, pleasure and pain. He that has put off all lust and desire, all hope and fear, all will to exist as a sinful, because a sentient, being, has won to the heaven of extinction or Nirvāna. He may still tread the earth, but he is a saint or Brahman, is in heaven, has quitted the transient and enjoys eternity.

Such was the Buddha's gospel, as his most ancient scriptures enunciate it. Nirvāna is constantly defined in them as supreme happiness. It is not even clear how far, if we interpret it strictly, this philosophy leaves any self to be happy. However this be, its practical expression is the life of the monk who has separated himself from the world. Five commandments must be observed by him who would even approach the higher life of saint and ascetic. They are these: to kill no living thing; not to lay hands on another's property; not to touch another's wife; not to speak what is untrue; not to drink intoxicating drinks.

Though couched in the negative, these rules must be interpreted in the amplest and widest sense by all believers. The Order, however, which the would-be ascetic can enter by regular initiation, when he is twenty years of age, entails a discipline much more severe. He has gone forth from home into homelessness, and has not where to lay his head. He must eat only the morsels he gets by begging; must dress in such rags as he can pick up; must sleep under trees. Mendicancy is his recognized way of life. Furthermore, he must abstain all his life from sexual intercourse; he may not take even a blade of grass without permission of the owner; he must not kill even a worm or ant; he must not boast of his perfection. In practice the lives of Buddhist monks are not so squalid as these rules would lead us to suppose. Thanks to the reverent charity of the laymen, they do not live much worse than Benedictine monks; and the prohibition to live in houses does not extend to caves. Everywhere in India and Ceylon they hollowed out cells and churches in the cliffs and rocks, which are the wonder of the European tourist.

But long before the advent of Buddhism, the hermit, or wandering beggar, was a familiar figure in India. No formal initiation was imposed on the would-be ascetic, save (in the case of young men) the duty to live at first in his teacher's house. One who had thus fulfilled the duties of the student order must "go forth remaining chaste," says the *Āpastamba*, ii. 9. 8. He shall then "live without a fire, without a house, without pleasures, without protection; remaining silent and uttering speech only on the occasion of the daily recitation of the Veda; begging so much food only in the village as will sustain his life, he shall wander about, neither caring for this world nor for heaven. He shall only wear clothes thrown away by others. Some declare that he shall even go naked. Abandoning truth and falsehood, pleasure and pain, the Vedas, this world and the next, he shall seek the Universal Soul, in knowledge of which standeth eternal salvation."

Such a life was specially recommended for one who has lived the life of a householder, and, having begotten sons according to the sacred law and offered sacrifices, desires in his old age to abandon worldly objects and direct his mind to final liberation. He leaves his wife, if she will not accompany him, and goes forth into the forest, committing her and his house to his sons. He must indeed take with him the sacred fire and implements for domestic sacrifice, but until death overtakes him he must wander silent, alone, possessing no hearth nor dwelling, begging his food in the villages, firm of purpose, with a potsherd for an alms bowl, the roots of trees for a dwelling, and clad in coarse worn-out garments. "Let him not desire to die, let him not desire to live; let him wait for his appointed time, as a servant waits for the payment of his wages. Let him drink water purified by straining with a cloth, let him utter speech purified by truth, let him keep his heart pure. Let him patiently bear hard words, let him not insult anybody, let him not become any one's enemy for the sake of this perishable body. . . . Let him reflect on the transmigrations of men, caused by their sinful deeds, on their falling into hell, and on their torments in the world of Yama. . . . A twice-born man who becomes an ascetic thus shakes off sin here below and reaches the highest Brahman" (*Laws of Manu*, by G. Bühler, vi. 85).

This old-world wisdom of the Hindus, a thousand years before our era, is worthily to be paralleled from the Manichaeism of about the year 400. Augustine has preserved (*contra Faustum*, v. 1) the portraiture of a Manichaean elect as drawn by himself:—

"I have given up father and mother, wife, children and all else that the gospel bids us, and do you ask if I accept the gospel? Are you then still ignorant of what the word gospel means? It is nothing else than the preaching and precept of Christ. I have cast away gold and silver, and have ceased to carry even copper in my belt, being content with my daily bread, nor caring for the morrow, nor anxious how my belly shall be filled or my body clothed; and do you ask me if I accept the gospel? You behold in me those beatitudes of Christ which make up the gospel, and you ask me if I accept it. You behold me gentle, a peacemaker, pure of heart, a mourner, hungering, thirsting, bearing persecutions and hatreds for righteousness' sake, and do you doubt whether I accept the gospel. . . . All that was mine I have given up, father, mother, wife, children, gold, silver, eating, drinking, delights, pleasures. Deem this a sufficient answer to your question and deem yourself on the way to be blessed, if you have not been scandalized in me."

The Greek Cynics (see CYNICS) played a great part in the history of Asceticism, and they were so much the precursors of the Christian hermits that descriptions of them in profane literature have been mistaken for pictures of early monasticism. In striving to imitate the rugged strength and independence of their master Socrates, they went to such extremes as rather to caricature him. They affected to live like beggars, bearing staff and wallet, owning nothing, renouncing pleasures, riches, honours. For older thinkers like Plato and Aristotle the perfect life was that of the citizen and householder; but the Cynics were individualists, citizens of the world without loyalty or respect for the ancient city state, the decay of which was coincident with their rise. Their zeal for renunciation often extended not to pleasures, marriage and property alone, but to cleanliness, knowledge and good manners as well, and in this respect also they were the forerunners of later monks.

Philo (20 B.C.–A.D. 40) has left us many pictures of the life which to his mind impersonated the highest wisdom, and they are all inspired by the more respectable sort of cynicism, which had taken deep root among Greek Jews of the day. One such picture merits citation from his tract *On Change of Names* (vol. i. 583, ed. Mangey): "All this company of the good and wise have of their own free will divested themselves of too copious wealth; nay, have spurned the things dear to the flesh. For of

good habit and lusty are athletes, since they have fortified against the soul the body which should be its servant; but the disciples of wisdom are pale and wasted, and in a manner reduced to skeletons, because they have sacrificed the whole of their bodily strength to the faculties of the soul."

His own favourite ascetics, the Therapeutae, whose chief centre was in Egypt, had renounced property and all its temptations, and fled, irrevocably abandoning brothers, children, wives, parents, throngs of kinsmen, intimacy of friends, the fatherlands where they were born and bred (see THERAPEUTAE). Here we have the ideal of early Christian renunciation at work, but apart from the influence of Jesus. In the pages of Epictetus the same ideal is constantly held up to us.

In the Christian Church there was from the earliest age a leaning to excessive asceticism, and it needed a severe struggle on the part of Paul, and of the Catholic teachers who followed him, to secure for the baptized the right to be married, to own property, to engage in war and commerce, or to assume public office. One and all of the permanent institutions of society were condemned by the early enthusiasts, especially by those who looked forward to a speedy advent of the millennium, as alien to the kingdom of God and as impediments to the life of grace.

Marriage and property had already been eschewed in the Jewish Essene and Therapeutic sects, and in Christianity the name of Encratite was given to those who repudiated marriage and the use of wine. They did not form a sect, but represented an impulse felt everywhere. In early and popular apocryphal histories the apostles are represented as insisting that their converts should either not contract wedlock or should dissolve the tie if already formed. This is the plot of the *Acts of Thecla*, a story which probably goes back to the first century. Repudiation of the tie by fervent women, betrothed or already wives, occasioned much domestic friction and popular persecution. In the Syriac churches, even as late as the 4th century, the married state seems to have been regarded as incompatible with the perfection of the initiated. Renunciation of the state of wedlock was anyhow imposed on the faithful during the lengthy, often lifelong, terms of penance imposed upon them for sins committed; and later, when monkery took the place, in a church become worldly, partly of the primitive baptism and partly of that rigorous penance which was the rebaptism and medicine of the lapsed, celibacy and virginity were held essential thereto, no less than renunciation of property and money-making.

Together with the rage for virginity went the institution of *virgines subintroductae*, or of spiritual wives; for it was often assumed that the grace of baptism restored the original purity of life led by Adam and Eve in common before the Fall. Such rigours are encouraged in the *Shepherd of Hermas*, a book which emanated from Rome and up to the 4th century was read in church. They were common in the African churches, where they led to abuses which taxed the energy even of a Cyprian. They were still rife in Antioch in 260. We detect them in the Celtic church of St Patrick, and, as late as the 7th century, among the Celtic elders of the north of France. In the Syriac church as late as 340, such relations prevailed between the "Sons and daughters of the Resurrection." It continued among the Albigenses and other dissident sects of the middle ages, among whom it served a double purpose; for their elders were thus not only able to prove their own chastity, but to elude the inquisitors, who were less inclined to suspect a man of the catharism which regarded marriage as the "greater adultery" (*maius adulterium*) if they found him cohabiting (in appearance at least) with a woman. There was hardly an early council, great or small, that did not condemn this custom, as well as the other one, still more painful to think of, of self-emasculation. In the Catholic church, however, common sense prevailed, and those who desired to follow the Encratite ideal repaired to the monasteries.

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ASCHAFFENBURG, a town of Germany, in the kingdom of Bavaria, on the right bank of the Main, at its confluence with the Aschaff, near the foot of the Spessart, 26 m. by rail S.E. of Frankfort-on-Main. Pop. (1900) 18,091; (1905) 25,275. Its chief buildings are the Johannisburg, built (1605–1614) by Archbishop Schweikard of Cronberg, which contains a library with a number of *incunabula*, a collection of engravings and paintings; the *Stiftskirche*, or cathedral, founded in 980 by Otto of Bavaria, but dating in the main from the early 12th and the 13th centuries, in which are preserved various monuments by the Vischers, and a sarcophagus, with the relics of St Margaret (1540); the Capuchin hospital; a theatre, which was formerly the house of the Teutonic order; and several mansions of the German nobility. The town, which has been remarkable for its educational establishments since the 10th century, has a gymnasium, lyceum, seminarium and other schools. There is an archaeological museum in the old abbey buildings. The graves of Klemens Brentano and his brother Christian (d. 1851) are in the churchyard; and Wilhelm Heinse is buried in the town. Coloured and white paper, ready-made clothing, cellulose, tobacco, lime and liqueurs are the chief manufactures, while a considerable export trade is done down the Main in wood, cattle and wine.

Aschaffenburg, called in the middle ages Aschafaburg and also Askenburg, was originally a Roman settlement. The 10th and 23rd Roman legions had their station here, and on the ruins of their *castrum* the Frankish mayors of the palace built a castle. Bonifacius erected a chapel to St Martin, and founded a Benedictine monastery. A stone bridge over the Main was built by Archbishop Willigis in 989. Adalbert increased the importance of the town in various ways about 1122. In 1292 a synod was held here, and in 1474 an imperial diet, preliminary to that of Vienna, in which the concordat was decided which has therefore been sometimes called the *Aschaffenburg Concordat*.

The town suffered greatly during the Thirty Years' War, being held in turn by the various belligerents. In 1842–1849, King Louis built himself to the west of the town a country house, called the *Pompeianum*, from its being an imitation of the house of Castor and Pollux at Pompeii. In 1866 the Prussians inflicted a severe defeat on the Austrians in the neighbourhood.

The principality of Aschaffenburg, deriving its name from the city, comprehended an area of 654 English sq. m. It formed part of the electorate of Mainz, and in 1803 was made over to the archchancellor, Archbishop Charles of Dalberg. In 1806 it was annexed to the grand-duchy of Frankfort; and in 1814 was transferred to Bavaria, in virtue of a treaty concluded on the 19th of June between that power and Austria. With lower Franconia, it now forms a district of the kingdom of Bavaria.

ASCHAM, ROGER (*c.* 1515–1568), English scholar and writer, was born at Kirby Wiske, a village in the North Riding of Yorkshire, near Northallerton, about the year 1515. His name would be more properly spelt Askham, being derived, doubtless, from Askham in the West Riding. He was the third son of John Ascham, steward to Lord Scrope of Bolton. The family name of his mother Margaret is unknown, but she is said to have been well connected. The authority for this statement, as for most others concerning Ascham's early life, is Edward Grant, headmaster of Westminster, who collected and edited his letters and delivered a panegyrical oration on his life in 1576.

Ascham was educated not at school, but in the house of Sir Humphry Wingfield, a barrister, and in 1533 speaker of the House of Commons, as Ascham himself tells us, in the *Toxophilus*, p. 120 (not, as by a mistake which originated with Grant and has been repeated ever since, Sir Anthony Wingfield, who was nephew

of the speaker). Sir Humphry "ever loved and used to have many children brought up in his house," where they were under a tutor named R. Bond. Their sport was archery, and Sir Humphry "himself would at term times bring down from London both bows and shafts and go with them himself to the field and see them shoot." Hence Ascham's earliest English work, the *Toxophilus*, the importance which he attributed to archery in educational establishments, and probably the provision for archery in the statutes of St Albans, Harrow and other Elizabethan schools. From this private tuition Ascham was sent "about 1530," at the age, it is said, of fifteen, to St John's College, Cambridge, then the largest and most learned college in either university. Here he fell under the influence of John Cheke, who was admitted a fellow in Ascham's first year, and Sir Thomas Smith. His guide and friend was Robert Pember, "a man of the greatest learning and with an admirable facility in the Greek tongue." On his advice he practised seriously the precept embodied in the saying, "I know nothing about the subject, I have not even lectured on it," and "to learn Greek more quickly, while still a boy, taught Greek to boys." In Latin he specially studied Cicero and Caesar. He became B.A. on the 18th of February 1534/5. Dr Nicholas Metcalfe was then master of the college, "a papist, indeed, and yet if any young man given to the new learning as they termed it, went beyond his fellows," he "lacked neither open praise, nor private exhibition." He procured Ascham's election to a fellowship, "though being a new bachelor of arts, I chanced among my companions to speak against the Pope . . . after grievous rebuke and some punishment, open warning was given to all the fellows, none to be so hardy, as to give me his voice at that election." The day of election Ascham regarded as his "birthday," and "the whole foundation of the poor learning I have and of all the furtherance that hitherto elsewhere I have obtained." He took his M.A. degree on the 3rd of July 1537. He stayed for some time at Cambridge taking pupils, among whom was William Grindal, who in 1544 became tutor to Princess Elizabeth. Ascham himself cultivated music, acquired fame for a beautiful handwriting, and lectured on mathematics. Before 1540, when the Regius professorship of Greek was established, Ascham "was paid a handsome salary to profess the Greek tongue in public," and held also lectures in St John's College. He obtained from Edward Lee, then archbishop of York, a pension of £2 a year, in return for which Ascham translated Oecumenius' Commentaries on the Pauline Epistles. But the archbishop, scenting heresy in some passage relating to the marriage of the clergy, sent it back to him, with a present indeed, but with something like a reprimand, to which Ascham answered with an assurance that he was "no seeker after novelties," as his lectures showed. He was on safer ground in writing in 1542–1543 a book, which he told Sir William Paget in the summer of 1544 was in the press, "on the art of Shooting." This was no doubt suggested partly by the act of parliament 33 Henry VIII. c. 9, "an acte for mayntenaunce of Artyllarie and debarringe of unlawful games," requiring every one under sixty, of good health, the clergy, judges, &c., excepted, "to use shooting in the long bow," and fixing the price at which bows were to be sold. Under the title of *Toxophilus* he presented it to Henry VIII. at Greenwich soon after his triumphant return from the capture of Boulogne, and promptly received a grant of a pension of £10 a year, equal to some £200 a year of our money. A novelty of the book was that the author had "written this Englishe matter in the Englishe tongue for Englishe men," though he thought it necessary to defend himself by the argument that what "the best of the realm think it honest to use" he "ought not to suppose it vile for him to write." It is a Platonic dialogue between Toxophilus and Philologus, and nowadays its chief interest lies in its incidental remarks. It may probably claim to have been the model for Izaak Walton's *Compleat Angler*.

From 1541, or earlier, Ascham acted as letter-writer to the university and also to his college. Perhaps the best specimen of his skill was the letter written to the protector Somerset in 1548 on behalf of Sedbergh school, which was attached to St John's College by the founder, Dr Lupton, in 1525, and the endowment of which had been confiscated under the Chantries Act. In 1546 Ascham was elected public orator by the university on Sir John Cheke's retirement.

Shortly after the beginning of the reign of Edward VI., Ascham made public profession of Protestant opinions in a disputation on the doctrine of the Mass, begun in his own college and then removed for greater publicity to the public schools of the university, where it was stopped by the vice-chancellor. Thereon Ascham wrote a letter of complaint to Sir William Cecil. This stood him in good stead. In January 1548, Grindal, the princess Elizabeth's tutor, died. Ascham had already corresponded with the princess, and in one of his letters says that he returns her pen which he has mended. Through Cecil and at the princess's own wish he was selected as her tutor against another candidate pressed by Admiral Seymour and Queen Katherine. Ascham taught Elizabeth—then sixteen years old—for two years, chiefly at Cheshunt. In a letter to Sturm, the Strassburg schoolmaster, he praises her "beauty, stature, wisdom and industry. She talks French and Italian as well as English: she has often talked to me readily and well in Latin and moderately so in Greek. When she writes Greek and Latin nothing is more beautiful than her handwriting . . . she read with me almost all Cicero and great part of Titus Livius: for she drew all her knowledge of Latin from those two authors. She used to give the morning to the Greek Testament and afterwards read select orations of Isocrates and the tragedies of Sophocles. To these I added St Cyprian and Melanchthon's Commonplaces." In 1550 Ascham quarrelled with Elizabeth's steward and returned to Cambridge. Cheke then procured him the secretaryship to Sir Richard Morrison (Moryson), appointed ambassador to Charles V. It was on his way to join Morrison that he paid his celebrated morning call on Lady Jane Grey at Bradgate, where he found her reading Plato's *Phaedo*, while every one else was out hunting.

The embassy went to Louvain, where he found the university very inferior to Cambridge, then to Innsbruck and Venice. Ascham read Greek with the ambassador four or five days a week. His letters during the embassy, which was recalled on Mary's accession, were published in English in 1553, as a "Report" on Germany. Through Bishop Gardiner he was appointed Latin secretary to Queen Mary with a pension of £20 a year. His Protestantism he must have quietly sunk, though he told Sturm that "some endeavoured to hinder the flow of Gardiner's benevolence on account of his religion." Probably his never having been in orders tended to his safety. On the 1st of June 1554 he married Margaret Howe, whom he described as niece of Sir R. (? J., certainly not, as has been said, Henry) Wallop. By her he had two sons. From his frequent complaints of his poverty then and later, he seems to have lived beyond his income, though, like most courtiers, he obtained divers lucrative leases of ecclesiastical and crown property. In 1555 he resumed his studies with Princess Elizabeth, reading in Greek the orations of Aeschines and Demosthenes' *De Corona*. Soon after Elizabeth's accession, on the 5th of October 1559, he was given, though a layman, the canonry and prebend of Wetwang in York minster. In 1563 he began the work which has made him famous, *The Scholemaster*. The occasion of it was, he tells us (though he is perhaps merely imitating Boccaccio), that during the "great plague" at London in 1563 the court was at Windsor, and there on the 10th of December he was dining with Sir William Cecil, secretary of state, and other ministers. Cecil said he had "strange news; that divers scholars of Eaton be run away from the schole for fear of beating"; and expressed his wish that "more discretion was used by schoolmasters in correction than commonly is." A debate took place, the party being pretty evenly divided between floggers and anti-floggers, with Ascham as the champion of the latter. Afterwards Sir Richard Sackville, the treasurer, came up to Ascham and told him that "a fond schoolmaster" had, by his brutality, made him hate learning, much to his loss, and as he had now a young son, whom he wished to be learned, he offered, if Ascham would name a tutor, to pay for the education of their respective sons under

Ascham's orders, and invited Ascham to write a treatise on "the right order of teaching." *The Scholemaster* was the result. It is not, as might be supposed, a general treatise on educational method, but "a plaine and perfite way of teachyng children to understand, write and speake in Latin tong"; and it was not intended for schools, but "specially prepared for the private brynging up of youth in gentlemen and noblemens houses." The perfect way simply consisted in "the double translation of a model book"; the book recommended by this professional letter-writer being "Sturmius' *Select Letters of Cicero*." As a method of learning a language by a single pupil, this method might be useful; as a method of education in school nothing more deadening could be conceived. The method itself seems to have been taken from Cicero. Nor was the famous plea for the substitution of gentleness and persuasion for coercion and flogging in schools, which has been one of the main attractions of the book, novel. It was being practised and preached at that very time by Christopher Jonson (*c.* 1536–1597) at Winchester; it had been enforced at length by Wolsey in his statutes for his Ipswich College in 1528, following Robert Sherborne, bishop of Chichester, in founding Rolleston school; and had been repeatedly urged by Erasmus and others, to say nothing of William of Wykeham himself in the statutes of Winchester College in 1400. But Ascham's was the first definite demonstration in favour of humanity in the vulgar tongue and in an easy style by a well-known "educationist," though not one who had any actual experience as a schoolmaster. What largely contributed to its fame was its picture of Lady Jane Grey, whose love of learning was due to her finding her tutor a refuge from pinching, ear-boxing and bullying parents; some exceedingly good criticisms of various authors, and a spirited defence of English as a vehicle of thought and literature, of which it was itself an excellent example. The book was not published till after Ascham's death, which took place on the 23rd of December 1568, owing to a chill caught by sitting up all night to finish a New Year's poem to the queen.

His letters were collected and published in 1576, and went through several editions, the latest at Nuremberg in 1611; they were re-edited by William Elstob in 1703. His English works were edited by James Bennett with a life by Dr Johnson in 1771, reprinted in 8vo in 1815. Dr Giles in 1864–1865 published in 4 vols. select letters with the *Toxophilus* and *Scholemaster* and the life by Edward Grant. *The Scholemaster* was reprinted in 1571 and 1589. It was edited by the Rev. J. Upton in 1711 and in 1743, by Prof. J. E. B. Mayor in 1863, and by Prof. Edward Arber in 1870. The *Toxophilus* was republished in 1571, 1589 and 1788, and by Prof. Edward Arber in 1868 and 1902. (A. F. L.)

ASCHERSLEBEN, a town of Germany, in the Prussian province of Saxony, 36 m. by rail N.W. from Halle, and at the junction of lines to Cöthen and Nienhagen. Pop. (1900) 27,245; (1905) 27,876. It contains one Roman Catholic and four Protestant churches, a synagogue, a fine town-hall dating from the 16th century, and several schools. The discovery of coal in the neighbourhood stimulated and altered its industries. In addition to the manufacture of woollen wares, for which it has long been known, there is now extensive production of vinegar, paraffin, potash and especially beetroot-sugar; while the surrounding district, which was formerly devoted in great part to market-gardening, is now turned almost entirely into beetroot fields. There are also iron, zinc and chemical manufactures, and the cultivation of agricultural seeds is carried on. In the neighbourhood are brine springs and a spa (Wilhelmsbad). Aschersleben was probably founded in the 11th century by Count Esico of Ballenstedt, the ancestor of the house of Anhalt, whose grandson, Otto, called himself count of Ascania and Aschersleben, deriving the former part of the title from his castle in the neighbourhood of the town. On the death of Otto III. (1315) Aschersleben passed into the hands of the bishop of Halberstadt, and at the peace of 1648 was, with the bishopric, united to Brandenburg.

ASCIANO, a town of Tuscany, in the province of Siena, 19 m. S.E. of the town of Siena by rail. Pop. (1901) 7618. It is surrounded by walls built by the Sienese in 1351, and has some 14th-century churches with paintings of the same period. Six miles to the south is the large Benedictine monastery of Monte Oliveto Maggiore, founded in 1320, famous for the frescoes by Luca Signorelli (1497–1498) and Antonio Bazzi, called Sodoma (1505), in the cloister, illustrating scenes from the legend of St Benedict; the latter master's work is perhaps nowhere better represented than here. The church contains fine inlaid choir stalls by Fra Giovanni da Verona. The buildings, which are mostly of red brick, are conspicuous against the gray clayey and sandy soil. The monastery is described by Aeneas Sylvius Piccolomini (Pope Pius II.) in his *Commentaria*. Remains of Roman baths, with a fine mosaic pavement, were found within the town in 1898 (G. Pellegrini in *Notizie degli scavi*, 1899, 6).

ASCITANS (or ASCITAE; from *ἀσκός*, the Greek for a wine-skin), a peculiar sect of 2nd-century Christians (Montanists), who introduced the practice of dancing round a wine-skin at their meetings.

ASCITES (Gr. *ἀσκίτης*, dropsical, from *ἀσκός*, bag; *sc. νόσος*, disease), the term in medicine applied to an effusion of non-inflammatory fluid within the peritoneum. It is not a disease in itself, but is one of the manifestations of disease elsewhere—usually in the kidneys, heart, or in connexion with the liver (portal obstruction). Portal obstruction is the commonest cause of well-marked ascites. It is produced by (1) diseases within the liver, as cirrhosis (usually alcoholic) and cancer; (2) diseases outside the liver, as cancer of stomach, duodenum or pancreas, causing pressure on the portal vein, or enlarged glands in the fissure of the liver producing the same effect. Ascites is one of the late symptoms in the disease, and precedes dropsy of the leg, which may come on later, due to pressure on the large veins in the abdominal cavity by the ascitic fluid. In ascites due to heart disease, the dropsy of the feet and legs precedes the ascites, and there will be a history of palpitation, shortness of breath, and perhaps cough. In the ascites of kidney troubles there will be a history of general oedema—puffiness of face and eyes on rising in the morning probably having attracted the attention of the patient or his friends previously. Other less common causes of ascites are chronic peritonitis, either tuberculous in the young, or due to cancer in the aged, and more rarely still pernicious anaemia.

ASCLEPIADES, Greek physician, was born at Prusa in Bithynia in 124 B.C., and flourished at Rome in the end of the 2nd century B.C. He travelled much when young, and seems at first to have settled at Rome as a rhetorician. In that profession he did not succeed, but he acquired great reputation as a physician. He founded his medical practice on a modification of the atomic or corpuscular theory, according to which disease results from an irregular or inharmonious motion of the corpuscles of the body. His remedies were, therefore, directed to the restoration of harmony, and he trusted much to changes of diet, accompanied by friction, bathing and exercise, though he also employed emetics and bleeding. He recommended the use of wine, and in every way strove to render himself as agreeable as possible to his patients. His pupils were very numerous, and the school formed by them was called the Methodical. Asclepiades died at an advanced age.

ASCLEPIADES, of Samos, epigrammatist and lyric poet, friend of Theocritus, flourished about 270 B.C. He was the earliest and most important of the convivial and erotic epigrammatists. Only a few of his compositions are actual "inscriptions"; others sing the praises of the poets whom he specially admired, but the majority of them are love-songs. It is doubtful whether he is the author of all the epigrams (some 40 in number) which bear his name in the Greek Anthology. He possibly gave his name to the Asclepiadean metre.

ASCLEPIODOTUS, Greek military writer, flourished in the 1st century B.C. Nothing is known of him except that he was a pupil of Poseidonius the Stoic (d. 51 B.C.). He is the supposed author of a treatise on Graeco-Macedonian tactics (*Τακτικὰ Κεφάλαια*), which, however, is probably not his own work, but the skeleton outline of the lectures delivered by his master, who is known to have written a work on the subject.

ASCOLI, GRAZIADIO ISAIA (1829–1907), Italian philologist; of Jewish family, was born at Görz, and at an early age showed a

marked linguistic talent. In 1854 he published his *Studii orientali e linguistici*, and in 1860 was appointed professor of philology at Milan. He made various learned contributions to the study of Indo-European and Semitic languages, and also of the gipsy language, but his special field was the Italian dialects. He founded the *Archivio glottologico italiano* in 1873, publishing in it his *Saggi Ladini*, and making it in succeeding years the great organ of original scholarship on this subject. He was universally recognized as the greatest authority on Italian linguistics, and his article in the *Encyclopaedia Britannica* (9th ed., revised for this edition) became the classic exposition in English. (See ITALY: *Language*.)

ASCOLI PICENO[1] (anc. *Asculum*), a town and episcopal see of the Marches, Italy, the capital of the province of Ascoli Piceno, 17 m. W. of Porto d' Ascoli (a station on the coast railway, 56 m. S.S.E. of Ancona), and 53 m. S. of Ancona direct, situated on the S. bank of the Tronto (anc. *Truentus*) at its confluence with the Castellano, 500 ft. above sea-level, and surrounded by lofty mountains. Pop. (1901) town, 12,256; commune, 28,608. The Porta Romana is a double-arched Roman gate; adjacent are remains of the massive ancient city walls, in rectangular blocks of stone 2 ft. in height, and remains of still earlier fortifications have been found at this point (F. Barnabei in *Notizie degli scavi*, 1887, 252). The church of S. Gregorio is built into a Roman tetrastyle Corinthian temple, two columns of which and the *cella* are still preserved; the site of the Roman theatre can be distinguished; and the church and convent of the Annunziata (with two fine cloisters and a good fresco by Cola d' Amatrice in the refectory) are erected upon large Roman substructures of concrete, which must have supported some considerable building. Higher up is the castle, which now shows no traces of fortifications older than medieval; it commands a fine view of the town and of the mountains which encircle it. The town has many good pre-Renaissance buildings; the picturesque colonnaded market-place contains the fine Gothic church of S. Francesco and the original Palazzo del Comune, now the prefecture (Gothic with Renaissance additions). The cathedral is in origin Romanesque,[2] but has been much altered, and was restored in 1888 by Count Giuseppe Sacconi (1855–1905). The frescoes in the dome, of the same date, are by Cesare Mariani. The cope presented to the cathedral treasury by Pope Nicholas IV. was stolen in 1904, and sold to Mr J. Pierpont Morgan, who generously returned it to the Italian government, and it was then placed for greater safety in the Galleria Corsini at Rome. The baptistery still preserves its ancient character; and the churches of S. Vittore and SS. Vincenzo ed Anastasio are also good Romanesque buildings. The fortress of the Malatesta, constructed in 1349, has been in the main destroyed; the part of it which remains is now a prison. The present Palazzo Comunale, a Renaissance edifice, contains a fine museum, chiefly remarkable for the contents of prehistoric tombs found in the district (including good bronze fibulae, necklaces, amulets, &c., often decorated with amber), and a large collection of acorn-shaped lead missiles (*glandes*) used by slingers, belonging to the time of the siege of Asculum during the Social War (89 B.C.). There is also a picture gallery containing works by local masters, Pietro Alamanni, Cola d' Amatrice, Carlo Crivelli, &c. The bridges across the ravines which defend the town are of considerable importance; the Ponte di Porta Cappucina is a very fine Roman bridge, with a single arch of 71 ft. span. The Ponte di Cecco (so named from Cecco d' Ascoli), with two arches, is also Roman and belongs to the Via Salaria; the Ponte Maggiore and the Ponte Cartaro are, on the other hand, medieval, though the latter perhaps preserves some traces of Roman work. Near Ascoli is Castel Trosino, where an extensive Lombard necropolis of the 7th century was discovered in 1895; the contents of the tombs are now exhibited in the Museo Nazionale delle Terme at Rome (*Notizie degli scavi*, 1895, 35).

The ancient Asculum was the capital of Picenum, and it occupied a strong position in the centre of difficult country. It was taken in 268 B.C. by the Romans, and the Via Salaria was no doubt prolonged thus far at this period; the distance from Rome is 120 m. It took a prominent part in the Social War against Rome, the proconsul Q. Servilius and all the Roman citizens within its walls being massacred by the inhabitants in 90 B.C. It was captured after a long siege by Pompeius Strabo in 89 B.C. The leader, Judacilius, committed suicide, the principal citizens were put to death, and the rest exiled. The Roman general celebrated his triumph on the 25th of December of that year. Caesar occupied it, however, as a strong position after crossing the Rubicon; and it received a Roman colony, perhaps under the triumvirs, and became a place of some importance. In A.D. 301 it became the capital of Picenum Suburbicarium. In 545 it was taken by Totila, but is spoken of by Paulus Diaconus as the chief city of Picenum shortly afterwards. From the time of Charlemagne it was under the rule of its bishops, who had the title of prince and the right to coin money, until 1185, when it became a free republic. It had many struggles with Fermo, and in the 15th century came more directly under the papal sway.

See N. Persichetti in *Römische Mitteilungen* (1903), 295 seq.

(T. As.)

ASCONIUS PEDIANUS, QUINTUS (9 B.C.–A.D. 76; or A.D. 3–88), Roman grammarian and historian, was probably a native of Patavium (Padua). In his later years he resided at Rome, where he died, after having been blind for twelve years, at the age of eighty-five. During the reigns of Claudius and Nero he compiled for his sons, from various sources—*e.g.* the Gazette (*Acta Publica*), shorthand reports or "skeletons" (*commentarii*) of Cicero's unpublished speeches, Tiro's life of Cicero, speeches and letters of Cicero's contemporaries, various historical writers, *e.g.* Varro, Atticus, Antias, Tuditanus and Fenestella (a contemporary of Livy whom he often criticizes)—historical commentaries on Cicero's speeches, of which only five, viz. *in Pisonem*, *pro Scauro*. *pro Milone*, *pro Cornelio* and *in toga candida*, in a very mutilated condition, are preserved. In a note upon the speech *pro Scauro*, he speaks of Longus Caecina (d. A.D. 57) as still living, while his words imply that Claudius (d. 54) was not alive. This statement, therefore, must have been written between A.D. 54 and 57. These valuable notes, written in good Latin, relate chiefly to legal, historical and antiquarian matters. A commentary, of inferior Latinity and mainly of a grammatical character, on Cicero's Verrine orations, is universally regarded as spurious. Both works were found by Poggio in a MS. at St Gallen in 1416. This MS. is lost, but three transcripts were made by Poggio, Zomini (Sozomenus) of Pistoia and Bartolommeo da Montepulciano. That of Poggio is now at Madrid (Matritensis x. 81), and that of Zomini is in the Forteguerri library at Pistoia (No. 37). A copy of Bartolommeo's transcript exists in Florence (Laur. liv. 5). The later MSS. are derived from Poggio's copy. Other works attributed to Asconius were: a life of Sallust, a defence of Virgil against his detractors, and a treatise (perhaps a symposium in imitation of Plato) on health and long life.

Editions by Kiessling-Schöll (1875), and A. C. Clark (Oxford, 1906), which contains a previously unpublished collation of Poggio's transcript. See also Madvig, *De Asconio Pediano* (1828).

ASCOT, a village in the Wokingham parliamentary division of Berkshire, England, famous for its race-meetings. Pop. of parish of Ascot Heath (1901), 1927. The station on the South-Western railway, 29 m. W.S.W. of London, is called Ascot and Sunninghill; the second name belonging to an adjacent township with a population (civil parish) of 4719. The race-course is on Ascot Heath, and was laid out by order of Queen Anne in 1711, and on the 11th of August in that year the first meeting was held and attended by the queen. The course is almost exactly 2 m. in circumference, and the meetings are held in June. The principal race is that for the Ascot Gold Cup, instituted in 1807. The meeting is one of the most fashionable in England, and is commonly attended by members of the royal family. The royal procession, for which the meeting is peculiarly famous, was initiated by George IV. in 1820.

See R. Herod, *Royal Ascot* (London, 1900).

[1] The epithet distinguishes it from Ascoli Satriano (anc. *Ausculum*), which lies 19 m. S. of Foggia by rail.

[2] It contains a fine polyptych by Carlo Crivelli (1473).

ASCUS (Gr. *ἀσκός*, a bag), a botanical term for the membranous sacs containing the reproductive spores in certain lichens and fungi. Various compounds of the word are used, *e.g. ascophorous*, producing asci; *ascospore*, the spore (or sporule) developed in the ascus; *ascogonium*, the organ producing it, &c.

ASELLI [ASELLIUS, or ASELLIO], **GASPARO** (1581–1626), Italian physician, was born at Cremona about 1581, became professor of anatomy and surgery at Pavia, and practised at Milan, where he died in 1626. To him is due the discovery of the lacteal vessels, published in *De Lactibus* (Milan, 1627).

ASGILL, JOHN (1659–1738), English writer, was born at Hanley Castle, in Worcestershire, in 1659. He was bred to the law, and gained considerable reputation in his profession, increased by two pamphlets—the first (1696) advocating the establishment of some currency other than the usual gold and silver, the second (1698) on a registry for titles of lands. In 1699, when a commission was appointed to settle disputed claims in Ireland, he set out for that country, attracted by the hopes of practice. Before leaving London he put in the hands of the printer a tract, entitled *An Argument proving that, according to the Covenant of Eternal Life revealed in the Scripture, Man may be translated from hence into that Eternal Life without passing through Death* (1700). Coleridge has highly praised the "genuine Saxon English," the "irony" and "humour" of this extraordinary pamphlet, which interpreted the relation between God and man by the technical rules of law, and insisted that, Christ having wiped out Adam's sin, the penalty of death must consequently be illegal for those who claim exemption. How far it was meant seriously was doubted at the time, and may be doubted now. But its fame preceded the author to Ireland, and was of material service in securing his professional success, so that he amassed money, purchased an estate, and married a daughter of the second Lord Kenmare. He was returned both to the Irish and English parliaments, but was expelled from both on account of his "blasphemous" pamphlet. He was also involved in money difficulties, and litigation about his Irish estate, and these circumstances may have had something to do with his trouble in parliament. In 1707 he was arrested for debt, and the remainder of his life was spent in the Fleet prison, or within the rules of the king's bench. He died in 1738. Asgill also wrote in 1714–1715 some pamphlets defending the Hanoverian succession against the claims of the Pretender.

ASH[1] (Ger. *Esche*), a common name (Fr. *frêne*) given to certain trees. The common ash (*Fraxinus excelsior*) belongs to the natural order Oleaceae, the olive family, an order of trees and shrubs which includes lilac, privet and jasmine. The Hebrew word *Oren*, translated "ash" in Isaiah xliv. 14, cannot refer to an ash tree, as that is not a native of Palestine, but probably refers to the Aleppo pine (*Pinus halepensis*). The ash is a native of Great Britain and the greater part of Europe, and also extends to Asia. The tree is distinguished for its height and contour, as well as for its graceful foliage. It attains a height of from 50 to 80 ft., and flowers in March and April, before the leaves are developed. The reddish flowers grow in clusters, but are not showy.. They are naked, that is without sepals or petals, and generally imperfect, wanting either stamens or pistil. The large leaves, which are late in appearing, are pinnately compound, bearing four to seven pairs of gracefully tapering toothed leaflets on a slender stalk. The dry winged fruits, the so-called keys, are a characteristic feature and often remain hanging in bunches long after the leaves have fallen in autumn. The leaves fall early, but the greyish twigs and black buds render the tree conspicuous in winter and especially in early spring.

The ash is in Britain next in value to the oak as a timber-tree. It requires a good deep loam with gravelly subsoil, and a situation naturally sheltered, such as the steep banks of glens, rivers or lakes; in cold and wet clay it does not succeed. As the value of the timber depends chiefly on its toughness and elasticity, it is best grown in masses where the soil is good; the trunk is thus drawn up free from large side-branches. The tree is easily propagated from seeds; it throws up strong root shoots. The ash requires much light, but grows rapidly, and its terminal shoots pierce easily through thickets of beech, with which it is often associated. Unmixed ash plantations are seldom satisfactory, because the foliage does not sufficiently cover the ground; but when mixed with beech it grows well, and attains great height and girth. Owing to the dense mass of roots which it sends out horizontally a little beneath the surface of the ground, the ash does much harm to vegetation beneath its shade, and is therefore obnoxious as a hedgerow tree. Coppice shoots yield excellent hop-poles, crates, hoops, whip-handles, &c. The timber is much used for agricultural implements, and by coach-builders and wheelwrights.

A variety of the common species, known as var. *heterophylla*, has simple leaves. It occurs wild in woods in Europe and England. Another variety of ash (*pendula*) is met with in which the branches are pendulous and weeping. Sometimes this variety is grafted on the tall stem of the common ash, so as to produce a pleasing effect. It is said that the weeping variety was first observed at Gamlingay, in Cambridgeshire. A variety (*crispa*) occurs with curled leaves, and another with warty stems and branches, called *verrucosa*. *F. Ornus* is the manna ash (see MANNA), a handsome tree with greenish-white flowers and native in south Europe. In southern Europe there is a small-leaved ash, called *Fraxinus parvifolia*. *F. floribunda*, a large tree with terminal panicles of white flowers, is a native of the Himalayas. In America there are several species—such as *Fraxinus americana*, the white ash; *F. pubescens*, the red ash; and *F. sambucifolia*, the black ash.

The "mountain ash" belongs to a totally different family from the common ash. It is called *Pyrus Aucuparia*, and belongs to the natural order Rosaceae, and the tribe *Pomeae*, which includes also apples, pears, &c. Its common name is probably due to its resemblance to the true ash, in its smooth grey bark, graceful ascending branches, and especially the form of the leaf, which is also pinnately compound but smaller than in the true ash. Its common name in Scotland is the rowan tree; it is well known by its clusters of white blossoms and succulent scarlet fruit. The name of poison ash is given to *Rhus venenata*, the North American poison elder or sumach, belonging to the Anacardiaceae (Cashew family). The bitter ash of the West Indies is *Simaruba excelsa*, which belongs to the natural order Simarubaceae. The Cape ash is *Ekebergia capensis*, belonging to the natural order Meliaceae, a large tree, a native of the Cape of Good Hope. The prickly ash, *Xanthoxylon Clava-Herculis* (nat. ord. Xanthoxyleae), a native of the south-eastern United States, is a small tree, the trunk of which is studded with corky tubercles, while the branches are armed with stout, sharp, brown prickles.

A'SHĀ [MAIMŪN IBN QAIS], Arabian poet, was born before Mahomet, and lived long enough to accept the mission of the prophet. He was born in Manfūha, a village of al-Yemāma in the centre of Arabia, and became a wandering singer, passing through all Arabia from Hadramut in the south to al-Hīra in the north, and naturally frequenting the annual fair at Okaz (Ukāz). His love poems are devoted to the praise of Huraira, a black female slave. Even before the time of Mahomet he is said to have believed in the resurrection and last judgment, and to have been a monotheist. These beliefs may have been due to his intercourse with the bishop of Nejrān (Najrān) and the 'Ibādites (Christians) of al-Hīra. His poems were praised for their descriptions of the wild ass, for the praise of wine, for their skill in praise and satire, and for the varieties of metre employed. His best-known poem is that in praise of Mahomet.

His poems have been collected from various sources in L. Cheikho's *Les Poètes arabes chrétiens* (Jesuit press, Beirut, 1890), pp. 357-399. His eulogy of Mahomet has been edited by H. Thorbecke, *Al Aša's Lobgedicht auf Muhammad* (Leipzig, 1875). (G. W. T.)

ASHANTI, a British possession in West Africa, bounded W. by the (French) Ivory Coast colony, N. by the British Protectorate known as Northern Territories of the Gold Coast (see

[1] The homonym, ash or (pl.) ashes, the residue (of a body, &c.) after burning, is a common Teutonic word, Ger. *Asche*, connected with the root found in Lat. *ardere*, to burn.

Gold Coast), and E. by the river Volta (which separates it from the German colony of Togoland); the southern frontier is conterminous with the northern frontier of the (British) Gold Coast colony. It forms an irregular oblong, with a triangular projection (the country of the Adansi) southward. It has an area of 23,000 sq. m., and a population estimated (1907) at 500,000.

Physical Features; Flora and Fauna.—A great part of Ashanti is covered with primeval and almost impenetrable forest.[1] Many of the trees, chiefly silk-cotton and hardwood, attain splendid proportions, the bombax reaching a height of over 200 ft., but the monotony is oppressive, and is seldom relieved by the sight of flowers, birds or beasts. Ferns are abundant, and the mimosa rises to heights of from 30 to 60 ft. All over the forest spread lianas, or monkey-ropes, their usual position being that of immense festoons hanging from tree to tree. To these lianas (species of which yield one kind of the rubber of commerce) is due largely the weird aspect of the forest. The country round the towns, however, is cultivated with care, the fields yielding in abundance grain, yams, vegetables and fruits. In the north-eastern districts the primeval forest gives place to park-like country, consisting of plains covered with high coarse grass, and dotted with occasional baobabs, as well as with wild plum, shea-butter, dwarf date, fan palms, and other small trees. Among the wild animals are the elephant (comparatively rare), the leopard, varieties of antelope, many kinds of monkeys and numerous venomous snakes. Crocodiles and two kinds of hippopotami, the ordinary and a pygmy variety, are found in the rivers. Of birds, parrots are the most characteristic. Insect life is abundant.

About 25 m. south-east of Kumasi is Lake Busumchwi, the sacred lake of the Ashanti. It is surrounded by forest-clad hills some 800 ft. high, is nearly circular and has a maximum diameter of 6 m. The Black Volta, and lower down the Volta (*q.v.*), form the northern frontier, and various tributaries of the Volta, running generally in a northerly direction, traverse the eastern portion of the country. In the central parts are the upper courses of the Ofin and of some tributaries of the Prah. Farther west are the Tano and Bia rivers, which empty their waters into the Assini lagoon. In their course through Ashanti, the rivers, apart from the Volta, are navigable by canoes only. The elevation of the country is generally below 2000 ft., but it rises towards the north.

Climate.—The climate, although unsuited to the prolonged residence of Europeans, is less unhealthy than that of the coast towns of West Africa. The water-supply is good and abundant. The rainy season lasts from the end of May until October; storms are frequent and violent. The mean temperature at Kumasi is 76° F., the mean annual rainfall 40 ins.

Inhabitants.—The most probable tradition represents the Ashanti as deriving their origin from bands of fugitives, who in the 16th or 17th century were driven before the Moslem tribes migrating southward from the countries on the Niger and Senegal. Having obtained possession of a region of impenetrable forest, they defended themselves with a valour which, becoming part of their national character, raised them to the rank of a powerful and conquering nation. They are of the pure negro type, and are supposed to be originally of the same race as the Fanti, nearer the coast, and speak the same language. The separation of Fanti and Ashanti has been ascribed to a famine which drove the former south, and led them to live on *fan*, or herbs, while the latter subsisted on *san*, or Indian corn, &c., whence the names Fanti and Santi. The Ashanti are divided into a large number of tribes, of whom a dozen may be distinguished, namely, the Bekwai, Adansi, Juabin, Kokofu, Kumasi, Mampon, Nsuta, Nkwanta, Dadiassi, Daniassi, Ofinsu and Adjisu. Each tribe has its own king, but from the beginning of the 18th century the king of Kumasi was recognized as king paramount, and was spoken of as the king of Ashanti. As paramount king he succeeded to the "golden stool," the symbol of authority among the Ashanti. After the deposition of Prempeh (1896) no king of Kumasi was chosen; Prempeh himself was never "enstooled." The government of Ashanti was formerly a mixture of monarchy and military aristocracy. The confederate tribes were originally organized for purposes of war into six great divisions or clans, this organization developing into the main social fabric of the state. The chiefs of the clans, with a few sub-chiefs having hereditary rights, formed the King's Council, and the king, unless of exceptionally strong character, often exercised less power than the council of chiefs, each of whom kept his little court, making a profuse display of barbaric pomp. Land is held in common by the tribes, lands unallotted being attached to the office of head chief or king and called "stool lands." Polygamy is practised by all who can afford it. It is stated by the early chroniclers that the king of Ashanti was bound to maintain the "fetish" number of 3333 wives; many of these, however, were employed in menial services. The crown descended to the king's brother, or his sister's son, not to his own offspring. The queen mother exercised considerable authority in the state, but the king's wives had no power. The system of human sacrifices, practised among the Ashanti until the closing years of the 19th century, was founded on a sentiment of piety towards parents and other connexions—the chiefs believing that the rank of their dead relatives in the future world would be measured by the number of attendants sent after them. There were two periods, called the great Adai and little Adai, at which human victims, chiefly prisoners of war or condemned criminals, were immolated. There is reason to believe that the extent of this practice was not so great as was currently reported.

There are a few Mahommedans in Ashanti, most of them traders from other countries, and the Basel and Wesleyan missionaries have obtained some converts to Christianity; but the great bulk of the people are spirit-worshippers. Unlike many West African races, the Ashanti in general show a repugnance to the doctrines of Islam.

Towns and Trade.—Besides the capital, Kumasi (*q.v.*), with a population of some 6000, there are few important towns in Ashanti. Obuassi, in the south-west, is the centre of the gold-mining industry. Wam is on the western border, Nkoranza, Atabubu and Kintampo in the north. Kintampo is a town of some size and is about 130 m. north-east of Kumasi. It is the meeting-place of traders from the Niger countries and from the coast. Formerly one of the great slave and ivory marts of West Africa, it is now a centre of the kola-nut commerce and a depot for government stores. The Ashanti are skilful in several species of manufacture, particularly in weaving cotton. Their pottery and works in gold also show considerable skill. A large quantity of silver-plate and goldsmiths' work of great value and considerable artistic elaboration was found in 1874 in the king's palace at Kumasi, not the least remarkable objects being masks of beaten gold. The influence of Moorish art is perceptible.

The vegetable products do not differ greatly from those found on the Gold Coast; the most important commercially is the rubber tree (*Funtumia elastica*). The nut of the kola tree is in great demand, and since 1905 many cocoa plantations have been established, especially in the eastern districts. Tobacco is cultivated in the northern regions. Gum copal is exported. Part of the trade of Ashanti had been diverted to the French port of Assini in consequence of the wars waged between England and the Ashanti, but on the suppression of the revolt of 1900 measures were taken to improve trade between Kumasi and Cape Coast. Kumasi is the distributing centre for the whole of Ashanti and the hinterland. Gold exists in the western districts of the country, and several companies were formed to work the mines in the period 1895–1901. Most of the gold exported from the Gold Coast in 1902 and following years came from the Obuassi mines. The gold output from Ashanti amounted in 1905 to 68,259 oz., valued at £254,790. The railway to Kumasi from Sekondi, which was completed in 1903, passes through the auriferous region. As far as the trade goes through British

[1] The exact area of dense forest land is unknown, but is estimated at fully 12,000 sq. m.

territory southward, the figures are included in those of the Gold Coast; but Ashanti does also a considerable trade with its French and German neighbours, and northwards with the Niger countries. Its revenue and expenditure are included in those of the Gold Coast. Revenue is obtained principally from caravan taxes, liquor licences, rents from government land and contributions from the gold-mining companies.

Communications.—The railway to Kumasi, cut through one of the densest forest regions, is described under GOLD COAST. The usual means of communication is by tortuous paths through the forest, too narrow to admit any wheeled vehicle. A wide road, 141 m. long, has been cut through the bush from Cape Coast to Kumasi, and from Kumasi ancient caravan routes go to the chief trading centres farther inland. Where rivers and swamps have to be crossed, ferries are maintained. A favourite mode of travelling in the bush is in a palanquin borne on the heads of four carriers. Telegraph lines connect Kumasi with the coast towns and with the towns in the Northern Territories. There is a well-organized postal service.

History.—The Ashanti first came under the notice of Europeans early in the 18th century, through their successful wars with the kingdoms bordering the maritime territory. Osai Tutu may be considered as the real founder of the Ashanti power. He either built or greatly extended Kumasi; he subdued the neighbouring state of Denkera (1719) and the Mahommedan countries of Gaman (Jaman) and Banna, and extended the empire by conquests both on the east and west. At last he was defeated and slain (1731); but his successor, Osai Apoko, made further acquisitions towards the coast. In 1800, Osai Tutu Quamina, an enterprising and ambitious man, who appears early to have formed the desire of opening a communication with white nations, became king. About 1807, two chiefs of the Assin, whom he had defeated in battle, sought refuge among the Fanti, the ruling people on the coast. On the refusal of the Fanti to deliver up the fugitives, Osai Tutu invaded their country, defeated them and drove them towards the sea. The Ashanti reached the coast near Anamabo, where there was then a British fort. The governor exhorted the townsmen to come to terms and offered to mediate; but they resolved to abide the contest. The result was the destruction of the town, and the slaughter of 8000 of the inhabitants. The Ashanti, who lost over 2000 men, failed, however, to storm the English fort, though the garrison was reduced from twenty-four to eight men. A truce was agreed to, and the king refusing to treat except with the governor of Cape Coast, Colonel G. Torrane (governor 1805–1807) repaired to Anamabo, where he was received with great pomp. Torrane determined to surrender the fugitive Assin chiefs, but one succeeded in escaping; the other, on being given up, was put to death by the Ashanti. Torrane concluded an agreement with the Ashanti, acknowledging their conquest of Fantiland, and delivering up to them half the fugitives in Anamabo fort (most of the remainder were sold by Torrane and the members of his council as slaves). The governor also agreed to pay rent to the Ashanti for Anamabo fort and Cape Coast castle. The character of this man, who died on the coast in 1808, is indicated by Osai Tutu's eulogy of him. "From the hour Governor Torrane delivered up Tchibbu [one of the Assin fugitives] I took the English for my friends," said the king of Ashanti, "because I saw their object was trade only and they did not care for the people. Torrane was a man of sense and he pleased me much."

Early relations with the British.

In consequence of repeated invasions of Fantiland by the Ashanti, the British in 1817 sent Frederick James, commandant of Accra fort, T. E. Bowdich and W. Hutchinson on a mission to Kumasi. After one or two harmonious interviews, the king advanced a claim for the payment of the quit rents for Anamabo fort and Cape Coast castle, rents the major part of which the Fanti had induced the British to pay to them, leaving only a nominal sum for transmission to Kumasi. Mr James, the head of the mission, volunteered no satisfactory explanation, whereupon the king broke into uncontrollable rage, calling the emissaries cheats and liars. Bowdich and Hutchinson, thinking that British interests and the safety of the mission were endangered, took the negotiation into their own hands. Mr James was recalled, and a treaty was concluded, by which the king's demands were satisfied, and the right of the British to control the natives in the coast towns recognized.

The government at home, though they demurred somewhat to the course that had been pursued, saw the wisdom of cultivating intercourse with this powerful African kingdom. They sent out, therefore, to Kumasi, as consul, Mr Joseph Dupuis, formerly consul at Mogador, who arrived at Cape Coast in January 1819. By that time fresh difficulties had arisen between the coast natives, who were supported by the British, and the Ashanti. Dupuis set out on the 9th of February 1820, and on the 28th arrived at Kumasi. After several meetings with the king, a treaty was drawn up, which acknowledged the sovereignty of Ashanti over the territory of the Fanti, and left the natives of Cape Coast to the mercy of their enemies. Mr J. Hope Smith, the governor of Cape Coast, disowned the treaty, as betraying the interests of the natives under British protection. Mr Hope Smith was supported by the government in London, which in 1821 assumed direct control of the British settlements. Sir Charles M'Carthy, the first governor appointed by the crown, espoused the cause of the Fanti, but was defeated in battle by the Ashanti, the 21st of January 1824, at a place beyond the Prah called Essamako. The Ashanti had 10,000 men to Sir Charles's 500. Sir Charles and eight other Europeans were killed. The skull of the governor was afterwards used at Kumasi as a royal drinking-cup. It was asserted that Sir Charles lost the battle through his ordnance-keeper bringing up kegs filled with vermicelli instead of ammunition. The fact is that the mistake, if made, only hastened the inevitable catastrophe. On the very day of this defeat Osai Tutu Quamina died and was succeeded by Osai Okoto. A state of chronic warfare ensued, until the Ashanti sustained a signal defeat at Dodowah on the 7th of August 1826. From this time the power of the Ashanti over the coast tribes waned, and in 1831 the king was obliged to purchase peace from Mr George Maclean, then administrator of the Gold Coast, at the price of 600 oz. of gold, and to send his son as a hostage to Cape Coast. The payment of ground rent for the forts held by the British had ceased after the battle of Dodowah, and by the treaty concluded by Maclean the river Prah was fixed as the boundary of the Ashanti kingdom, all the tribes south of it being under British protection.

Sir Charles M'Carthy's fate.

The king (Kwaka Dua I.), who had succeeded Osai Okoto in 1838, was a peace-loving monarch who encouraged trade, but in 1852 the Ashanti tried to reassert authority over the Fanti in the Gold Coast protectorate, and in 1863 a war was caused by the refusal of the king's demand for the surrender by the British of a fugitive chief and a runaway slave-boy. The Ashanti were victorious in two battles and retired unmolested. The governor, Mr Richard Pine, urged the advisability of an advance on Kumasi, but this the British government would not allow. No further fighting followed, but the prestige of the Ashanti greatly increased. "The white men" (said Kwaka Dua) "bring many cannon to the bush, but the bush is stronger than the cannon." In April 1867 Kwaka Dua died, and after an interval of civil war was succeeded by Kofi Karikari, who on being enstooled swore, "My business shall be war." Thereafter preparations were made throughout Ashanti to attack the Fanti tribes, and the result was the war of 1873–74.

Two distinct events were the immediate cause of the war. The principal was the transference of Elmina fort from the Dutch to the British, which took place on the 2nd of April 1872. The Elmina were regarded by the Ashanti as their subjects, and the king of Ashanti held the Elmina "custom-note,"—that is, he received from the Dutch an annual payment, in its origin a ground rent for the fort, but looked upon by the Dutch as a present for trade purposes. The Ashanti greatly resented the occupation by Britain of what they considered Ashanti territory. Another but minor cause of the war was the holding in captivity by the

The war of 1873–1874.

Ashanti of four Europeans. An Ashanti force invaded Krepi, a territory beyond the Volta, and in June 1869 captured Mr Fritz A. Ramseyer, his wife and infant son (the child died of privation shortly afterwards), and Mr J. Kühne, members of the Basel mission. Monsieur M. J. Bonnat, a French trader, was also captured at another place. The captives were taken to Kumasi. Negotiations for their release were begun, but the Europeans were still prisoners when the sale of Elmina occurred. The Ashanti delayed war until their preparations were complete, whilst the Gold Coast officials appear to have thought the risk of hostilities remote. However, on the 22nd of January 1873 an Ashanti force crossed the Prah and invaded the British protectorate. They defeated the Fanti, stirred up disputes at Elmina, and encamped at Mampon near Cape Coast, to the great alarm of the inhabitants. Measures were taken for the defence of the territory and the punishment of the assailants, which culminated in the despatch of Sir Garnet (afterwards Viscount) Wolseley as British administrator, £800,000 being voted by parliament for the expenses of the expedition. On landing (October 2) at Cape Coast, Wolseley found the Ashanti, who had been decimated by smallpox and fever, preparing to return home. He determined, however, to march to Kumasi, whilst Captain (afterwards Sir) John Glover, R.N., administrator of Lagos, was with a force of native levies to co-operate from the east and take the Ashanti in rear. Meanwhile the enemy broke up camp, and, although harassed by native levies raised by the British, effected an orderly retreat. The Ashanti army re-entered Kumasi on the 22nd of December. Wolseley asked for the help of white troops, and the 2nd battalion Rifle Brigade, the 23rd Fusiliers and 42nd Highlanders were despatched. Seeing the preparations made by his enemy, Kofi Karikari endeavoured to make peace, and in response to General Wolseley's demands the European captives were released (January 1874). Sir Garnet determined that peace must be signed in Kumasi and continued his advance. On the 20th of January the river Prah was crossed by the European troops; on the 24th the Adansi hills were reached; on the 31st there was severe fighting at Amoaful; on the 1st of February Bekwai was captured; and on the evening of the 4th the victorious army was in Kumasi, after seven hours' fighting. The king, who had led his army, fled into the bush when he saw the day was lost. As the 42nd Highlanders pushed forward to Kumasi, the town was found full of Ashanti soldiers, but not a shot was fired at the invaders. Sir Garnet Wolseley sent messengers to the king, but Kofi Karikari refused to surrender. As his force was small, provisions scarce, and the rainy season setting in, and as he was encumbered with many sick and wounded, the British general decided to retire. On the 6th, therefore, the homeward march was commenced, the city being left behind in flames. In the meantime Captain Glover's force had crossed the Prah on the 15th of January, and the Ashanti opposition weakening after the capture of Kumasi, Glover was able to push forward. On the 11th of February, Captain (later General) R. W. Sartorius, who had been sent ahead with twenty Hausa only, found Kumasi still deserted. Captain Sartorius and his twenty men marched 50 m. through the heart of the enemy's country. On the 12th Glover and his force of natives entered the Ashanti capital. The news of Glover's approach induced the king, who feared also the return of the white troops, to sue for peace. On the 9th of February a messenger from Kofi Karikari overtook Sir Garnet, who on the 13th at Fomana received the Ashanti envoys. A treaty was concluded whereby the king agreed, among other conditions, to pay 50,000 oz. of gold, to renounce all claim to homage from certain neighbouring kings, and all pretensions of supremacy over any part of the former Dutch protectorate, to promote freedom of trade, to keep open a road from Kumasi to the Prah, and to do his best to check the practice of human sacrifice. Besides coloured troops, there were employed in this campaign about 2400 Europeans, who suffered severely from fever and otherwise, though the mortality among the men was slight. Seventy-one per cent of the troops were on the sick list, and more than forty officers died—only six from wounds. The success of the expedition was facilitated by the exertions of Captain (afterwards General Sir William) Butler and Captain (afterwards General W. L.) Dalrymple, who effected diversions with very inadequate resources.

A British protectorate established.

One result of the war of 1873–74 was that several states dependent on Ashanti declared themselves independent, and sought British protection. This was refused, and the inaction of the colonial office contributed to the reconsolidation of the Ashanti power.[1] Shortly after the war the Ashanti deposed Kofi Karikari, and placed on the golden stool—the symbol of sovereignty—his brother Mensa. This monarch broke almost every article of the Fomana treaty, and even the payment of the indemnity was not demanded. (In all, only 4000 oz. of gold, out of the 50,000 stipulated for, were paid.) Mensa's rule was tyrannous and stained with repeated human sacrifices. In 1883 a revolution displaced that monarch, who was succeeded by Kwaka Dua II.—a young man who died (June 1884) within a few months of his election. In the same month died the ex-king Kofi Karikari, and disruption threatened Ashanti. At length, after a desolating civil war, Prince Prempeh—who took the name of Kwaka Dua III.—was chosen king (March 26, 1888), the colonial government having been forced to intervene in the dispute owing to the troubles it occasioned in the Gold Coast. The election of Prempeh took place in the presence and with the sanction of an officer of the Gold Coast government. Prempeh defeated his enemies, and for a time peace and prosperity returned to Ashanti. However in 1893 there was fresh trouble between Ashanti and the tribes of the protectorate, and the roads were closed to traders by Prempeh's orders. The British government was forced to interfere, more especially as the country, by international agreement, had been included in the British sphere of influence. A mission was despatched to Prempeh, calling upon him to fulfil the terms of the 1874 treaty, and further, to accept a British protectorate and receive a resident at Kumasi. The king declined to treat with the governor of the Gold Coast, and despatched informal agents to England, whom the secretary of state refused to receive. To the demands of the British mission relative to the acceptance of a protectorate and other matters, Prempeh made no reply in the three weeks' grace allowed, which expired on the 31st of October 1895. To enforce the British demands, to put an end to the misgovernment and barbarities carried on at Kumasi, and to establish law, order and security for trade, an expedition was at length decided upon. The force, placed under Colonel Sir Francis Scott, consisted of the 2nd West Yorkshire regiment, a "special service corps," made up of detachments from various regiments in the United Kingdom, under specially selected officers, the 2nd West India regiment, and the Gold Coast and Lagos Hausa. The composition of the special service corps was much criticized at the time; but as it was not called upon for fighting purposes, no inferences as to its efficiency are possible. The details of the expedition were carefully organized. Before the arrival of the staff and contingent from England (December 1895) the native forces were employed in improving the road from Cape Coast to Prahsu (70 m.), and in establishing road stations to serve as standing camps for the troops. About 12,000 carriers were collected, the load allotted to each being 50 lb. In addition, a force of native scouts, which ultimately reached a total of 860 men, was organized in eighteen companies, and partly armed with Snider rifles, to cover the advance of the main column, which started on the 27th of December, and to improve the road. The king of Bekwai having asked for British protection, a small force was pressed forward and occupied this native town, about 25 m. from Kumasi, on the 4th of January 1896. The advance continued, and at Ordahsu a mission arrived from King Prempeh offering unconditional submission. On the 17th of January Kumasi was occupied, and Colonel Sir F. Scott received the king. Effective measures

[1] An attempt was made late in 1875, by the despatch of Dr V. S. Gouldsbury on a mission to Eastern Akim, Juabin and Kumasi, to repair the effects of the previous inaction of the colonial government, but without success.

were taken to prevent his escape, and on the 20th Prempeh made submission to Mr (afterwards Sir W. E.) Maxwell, the governor of Cape Coast, in native fashion. After this act of public humiliation, the king and the queen mother with the principal chiefs were arrested and taken as prisoners to Cape Coast, where they were embarked on board H.M.S. "Racoon" for Elmina. The fetish buildings at Bantama were burned, and on the 22nd of January Bokro, a village 5 m. from Kumasi, and Maheer, the king's summer palace, were visited by the native scouts and found deserted. On the same day, leaving the Hausa at Kumasi, the expedition began the return march of 150 m. to Cape Coast. The complete success of the expedition was due to the excellent organization of the supply and transport services, while the promptitude with which the operations were carried out probably accounts in great measure for the absence of resistance. Although no fighting occurred, a heavy strain was thrown upon all ranks, and fever claimed many victims, among whom was Prince Henry of Battenberg, who had volunteered for the post of military secretary to Colonel Sir F. Scott.

Prempeh deposed.

After the deportation of Prempeh no successor was appointed to the throne of Ashanti. A British resident, Captain Donald W. Stewart, was installed at Kumasi, and whilst the other states of the confederacy retained their king and tribal system the affairs of the Kumasi were administered by chiefs under British guidance. Mr and Mrs Ramseyer (two of the missionaries imprisoned by King Kofi Karikari for four and a half years) returned to Kumasi, and other missionaries followed. A fort was built in Kumasi and garrisoned with Gold Coast constabulary. Though outwardly submissive, the Kumasi chiefs were far from reconciled to British rule, and in 1900 a serious rebellion broke out. The tribes involved were the Kumasi, Adansi and Kokofu; the other tribes of the Ashanti confederation remained loyal. The rebels were, however, able to command a force reported to number 40,000. On the 28th of March, before the rebellion had declared itself, the governor of the Gold Coast, Sir F. Hodgson, in a public palaver at Kumasi, announced that the Ashanti chiefs would have to pay the British government 4000 oz. of gold yearly, and he reproached the chiefs with not having brought to him the golden stool, which the Kumasi had kept hidden since 1896. Three days afterwards the Kumasi warriors attacked a party of Hausa sent with the chief object of discovering the golden stool. (In the previous January a secret attempt to seize the stool had failed.) The Kumasi, who were longing to wipe out the dishonour of having let Prempeh be deported without fighting, next threatened the fort of Kumasi. Mr Ramseyer and the other Basel missionaries, and Sir F. and Lady Hodgson, took refuge in the fort, and reinforcements were urgently asked for. On the 18th of April 100 Gold Coast constabulary arrived. On the 29th the Kumasi attacked in force, but were repulsed. The same day a party of 250 Lagos constabulary reached Kumasi. They had fought their way up, and came in with little ammunition. On the 15th of May Major A. Morris arrived from the British territory north of Ashanti, also with 250 men. The garrison now numbered 700. The 29 Europeans in the fort included four women. Outside the fort were gathered 3000 native refugees. Famine and disease soon began to tell their tale. Sir F. Hodgson sent out a message on the 4th of June (it reached the relieving force on the 12th of June), saying that they could only hold out to the 11th of June. However, it was not till the 23rd of June that the governor and all the Europeans save three, together with 600 Hausa of all ranks, sallied out of the fort. Avoiding the main road, held by the enemy in force, they attacked a weakly held stockade, and succeeded in cutting their way through, with a loss of two British officers mortally wounded, 39 Hausa killed, and double that number wounded or missing. The governor's party reached Cape Coast safely on the 10th of July.

Siege and relief of Kumasi.

A force of 100 Hausa, with three white men (Captain Bishop, Mr Ralph and Dr Hay), was left behind in Kumasi fort with rations to last three weeks. Meantime a relief expedition had been organized at Cape Coast by Colonel James Willcocks. This officer reached Cape Coast from Nigeria on the 26th of May. The difficulties before him were appalling. Carriers could scarcely be obtained, there were no local food supplies, the rainy season was at its height, all the roads were deep mire, the bush was almost impenetrable, and the enemy were both brave and cunning, fighting behind concealed stockades. It was not until the 2nd of July that Colonel Willcocks was able to advance to Fumsu. On the next day he heard of the escape of the governor and of the straits of the garrison left at Kumasi. He determined to relieve the fort in time, and on the 9th of July reached Bekwai, the king of which place had remained loyal. Making his final dispositions, the colonel spread a report that on the 13th he would attack Kokofu, east of Bekwai, and this drew off several thousands of the enemy from Kumasi. After feinting to attack Kokofu, Colonel Willcocks suddenly marched west. There was smart fighting on the 14th, and at 4.30 P.M. on the 15th, after a march since daybreak through roads "in indescribably bad condition," the main rebel stockade was encountered. It was carried at the point of the bayonet by the Yoruba troops, who proved themselves fully equal to the Hausa. "The charge could not have been beaten in *élan* by any soldiers." Kumasi was entered the same evening, a bugler of the war-worn garrison of the fort sounding the "general salute" as the relieving column came in view. Most of the defenders were too weak to stand. Outside the fort nothing was to be seen but burnt-down houses and putrid bodies. The relieving force that marched into Kumasi consisted of 1000 fighting men (all West Africans), with 60 white officers and non-commissioned officers, two 75-millimetre guns, four seven-pounder guns and six Maxims.

Kumasi relieved, there remained the task of crushing the rebellion. Colonel Willcocks's force was increased by Yaos and a few Sikhs from Central Africa to a total of 3368 natives, with 134 British officers and 35 British non-commissioned officers. In addition there were Ashanti levies. On the 30th of September the Kumasi were completely beaten at Obassa. Thereafter many of the rebel chiefs surrendered, and the only two remaining in the field were captured on the 28th of December. Thus 1901 opened with peace restored. The total number of casualties during the campaign (including those who died of disease) was 1007. Nine British officers were killed in action, forty-three were wounded, and six died of disease. The commander, Colonel Willcocks, was promoted and created a K.C.M.G.

Progress under British administration.

By an order in council, dated the 26th of September 1901, Ashanti was formally annexed to the British dominions, and given a separate administration under the control of the governor of the Gold Coast. A chief commissioner represents the governor in his absence, and is assisted by a staff of four commissioners and four assistant commissioners. A battalion of the Gold Coast regiment is stationed in the country with headquarters at Kumasi. The order in council mentioned, which may be described as the first constitution granted Ashanti by its British owners, provides that the governor, in issuing ordinances respecting the administration of justice, the raising of revenue, or any other matter, shall respect any native laws by which the civil relations of any chiefs, tribes or populations are regulated, "except so far as they may be incompatible with British sovereignty or clearly injurious to the welfare of the natives themselves." After the annexation of the country in 1901 the relations between the governing power and the governed steadily improved. Mr F. C. Fuller, who succeeded Sir Donald Stewart as chief commissioner early in 1905, was able to report in the following year that among the Ashanti suspicion of the "white man's" ulterior motives was speedily losing ground. The marked preference shown by the natives to resort to the civil and criminal courts established by the British demonstrated their faith in the impartial treatment awarded therein. Moreover, the maintenance of the tribal system and the support given to the lawful chiefs did much to win the confidence and respect of a people naturally suspicious, and mindful of their exiled king.

BIBLIOGRAPHY.—For a general survey of the country, see *Travels*

in Ashanti and Jaman, by R. A. Freeman (London, 1898); *Historical Geography of the British Colonies*, vol. iii. "West Africa," by C. P. Lucas (Oxford, 1900); and the *Annual Reports, Ashanti*, issued from 1906 onward by the Colonial Office, London. *The Tshi-speaking Peoples of the Gold Coast*, by Col. A. B. Ellis (London, 1887), deals with ethnology. Of early works on the country the most valuable are *A Mission from Cape Coast Castle to Ashantee*, by T. E. Bowdich (London, 1819); and *Journal of a Residence in Ashantee* (London, 1824), by J. Dupuis. For history generally, see *A History of the Gold Coast of West Africa*, by Col. A. B. Ellis (London, 1893); and *History of the Gold Coast and Asante . . . from about 1500 to 1860*, by C. C. Reindorf, a native pastor of the Basel mission (Basel, 1895).

For the British military campaigns, in addition to the official blue-books, consult: *Narrative of the Ashantee War*, 2 vols., by (Sir) Henry Brackenbury (London, 1874); *The Story of a Soldier's Life* by Viscount Wolseley, vol. ii. chs. xliii.-l. (London, 1903); *Coomassie*, by (Sir) H. M. Stanley, being the story of the 1873–74 expedition (new ed., London, 1896); *Life of Sir John Hawley Glover*, by Lady Glover, chs. iii.-x. (London, 1897); *The Downfall of Prempeh*, by (General) R. S. S. Baden-Powell, an account of the 1895–96 expedition (London, 1896); *From Kabul to Kumassi* (chs. xv. to end), by Sir James Willcocks, (London, 1904); *The Ashanti Campaign of 1900*, by Capt. C. H. Armitage and Lieut.-Col. A. F. Montanaro (London, 1901); *The Relief of Kumasi*, by Capt. H. C. J. Biss (London, 1901). The two books following are by besieged residents in Kumasi: *The Siege of Kumasi*, by Lady Hodgson (London, 1901); *Dark and Stormy Days at Kumasi*, 1900, from the diary of the Rev. Fritz Ramseyer (London, 1901). Many of the works quoted under GOLD COAST deal also with Ashanti. (F. R. C.)

ASH'ARĪ [Abū-l Hasan 'Ali ibn Isma'īl ul-Ash'arī], (873–935), Arabian theologian, was born of pure Arab stock at Baṣra, but spent the greater part of his life at Bagdad. Although belonging to an orthodox family, he became a pupil of the great Mu'tazalite teacher al-Jubbā'ī, and himself remained a Mu'tazalite until his fortieth year. In 912 he returned to the faith of his fathers and became its most distinguished champion, using the philosophical methods he had learned in the school of heresy. His theology, which occupied a mediate position between the extreme views on most points, became dominant among the Shafi'ites. He is said to have written over a hundred works, of which only four or five are known to be extant.

See W. Spitta, *Zur Geschichte Abu 'l-Hasan al Aš'arī's* (Leipzig, 1876); A. F. Mehren, *Exposé de la reforme de l'Islamisme commencée par Abou 'l-Hasan Ali el-Ash'ari* (Leiden, 1878); and D. B. Macdonald's *Muslim Theology* (London, 1903), especially the creed of Ash'ari in Appendix iii. (G. W. T.)

ASHBOURNE, a market-town in the western parliamentary division of Derbyshire, England, 13 m. W.N.W. of Derby, on the London & North-Western and the North Staffordshire railways. Pop. of urban district (1901) 4039. It is pleasantly situated on rising ground between two small valleys opening into that of the Dove, and the most beautiful scenery of Dovedale is not far distant. The church of St Oswald is cruciform, Early English and later; a fine building with a central tower and lofty octagonal spire. Its monuments and brasses are of much interest. The town has a large agricultural trade and a manufacture of corsets. The streams in the neighbourhood are in favour with trout fishermen. Ashbourne Hall, an ancient mansion, has associations with "Prince Charlie," who occupied it both before and after his advance on Derby in 1745. There are also many connexions with Dr Johnson, a frequent visitor here to his friend Dr Taylor, who occupied a house opposite the grammar school.

ASHBURNHAM, JOHN (*c.* 1603–1671), English Royalist, was the son of Sir John Ashburnham of Ashburnham in Sussex. He early entered the king's service. In 1627 he was sent to Paris by his relative the duke of Buckingham to make overtures for peace, and in 1628 he prepared to join the expedition to Rochelle interrupted by the duke's assassination. The same year he was made groom of the bedchamber and elected member of parliament for Hastings, which borough he also represented in the Long Parliament of 1640. In this capacity he rendered services by reporting proceedings to the king. He made a considerable fortune and recovered the Ashburnham estates alienated by his father. He became one of the king's chief advisers and had his full confidence. He attended Charles at York on the outbreak of the war with Scotland. In the Civil War he was made treasurer of the royal army, in which capacity he aroused Hyde's jealousy and remonstrances by infringing on his province as chancellor of the exchequer. In 1644 he was a commissioner at Uxbridge. He accompanied Charles in his flight from Oxford in April 1646 to the Scots, and subsequently escaped abroad, joining the queen at Paris, residing afterwards at Rouen and being sent to the Hague to obtain aid from the prince of Orange. After the seizure of Charles by the army, Ashburnham joined him at Hampton Court in 1647, where he had several conferences with Cromwell and other army officers. When Charles escaped from Hampton Court on the 11th of November, he followed Ashburnham's advice in opposition to that of Sir John Berkeley, who urged the king to go abroad, and took refuge in the Isle of Wight, being placed by Ashburnham in the hands of Robert Hammond, the governor. "Oh, Jack," the king exclaimed when he understood the situation, "thou hast undone me!" when Ashburnham, "falling into a great passion of weeping, offered to go and kill Hammond." By this fatal step Ashburnham incurred the unmerited charge of treachery and disloyalty. Clarendon, however, who censures his conduct, absolves him from any crime except that of folly and excessive self-confidence, and he was acquitted both by Charles I. and Charles II. He was separated with Berkeley from Charles on the 1st of January 1648, waited on the mainland in expectation of Charles's escape, and was afterwards taken and imprisoned at Windsor, and exchanged during the second Civil War for Sir W. Masham and other prisoners. He was one of the delinquents specially exempted from pardon in the treaty of Newport. In November he was allowed to compound for his estates, and declared himself willing to take the covenant. After the king's death he remained in England, an object of suspicion to all parties, corresponded with Charles II., and underwent several terms of imprisonment in the Tower and in Guernsey. At the Restoration he was reinstated in his former place of groom of the bedchamber and was compensated for his losses. He represented Sussex in parliament from 1661 till the 22nd of November 1667, when he was expelled the House for taking a bribe of £500 from French merchants for landing their wines. He died on the 15th of June 1671.

He had eight children, the eldest of whom, William, left a son John (1656–1710), who in 1689 was created Baron Ashburnham. John's second son, John (1687–1737), who became 3rd Baron Ashburnham on his brother's death in 1710, was created Viscount St Asaph and earl of Ashburnham in 1730. The 5th earl (b. 1840) was his direct descendant. Bertram (1797–1878), the 4th earl, was the collector of the famous Ashburnham library, which was dispersed in 1883 and 1884.

A Letter from Mr Ashburnham to a Friend, defending John Ashburnham's conduct with regard to the king, was published in 1648. His longer *Narrative* was published in 1830 by George, 3rd earl of Ashburnham (the latter's championship of his ancestor, however, being entirely uncritical and unconvincing); *A Letter to W. Lenthall* (1647) repudiates the charge brought against the king of violating his parole (*Thomason Tracts*, Brit. Museum, E 418 [4]).

ASHBURTON, ALEXANDER BARING, 1st BARON[1] (1774–1848), English politician and financier, 2nd son of Sir Francis Baring (the founder of the house of Baring Brothers & Co.) and of Harriet, daughter of William Herring, was born on the 27th of October 1774, and was brought up in his father's business. He was sent by the latter to the United States; married Anne, daughter of William Bingham, of Philadelphia, and formed wide connexions with American houses. In 1810, by his father's death, he became head of the firm. He sat in parliament for Taunton (1806–1826), Callington (1826–1831), Thetford (1831–1832), North Essex (1832–1835). He regarded politics from the point of view of the business man, opposed the orders in council, and the restrictions on trade with the United States in 1812, and in 1826 the act for the suppression of small bank-notes. He was a strong antagonist of Reform. He accepted the post of chancellor of the exchequer in the duke of Wellington's projected ministry of 1832; but afterwards, alarmed at the scene in parliament, declared "he would face a thousand devils rather than such a House of Commons," and advised the recall

[1] *i. e.* in the existing line; see below for the earlier creation.

of Lord Grey. In 1834 he was president of the board of trade and master of the mint in Sir Robert Peel's government, and on the latter's retirement was created Baron Ashburton on the 10th of April 1835, taking the title previously held by John Dunning, his aunt's husband. In 1842 he was despatched to America, and the same year concluded the Ashburton or Webster-Ashburton treaty. A compromise was settled concerning the north-east boundary of Maine, the extradition of certain criminals was arranged, each state agreed to maintain a squadron of at least eighty guns on the coast of Africa for the suppression of the slave trade, and the two governments agreed to unite in an effort to persuade other powers to close all slave markets within their territories. Despite his earlier attitude, Lord Ashburton disapproved of Peel's free-trade projects, and opposed the Bank Charter Act of 1844. He was a trustee of the British Museum and of the National Gallery, a privy councillor and D.C.L. of Oxford. He published, besides several speeches, *An Enquiry into the Causes and Consequences of the Orders in Council* (1808), and *The Financial and Commercial Crisis Considered* (1847). He died on the 13th of May 1848, leaving a large family, his eldest son becoming 2nd baron. The 5th baron (b. 1866) succeeded to the title in 1889.

ASHBURTON, JOHN DUNNING, 1ST BARON[1] (1731–1783), English lawyer, the second son of John Dunning of Ashburton, Devonshire, an attorney, was born at Ashburton on the 18th of October 1731, and was educated at the free grammar school of his native place. At first articled to his father, he was admitted, at the age of nineteen, to the Middle Temple, and called to the bar in 1756, where he came very slowly into practice. He went the western circuit for several years without receiving a single brief. In 1762 he was employed to draw up a defence of the British East India Company against the Dutch East India Company, which had memorialized the crown on certain grievances, and the masterly style which characterized the document procured him at once reputation and emolument. In 1763 he distinguished himself as counsel on the side of Wilkes, whose cause he conducted throughout. His powerful argument against the validity of general warrants in the case of *Leach* v. *Money* (June 18, 1763) established his reputation, and his practice from that period gradually increased to such an extent that in 1776 he is said to have been in the receipt of nearly £10,000 per annum. In 1766 he was chosen recorder of Bristol, and in December 1767 he was appointed solicitor-general. The latter appointment he held till May 1770, when he retired with his friend Lord Shelburne. In 1771 he was presented with the freedom of the city of London. From this period he was considered as a regular member of the opposition, and distinguished himself by many able speeches in parliament. He was first chosen member for Calne in 1768, and continued to represent that borough until he was promoted to the peerage. In 1780 he brought forward a motion that the "influence of the crown had increased, was increasing, and ought to be diminished," which he carried by a majority of eighteen. He strongly opposed the system of sinecure officers and pensions; but his probity was not strong enough to prevent his taking advantage of it himself. In 1782, when the marquis of Rockingham became prime minister, Dunning was appointed chancellor of the duchy of Lancaster, a rich sinecure; and about the same time he was advanced to the peerage, with the title of Lord Ashburton. Under Lord Shelburne's administration he accepted a pension of £4000 a year. He died at Exmouth on the 18th of August 1783. Though possessed of an insignificant person, an awkward manner and a provincial accent, Lord Ashburton was one of the most fluent and persuasive orators of his time. He had married Elizabeth Baring, and was succeeded as 2nd baron by his son Richard, at whose death in 1823 the title became extinct, being revived in 1835 by Alexander Baring.

Besides the answer to the Dutch memorial, Lord Ashburton is supposed to have assisted in writing a pamphlet on the law of libel, and to have been the author of *A Letter to the Proprietors of East India Stock, on the subject of Lord Clive's Jaghire, occasioned by his Lordship's Letter on that Subject* (1764, 8vo). He was at one time suspected of being the author of the *Letters of Junius*.

[1] *i.e.* of the first creation; for the present title see above.

ASHBURTON, a river of Western Australia, rising in the mountains west of the Great Sandy Desert, and following a course north-westward for 400 m., into Exmouth Gulf. In its upper reaches it flows through a rich gold-bearing district to which it gives name, and nearer its mouth it traverses a vast tract of fine pastoral country. The outlet for both these districts is the port of Onslow, at the mouth of the river, near which there are several pearl-fishing stations. The river is not navigable.

ASHBURTON, a market-town in the Ashburton parliamentary division of Devonshire, England, 24 m. N.W. by W. of Plymouth, on a branch of the Great Western railway. Pop. of urban district (1901) 2628. It lies in a valley surrounded by hills, at a short distance from the river Dart; the scenery, towards Dartmoor and in the neighbourhood of Buckland and Holne Chase, being unsurpassed in the county. The church of St Andrew is cruciform with a lofty tower. It was built early in the 15th century, and contains a fine old oak roof over the north aisle, and a tablet in memory of John Dunning, solicitor-general and 1st Baron Ashburton (1731–1783). The inscription is by Dr Johnson. Lord Ashburton was educated at the grammar school, which was founded as a chantry in 1314. Serge is manufactured in Ashburton, and there are breweries, paint factories and saw-mills. A large deposit of umber is worked in the neighbourhood. Slate quarries and copper and tin mines were formerly valuable. A neighbouring centre of the serge industry is the urban district of BUCKFASTLEIGH (pop. 2520), 3 m. S.S.W. Between the two towns is Buckfast Abbey, said to have been, before the Conquest, a Benedictine house, and refounded for Cistercians in 1137. It was restored to use in 1882 by a French Benedictine community, the fine Perpendicular abbot's tower remaining, while other parts have been rebuilt on the original lines.

Ashburton (Essebretona, Asperton, Ashperton) is a borough by prescription and an ancient stannary town. It was governed by a portreeve and bailiff, elected annually at the court leet held by the lord of the manor. According to Domesday, Ashburton was held in chief by Osbern, bishop of Exeter, and rendered geld for six hides. In 1552, as the two manors of Ashburton Borough and Ashburton Foreign, it was sold by the bishop, and subsequently became crown property. Finally, it was acquired in moieties by the Clinton family, and the present Lord Clinton is joint lord of the manor with Sir Robert Jardine. In 1298 and 1407 Ashburton returned two members, from 1407 until 1640 one member only, and then again two members, until deprived of one by the Reform Act of 1832 and of the other by the Reform Act of 1885. In the reign of Edward II. Bishop Stapledon obtained a Saturday market, and two annual fairs lasting three days at the feasts of St Laurence (August 10) and St Martin in winter (November 11). In 1672 John Ford was granted a Tuesday market for the sale of wool and woollen goods made from English yarn, and in 1705 Andrew Quicke obtained two annual fairs, on the first Thursdays in March and June, for the sale of cattle, corn and merchandise.

ASHBY, TURNER (1824–1862), American cavalry leader in the Confederate army, was born in Fauquier county, Virginia, in 1824. Before the Civil War he was a planter in Markham, Fauquier county, and a local politician. When hostilities began he raised a regiment of cavalry, which he led with conspicuous success in the Valley campaigns of 1861–62, under Joseph Johnston and Stonewall Jackson. He was promoted a brigadier-general shortly before his death, which took place in a cavalry skirmish at Harrisonburg, Va., on the 6th of June 1862. By his early death the Confederates lost one of the best cavalry officers in their service.

ASHBY-DE-LA-ZOUCH, a market-town in the Bosworth parliamentary division of Leicestershire, England; 118 m. N.W. by N. from London by the Midland railway, on the Leicester-Burton branch. Pop. of urban district (1901) 4726. The church of St Helen is a fine Perpendicular building, restored and enlarged (1880); it contains monuments of the Huntingdon family, and an old finger-pillory for the punishment of misbehaviour in church. The Ivanhoe baths, erected in 1826, are frequented for their saline waters, which, as containing bromine, are found useful in scrofulous and rheumatic complaints. The springs are at Moira, 3 m. west. There is a Queen Eleanor cross commemorating the countess of Loudoun, by Sir Gilbert Scott. To the south of the town are the extensive remains of Ashby

Castle. There are extensive coal-mines in the neighbouring district, as at Moira, whence the Ashby-de-la-Zouch canal runs south to the Coventry canal.

At the time of the Domesday survey Ashby-de-la-Zouch formed part of the estates of Hugh de Grentmaisnel. Soon after it was held by Robert Beaumeis, from whom it passed by female descent to the family of la Zouch, whence it derived the adjunct to its name, having been hitherto known as Ashby or Essebi. The earliest record of a grant of market rights is in 1219, when Roger la Zouch obtained a grant of a weekly market and a two days' fair at the feast of St Helen, in consideration of a fine of one palfrey. In the 15th century the manor was held by James Butler, earl of Ormond, after whose attainder it was granted in 1461 to Lord Hastings, who in 1474 obtained royal licence to empark 3000 acres and to build and fortify a castle. At this castle Mary queen of Scots was detained in 1569 under the custody of the earls of Huntingdon and Shrewsbury. During the Civil War Colonel Henry Hastings fortified and held it for the king, and it was visited by Charles in 1645. In 1648, at the close of the war, it was dismantled by order of parliament. It plays a great part in Sir Walter Scott's *Ivanhoe*. In the 18th century Ashby was celebrated as one of the best markets for horses in England, and had besides prosperous factories for woollen and cotton stockings and for hats.

See *Victoria County History—Leicestershire; History of Ashby-de-la-Zouch* (Ashby-de-la-Zouch, 1852).

A-SHE-HO (Manch. *Alchuku*), a town of Manchuria, China, 125 m. N.E. of Kirin, and 30 m. S. of the Sungari. It is governed by a mandarin of the second class. Pop. about 60,000.

ASHER, a tribe of Israel, called after the son of Jacob and Zilpah, Leah's maid. The name is taken by the narrator of Gen. xxx. 12 seq. (J) to mean happy or propitious, possibly an allusion to the fertility of the tribe's territory (with which cf. Gen. xlix. 20, Deut. xxxiii. 24); on the other hand, like Gad, it may have been originally a divine title. The district held by this tribe bordered upon Naphtali, and lay to the north of Issachar and Zebulun, and to the south of Dan. But the boundaries are not definite and the references to its territory are obscure. Asher is blamed for taking no part in the fight against Sisera (Judg. v. 17), and although it shares with Zebulun and Naphtali in Gideon's defeat of the Midianites (Judg. vi. 35, vii. 23), the narrative in question is not the older of the two accounts of the event, and the incorporation of the name is probably due to a late redactor. Lying as it did in the closest proximity to Phoenicians and Aramaeans, its population must have been exceptionally mixed, and the description of the occupation of Palestine in Judg. i. 31 seq. shows that it contained a strong Canaanite element. In the Blessing of Moses it is bidden to defend itself—evidently against invasion (Deut. xxxiii. 25).

Even in the time of Seti I. and Rameses II. (latter half of 14th cent. B.C.) the district to the west of Galilee appears to have been known to the Egyptians as Aser(u), so that it is possible to infer either (*a*) that Asher was an Israelite tribe which, if it ever went down into Egypt, separated itself from its brethren in Egypt and migrated north, "an example which was probably followed by some of the other tribes as well" (Hommel, *Ancient Hebrew Tradition*, p. 228); or (*b*) it was a district which, if never closely bound to Israel, was at least regarded as part of the national kingdom, and treated as Israelite by the genealogical device of making it a "son" of Jacob. It is possible that some of its Israelite population had followed the example of Dan and moved from an earlier home in the south. Two of the clans of Asher, Heber and Malchiel, have been associated with Milk-ili and Habiri, the names of a hostile chief and people in the Amarna Tablets (Jastrow, *Journal Bibl. Lit.* xi. pp. 118 seq., xii. pp. 61 seq., Hommel), but it is scarcely probable that events of about 1400 B.C. should have survived only in this form. This applies also to the suggestion that the name Asher has been derived from a famous Abd-ashirta of the same period (Barton, *ib.* xv. p. 174). Some connexion with the goddess Ashir(t)a, however, is not unlikely.

See further H. W. Hogg, *Ency. Bibl.* col. 327 seq.; E. Meyer, *Israeliten*, pp. 540 sqq. (S. A. C.)

'ASHER BEN YEHIEL (known as *Rosh*), Jewish rabbi and codifier, was born in the Rhine district *c.* 1250, and died in Toledo 1327. Endangered by the persecutions inflicted on the German Jews in the 13th century, 'Asher fled to Spain, where he was made rabbi of Toledo. His enforced exile impoverished him, and from this date begins an important change in the status of medieval rabbis. Before the 14th century, rabbis had obtained a livelihood by the exercise of some secular profession, particularly medicine, and received no salary for performing the rabbinic function. This was now changed. A disciple of Meir of Rothenburg, 'Asher's sole interest was in the Talmud. He was a man of austere piety, profound and narrow. He was a determined opponent of the study of philosophy, and thus was antipathetic to the Spanish spirit. The Jews of Spain continued, nevertheless, devotees of secular sciences as well as of rabbinical lore. 'Asher was the first of the German rabbis to display strong talent for systematization, and his chief work partook of the nature of a compendium of the Talmud. Compiled between 1307 and 1314, 'Asher's *Compendium* resembled, and to a large extent superseded, the work of 'Al-phasi (*q.v.*). 'Asher's *Compendium* is printed in most editions of the Talmud, and it differed from previous Compendia in greater simplicity and in the deference shown to German authorities. 'Asher's son Jacob, who died at Toledo before 1340, was the author of the four *Turim*, a very profound and popular codification of rabbinical law. This work was the standard code until Joseph Qaro directly based on it his widely accepted Code of Jewish law, the *Shulḥan 'Arukh*. (I. A.)

ASHEVILLE, a city and the county-seat of Buncombe county, North Carolina, U.S.A., in the mountainous Blue Ridge region in the west part of the state, about 210 m. W. of Raleigh. Pop. (1890) 10,235; (1900) 14,694, of whom 4724 were negroes; (1910, census) 18,762. Asheville is situated at the junction of three branches of the Southern railway, on a high terrace on the east bank of the French Broad river, at the mouth of the Swannanoa, about 2300 ft. above the sea. The city is best known as one of the most popular health and pleasure resorts in the south, being a summer resort for southerners and a winter resort for northerners. It has a dry and equable climate and beautiful scenery. Among its social clubs are the Albemarle, the Asheville, the Elks, the Tahkeeostee and the Swannanoa Country clubs. An extensive system of city and suburban parks, connected by a series of beautiful drives, adds to the city's attractiveness. There are great forests in the vicinity. Among the public buildings are the city hall, the court house, the Federal building, the public library and an auditorium. In or near Asheville are a normal and collegiate institute for young women (1892), and, occupying the same campus, a home industrial school (1887) for girls, both under the control of the Woman's Board of Home Missions of the Presbyterian Church; the Asheville farm school for boys, an industrial school for negroes; the Asheville school for boys (5 m. west of Asheville); and the Bingham school (1793), founded at Pittsboro, N.C., by William Bingham (d. 1826), and removed to its present site (3 m. north-west of Asheville) in 1891. About 2 m. south-east of the city is Biltmore, the estate of George W. Vanderbilt, its 125,000 acres constituting what is probably the finest country place in the United States. The central feature of the estate is a château (375×150 ft.) of French Renaissance design, after the famous château at Blois, France. In the neighbourhood is a model village, with an elementary school, an industrial school for whites, a hospital and a church, maintained by Mr Vanderbilt. Both the château and the village were designed by Richard M. Hunt; the landscape gardening was done by Frederick Law Olmsted. A collection of woody plants, one of the largest and finest in the world, and a broad forest and hunting preserve, known as Pisgah Forest (100,000 acres), are also maintained by the owner. Asheville is a market for live-stock, dairy products, lumber and fruits, and has various manufactories (in which a good water-power is utilized), including tanneries, cotton mills, brick and tile factories, and a wood-working and veneer plant. The value of the city's factory products increased from $1,300,698 in 1900 to $1,918,362 in 1905, or 47·5%. The city was named in honour of Samuel Ashe (1725–1813), chief-justice of North Carolina from 1777 to 1796, and John Ashe (1720–1781), a North Carolina soldier who distinguished himself in the War of

Independence, was settled about 1790, and was incorporated in 1835. The city's boundaries were enlarged in 1905.

ASHFORD, a market-town in the Southern or Ashford parliamentary division of Kent, England, 56 m. S.E. of London by the South-Eastern & Chatham railway. Pop. of urban district (1901) 12,808. It is pleasantly situated on a gentle eminence near the confluence of the upper branches of the river Stour. It has a fine Perpendicular church dedicated to St Mary, with a lofty, well-proportioned tower and many interesting monuments. The grammar school was founded by Sir Norman Knatchbull in the reign of Charles I. Ashford has agricultural implement works and breweries; and the large locomotive and carriage works of the South-Eastern & Chatham railway are here. At Bethersden, between Ashford and Tenterden, marble quarries were formerly worked extensively, supplying material to the cathedrals of Canterbury and Rochester, and to many local churches. At Charing, north-west of Ashford, the archbishops of Canterbury had a residence from pre-Conquest times, and ruins of a palace, mainly of the Decorated period, remain. On the south-eastern outskirts of Ashford is the populous village of Willesborough (3602).

Ashford (Esselesford, Asshatisforde, Essheford) was held at the time of the Domesday survey by Hugh de Montfort, who came to England with William the Conqueror. A Saturday market and an annual fair were granted to the lord of the manor by Henry III. in 1243. Further annual fairs were granted by Edward III. in 1349 and by Edward IV. in 1466. In 1672 Charles II. granted a market on every second Tuesday, with a court of pie-powder. James I. in 1607, at the petition of the inhabitants of Ashford, gave Sir John Smith, Kt., the right of holding a court of record in the town on every third Tuesday. The fertility of the pasture-land in Romney Marsh to the south and east of Ashford caused the cattle trade to increase in the latter half of the 18th century, and led to the establishment of a stock market in 1784. The town has never been incorporated.

See Edward Hasted, *History and Survey of Kent* (Canterbury, 1778–1799, 2nd ed. 1797–1801); *Victoria County History—Kent.*

'ASHI (352–427), Jewish *'amora*, the first editor of the Talmud, was born at Babylon. He was head of the Sura Academy, and there began the Babylonian Talmud, spending thirty years of his life at it. He left the work incomplete, and it was finished by his disciple Rabina just before the year 500 A.D. (See TALMUD.)

ASHINGTON, an urban district in the Wansbeck parliamentary division of Northumberland, England, 4 m. E. of Morpeth, on the Newbiggin branch of the North Eastern railway. Pop. (1901) 13,956. The district, especially along the river Wansbeck, is not without beauty, but there are numerous collieries, from the existence of which springs the modern growth of Ashington. At Bothal on the river (from which parish that of Ashington was formed) is the castle originally belonging to the Bertram family, of which Roger Bertram probably built the gatehouse, the only habitable portion remaining, in the reign of Edward III. The ruins of the castle are fragmentary, but of considerable extent. The church of St Andrew here has interesting details from Early English to Perpendicular date, and in the neighbouring woods is a ruined chapel of St Mary. The mining centre of Ashington lies 2 m. north-east, on the high ground north of the Wansbeck.

'ASHKENAZI, SEBI (1656–1718), known as Ḥakham Ṣebi, for some time rabbi of Amsterdam, was a resolute opponent of the followers of the pseudo-Messiah, Sabbatai Ṣebi (*q.v.*). He had a chequered career, owing to his independence of character. He visited many lands, including England, where he wielded much influence. His *Responsa* are held in high esteem.

ASHLAND, a city of Boyd county, Kentucky, U.S.A., on the Ohio river, about 130 m. E. by N. of Frankfort. Pop. (1890) 4195; (1900) 6800 (489 negroes); (1910) 8688. It is served by the Chesapeake & Ohio (being a terminal of the Lexington and Big Sandy Divisions) and the Norfolk & Western railways, and is connected with Huntington, West Virginia, by an electric line. The city has a fine natural park (Central Park) of about 30 acres; and Clyffeside Park (maintained by a private corporation), of about 75 acres, just east of the city, is a pleasure resort and a meeting-ground (with a casino seating 3000 people) for the Tri-State "Chautauqua" (for certain parts of Kentucky, Ohio and West Virginia). The surrounding country abounds in coal, iron ore, oil, clay, stone and timber, for which the city is a distributing centre. Ashland has considerable river traffic, and various manufactures, including pig iron, nails, wire rods, steel billets, sheet steel, dressed lumber (especially poplar), furniture, fire brick and leather. Ashland was settled in 1854, and was chartered as a city in 1870.

ASHLAND, a borough of Schuylkill county, Pennsylvania, U.S.A., about 50 m. N.E. of Harrisburg and about 100 m. N.W. of Philadelphia. Pop. (1890) 7346; (1900) 6438 (969 foreign-born); (1910) 6855. It is served by the Lehigh Valley and the Philadelphia & Reading railways, and by the electric lines of the Schuylkill Railway Company and the Shamokin & Mount Carmel Transit Company. The borough is built on the slope of Locust Mountain, about 885 ft. above sea-level. Its chief industry is the mining of anthracite coal at several collieries in the vicinity; and at Fountain Springs, 1 m. south-east, is a state hospital for injured persons of the Anthracite Coal Region of Pennsylvania, opened in 1883. The municipality owns and operates the waterworks. Ashland was laid out as a town in 1847, and was named in honour of Henry Clay's home at Lexington, Ky.; in 1857 it was incorporated.

ASHLAND, a village of Hanover county, Virginia, U.S.A., 17 m. N.W. of Richmond. Pop. (1900) 1147; (1910) 1324. It is served by the Richmond, Fredericksburg & Potomac railway, and is a favourite resort from Richmond. Here is situated the Randolph-Macon College (Methodist Episcopal, South), one of the oldest Methodist Episcopal colleges in the United States. In 1832, two years after receiving its charter, it opened near Boydton, Mecklenburg county, Virginia, and in 1868 was removed to Ashland. The college in 1907–1908 had 150 students and a faculty of 16; it publishes an endowed historical series called *The John P. Branch Historical Papers of Randolph-Macon College*; and it is a part of the "Randolph-Macon System of Colleges and Academies," which includes, besides, Randolph-Macon Academy (1890) at Bedford City, Virginia, and Randolph-Macon Academy (1892) at Front Royal, Virginia, both for boys; Randolph-Macon Woman's College (1893) at Lynchburg, Virginia, which in 1907–1908 had an enrolment of 390; and Randolph-Macon Institute, for girls, Danville, Virginia, which was admitted into the "System" in 1897. These five institutions are under the control of a single board of trustees; the work of the preparatory schools is thus correlated with that of the colleges. About 7 m. out of Ashland is the birthplace of Henry Clay, and about 15 m. distant is the birthplace of Patrick Henry. Ashland was settled in 1845 and was incorporated in 1856.

ASHLAND, a city and the county-seat of Ashland county, Wisconsin, U.S.A., situated about 315 m. N.W. of Milwaukee, and about 70 m. E. of Superior and Duluth, in the N. part of the state, at the head of Chequamegon Bay, an arm of Lake Superior. Pop. (1890) 9956; (1900) 13,074, of whom 4417 were foreign-born; (1910, census) 11,594. It is served by the Chicago & North-Western, the Northern Pacific, the Chicago, St Paul, Minneapolis & Omaha, and the Wisconsin Central railways, and by several steamboat lines on the Great Lakes. The city is attractively situated, has a dry, healthful climate, and is a summer resort. It has a fine Federal building, one of the best high-school buildings in Wisconsin, the Vaughn public library (1895), a Roman Catholic hospital, and the Rinehart hospital, and is the seat of the Northland College and Academy (Congregational). Ashland has an excellent harbour, has large iron-ore and coal docks, and is the principal port for the shipment of iron ore from the rich Gogebic Range, the annual ore shipment approximating 3,500,000 tons, valued at $12,000,000, and it has also an extensive export trade in lumber. Brownstone quarried in the vicinity is also an important export. The lake trade amounts to more than $35,000,000 annually. Ashland has large saw-mills, iron and steel rolling mills, foundries and machine shops, railway repair shops (of the Chicago & North-Western railway), knitting works, and manufactories of dynamite, sulphite fibre, charcoal and wood-alcohol. In 1905 its total factory product was valued at $4,210,265. Settled

about 1854, Ashland was incorporated as a village in 1863 and received a city charter in 1887.

ASHLAR, also written ASHLER, ASHELERE, &c. (probably from Lat. *axilla*, diminutive of *axis*, an axle), hewn or squared stone, generally applied to that used for facing walls. In a contract of date 1398 we read—"Murus erit exterius de puro lapide vocato *achilar*, plane incisso, interius vero de lapide fracto vocato *roghwall*." "Clene hewen ashler" often occurs in mediaeval documents; this no doubt means tooled or finely worked, in contradistinction to rough-axed faces.

An "ashlar piece" in building is an upright piece of timber framed between the common rafters and the wall plate.

ASHLEY, WILLIAM JAMES (1860–), English economist, was born in London on the 25th of February 1860. He was educated at St Olave's grammar school and Balliol College, Oxford, and became a fellow of Lincoln College. In 1888 he was appointed professor of political economy and constitutional history in Toronto University, a post which he resigned in 1892, in order to become professor of economic history at Harvard University. In 1901 he was appointed professor of commerce and finance in Birmingham University and in 1902 dean of the faculty of commerce. Professor Ashley became well known for his work on the early history of English industry, and for his prominence among those English economists who supported Mr Chamberlain's tariff reform movement. His most important works are *Early History of the English Woollen Industry* (1887); *Introduction to English Economic History and Theory* (2 parts, 1888–1893); *Surveys, Historic and Economic* (1900); *Adjustment of Wages* (1903); the *Tariff Problem* (2nd ed. 1904); *Progress of the German Working Classes* (1904).

ASHMOLE, ELIAS (1617–1692), English antiquarian, and founder of the Ashmolean Museum at Oxford, was born at Lichfield on the 23rd of May 1617, the son of a saddler. In 1638 he became a solicitor, and in 1644 was appointed commissioner of excise. At Oxford, whither this brought him when the Royalist Parliament was sitting there, he made friends with Captain (afterwards Sir) George Wharton, through whose influence he obtained the king's commission as captain of horse and comptroller of the ordnance. In 1646 he was initiated as a Freemason—the first gentleman, or amateur, to be "accepted." In 1649 he married Lady Mainwaring, some twenty years his senior and a relative of his first wife who had died eight years before. This marriage placed him in a position of affluence that enabled him to devote his whole time to his favourite studies. His interest in astrology, aroused by Wharton, and by William Lilly,—whom with other astrologers he met in London in 1646,—seems, in the following years, to have subsided in favour of heraldry and antiquarian research. In 1657 his wife petitioned for a separation, but failing to gain her case returned to live with him. Between this crisis in his domestic life and the time of her death in 1668, Ashmole was in high favour at court. He was made successively Windsor herald, commissioner, comptroller and accountant-general of excise, commissioner for Surinam and comptroller of the White Office. He afterwards refused the office of Garter king-at-arms in favour of Sir William Dugdale, whose daughter he had married in 1668. In 1672 he published his *Institutions, Laws and Ceremonies of the Order of the Garter*, a work which was practically exhaustive, and is an example of his diligence and years of patient antiquarian research. Five years later he presented the Ashmolean Museum, the first public museum of curiosities in the kingdom, the larger part of which he had inherited from a friend, John Tradescant, to the university of Oxford. He made it a condition that a suitable building should be erected for its reception, and the collection was not finally installed until 1683. Subsequently he made the further gift to the university of his library. He died on the 18th of May 1692.

ASHRAF (SHUREFA, SHERIFS), a small scattered tribe of African "Arabs" settled near Tokar, in the valleys of the Gash and Baraka, and in the Amarar country north of Suakin. They call themselves Beni Hashin, and claim descent from Mahomet; hence their name, *sherif* (plural *ashraf*) being the title applied to descendants of the prophet. In the time of the khalifa Abdulla (1885–1898), Ashraf was the name by which the family and adherents of his late master the mahdi were known, the mahdi's family claiming to be Ashraf. The Ashraf of Tokar remained loyal to Egypt during the Sudan troubles.

See *Anglo-Egyptian Sudan*, edited by Count Gleichen (London, 1905); *Fire and Sword in the Sudan*, by Slatin Pasha (London, 1896); for the Ashraf or Sherifs in Arabia, see ARABIA: *Geography*.

ASHREF, a town of Persia in the province of Mazandaran, about 50 m. W. of Astarabad and 5 m. inland from the Caspian Sea, in 36° 42′ N. and 53° 32′ E. The population is about 6000, comprising descendants of some Georgians introduced by Shah Abbas I. (1587–1629) and a number of Gudars, a peculiar pariah race, probably of Indian origin. The place was without importance until 1612, when Shah Abbas began building and laying out the palaces and gardens in the neighbourhood now collectively known as Bagh i Shah (the garden of the shah). The palaces, completed in 1627, are now in ruins, but the gardens with their luxuriant vegetation and gigantic cypress and orange trees are well worth a visit. There were originally six separate gardens, all contained within one large wall but separated one from another by high walls. The principal palace was the Chehel Situn (forty pillars), destroyed by the Afghans in 1723, and, although rebuilt by Nadir Shah in 1731, already in ruins in 1743. About ¾ m. north of the town is the Safi-abad garden, with a palace built by Shah Safi (1629–1642) for his daughter. It is situated on a lovely wooded hill, and was repaired and in part renovated about 1870 by Nâṣiru'd-Din Shah.

ASHTABULA, a city of Ashtabula county, Ohio, U.S.A., in Ashtabula township, on the Ashtabula river and Lake Erie, and 54 m. N.E. of Cleveland. Pop. (1890) 8338; (1900) 12,949, of whom 3688 were foreign-born; (1910, census) 18,266. There is a large Finnish-born population in the city and in Ashtabula county, and the *Amerikan Sanomat*, established here in 1897, is one of the most widely read Finnish weeklies in the country. Ashtabula is served by the Pennsylvania, the Lake Shore & Michigan Southern, and the New York, Chicago & St Louis railways, and by inter-urban electric lines. The city is built on the high bank of the river about 75 ft. above the lake, and commands good views of diversified scenery. There is a public library. Ashtabula has an excellent harbour, to and from which large quantities of iron ore and coal are shipped. More iron ore is received at this port annually than at any other port in the country, or, probably, in the world; the ore is shipped thence by rail to Pittsburg, Youngstown and other iron manufacturing centres. In 1907 the port received 7,542,149 gross tons of iron ore, and shipped 2,632,027 net tons of soft coal. Among the city's manufactures are leather, worsted goods, agricultural implements, and foundry and machine shop products; in 1905 the total value of the factory product was $1,895,454, an increase of 114·3 % in five years. There are large green-houses in and near Ashtabula, and quantities of lettuce, cucumbers and tomatoes are raised under glass and shipped to Pittsburg and other large cities. The first settlement here was made about 1801. Ashtabula township was created in 1808, and from it the townships of Kingsville, Plymouth and Sheffield have subsequently been formed. The village of Ashtabula was incorporated in 1831, and received a city charter in 1891. The name *Ashtabula* is an Indian word first applied to the river and said to mean "fish river."

ASHTON-IN-MAKERFIELD, an urban district in the Newton parliamentary division of Lancashire, England, 4 m. S. of Wigan, on the Great Central railway. Pop. (1901) 18,687. The district is rich in minerals, and has large collieries, and a colliery company's institute; iron goods are manufactured.

ASHTON-UNDER-LYNE, a market-town and municipal and parliamentary borough of Lancashire, England, on the river Tame, a tributary of the Mersey, 185 m. N.W. by N. from London and 6½ E. from Manchester. Area, 1346 acres. Pop. (1891) 40,486; (1901) 43,890. It is served by the London & North-Western and the Lancashire & Yorkshire railways (Charlestown station), and by the Great Central (Park Parade station).

The church of St Michael is Perpendicular, but almost wholly rebuilt. In the vicinity are barracks. The Old Hall, or manor house of the Asshetons, remains in an altered form, with an ancient prison adjoining, and the name of Gallows Meadow, still preserved, recalls the summary execution of justice by the lords of the manor. In the vicinity of Ashton a few picturesque old houses remain among the numerous modern residences. Stamford Park, presented by Lord Stamford, is shared by the towns of Ashton and Stalybridge, which extends across the Tame into Cheshire. A technical school, school of art and free library, and several hospitals are maintained. Chief among industries are cotton-spinning, hat-making and iron-founding and machinery works; and there are large collieries in the neighbourhood. The parliamentary borough, which returns one member, extends into Cheshire. The corporation consists of a mayor, 8 aldermen and 24 councillors.

The derivation from the Saxon *æsc* (ash) and *tun* (an enclosed place) accounts for the earliest orthography Estun. The addition *subtus lineam* is found in ancient deeds and is due to the position of the place below the line or boundary of Cheshire, which once formed the frontier between the kingdoms of Northumbria and Mercia. The manor was granted to Roger de Poictou by William I., but before the end of his reign came to the Greslets as part of the barony of Manchester. It was held by the Asshetons from 1335 to 1515, when it passed by marriage to the Booths of Dunham Massey, and is now held by the earl of Stamford, the representative of that family. The lord of the manor still holds the ancient court-leet and court-baron half-yearly in May and November, in which cognizance is taken of breaches of agreement among the tenants, especially concerning the repair of roads and cultivation of lands. The place had long enjoyed the name of borough, but it was not till 1847 that a charter of incorporation was granted. Under the Reform Act (1832) it returns one member. One of the markets dates back to 1436. The ancient industry was woollen, but soon after the invention of the spinning frame the cotton trade was introduced, and as early as 1769 the weaving of ginghams, nankeens and calicoes was carried on, and the weaving of cotton yarn by machinery soon became the staple industry. A chapel or church existed here as early as 1261–1262.

ASH WEDNESDAY, in the Western Church, the first day of Lent (*q.v.*), so called from the ceremonial use of ashes, as a symbol of penitence, in the service prescribed for the day. The custom, which is ultimately based on the penance of "sackcloth and ashes" spoken of by the prophets of the Old Testament, has been dropped in those of the reformed Churches which still observe the fast; but it is retained in the Roman Catholic Church, the day being known as *dies cinerum* (day of ashes) or *dies cineris et cilicii* (day of ash and sackcloth). The ashes, obtained by burning the palms or their substitutes used in the ceremonial of the previous Palm Sunday, are placed in a vessel on the altar before High Mass. The priest, vested in a violet cope, prays that God may send His angel to hallow the ash, that it become a *remedium salubre* for all penitents. After another prayer the ashes are thrice sprinkled with holy water and thrice censed. Then the priest invites those present to approach and, dipping his thumb in the ashes, marks them as they kneel with the sign of the cross on the forehead (or in the case of clerics on the place of tonsure), with the words: *Memento, homo, quia pulvis es et in pulverem reverteris* (Remember, man, that thou art dust and unto dust thou shalt return). The celebrant himself either sprinkles the ash on his own head in silence, or receives it from the priest of highest dignity present.

This ceremony is derived from the custom of public penance in the early Church, when the sinner to be reconciled had to appear in the congregation clad in sackcloth and covered with ashes (cf. Tertullian, *De Pudicitia*, 13). At what date this use was extended to the whole congregation is not known. The phrase *dies cinerum* appears in the earliest extant copies of the Gregorian Sacramentary, and it is probable that the custom was already established by the 8th century. The Anglo-Saxon homilist Ælfric, in his *Lives of the Saints* (996 or 997), refers to it as in common use; but the earliest evidence of its authoritative prescription is a decree of the synod of Beneventum in 1091.

Of the reformed Churches the Anglican Church alone marks the day by any special service. This is known as the Commination service, its distinctive element being the solemn reading of "the general sentences of God's cursing against sinners, gathered out of the seven and twentieth chapter of Deuteronomy, and other places of Scripture." The lections for the day are the same as in the Roman Church (Joel ii. 12, &c., and Matt. vi. 16, &c.). In the American Prayer Book the office of Commination is omitted, with the exception of the three concluding prayers, which are derived from the prayers and anthems said or sung during the blessing and distribution of the ashes according to the Sarum Missal. The ceremonial of the ashes was not proscribed in England at the Reformation; it was indeed enjoined by a proclamation of Henry VIII. (February 26, 1538) and again in 1550 under Edward VI.; but it had fallen into complete disuse by the beginning of the 17th century.

See Wetzer and Welte, *Kirchenlexikon*, and Herzog-Hauck, *Realencyklopädie* (3rd ed.), s. "*Aschermittwoch*"; L. Duchesne, *Christian Worship*, trans. by M. L. McClure (London, 1904).

ASHWELL, LENA (1872–), English actress, was the daughter of Commander Pocock, R.N. In 1896 she married the actor Arthur Playfair, whom she divorced in 1908; later in the latter year she married Dr Simson. In 1895 she played Elaine in Sir Henry Irving's production of *King Arthur* at the Lyceum, and again acted with him in 1903 in *Dante*. She made her first striking success, however, on the London stage in *Mrs Dane's Defence* with Sir Charles Wyndham in 1900, and a few years later her acting in *Leah Kleschna* confirmed her position as one of the leading actresses in London. In 1907 she started under her own management at the Kingsway theatre.

ASIA, the name of one of the great continents into which the earth's surface is divided, embracing the north-eastern portion of the great mass of land which constitutes what is generally known as the Old World, of which Europe forms the north-western and Africa the south-western region.

Much doubt attaches to the origin of the name. Some of the earliest Greek geographers divided their known world into two portions only, Europe and Asia, in which last Libya (the Greek name for Africa) was included. Herodotus, who ranks Libya as one of the chief divisions of the world, separating it from Asia, repudiates as fables the ordinary explanations assigned to the names Europe and Asia, but confesses his inability to say whence they came. It would appear probable, however, that the former of these words was derived from an Assyrian or Hebrew root, which signifies the west or setting sun, and the latter from a corresponding root meaning the east or rising sun, and that they were used at one time to imply the west and the east. There is ground also for supposing that they may at first have been used with a specific or restricted local application, a more extended signification having eventually been given to them. After the word Asia had acquired its larger sense, it was still specially used by the Greeks to designate the country around Ephesus. The idea of Asia as originally formed was necessarily indefinite, and long continued to be so; and the area to which the name was finally applied, as geographical knowledge increased, was to a great extent determined by arbitrary and not very precise conceptions, rather than on the basis of natural relations and differences subsisting between it and the surrounding regions.

Geography

Boundaries.

The northern boundary of Asia is formed by the Arctic Ocean; the coast-line falls between 70° and 75° N., and so lies within the Arctic circle, having its extreme northern point in Cape Sivero-Vostochnyi (*i.e.* north-east) or Chelyuskin, in 78° N. On the south the coast-line is far more irregular, the Arabian Sea, the Bay of Bengal, and the China Sea reaching about to the northern tropic at the mouths of the Indus, of the Ganges and of the Canton river;

while the great peninsulas of Arabia, Hindostan and Cambodia descend to about 10° N., and the Malay peninsula extends within a degree and a half of the equator. On the west the extreme point of Asia is found on the shore of the Mediterranean, at Cape Baba, in 26° E., nor far from the Dardanelles. Thence the boundary passes in the one direction through the Mediterranean, and down the Red Sea to the southern point of Arabia, at the strait of Bab-el-Mandeb, in 45° E.; and in the other through the Black Sea, and along the range of Caucasus, following approximately 40° N. to the Caspian, whence it turns to the north on a line not far from the 60th meridian, along the Ural Mountains, and meets the Arctic Ocean nearly opposite the island of Novaya Zemlya. The most easterly point of Asia is East Cape (Vostochnyi, *i.e.* east, or Dezhnev), in 190° E., at the entrance of Bering Strait. The boundary between this point and the extremity of the Malay Peninsula follows the coast of the Northern Pacific and the China Sea, on a line deeply broken by the projection of the peninsulas of Kamchatka and Korea, and the recession of the Sea of Okhotsk, the Yellow Sea, and the Gulfs of Tongking and Siam.

On the east and south-east of Asia are several important groups of islands, the more southern of which link this continent to Australia, and to the islands of the Pacific. The Kurile Islands, the Japanese group, Luchu, Formosa and the Philippines, may be regarded as unquestionable outliers of Asia. Between the islands of the Malay archipelago from Sumatra to New Guinea, and the neighbouring Asiatic continent, no definite relations appear ever to have existed, and no distinctly marked boundary for Asia has been established by the old geographers in this quarter. Modern science, however, has indicated a line of physical separation along the channel between Borneo and Celebes, called the Straits of Macassar, which follows approximately 120° E., to the west of which the flora and fauna are essentially Asiatic in their type, while to the south and east the Australian element begins to be distinctly marked, soon to become predominant. To this boundary has been given the name of Wallace's line, after the eminent naturalist, A. R. Wallace, who first indicated its existence.

Islands.

Owing to the great extent of Asia, it is not easy to obtain a correct conception of the actual form of its outline from ordinary maps, the distortions which accompany projections of large spherical areas on a flat surface being necessarily great and misleading. Turning, therefore, to a globe, Asia, viewed as a whole, will be seen to have the form of a great isosceles spherical triangle, having its north-eastern apex at East Cape (Vostochnyi), in Bering Strait; its two equal sides, in length about a quadrant of the sphere, or 6500 m., extending on the west to the southern point of Arabia, and on the east to the extremity of the Malay peninsula; and the base between these points occupying about 60° of a great circle, or 4500 m., and being deeply indented by the Arabian Sea and the Bay of Bengal on either side of the Indian peninsula. A great circle, drawn through East Cape and the southern point of Arabia, passes nearly along the coast-line of the Arctic Ocean, over the Ural Mountains, through the western part of the Caspian, and nearly along the boundary between Persia and Asiatic Turkey. Asia Minor and the north-western half of Arabia lie outside such a great circle, which otherwise indicates, with fair accuracy, the north-western boundary of Asia. In like manner a great circle drawn through East Cape and the extremity of the Malay peninsula, passes nearly over the coasts of Manchuria, China and Cochin-China, and departs comparatively little from the eastern boundary.

Form of continent.

Asia is divided laterally along the parallel of 40° north by a depression which, beginning on the east of the desert of Gobi, extends westwards through Mongolia to Chinese Turkestan. To the west of Kashgar the central depression is limited by the meridional range of Sarikol and the great elevation of the Pamir, of which the Sarikol is the eastern face. The level of this depression (once a vast inland sea) between the mountains which enclose the sources of the Hwang-ho and the Sarikol range probably never exceeds 2000 ft. above sea, and modern researches tend to prove that in the central portions of the Gobi (about Lop Nor) it may be actually below sea-level. A vast proportion of the continent north of this central line is but a few hundred feet in altitude. Shelving gradually upward from the low flats of Siberia the general continental level rises to a great central water-parting, or divide, which stretches from the Black Sea through the Elburz and the Hindu Kush to the Tian-shan mountains in the Pamir region, and hence to Bering Strait on the extreme north-east. This great divide is not always marked by well-defined ranges facing steeply either to the north or south. There are considerable spaces where the strike, or axis, of the main ranges is transverse to the water-parting, which is then represented by intermediate highlands forming lacustrine regions with an indefinite watershed. Only a part of this great continental divide (including such ranges as the Hindu Kush, Tian-shan, Altai or Khangai) rises to any great height, a considerable portion of it being below 5000 ft. in altitude. South of the divide the level at once drops to the central depression of Gobi, which forms a vast interior, almost waterless space, where the local drainage is lost in deserts or swamps. South of this enclosed depression is another great hydrographic barrier which parts it from the low plains of the Amur, of China, Siam and India, bordered by the shallows of the Yellow Sea and the shoals which enclose the islands of Japan and Formosa, all of them once an integral part of the continent. This second barrier is one of the most mighty upheavals in the world, by reason both of its extent and its altitude. Starting from the Amur river and reaching along the eastern margin of the Gobi desert towards the sources of the Hwang-ho, it merges into the Altyn-tagh and the Kuen-lun, forming the northern face of the vast Tibetan highlands which are bounded on the south by the Himalaya. The Pamir highlands between the base of the Tian-shan mountains and the eastern buttresses of the Hindu Kush unite these two great divides, enclosing the Gobi depression on the west; and they would again be united on the east but for the transverse valley of the Amur, which parts the Khingan mountains from the Yablonoi system to the east of Lake Baikal.

General physiography.

If we consider the whole continent to be divided into three sections, viz. a northern section with an average altitude of less than 5000 ft. above sea, where all the main rivers flow northward to the Mediterranean, the Arctic Sea, or the Caspian; a central section of depression, where the drainage is lost in swamps or *hamūns*, and of which the average level probably does not exceed 2000 ft. above sea; and a southern section divided between highly elevated table-lands from 15,000 to 16,000 ft. in altitude, and lowlands of the Arabian, Indian, Siamese and Chinese peninsulas, with an ocean outlet for its drainage; we find that there is only one direct connexion between northern and southern sections which involves no mountain passes, and no formidable barrier of altitudes. That one is afforded by the narrow valley of the Hari Rud to the west of Herat. From the Caspian to Karachi it is possible to pass without encountering any orographic obstacle greater than the divide which separates the valley of the Hari Rud from the Helmund *hamūn* basin, which may be represented by an altitude of about 4000 ft. above sea-level. This fact possesses great significance in connexion with the development of Asiatic railways.

Hydrography.

If we examine the hydrographic basins of the three divisions of Asia thus indicated we find that the northern division, including the drainage falling into the Arctic Sea, the Aralo-Caspian depression, or the Mediterranean, embraces an area of about 6,394,500 sq. m., as follows:—

	Sq. m.
Area of Arctic river basins	4,367,000
,, Aralo-Caspian basin	1,759,000
,, Mediterranean	268,500
Total	6,394,500

The southern division is nearly equal in extent—

	Sq. m.
Pacific drainage	3,641,000
Indian Ocean	2,873,000
Total	6,514,000

The interior or inland basins, including the lacustrine regions south of the Arctic watershed, the Gobi depression, Tibetan plateau, the Iranian (or Perso-Afghan) uplands, the Syro-Arabian inland basin, and that of Asia Minor, amount to 3,141,500 sq. m. or about half the extent of the other two.

By far the largest Asiatic river basin is that of the Ob, which exceeds 1,000,000 sq. m. in extent. On the east and south the Amur embraces no less than 776,000 sq. m., the Yang-tsze-kiang including 685,000, the Ganges 409,500, and the Indus 370,000 sq. m.[1]

The lakes of Asia are innumerable, and vary in size from an inland sea (such as Lakes Baikal and Balkash) to a highland loch, or the indefinitely extended swamps of Persia. Many of them are at high elevations (Lake Victoria, 13,400 ft., being probably the most elevated), and are undoubted vestiges of an ancient period of glaciation. Such lakes, as a rule, show indications of a gradual decrease in size. Others are relics of an earlier geological period, when land areas

[1] Authorities differ in their methods and results of computation of these and other similar measurements.

recently upheaved from the sea were spread at low levels with alternate inundations of salt and fresh water. Of these Lop Nor and the Helmund *hamūns* are typical. Such lakes (in common with all the plateau *hamūns* of south-west Baluchistan and Persia) change their form and extent from season to season, and many of them are impregnated with saline deposits from the underlying strata. The *kavirs*, or salt depressions, of the Persian desert are more frequently widespread deposits of mud and salt than water-covered areas.

Political divisions.

Although for the purposes of geographical nomenclature, boundaries formed by a coast-line—that is, by depressions of the earth's solid crust *below* the ocean level—are most easily recognized and are of special convenience; and although such boundaries, from following lines on which the continuity of the land is interrupted, often necessarily indicate important differences in the conditions of adjoining countries, and of their political and physical relations, yet variations of the elevation of the surface *above* the sea-level frequently produce effects not less marked. The changes of temperature and climate caused by difference of elevation are quite comparable in their magnitude and effect on all organized creatures with those due to differences of latitude; and the relative position of the high and low lands on the earth's surface, by modifying the direction of the winds, the fall of rain, and other atmospheric phenomena, produce effects in no sense less important than those due to the relative distribution of the land and sea. Hence the study of the mountain ranges of a continent is, for a proper apprehension of its physical conditions and characteristics, as essential as the examination of its extent and position in relation to the equator and poles, and the configuration of its coasts.

Himalayan boundary.

From such causes the physical conditions of a large part of Asia, and the history of its population, have been very greatly influenced by the occurrence of the mass of mountain above described, which includes the Himalaya and the whole elevated area having true physical connexion with that range, and occupies an area about 2000 m. in length and varying from 100 to 500 m. in width, between 65°and 100°east and between 28° and 35° north. These mountains, which include the highest peaks in the world, rise, along their entire length, far above the line of perpetual snow, and few of the passes across the main ridges are at a less altitude than 15,000 or 16,000 ft. above the sea. Peaks of 20,000 ft. abound along the whole chain, and the points that exceed that elevation are numerous. A mountain range such as this, attaining altitudes at which vegetable life ceases, and the support of animal life is extremely difficult, constitutes an almost impassable barrier against the spread of all forms of living creatures. The mountain mass, moreover, is not less important in causing a complete separation between the atmospheric conditions on its opposite flanks, by reason of the extent to which it penetrates that stratum of the atmosphere which is in contact with the earth's surface and is effective in determining climate. The highest summits create serious obstructions to the movements of nearly three-fourths of the mass of the air resting on this part of the earth, and of nearly the whole of the moisture it contains; the average height of the entire chain is such as to make it an almost absolute barrier to one-half of the air and three-fourths of the moisture; while the lower ranges also produce important atmospheric effects, one-fourth of the air and one-half of the watery vapour it carries with it lying below 9000 ft.

This great mass of mountain, constituting as it does a complete natural line of division across a large part of the continent, will form a convenient basis from which to work, in proceeding, as will now be done, to give a general view of the principal countries contained in Asia.

Tibet.

The summit of the great mountain mass is occupied by Tibet, a country known by its inhabitants under the name of *Bod* or *Bodyul*. Tibet is a rugged table-land, narrow as compared with its length, broken up by a succession of mountain ranges, which follow as a rule the direction of the length of the table-land, and commonly rise into the regions of perpetual snow; between the flanks of these lie valleys, closely hemmed in, usually narrow, having a very moderate inclination, but at intervals opening out into wide plains, and occupied either by rivers, or frequently by lakes from which there is no outflow and the waters of which are salt. The eastern termination of Tibet is in the line of snowy mountains which flanks China on the west, between the 27th and 35th parallels of latitude, and about 103° east. On the west the table-land is prolonged beyond the political limits of Tibet, though with much the same physical features, to about 70°east, beyond which it terminates; and the ranges which are covered with perpetual snow as far west as Samarkand, thence rapidly diminish in height, and terminate in low hills north of Bokhara.

The mean elevation of Tibet may be taken as 15,000 ft. above the sea. The broad mountainous slope by which it is connected with the lower levels of Hindostan contains the ranges known as the Himalaya; the name Kuen-lun is generally applied to the northern slope that descends to the central plains of the Gobi, though these mountains are not locally known under those names, Kuen-lun being apparently a Chinese designation.

The extreme rigour of the climate of Tibet, which combines great cold with great drought, makes the country essentially very poor, and the chief portion of it little better than desert. The vegetation is everywhere most scanty, and scarcely anything deserving the name of a tree is to be found unless in the more sheltered spots, and then artificially planted. The population in the lower and warmer valleys live in houses, and follow agriculture; in the higher regions they are nomadic shepherds, thinly scattered over a large area.

China.

China lies between the eastern flank of the Tibetan plateau and the North Pacific, having its northern and southern limits about on 40° and 20° N. respectively. The country, though generally broken up with mountains of moderate elevation, possesses none of very great importance apart from those of its western border. It is well watered, populous, and, as a rule, highly cultivated, fertile, and well wooded; the climate is analogous to that of southern Europe, with hot summers, and winters everywhere cold and in the north decidedly severe.

Indo-Chinese region.

From the eastern extremity of the Tibetan mountains, between the 95th and 100th meridians, high ranges extend from about 35° N. in a southerly direction, which, spreading outwards as they go south, reach the sea at various points in Cochin-China, the Malay peninsula, and the east flank of Bengal. Between these ranges, which are probably permanently snowy to about 27° N., flow the great rivers of the Indo-Chinese peninsula, the Mekong, the Menam, the Salween, and the Irrawaddy, the valleys of which form the main portions of the states of Cochin-China (including Tongking and Cambodia), of Siam (including Laos) and of Burma. The people of Cochin-China are called Anam; it is probably from a corruption of their name for the capital of Tongking, Kechao, that the Portuguese Cochin has been derived. All these countries are well watered, populous and fertile, with a climate very similar to that of eastern Bengal. The geography of the region in which the mountains of Cochin-China and Siam join Tibet is still imperfectly known, but there is no ground left for doubting that the great river of eastern Tibet, the Tsanpo, supplies the main stream of the Brahmaputra. The two great rivers of China, the Hwang-ho and the Yang-tsze-kiang take their rise from the eastern face of Tibet, the former from the north-east angle, the latter from the south-east. The main stream of this last is called Dichu in Tibet, and its chief feeder is the Ya-lung-kiang, which rises not far from the Hwang-ho, and is considered the territorial boundary between China and Tibet.

British India.

British India comprises approximately the area between the 95th and 70th meridians, and between the Tibetan table-land and the Indian Ocean. The Indian peninsula from 25° N. southwards is a table-land, having its greatest elevation on the west, where the highest points rise to over 8000 ft., though the ordinary altitude of the higher hills hardly exceeds 4000 ft.; the general level of the table-land lies between 3000 ft. as a maximum and 1000 ft.

From the delta of the Ganges and Brahmaputra on the east to that of the Indus on the west, and intervening between the table-land of the peninsula and the foot of the Himalayan slope of the Tibetan plateau, lies the great plain of northern India, which rises at its highest point to about 1000 ft., and includes altogether, with its prolongation up the valley of Assam, an area of about 500,000 sq. m., comprising the richest, the most populous and most civilized districts of India. The great plain extends, with an almost unbroken surface, from the most western to the most eastern extremity of British India, and is composed of deposits so finely comminuted, that it is no exaggeration to say that it is possible to go from the Bay of Bengal up the Ganges, through the Punjab, and down the Indus again to the sea, over a distance of 2000 m. and more, without finding a pebble, however small.

The great rivers of northern India—the Ganges, the Brahmaputra and the Indus—all derive their waters from the Tibetan mountain mass; and it is a remarkable circumstance that the northern water-parting of India should lie to the north of the Himalaya in the regions of central Tibet.

The population of India is very large, some of its districts being among the most densely peopled in the world. The country is generally well cleared, and forests are, as a rule, found only along the flanks of the mountains, where the fall of rain is most abundant. The more open parts are highly cultivated, and large cities abound. The climate is generally such as to secure the population the necessaries of life without severe labour; the extremes of heat and drought are such as to render the land unsuitable for pasture, and the people everywhere subsist by cultivation of the soil or commerce, and live in settled villages or towns.

The island of Ceylon is distinguished from the neighbouring parts of British India by little more than its separate administration and the Buddhistic religion of its population. The highest point in Ceylon rises to about 9000 ft. above the sea, and the mountain slopes are densely covered with forest. The lower levels are in climate and cultivation quite similar to the regions in the same latitude on the Malay peninsula.

Of the islands in the Bay of Bengal the Nicobar and Andaman groups are alone worth notice. They are placed on a line joining the north end of Sumatra and Cape Negrais, the south-western extremity of Burma. They possibly owe their existence to the volcanic agencies which are known to extend from Sumatra across this part of the Indian Ocean.

The Laccadives and Maldives are groups of small coral islands,

ASIA
Scale. 1: 30,000,000
English Statute Miles
Kilometres
Political Colouring:
British
U.S.A.(Philippines)
German
French
Dutch
Portuguese
Sea under 100 fathoms deep, tinted light, over 100 fathoms, dark.
Depressions below Sea-level
Deserts
Marshes
Longitude East 60 of Greenwich
EUROPEAN RUSSIA
WEST SIBERIA
TURKESTAN
ARABIAN SEA
Gulf of Aden
Gulf of Oman
Gulf of Cutch
Persian Gulf
Black Sea
Caspian Sea
Aral Sea
Lake Baikal
Lake Balkash
Lake Tsai
Lake Koko-nor
Lake Lop-nor
Lake Baikal
Sea of Japan
Yellow Sea
Gulf of Pechili
Gulf of Siam
Bay of Bengal
Andaman Islands
Laccadive Islands
Maldive Islands
Sokotra
Socotra
Perim
Aden
Muscat
Karachi
Bombay
Calcutta
Madras
Colombo
Singapore
Penang
Rangoon
Mandalay
Saigon
Hong Kong
Canton
Amoy
Foochow
Shanghai
Nanking
Hankow
Peking
Tientsin
Port Arthur
Vladivostock
Nagasaki
Yokohama
Tokio
Osaka
Kobe
Nagoya
Hakodate
Seoul
Fusan
Gensan
Chemulpo
Wonsan
Taiwan
Formosa
Hainan
Luzon
Manila
Borneo
Sumatra
Java
Celebes
Timor
New Guinea
Australia
Tasmania
New Zealand
Japan
Korea
Siberia
Mongolia
Manchuria
China
India
Persia
Arabia
Afghanistan
Baluchistan
Punjab
Bokhara
Khiva
Tashkent
Samarkand
Merv
Herat
Kandahar
Kabul
Quetta
Multan
Lahore
Delhi
Agra
Jaipur
Ajmere
Gwalior
Jodhpur
Hyderabad
Ahmedabad
Surat
Poona
Bangalore
Madras
Trichinopoly
Madura
Cape Comorin
Ceylon
Colombo
Kandy
Jaffna
Trincomalee
Galle
Point de Galle
Gulf of Manaar
Palk Strait
Adam's Bridge
Nicobar Islands
Andaman Islands
Laccadive Islands
Maldive Islands
Chagos Archipelago
Diego Garcia
Mauritius
Reunion
Madagascar
Zanzibar
Mombasa
Aden
Berbera
Obock
Djibouti
Massawa
Suakin
Port Sudan
Khartoum
Omdurman
Kassala
Gondokoro
Lado
Fashoda
Wadelai
Albert Nyanza
Victoria Nyanza
Tanganyika
Nyasa
Lake Rudolf
Lake Stefanie
Lake Chad
Lake Tchad
Lake Victoria
Lake Albert
Lake Edward
Lake Tanganyika
Lake

EASTERN SIBERIA
EASTERN EMPIRE
SEA OF OKHOTSK
BERING SEA
SEA OF JAPAN
PACIFIC OCEAN
MONGOLIA
Desert of Gobi
CHINA
YELLOW SEA
TIBET
Highland of Khor
Himalaya Mountains
Mountains
Turkestan
Tarim Basin
Takla Makan Desert
Hindustan
BAY OF BENGAL
Ceylon
Andaman Islands
Nicobar Islands
Sumatra
BORNEO
Celebes Sea
Sulu Sea
Luzon
Mindanao
Sakhalin Island
HONDO
Shikoku
Okinawa Islands
Ryukyu Islands
Formosa
Hainan
FRENCH INDO-CHINA
SIAM
Lake Baikal
Lake Hanka
Lake Kokonor
Lake Tali
Lake Tonle Sap
Lake Toba
Lake Singkarak
Lake Manindjau
Lake Ranau
Lake Lanao
Lake Taal
Lake Buluan
Lake Sentani
Lake Tondano
Lake Poso
Lake Matana
Lake Towuti
Lake Mahakam
Lake Sarawak
Lake Kinabalu
Lake Kerinci
Lake Batur
Lake Rawa Pening
Lake Kelimutu
Lake Sanggau
Lake Sentarum
Lake Kapuas
Lake Sambas
Lake Pontianak
Lake Sambir
Lake Sambas
Lake Pontianak
Lake Sambir
Lake Sambas
Lake Pontianak
Lake Sambir

situated along the 73rd meridian, at no great distance from the Indian peninsula, on which they have a political dependency.

The portion of Asia west of British India, excluding Arabia and Syria, forms another extensive plateau covering an area as large as that of Tibet, though at a much lower altitude. Its southern border runs along the Arabian Sea, the Persian Gulf, the Tigris, and thence westward to the north-east angle of the Levant; on the north the high land follows nearly 36° N. to the southern shore of the Caspian, and thence to the Black Sea and Sea of Marmora. Afghanistan, Baluchistan, Iran or Persia, Armenia and the provinces of Asia Minor occupy this high region, with which they are nearly conterminous. The eastern flank of this tableland follows a line of hills drawn a short distance from the Indus, between the mouth of that river and the Himalaya, about on the 72nd meridian; these hills do not generally exceed 4000 or 5000 ft. in elevation, but a few of the summits reach 10,000 ft. or more. The southern and south-western face follows the coast closely up the Persian Gulf from the mouth of the Indus, and is formed farther west by the mountain scarp, which, rising in many points to 10,000 ft., flanks the Tigris and the Mesopotamian plains, and extends along Kurdistan and Armenia nearly to the 40th meridian; beyond which it turns along the Taurus range, and the north-eastern angle of the Mediterranean. The north-eastern portion of the Afghan tableland abuts on the Himalaya and Tibet, with which it forms a continuous mass of mountain between the 71st and 72nd meridians, and 34° and 36° N. From the point of intersection of the 71st meridian with the 36th parallel of latitude, an unbroken range of mountain stretches on one side towards the north-east, up to the crest of the northern slope of the Tibetan plateau, and on the other nearly due west as far as the Caspian. The north-eastern portion of this range is of great altitude, and separates the headwaters of the Oxus, which run off to the Aral Sea, from those of the Indus and its Kabul tributary, which, uniting below Peshawar, are thence discharged southward into the Arabian Sea. The western part of the range, which received the name of Paropamisus Mons from the ancients, diminishes in height west of the 65th meridian and constitutes the northern face of the Afghan and Persian plateau, rising abruptly from the plains of the Turkoman desert, which lies between the Oxus and the Caspian. These mountains at some points attain a height of 10,000 or 12,000 ft. Along the south coast of the Caspian this line of elevation is prolonged as the Elburz range (not to be confused with the Elburz of the Caucasus), and has its culminating point in Demavend, which rises to 19,400 ft. above the sea; thence it extends to the north-west to Ararat, which rises to upwards of 17,000 ft., from the vicinity of which the Euphrates flows off to the south-west, across the high lands of Armenia. Below the north-east declivity of this range lies Georgia, on the other side of which province rises the Caucasus, the boundary of Asia and Europe between the Caspian and Black Seas, the highest points of which reach an elevation of nearly 19,000 ft. West of Ararat high hills extend along the Black Sea, between which and the Taurus range lies the plateau of Asia Minor, reaching to the Aegean Sea; the mountains along the Black Sea, on which are the Olympus and Ida of the ancients, rise to 6000 or 7000 ft.; the Taurus is more lofty, reaching 8000 and 10,000 ft.; both ranges decline in altitude as they approach the Mediterranean.

The Nearer East.

This great plateau, extending from the Mediterranean to the Indus, has a length of about 2500 m. from east to west, and a breadth of upwards of 600 m. on the west and nowhere of less than 250 m. It lies generally at altitudes between 2000 ft. and 8000 ft. above the sea-level. Viewed as a whole, the eastern half of this region, comprising Persia, Afghanistan and Baluchistan, is poor and unproductive. The climate is very severe in the winter and extremely hot in summer. The rainfall is very scanty, and running waters are hardly known, excepting among the mountains which form the scarps of the elevated country. The population is sparse, frequently nomadic and addicted to plunder; progress in the arts and habits of civilization is small. The western part of the area falls within the Turkish empire. Its climate is less hot and arid, its natural productiveness much greater, and its population more settled and on the whole more advanced.

The peninsula of Arabia, with Syria, its continuation to the north-west, has some of the characteristics of the hottest and driest parts of Persia and Baluchistan. Excepting the northern part of this tract, which is conterminous with the plain of Mesopotamia (which at its highest point reaches an elevation of about 700 ft. above the sea), the country is covered with low mountains, rising to 3000 or 4000 ft. in altitude, having among them narrow valleys in which the vegetation is scanty, with exceptional regions of greater fertility in the neighbourhood of the coasts, where the rainfall is greatest. In northern Syria the mountains of Lebanon rise to about 10,000 ft., and with a more copious water supply the country becomes more productive. The whole tract, excepting south-eastern Arabia, is nominally subject to Turkey, but the people are to no small extent practically independent, living a nomadic, pastoral and freebooting life under petty chiefs, in the more arid districts, but settled in towns in the more fertile tracts, where agriculture becomes more profitable and external commerce is established.

Arabia.

The area between the northern border of the Persian high lands and the Caspian and Aral Seas is a nearly desert low-lying plain, extending to the foot of the north-western extremity of the great Tibeto-Himalayan mountains, and prolonged eastward up the valleys of the Oxus (Amu-Darya) and Jaxartes (Syr-Darya), and northward across the country of the Kirghiz to the south-western border of Siberia. It includes Bokhara, Khiva and Turkestan proper, in which the Uzbeg Turks are dominant, and for the most part is inhabited by nomadic tribes, who are marauders, enjoying the reputation of being the worst among a race of professed robbers. The tribes to the north, subject to Russia, are naturally more peaceable, and have been brought into some degree of discipline. In this tract the rainfall is nowhere sufficient for the purposes of agriculture, which is only possible by help of irrigation; and the fixed population (which contains a non-Turkish element) is comparatively small, and restricted to the towns and the districts near the rivers.

Trans-Caspian region and central Asia.

The north-western extremity of the elevated Tibeto-Himalayan mountain plateau is situated about on 73° E. and 39° N. This region is known as Pamir; it has all the characteristics of the highest regions of Tibet, and so far fitly receives the Russian designation of steppe; but it seems to have no special peculiarities, and the reason of its having been so long regarded as a geographical enigma is not obvious. From it the Oxus, or Amu, flows off to the west, and the Jaxartes, or Syr, to the north, through the Turki state of Khokand, while to the east the waters run down past Kashgar to the central desert of the Gobi, uniting with the streams from the northern slope of the Tibetan plateau that traverse the principalities of Yarkand and Khotan, which are also Turki. Here the Tibetan mountains unite with the line of elevation which stretches across the continent from the Pacific, and which separates Siberia from the region commonly spoken of under the name of central Asia.

A range of mountains, called Stanovoi, rising to heights of 4000 or 5000 ft., follows the southern coast of the eastern extremity of Asia from Kamchatka to the borders of Manchuria, as far as the 135th meridian, in lat. 55° N. Thence the Yablonoi range, continuing in the same direction, divides the waters of the river Lena, which flows through Siberia into the Arctic Sea, from those of the river Amur, which falls into the North Pacific; the basin of this river, with its affluents, constitutes Manchuria. From the north of Manchuria the Khingan range stretches southward to the Chinese frontier near Peking, east of which the drainage falls into the Amur and the Yellow Sea, while to the west is an almost rainless region, the inclination of which is towards the central area of the continent, Mongolia.

Manchuria.

From the western end of the Yablonoi range, on the 115th meridian, a mountainous belt extends along a somewhat irregular line to the extremity of Pamir, known under various names in its different parts, and broken up into several branches, enclosing among them many isolated drainage areas, from which there is no outflow, and within which numerous lakes are formed. The most important of these ranges is the Tian-shan or Celestial Mountains, which form the northern boundary of the Gobi desert; they lie between 40° and 43° N., and between 75° and 95° E., and some of the summits are said to exceed 20,000 ft. in altitude; along the foot of this range are the principal cultivated districts of central Asia, and here too are situated the few towns which have sprung up in this barren and thinly peopled region. Next may be named the Ala-tau, on the prolongation of the Tian-shan, flanking the Syr on the north, and rising to 14,000 or 15,000 ft. It forms the barrier between the Issyk-kul and Balkash lakes, the elevation of which is about 5000 ft. Last is the Altai, near the 50th parallel, rising to 10,000 or 12,000 ft., which separates the waters of the great rivers of western Siberia from those that collect into the lakes of north-west Mongolia, Dzungaria and Kalka.. A line of elevation is continued west of the Altai to the Ural Mountains, not rising to considerable altitudes; this divides the drainage of south-west Siberia from the great plains lying north-east of the Aral Sea.

Mongolia.

The central area bounded on the north and north-west by the Yablonoi Mountains and their western extension in the Tian-shan, on the south by the northern face of the Tibetan plateau, and on the east by the Khingan range before alluded to, forms the great desert of central Asia, known as the Gobi. Its eastern part is nearly conterminous with south Mongolia, its western forms Chinese or eastern Turkestan. It appears likely that no part of this great central Asiatic desert is less than 2000 ft. above the sea-level. The elevation of the plain about Kashgar and Yarkand is from 4000 to 6000 ft. The more northern parts of Mongolia are between 4000 and 6000 ft., and no portion of the route across the desert between the Chinese frontier and Kiakhta is below 3000 ft. The precise positions of the mountain ridges that traverse this central area are not properly known; their elevation is everywhere considerable, and many points are known to exceed 10,000 or 12,000 ft.

In Mongolia the population is essentially nomadic, its wealth consisting in herds of horned cattle, sheep, horses and camels. The Turki tribes, occupying western Mongolia, are among the least civilized of human beings, and it is chiefly to their extreme barbarity and cruelty that our ignorance of central Asia is due. The climate is very severe, with great extremes of heat and cold. The drought is very great; rain falls rarely and in small quantities. The surface is for the most part a hard stony desert, areas of blown sand occurring but exceptionally. There are few towns or settled villages, except

along the slopes of the higher mountains, on which the rain falls more abundantly, or the melting snow supplies streams for irrigation. It is only in such situations that cultivated lands are found, and beyond them trees are hardly to be seen.

Siberia.

The portion of Asia which lies between the Arctic Ocean and the mountainous belt bounding Manchuria, Mongolia and Turkestan on the north is Siberia. It includes an immense high and broken plateau which spreads from south-west to north-east, losing in width and altitude as it advances north-east. It is fringed on either side by high border ridges, which subside on the north-west into a stretch of high plains, 1500 to 2000 ft. high, finally dropping to lowlands a few hundred feet above sea-level. The extremes of heat and cold are very great. The rainfall, though not heavy, is sufficient to maintain such vegetation as is compatible with the conditions of temperature, and the surface is often swampy or peaty. The mountain-sides are commonly clothed with pine forests, and the plains with grasses or shrubs. The population is very scanty; the cultivated tracts are comparatively small in extent and restricted to the more settled districts. The towns are entirely Russian. The indigenous races are nomadic Mongols, of a peaceful character, but in a very backward state of civilization. The Ural Mountains do not exceed 2000 or 3000 ft. in average altitude, the highest summits not exceeding 6000 ft., and one of the passes being as low as 1400 ft. In the southern half of the range are the chief mining districts of Russia. The Ob, Yenisei and Lena, which traverse Siberia, are among the largest rivers in the world.

Malay Archipelago.

The southern group of the Malay Archipelago, from Sumatra to Java and Timor, extends in the arc of a circle between 95° and 127° E., and from 5° to 10° S. The central part of the group is a volcanic region, many of the volcanoes being still active, the summits frequently rising to 10,000 ft. or more.

Sumatra, the largest of the islands, is but thinly peopled; the greater part of the surface is covered with dense forest, the cultivated area being comparatively small, confined to the low lands, and chiefly in the volcanic region near the centre of the island. Java is the most thickly peopled, best cultivated and most advanced island of the whole Eastern archipelago. It has attained a high degree of wealth and prosperity under the Dutch government. The people are peaceful and industrious, and chiefly occupied with agriculture. The highest of the volcanic peaks rises to 12,000 ft. above the sea. The eastern islands of this group are less productive and less advanced.

Borneo, the most western and the largest of the northern group of islands which extends between 110° and 150° E., as far as New Guinea or Papua, is but little known. The population is small, rude and uncivilized; and the surface is rough and mountainous and generally covered with forest except near the coast, to the alluvial lands on which settlers have been attracted from various surrounding countries. The highest mountain rises to nearly 14,000 ft., but the ordinary elevations do not exceed 4000 or 5000 ft.

Of Celebes less is known than of Borneo, which it resembles in condition and natural characteristics. The highest known peaks rise to 8000 ft., some of them being volcanic.

Pacific Islands.

New Guinea extends almost to the same meridian as the eastern coast of Australia, from the north point of which it is separated by Torres Straits. Very little is known of the interior. The mountains are said to rise to 20,000 ft., having the appearance of being permanently covered with snow; the surface seems generally to be clothed with thick wood. The inhabitants are of the Negrito type, with curly or crisp and bushy hair; those of the west coast have come more into communication with the traders of other islands and are fairly civilized. Eastward, many of the tribes are barbarous savages.

The Philippine Islands lie between 5° and 20° N., between Borneo and southern China. The highest land does not rise to a greater height than 10,250 ft.; the climate is well suited for agriculture, and the islands generally are fertile and fairly cultivated, though not coming up to the standard of Java either in wealth or population.

Formosa, which is situated under the northern tropic, near the coast of China, is traversed by a high range of mountains, reaching nearly 13,000 ft. in elevation. On its western side, which is occupied by an immigrant Chinese population, are open and well-cultivated plains; on the east it is mountainous, and occupied by independent indigenous tribes in a less advanced state.

The islands of Japan, not including Sakhalin, of which half is Japanese, lie between the 30th and 45th parallels. The whole group is traversed by a line of volcanic mountains, some of which are in activity, the highest point being about 13,000 ft. above the sea. The country is generally well watered, fertile and well cultivated. The Japanese people have added to their ancient civilization and their remarkable artistic faculty, an adaptation of Western methods, and a capacity for progress in war and commerce, which single them out among Eastern races as a great modern world-force.

Exploration

The progress of geodetic surveys in Russia had long ago extended across the European half of the great empire, St Petersburg being connected with Tiflis on the southern slopes of the Caucasus by a direct system of triangulation carried out with the highest scientific precision. St Petersburg, again, is connected with Greenwich by European systems of triangulation; and the Greenwich meridian is adopted by Russia as the zero for all her longitude values. But beyond the eastern shores of the Caspian no system of direct geodetic measurements by first-class triangulation has been possible, and the surveys of Asiatic Russia are separated from those of Europe by the width of that inland sea. The arid nature of the trans-Caspian deserts has proved an insuperable obstacle to those rigorous methods of geodetic survey which distinguish Russian methods in Europe, so that Russian geography in central Asia is dependent on other means than that of direct measurement for the co-ordinate values in latitude and longitude for any given point. The astronomical observatory at Tashkent is adopted for the initial starting-point of the trans-Caspian triangulation of Russia; the triangulation ranks as second-class only, and now extends to the Pamir frontier beyond Osh. The longitude of the Tashkent observatory has been determined by telegraph differentially with Pulkova as follows:—

			H.	M.	S.
In 1875 via Ekaterinburg and	Omsk	.	2	35	52·151
„ 1891 „ Saratov	„ Orenburg	.	2	35	52·228
„ 1895 „ Kiev	„ Baku	.	2	35	51·997

With these three independent values, all falling within a range of 0ˢ·25, it is improbable that the mean value has an error as large as 0ˢ·10.

Extent of exact surveys in Asia.

Exact surveys in Russia, based upon triangulation, extend as far east as Chinese Turkestan in longitude about 75° E. of Greenwich. In India geodetic triangulation furnishes the basis for exact surveys as far east as the eastern boundaries of Burma in longitude about 100° E.

The close of the 19th century witnessed the forging of the final links in the great geodetic triangulation of India, so far as the peninsula is concerned. Further geodetic connexion with the European systems remains to be accomplished. Since 1890 further and more rigorous application of the telegraphic method of determining longitudes differentially with Greenwich has resulted in a slight correction (amounting to about 2″ of arc) to the previous determination by the same method through Suez. This last determination was effected through four arcs as follows:—

I. Greenwich—Potsdam.
II. Potsdam—Teheran.
III. Teheran—Bushire.
IV. Bushire—Karachi.

Each arc was measured with every precaution and a multitude of observations. The only element of uncertainty was caused by the retardation of the current, which between Potsdam and Teheran (3000 m.) took 0ˢ·20 to travel; but it is probable that the final value can be accepted as correct to within 0ˢ·05.

The final result of this latest determination is to place the Madras observatory 2′ 27″ to the west of the position adopted for it on the strength of absolute astronomical determinations.

Connexion between Russian and Indian surveys.

But while we have yet to wait for that expansion of principal triangulation which will bring Asia into connexion with Europe by the direct process of earth measurement, a topographical connexion has been effected between Russian and Indian surveys which sufficiently proves that the deductive methods employed by both countries for the determination of the co-ordinate values of fixed points so far agree that, for all practical purposes of future Asiatic cartography, no difficulty in adjustment between Indian and Russian mapping need be apprehended.

Extension of geographical surveys.

In connexion with the Indian triangulation minor extensions carried out on systems involving more or less irregularity have been pushed outwards on all sides. They reach through Afghanistan and Baluchistan to the eastern districts of Persia, and along the coast of Makran to that of Arabia. They have long ago included the farther mountain peaks of Nepal, and they now branch outwards towards western China and into Siam. These far extensions furnish the basis for a vast amount of exploratory survey of a strictly geographical character, and they have contributed largely towards raising the standard of accuracy in Asiatic geographical surveys to a level which was deemed unattainable fifty years ago. There is yet a vast field open in Asia for this class of surveys. While at the close of the 19th century western Asia (exclusive of Arabia) may be said to have been freed from all geographical perplexity, China, Mongolia and eastern Siberia still include enormous areas of which geographical knowledge is in a primitive stage of nebulous uncertainty.

Indian explorers.

Of scientific geographical exploration in Asia (beyond the limits of actual surveys) the modern period has been so prolific that it is only possible to refer in barest outline to some of the principal expeditions, most of which have been directed either to the great elevated tableland of Tibet or to the central depression which exists to the north of it. In southern Tibet the trans-Himalayan explorations of the native surveyors attached to the Indian survey, notably Pundits Nain Singh and Krishna, added largely to our knowledge of the great plateau. Nain Singh explored the sources of the Indus and of the Upper Brahmaputra in the years 1865–1867; and in 1874–1875 he followed a line from the eastern frontiers of Kashmir to the Tengri Nor lake and thence to Lhasa, in which city he remained for some months. Krishna's remarkable journey in 1879–1882 extended from Lhasa northwards through

Tsaidam to Sachu, or Saitu, in Mongolia. He subsequently passed through eastern Tibet to the town of Darchendo, or Tachienlu, on the high road between Lhasa and Peking, and on the borders of China. Failing to reach India through Upper Assam he returned to the neighbourhood of Lhasa, and crossed the Himalayas by a more westerly route. Both these explorers visited Lhasa.

In 1871–1873 the great Russian explorer, Nicolai Prjevalsky, crossed the Gobi desert from the north to Kansu in western China. He first defined the geography of Tsaidam, and mapped the hydrography of that remarkable region, from which emanate the great rivers of China, Siam and Burma. He penetrated southwards to within a month's march of Lhasa. In 1876 he visited the Lop Nor and discovered the Altyn Tagh range. In 1879 he followed up the Urangi river to the Altai Mountains, and demonstrated to the world the extraordinary physical changes which have passed over the heart of the Asiatic continent since Jenghiz Khan massed his vast armies in those provinces. He crossed, and named, the Dzungarian extension of the Gobi desert, and then traversed the Gobi itself from Hami to Sachu, which became a point of junction between his journeys and those of Krishna. He visited the sources of the Hwang-ho (Yellow river) and the Salween, and then returned to Russia. His fourth journey in 1883–1885 was to Sining (the great trade centre of the Chinese borderland), and thence through northern Tibet (crossing the Altyn Tagh to Lop Nor), and by the Cherchen-Keriya trade route to Khotan. From Khotan he followed the Tarim to Aksu.

Russian explorers.

Following Prjevalsky the Russian explorers, Pevtsov and Roborovski, in 1889–1890 (and again in 1894), added greatly to our knowledge of the topography of western Chinese Turkestan and the northern borders of Tibet; all these Russian expeditions being conducted on scientific principles and yielding results of the highest value. Among other distinguished Russian explorers in Asia, the names of Lessar, Annenkov (who bridged the Trans-Caspian deserts by a railway), P. K. Kozlov and Potanin are conspicuous during the 19th century.

Although the establishment of a lucrative trade between India and central Asia had been the dream of many successive Indian viceroys, and much had been done towards improving the approaches to Simla from the north, very little was really known of the highlands of the Pamirs, or of the regions of the great central depression, before the mission of Sir Douglas Forsyth to Yarkand in 1870. Robert Barkley Shaw and George Hayward were the European pioneers of geography into the central dominion of Kashgar, arriving at Yarkand within a few weeks of each other in 1868. Shaw subsequently accompanied Forsyth's mission in 1870, when Henry Trotter made the first maps of Chinese Turkestan. The next great accession to our knowledge of central Asiatic geography was gained with the Russo-Afghan Boundary Commission of 1884–1886, when Afghan Turkestan and the Oxus regions were mapped by Colonel Sir T. H. Holdich, Colonel St George Gore and Sir Adelbert Talbot; and when Ney Elias crossed from China through the Pamirs and Badakshan to the camp of the commission, identifying the great "Dragon Lake," Rangkul, on his way. About the same time a mission, under Captain (afterwards Sir Willaim) Lockhart, crossed the Hindu Kush into Wakhan, and returned to India by the Bashgol valley of Kafiristan. This was Colonel Woodthorpe's opportunity, and he was then enabled to verify the results of W. W. M'Nair's previous explorations, and to determine the conformation of the Hindu Kush. In 1885 Arthur Douglas Carey and Andrew Dalgleish, following more or less the tracks of Prjevalsky, contributed much that was new to the map of Asia; and in 1886 Captain (afterwards Sir Francis) Younghusband completed a most adventurous journey across the heart of the continent by crossing the Muztagh, the great mountain barrier between China and Kashmir.

Other explorations in central Asia.

It was in 1886–1887 that Pierre G. Bonvalot, accompanied by Prince Henri d'Orléans, crossed the Tibetan plateau from north to south, but failed to enter Lhasa. In 1889–1891 the American traveller, W. W. Rockhill, commenced his Tibetan journeys, and also attempted to reach Lhasa, without success. By his writings, as much as by his explorations, Rockhill has made his name great in the annals of Asiatic research. In 1891 Hamilton Bower made his famous journey from Leh to Peking. He, too, failed to penetrate the jealously-guarded portals of Lhasa; but he secured (with the assistance of a native surveyor) a splendid addition to our previous Tibetan mapping. In 1891–1892–1893 the gallant French explorer, Dutreuil de Rhins, was in the field of Tibet, where he finally sacrificed his life to his work; and the same years saw George N. (afterwards Lord) Curzon in the Pamirs, and St George Littledale on his first great Tibetan journey, accompanied by his wife. Littledale's first journey ended at Peking; his second, in 1894–1895, took him almost within sight of the sacred walls of Lhasa, but he failed to pass inside. Greatest among modern Asiatic explorers (if we except Prjevalsky) is the brave Swede, Professor Sven Hedin, whose travels through the deserts of Takla Makan and Tibet, and whose investigations in the glacial regions of the Sarikol mountains, occupied him from 1894 to 1896. His is a truly monumental record. From 1896 to 1898 we find two British cavalry officers taking the front position in the list of Tibetan travellers—Captain M. S. Wellby of the 18th Hussars and Captain H. Deasy of the 16th Lancers, each striking out a new line, and rendering most valuable service to geography. The latter continued the Pamir triangulation, which had been carried across the Hindu Kush by Colonels Sir T. H. Holdich and R. A. Wahab during the Pamir Boundary Commission of 1895, into the plains of Kashgar and to the sources of the Zarafshan.

Tibetan explorations.

Since the beginning of the century the work of Deasy in western Tibet has been well extended by Dr M. A. Stein and Captain C. G. Rawling, who have increased our knowledge of ancient fields of industry and commerce in Turkestan and Tibet. Ellsworth Huntington threw new light on the Tian-shan plateau and the Alai range by his explorations of 1903; and Sven Hedin, between 1899 and 1902, was collecting material in Turkestan and Tibetan fields, and resumed his journeys in 1905–1908, the result being to revolutionize our knowledge of the region north of the upper Tsanpo (see TIBET). The mission of Sir Francis Younghusband to Lhasa in 1904 resulted in an extension of the Indian system of triangulation which finally determined the geographical position of that city, and in a most valuable reconnaissance of the valleys of the Upper Brahmaputra and Indus by Captains C. H. D. Ryder and C. G. Rawling.

Meanwhile, in the Farther East so rapid has been the progress of geographical research since the first beginnings of investigation into the route connexion between Burma and China in 1874 (when the brave Augustus Margary lost his life), that a gradually increasing tide of exploration, setting from east to west and back again, has culminated in a flood of inquiring experts intent on economic and commercial development in China, essaying to unlock those doors to trade which are hereafter to be propped open for the benefit of humanity. Captain William Gill, of the Indian survey, first made his way across China to eastern Tibet and Burma, and subsequently delighted the world with his story of the *River of Golden Sand*. Then followed another charming writer, E. C. Baber, who, in 1877–1878, unravelled the geographic mysteries of the western provinces of the Celestial empire. Mark Bell crossed the continent in 1887 and illustrated its ancient trade routes, following the steps of Archibald Colquhoun, who wandered from Peking to Talifu in 1881. Meanwhile, the acquisition of Burma and the demarcation of boundaries had opened the way to the extension of geographical surveys in directions hitherto untraversed. Woodthorpe was followed into Burmese fields by many others; and amongst the earliest travellers to those mysterious mountains which hide the sources of the Irrawaddy, the Salween and the Mekong, was Prince Henri d'Orléans Burma was rapidly brought under survey; Siam was already in the map-making hands of James M'Carthy, whilst Curzon and Warrington Smyth added much to our knowledge of its picturesque coast districts. No more valuable contribution to the illustration of western Chinese configuration has been given to the public than that of C. C. Manifold who explored and mapped the upper basin of the Yang-tsze river between the years 1900 and 1904, whilst our knowledge of the geography of the Russo-Chinese borderland on the north-east has been largely advanced by the operations attending the Russo-Japanese war which terminated in 1905.

Chinese explorations.

Turning our attention westwards, no advance in the progress of scientific geography is more remarkable than that recorded on the northern and north-western frontiers of India. Here there is little matter of exploration. It has rather been a wide extension of scientific geographical mapping. The Afghan war of 1878–80; the Russo-Afghan Boundary Commission of 1884–1885; the occupation of Gilgit and Chitral; the extension of boundaries east and north of Afghanistan, and again, between Baluchistan and Persia —these, added to the opportunities afforded by the systematic survey of Baluchistan which has been steadily progressing since 1880—combined to produce a series of geographical maps which extend from the Oxus to the Indus, and from the Indus to the Euphrates.

Indian frontiers—Afghanistan, Baluchistan, Persia.

In these professional labours the Indian surveyors have been assisted by such scientific geographers as General Sir A. Houtum Schindler, Captain H. B. Vaughan and Major Percy M. Sykes in Persia, and by Sir George Robertson and Cockerill in Kafiristan and the Hindu Kush.

In still more western fields of research much additional light has been thrown since 1875 on the physiography of the great deserts and oases of Arabia. The labours of Charles Doughty and Wilfrid S. Blunt in northern Arabia in 1877–1878 were followed by those of G. Schweinfurth and E. Glaser in the south-west about ten years later. In 1884–1885 Colonel S. B. Miles made his adventurous journey through Oman, while Theodore Bent threw searchlights backwards into ancient Semitic history by his investigations in the Bahrein Islands in 1888 and in Hadramut in 1894–1895.

Arabia.

In northern Asia it is impossible to follow in detail the results of the organized Russian surveys. The vast steppes and forest-clad mountain regions of Siberia have assumed a new geographical aspect in the light of these revelations, and already promise a new world of economic resources to Russian enterprise in the near future. A remarkable expedition by Baron Toll in 1892 through the regions watered by the Lena, resulted in the collection of material which

Northern Asia, Siberia, &c.

will greatly help to elucidate some of the problems which beset the geological history of the world, proving *inter alia* the primeval existence of a boreal zone of the Jurassic sea round the North Pole.

In no other period of the world's history, of equal length of time, has so much scientific enterprise been directed towards the field of Asiatic inquiry. The first great result of recent geographical research has been to modify pre-existing ideas of the orography of the vast central region represented by Tibet and Mongolia. The great highland plateau which stretches from the Himalaya northwards to Chinese Turkestan, and from the frontier of Kashmir eastwards to China, has now been defined with comparative geographical exactness. The position of Sachu (or Saitu) in Mongolia may be taken as an obligatory point in modern map construction. The longitude value now adopted is 94° 54′ E. of Greenwich, which is the revised value given by Prjevalsky in the map accompanying the account of his fourth exploration into central Asia. Other values are as follows:—

General results of investigation.

Prjevalsky, by his second and third explorations	94° 26′
Krishna	94° 23′
Carey and Dalgleish	94° 48′
Littledale	94° 49′
Kreitner (with Szecheny's expedition)	94° 58′

The longitude of Darchendo, or Tachienlu, on the extreme east, may be accepted as another obligatory point. The adopted value by the Royal Geographical Society is 102° 12″. Krishna gives 102° 15″, Kreitner 102° 5″, Baber 102° 18″.

South and west the bounding territories are well fixed in geographical position by the Indian survey determinations of the value of Himalayan peaks. On the north the Chinese Turkestan explorations are now brought into survey connexion with Kashmir and India.

No longer do we regard the Kuen-lun mountains, which extend from the frontiers of Kashmir, north of Leh, almost due east to the Chinese province of Kansu, as the southern limit of the Gobi or Turkestan depression. This very remarkable longitudinal chain is undoubtedly the northern limit of the Chang Tang, the elevated highland steppes of Tibet; but from it there branches a minor system to the north-east from a point in about 83° E. longitude, which culminates in the Altyn Tagh, and extends eastwards in a continuous water-divide to the Nan Shan mountains, north of the Koko Nor basin. Thus between Tibet and the low-lying sands of Gobi we have, thrust in, a system of elevated valleys (Tsaidam), 8000 to 9000 ft. above sea-level, forming an intermediate steppe between the highest regions and the lowest, east of Lop Nor. All this is comparatively new geography, and it goes far to explain why the great trade routes from Peking to the west were pushed so far to the north.

On the western edge of the Kashgar plains, the political boundary between Russia and China is defined by the meridional range of Sarikol. This range (known to the ancients as Taurus and in medieval times as Bolor) like many others of the most important great natural mountain divisions of the world, consists of two parallel chains, of which the western is the water-divide of the Pamirs, and the eastern (which has been known as the Kashgar or Kandar range) is split at intervals by lateral gorges to allow of the passage of the main drainage from the eastern Pamir slopes.

Russo-Chinese boundary.

In western Asia we have learned the exact value of the mountain barrier which lies between Merv and Herat, and have mapped its connexion with the Elburz of Persia. We can now fully appreciate the factor in practical politics which that definite but somewhat irregular mountain system represents which connects the water-divide north of Herat with the southern abutment of the Hindu Kush, near Bamian. Every pass of importance is known and recorded; every route of significance has been explored and mapped; Afghanistan has assumed a new political entity by the demarcation of a boundary; the value of Herat and of the Pamirs as bases of aggression has been assessed, and the whole intervening space of mountain and plain thoroughly examined.

Indian frontiers—Afghanistan, &c.

Although within the limits of western Asiatic states, still under Asiatic government and beyond the active influence of European interests, the material progress of the Eastern world has appeared to remain stationary, yet large accessions to geographical knowledge have at least been made, and in some instances a deeper knowledge of the surface of the country and modern conditions of life has led to the straightening of many crooked paths in history, and a better appreciation of the slow processes of advancing civilization. The steady advance of scientific inquiry into every corner of Persia, backed by the unceasing efforts of a new school of geographical explorers, has left nothing unexamined that can be subjected to superficial observation. The geographical map of the country is fairly complete, and with it much detailed information is now accessible regarding the coast and harbours of the Persian Gulf, the routes and passes of the interior, and the possibilities of commercial development by the construction of trade roads uniting the Caspian, the Karun, the Persian Gulf, and India, via Seistan. Persia has assumed a comprehensible position as a factor in future Eastern politics.

Persia.

In Arabia progress has been slower, although the surveys carried out by Colonel Wahab in connexion with the boundary determined in the Aden hinterland added more exact geographical knowledge within a limited area. Little more is known of the wide spaces of interior desert than has already been given to the world in the works of Sir Richard F. Burton, Wm. Gifford Palgrave and Sir Lewis Pelly amongst Englishmen, and Karsten Niebuhr, John Lewis Burckhardt, Visconte, Jòseph Halévy and others, amongst foreign travellers. Charles Doughty and Wilfrid S. Blunt have visited and illustrated the district of Nejd, and described the waning glories of the Wahabi empire. But extended geographical knowledge does not point to any great practical issue. Commercial relations with Arabia remain much as they were in 1875.

Arabia.

In Asia Minor, Syria and Mesopotamia there is little to record of progress in material development beyond the promises held out by the Euphrates Valley railway concession to a German company. The exact information obtained by the researches of English surveyors in Palestine and beyond Jordan, or by the efforts of explorers in the regions that lie between the Mediterranean and the Caspian, have so far led rather to the elucidation of history than to fresh commercial enterprise or the possible increase of material wealth.

Asia Minor, &c.

Asiatic Russia, especially eastern Siberia and Mongolia, have been brought within the sphere of Russian exploration, with results so surprising as to form an epoch in the history of Asia. Here there has been a development of the resources of the Old World which parallels the best records of the New.

Russia in Asia.

The great central depression of the continent which reaches from the foot of the Pamir plateau on the west through the Tarim desert to Lop Nor and the Gobi has yielded up many interesting secrets. The remarkable phenomenon of the periodic shifting of the Lop Nor system has been revealed by the researches of Sven Hedin, and the former existence of highly civilized centres of Buddhist art and industry in the now sand-strewn wastes of the Turkestan desert has been clearly demonstrated by the same great explorer and by Dr M. A. Stein. The depression westward of the Caspian and Aral basins, and the original connexion of these seas, have also come under the close investigation of Russian scientists, with the result that the theory of an ancient connexion between the Oxus and the Caspian has been displaced by the more recent hypothesis of an extension of the Caspian Sea eastwards into Trans-Caspian territory within the post-Pleiocene age. The discovery of shells (now living in the Caspian) at a distance of about 100 m. inland, at an altitude of 140 to 280 ft. above the present level of the Caspian, gives support to this hypothesis, which is further advanced by the ascertained nature of the Kara-kum sands, which appear to be a purely marine formation exhibiting no traces of fluviatile deposits which might be considered as delta deposits of the Oxus.

Chinese Turkestan and Oxus basin.

In the discussion of this problem we find the names of Baron A. Kaulbars, Annentkov, P. M. Lessar, and A. M. Konshin prominent. Further matter of interest in connexion with the Oxus basin was elucidated by the researches of L. Griesbach in connexion with the Russo-Afghan Boundary Commission. He reported the gradual formation of an anticlinal or ridge extending longitudinally through the great Balkh plain of Afghan Turkestan, which effectually shuts off the northern affluents of that basin from actual junction with the river. This evidence of a gradual process of upheaval still in action may throw some light on the physical (especially the climatic) changes which must have passed over that part of Asia since Balkh was the "mother of cities," the great trade centre of Asia, and the plains of Balkh were green with cultivation. In the restoration of the outlines of ancient and medieval geography in Asia Sven Hedin's discoveries of the actual remains of cities which have long been buried under the advancing waves of sand in the Takla Makan desert, cities which flourished in the comparatively recent period of Buddhist ascendancy in High Asia, is of the very highest interest, filling up a blank in the identification of sites mentioned by early geographers and illustrating more fully the course of old pilgrim routes.

With the completion of the surveys of Baluchistan and Makran much light has also been thrown on the ancient connexion between east and west; and the final settlement of the southern boundaries of Afghanistan has led to the reopening of one at least of the old trade routes between Seistan and India.

Baluchistan and Makran.

Farther east no part of Asia has been brought under more careful investigation than the hydrography of the strange mountain wilderness that divides Tibet and Burma from China. In this field the researches of travellers already mentioned, combined with the more exact reconnaissance of native surveyors and of those exploring parties which have recently been working in the interests of commercial projects, have left little to future inquiry. We know now for certain that the great Tsanpo of Tibet and the Brahmaputra are one and the same river; that north of the point where the great countermarch of that river from east to west is effected are to be found the sources of the Salween, the Mekong, the Yang-tsze-kiang and the Hwang-ho, or Yellow river, in order, from west to east; and that south of it, thrust in between the extreme eastern edge of the Brahmaputra basin

Burma and China.

and the Salween, rise the dual sources of the Irrawaddy. From the water-divide which separates the most eastern affluent of the Brahmaputra, eastwards to the deep gorges which enclose the most westerly branch of the upper Yang-tsze-kiang (here running from north to south), is a short space of 100 m.; and within that space two mighty rivers, the Salween and the Mekong, send down their torrents to Burma and Siam. These three rivers flow parallel to each other for some 300 m., deep hidden in narrow and precipitous troughs, amidst some of the grandest scenery of Asia; spreading apart where the Yank-tsze takes its course eastwards, not far north of the parallel of 25°.

The comparatively restricted area which still remains for close investigation includes the most easterly sources of the Brahmaputra, the most northerly sources of the Irrawaddy, and some 300 m. of the course of the upper Salween.

Modern Boundary Demarcation.—The period from about 1880 has been an era of boundary-making in Asia, of defining the politico-geographical limits of empire, and of determining the responsibilities of government. Russia, Persia, Afghanistan, Baluchistan, India and China have all revised their borders, and with the revision the political relations between these countries have acquired a new and more assured basis. See also the articles on the different countries. We are not here concerned with understandings as to "spheres of influence," or with arrangements such as the Anglo-Russian Convention of 1907 concerning Persia.

Southern boundary of Russia in Asia.

The advance of Russia to the Turkoman deserts and the Oxus demanded a definite boundary between her trans-Caspian conquests and the kingdom of Afghanistan. This was determined on the north-west by the Russo-Afghan Boundary Commission of 1884–1886. A boundary was then fixed between the Hari Rud (the river of Herat) and the Oxus, which is almost entirely artificial in its construction. Zulfikar, where the boundary leaves the Hari Rud, is about 70 m. south of Sarakhs, and the most southerly point of the boundary (where it crosses the Kushk) is about 60 m. north of Herat. From the junction of the boundary with the Oxus at Khamiab about 150 m. above the crossing-point of the Russian Trans-Caspian railway at Charjui, the main channel of the Oxus river becomes the northern boundary of Afghanistan, separating that country from Russia, and so continues to its source in Victoria Lake of the Great Pamir. Beyond this point the Anglo-Russian Commission of 1895 demarcated a line to the snowfields and glaciers which overlook the Chinese border. Between the Russian Pamirs and Chinese Turkestan the rugged line of the Sarikol range intervenes, the actual dividing line being still indefinite. Beyond Kashgar the southern boundary of Siberia follows an irregular course to the north-east, partly defined by the Tian-shan and Alatau mountains, till it attains a northerly point in about 53° N. lat. marked by the Sayan range to the west of Irkutsk. It then deflects south-east till it touches the Kerulen affluent of the Amur river at a point which is shown in unofficial maps as about 117° 30′ E. long. and 49° 20′ N. lat. From here it follows this affluent to its junction with the Amur river, and the Amur river to its junction with the Usuri. It follows the Usuri to its head (its direction now being a little west of south), and finally strikes the Pacific coast on about 42° 30′ N. lat. at the mouth of the Tumen river 100 m. south of the Amur bay, at the head of which lies the Russian port of Vladivostok. At two points the Russian boundary nearly approaches that of provinces which are directly under British suzerainty. Where the Oxus river takes its great bend to the north from Ishkashim, the breadth of the Afghan territory intervening between that river and the main water-divide of the Hindu Kush is not more than 10 or 12 m.; and east of the Pamir extension of Afghanistan, where the Beyik Pass crosses the Sarikol range and drops into the Taghdumbash Pamir, there is but the narrow width of the Karachukar valley between the Sarikol and the Muztagh. Here, however, the boundary is again undefined. Eastwards of this the great Kashgar depression, which includes the Tarim desert, separates Russia from the vast sterile highlands of Tibet; and a continuous series of desert spaces of low elevation, marking the limits of a primeval inland sea from the Sarikol meridional watershed to the Khingan mountains on the western borders of Manchuria, divide her from the northern provinces of China. From the Khingan ranges to the Pacific, south of the Amur, stretch the rich districts of Manchuria, a province which connects Russia with the Korea by a series of valleys formed by the Sungari and its affluents—a land of hill and plain, forest and swamp, possessing a delightful climate, and vast undeveloped agricultural resources. Throughout this land of promise Russian influence was destroyed by Japan in the war of 1904. The possession of Port Arthur, and direct political control over Korea, place Japan in the dominant position as regards Manchuria.

Afghan political boundaries.

Coincident with the demarcation of Russian boundaries in Turkestan was that of northern Afghanistan. From the Hari Rud on the west to the Sarikol mountains on the east her northern limits were set by the Boundary Commissions of 1884–1886 and of 1895 respectively. Her southern and eastern boundaries were further defined by a series of minor commissions, working on the basis of the Kabul agreement of 1893, which lasted for nearly four years, terminating with the Mohmand settlement at the close of an expedition in 1897.

The Pamir extension of Afghan territory to the north-east reaches to a point a little short of 75° E., from whence it follows the water-divide to the head of the Taghdumbash Pamir, and is thenceforward defined by the water-parting of the Hindu Kush. It leaves the Hindu Kush near the Dorah Pass at the head of one of the minor Chitral affluents, and passing south-west divides Kafiristan from Chitral and Bajour, separates the sections of the Mohmands who are within the respective spheres of Afghan and British sovereignty, and crosses the Peshawar-Kabul route at Lundi-Khana. It thus places a broad width of independent territory between the boundaries of British India (which have remained practically, though not absolutely, untouched) and Afghanistan; and this independent belt includes Swat, Bajour and a part of the Mohmand territory north of the Kabul river. The same principle of maintaining an intervening width of neutral territory between the two countries is definitely established throughout the eastern borders of Afghanistan, along the full length of which a definite boundary has been demarcated to the point where it touches the northern limits of Baluchistan on the Gomal river. From the Gomal Baluchistan itself becomes an intervening state between British India and Afghanistan, and the dividing line between Baluchistan and Afghanistan is laid down with all the precision employed on the more northerly sections of the demarcation.

Baluchistan.

Baluchistan can no longer be regarded as a distinct entity amongst Asiatic nations, such as Afghanistan undoubtedly is. Baluchistan independence demands qualification. There is British Baluchistan *par excellence*, and there is the rest of Baluchistan which exists in various degrees of independence, but is everywhere subject to British control. British Baluchistan officially includes the districts of Peshin, Sibi and of Thal-Chotiali. As these districts had originally been Afghan, they were transferred to British authority by the treaty of Gandamak in 1879, although nominally they had been handed over to Kalat forty years previously. Now they form an official province of British Baluchistan within the Baluchistan Agency; and the agency extends from the Gomal to the Arabian Sea and the Persian frontier. Within this agency there are districts as independent as any in Afghanistan, but the political status of the province as a whole is almost precisely that of the native states of the Indian peninsula. The agent to the governor-general of India, with a staff of political assistants, practically exercises supreme control.

Kirman.

The increase of Russian influence on the northern Persian border and its extension southwards towards Seistan led to the appointment of a British consul at Kirman, the dominating town of southern Khorasan, directly connected with Meshed on the north; and the acquisition of rights of administration of the Nushki district secured to Great Britain the trade between Seistan and Quetta by the new Helmund desert route.

Boundary between French territory and India.

While British India has so far avoided actual geographical contact with one great European power in Asia on the north and west, she has touched another on the east. The Mekong river which limits British interests in Burma limits also those of France in Tongking. The eastern boundaries of Burma are not yet fully demarcated on the Chinese frontier. At a point level in latitude with Mogaung, near the northern termination of the Burmese railway system, this boundary is defined by the eastern watershed of the Nmaikha, the eastern of the two great northern affluents of the Irrawaddy. Then it follows an irregular course southwards to a position south-east of Bhamo in lat. 24°. It next defines the northern edge of the Shan States, and finally strikes the Mekong river in lat. 21° 45′ (approximately). From that point southwards the river becomes the boundary between the Shan States and Tongking for some 200 m., the channel of the river defining the limits of occupation (though not entirely of interest) between French and British subjects. Approximately on the parallel of 20° N. lat. the Burmese boundary leaves the Mekong to run westwards towards the Salween, and thereafter following the eastern watershed of the Salween basin it divides the Lower Burma provinces from Siam.

Area and political division.

The following table shows the areas of territories in Asia (continental and insular) dependent on the various extra-Asiatic powers, and of those which are independent or nominally so:—

Territory.	Sq. m.
Russian	6,495,970
British	1,998,220
Dutch	586,980
French	247,580
U.S.A.	114,370
German	193
Turkish	681,980
Chinese	4,299,600
Japanese	161,110
Other independent territories	2,232,270

The total area of Asia, continental and insular, is therefore somewhat over 16,819,000 sq. m. (but various authorities differ considerably in their detailed estimates). The population may be set down roughly as 823,000,000, of which 330,000,000 inhabit Chinese territory, 302,000,000 British, and 25,000,000 Russian. (T. H. H.*)

Geology

The geology of Asia is so complex and over wide areas so little known that it is difficult to give a connected account of either the structure or the development of the continent, and only the broader features can be dealt with here.

In the south, in Syria, Arabia and the peninsula of India, none but the oldest rocks are folded, and the Upper Palaeozoic, the Mesozoic and the Tertiary beds lie almost horizontally upon them. It is a region of quiescence or of faulting, but not of folding. North of this lies a broad belt in which the Mesozoic deposits and even the lower divisions of the Tertiary system are thrown into folds which extend in a series of arcs from west to east and now form the principal mountain ranges of central Asia. This belt includes Asia Minor, Persia, Afghanistan, Baluchistan, the Himalayas, the Tian-shan, and, although they are very different in direction, the Burmese ranges. The Kuen-lun, Nan-shan and the mountain ranges of southern China are, perhaps, of earlier date, but nevertheless they lie in the same belt. It is not true that throughout the whole width of this zone the beds are folded. There are considerable tracts which are but little disturbed, but these tracts are enclosed within the arcs formed by the folds, and the zone taken as a whole is distinctly one of crumpling. North of the folded belt, and including the greater part of Siberia, Mongolia and northern China, lies another area which is, in general, free from any important folding of Mesozoic or Tertiary age. There are, it is true, mountain ranges which are formed of folded beds; but in many cases the direction of the chains is different from that of the folds, so that the ranges must owe their elevation to other causes; and the folds, moreover, are of ancient date, for the most part Archaean or Palaeozoic. The configuration of the region is largely due to faulting, trough-like or tray-like depressions being formed, and the intervening strips, which have not been depressed, standing up as mountain ridges. Over a large part of Siberia and in the north of China, even the Cambrian beds still lie as horizontally as they were first laid down. In the extreme north, in the Verkhoyansk range and in the mountains of the Taimyr peninsula, there are indications of another zone of folding of Mesozoic or later date, but our information concerning these ranges is very scanty. Besides the three chief regions into which the mainland is thus seen to be divided, attention should be drawn to the festoons of islands which border the eastern side of the continent, and which are undoubtedly due to causes similar to those which produced the folds of the folded belt.

Of all the Asiatic ranges the Himalayan is, geologically, the best known; and the evidence which it affords shows clearly that the folds to which it owes its elevation were produced by an overthrust

from the north. It is, indeed, as if the high land of central Asia had been pushed southward against and over the unyielding mass formed by the old rocks of the Indian peninsula, and in the process the edges of the over-riding strata had been crumpled and folded. Overlooking all smaller details, we may consider Asia to consist of a northern mass and a southern mass, too rigid to crumple, but not too strong to fracture, and an intermediate belt of softer rock which was capable of folding. If then by the contraction of the earth's interior the outer crust were forced to accommodate itself to a smaller nucleus, the central softer belt would yield by crumpling; the more rigid masses to the north and south, if they gave way at all, would yield by faulting. It is interesting to observe, as will be shown later, that during the Mesozoic era there was a land-mass in the north of Asia and another in the south, and between them lay the sea in which ordinary marine sediments were deposited. The belt of folding does not precisely coincide with this central sea, but the correspondence is fairly close.

The present outline of the eastern coast and the nearly enclosed seas which lie between the islands and the mainland, are attributed by Richthofen chiefly to simple faulting.

Little is known of the early geological history of Asia beyond the fact that a large part of the continent was covered by the sea during the Cambrian and Ordovician periods. But there is positive evidence that much of the north and east of Asia has been land since the Palaeozoic era, and it has been conclusively proved that the peninsula of India has never been beneath the sea since the Carboniferous period at least. Between these ancient land masses lies an area in which marine deposits of Mesozoic age are well developed and which was evidently beneath the sea during the greater part of the Mesozoic era. The northern land-mass has been named Angaraland by E. Suess; the southern, of which the Indian peninsula is but a fragment, is called Gondwanaland by Neumayr, Suess and others; while the intervening sea is the central Mediterranean sea of Neumayr and the Tethys of Suess. The greater part of western Asia, including the basin of the Obi, the drainage area of the Aral Sea, together with Afghanistan, Baluchistan, Persia and Arabia, was covered by the sea during the later stages of the Cretaceous period; but a considerable part of this region was probably dry land in Jurassic times.

The northern land-mass begins in the north with the area which lies between the Yenisei and the Lena. Here the folded Archean rocks are overlaid by Cambrian and Ordovician beds, which still lie for the most part flat and undisturbed. Upon these rest patches of freshwater deposits containing numerous remains of plants. They consist chiefly of sandstone and conglomerate, but include workable seams of coal. Some of the deposits appear to be of Permian age, but others are probably Jurassic; and they are all included under the general name of the Angara series. Excepting in the extreme north, where marine Jurassic and Cretaceous fossils have been found, there is no evidence that this part of Siberia has been beneath the sea since the early part of the Palaeozoic era. Besides the plant beds extensive outflows of basic lava rest directly upon the Cambrian and Ordovician strata. The date of these eruptions is still uncertain, but they probably continued to a very recent period.

South and east of the Palaeozoic plateau is an extensive area consisting chiefly of Archean rocks, and including the greater part of Mongolia north of the Tian-shan. Here again there are no marine beds of Mesozoic or Tertiary age, while plant-bearing deposits belonging to the Angara series are known. Structurally, the folds of this region are of ancient date; but the area is crossed by a series of depressions formed by faults, and the intervening strips, which have not been depressed to the same extent, now stand up as mountain ranges. Farther south, in the Chinese provinces of Shansi and Shensi, the geological succession is similar in some respects to that of the Siberian Palaeozoic plateau, but the sequence is more complete. There is again a floor of folded Archean rocks overlaid by nearly horizontal strata of Lower Palaeozoic age; but these are followed by marine beds belonging to the Carboniferous period. From the Upper Carboniferous onward, however, no marine deposits are known; and, as in Siberia, plant-bearing beds are met with. Southern China is very different in structure, consisting largely of folded mountain chains, but the geological succession is very similar, and excepting near the Tibetan and Burmese borders, there are no marine deposits of Mesozoic or Tertiary age.

Thus it appears that from the Arctic Ocean there stretches a broad area as far as the south of China, in which no marine deposits of later date than Carboniferous have yet been found, except in the extreme north. Freshwater and terrestrial deposits of Mesozoic age occur in many places, and the conclusion is irresistible that the greater part of this area has been land since the close of the Palaeozoic era. The Triassic deposits of the Verkhoyansk Range show that this land did not extend to the Bering Sea; while the marine Mesozoic deposits of Japan on the east, the western Tian-shan on the west and Tibet on the south give us some idea of its limits in other directions.

In the same way the entire absence of any marine fossils in the peninsula of India, excepting near its borders, and the presence of the terrestrial and freshwater deposits of the Gondwana series, representing the whole of the geological scale from the top of the Carboniferous to the top of the Jurassic, show that this region also has been land since the Carboniferous period. It was a portion of a great land-mass which probably extended across the Indian Ocean and was at one time united with the south of Africa.

But these two land-masses were not connected. Between India and China there is a broad belt in which marine deposits of Mesozoic and Tertiary age are well developed. Marine Tertiary beds occur in Burma; in the Himalayas and in south Tibet there is a nearly complete series of marine deposits from the Carboniferous to the Eocene; in Afghanistan the Mesozoic beds are in part marine and in part fluviatile. The sea in which these strata were deposited seems to have attained its greatest extension in Upper Cretaceous times, when its waters spread over the whole of western Asia and even encroached slightly upon the Indian land. The Eocene sea, however, cannot have been much inferior in extent.

It was after the Eocene period that the main part of the elevation of the Himalayas took place, as is shown by the occurrence of nummulitic limestone at a height of 20,000 ft. The formation of this and of the other great mountain chains of central Asia resulted in the isolation of portions of the former central sea; and the same forces finally led to the elevation of the whole region and the union of the old continents of Angara and Gondwana. Gondwanaland, however, did not long survive, and the portion which lay between India and South Africa sank beneath the waves in Tertiary times.

Leaving out of consideration all evidence of more ancient volcanic activity, each of the three regions, into which, as we have seen, the continent may be divided, has been, during or since the Cretaceous period, the seat of great volcanic eruptions. In the southern region of unfolded beds are found the lavas of the "harras" of Arabia, and in India the extensive flows of the Deccan Trap. In the central folded belt lie the great volcanoes, now mostly extinct, of Asia Minor, Armenia, Persia and Baluchistan. In Burma also there is at least one extinct volcano. In the northern unfolded region great flows of basic lava lie directly upon the Cambrian and Ordovician beds of Siberia, but are certainly in part of Tertiary age. Similar flows on a smaller scale occur in Manchuria, Korea and northern China.

In all these cases, however, the eruptions have now almost ceased; and the great volcanoes of the present day lie in the islands off the eastern and south-eastern coasts.

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Climate

Temperature.

Among the places on the globe where the temperature falls lowest are some in northern Asia, and among those where it rises highest are some in southern Asia. The mean temperature of the north coast of eastern Siberia is but a few degrees above the zero of Fahrenheit; the lowest mean temperature anywhere observed is about 4° Fahr., at Melville Island, north of the American continent. The isothermals of mean annual temperature lie over northern Asia on curves tolerably regular in their outline, having their western branches in a somewhat higher latitude than their eastern; a reduction of 1° of latitude corresponds approximately—and irrespective of modifications due to elevation—to a rise of ½° Fahr., as far say as 30° N., where the mean temperature is about 75° Fahr. Farther south the increase is slower, and the highest mean temperature anywhere attained in southern Asia is not much above 82° Fahr.

The variations of temperature are very great in Siberia, amounting near the coast to more than 100° Fahr., between the mean of the hottest and coldest months, and to still more between the extreme temperatures of those months. In southern Asia, and particularly near the sea, the variation between the hottest and coldest monthly means is very much less, and under the equator it is reduced to about 5°. In Siberia the difference between the means of the hottest and coldest months is hardly anywhere less than 60° Fahr. On the Sea of Aral it is 80° Fahr.; and at Astrakhan, on the Caspian, more than 50°. At Tiflis it is 45°. In northern China, at Peking, it is 55°, reduced to 30° at Canton, and to 20° at Manila. In northern India the greatest difference does not exceed 40°; and it falls off to about 15° at Calcutta, and to about 10° or 12° at Bombay and Madras. The temperatures at the head of the Persian Gulf approximate to those of northern India, and those of Aden to Madras. At Singapore the range is less than 5°; and at Batavia in Java, and Galle in Ceylon, it is about the same. The extreme temperatures in Siberia may be considered to lie between 80° and 90° Fahr. for maxima, and between −40° and −70° Fahr. for minima. The extreme of heat near the Caspian and Aral Seas rises to nearly 100° Fahr., while that of cold falls to −20° Fahr. or lower. Compared with these figures, we find in southern Asia 110° or 112° Fahr. as a maximum hardly ever exceeded. The absolute minimum in northern India, in lat. 30°, hardly goes below 32°; at Calcutta it is about 40°, though the thermometer seldom falls to 50°. At Madras it rarely falls as low as 65°, or at Bombay below 60°. At Singapore and Batavia the thermometer very rarely falls below 70°, or rises above 90°. At Aden the minimum is a few degrees below 70°, the maximum not much exceeding 90°.

These figures sufficiently indicate the main characteristics of the air temperatures of Asia. Throughout its northern portion the winter is long and of extreme severity; and even down to the circle of 35° N. lat., the minimum temperature is almost as low as zero of Fahrenheit. The summers are hot, though short in the northern latitudes, the maximum of summer heat being comparatively little less than that observed in the tropical countries farther south. The moderating effect of the proximity of the ocean is felt in an important degree along the southern and eastern parts of Asia, where the land is broken up into islands or peninsulas. The great elevations above the sea-level of the central part of Asia, and of the table-lands of Afghanistan and Persia, tend to exaggerate the winter cold; while the sterility of the surface, due to the small rainfall over the same region, operates powerfully in the opposite direction in increasing the summer heat. In the summer a great accumulation of solar heat takes place on the dry surface soil, from which it cannot be released upwards by evaporation, as might be the case were the soil moist or covered with vegetation, nor can it be readily conveyed away downwards as happens on the ocean. In the winter similar consequences ensue, in a negative direction, from the prolonged loss of heat by radiation in the long and clear nights—an effect which is intensified wherever the surface is covered with snow, or the air little charged with vapour. In illustration of the very slow diffusion of heat in the solid crust of the earth, and as affording a further indication of the climate of northern Asia, reference may here be made to the frozen soil of Siberia, in the vicinity of Yakutsk. In this region the earth is frozen permanently to a depth of more than 380 ft. at which the temperature is still 5° or 6° Fahr. below the freezing point of water, the summer heat merely thawing the surface to a depth of about 3 ft. At a depth of 50 ft. the temperature is about 15° Fahr. below the freezing point. Under such conditions of the soil, the land, nevertheless, produces crops of wheat and other grain from fifteen to forty fold.

The very high summer temperatures of the area north of the tropic of Cancer are sufficiently accounted for, when compared with those observed south of the tropic, by the increased length of the day in the higher latitude, which more than compensates for the loss of heat due to the smaller mid-day altitude of the sun. The difference between the heating power of the sun's rays at noon on the 21st of June, in latitude 20° and in latitude 45°, is only about 2%; while the accumulated heat received during the day, which is lengthened to 15½ hours in the higher latitude, is greater by about 11% than in the lower latitude, where the day consists only of 13¼ hours.

Although the foregoing account of the temperatures of Asia supplies the main outline of the observed phenomena, a very important modifying cause, of which more will be said hereafter, comes into operation over the whole of the tropical region, namely, the periodical summer rains. These tend very greatly to arrest the increase of the summer heat over the area where they prevail, and otherwise give it altogether peculiar characteristics.

Pressure and Winds.

The great summer heat, by expanding the air upwards, disturbs the level of the planes of equal pressure, and causes an outflow of the upper strata from the heated area. The winter cold produces an effect of just an opposite nature, and causes an accumulation of air over the cold area, The diminution of barometric pressure which takes place all over Asia during the summer months, and the increase in the winter, are hence, no doubt, the results of the alternate heating and cooling of the air over the continent.

The necessary and immediate results of such periodical changes of pressure are winds, which, speaking generally, blow from the area of greatest to that of least pressure—subject, however, to certain modifications of direction, arising from the absolute motion of the whole body of the air due to the revolution of the earth on its axis from west to east. The south-westerly winds which prevail north of the equator during the hot half of the year, to which navigators have given the name of the south-west monsoon (the latter word being a corruption of the Indian name for season), arise from the great diminution of atmospheric pressure over Asia, which begins to be strongly marked with the great rise of temperature in April and May, and the simultaneous relatively higher pressure over the equator and the regions south of it. This diminution of pressure, which continues as the heat increases till it reaches its maximum in July soon after the solstice, is followed by the corresponding development of the south-west monsoon; and as the barometric pressure is gradually restored, and becomes equalized within the tropics soon after the equinox in October, with the general fall of temperature north of the equator, the south-west winds fall off, and are succeeded by a north-east monsoon, which is developed during the winter months by the relatively greater atmospheric pressure which then occurs over Asia, as compared with the equatorial region.

Although the succession of the periodical winds follows the progress of the seasons as just described, the changes in the wind's direction everywhere take place under the operation of special local influences which often disguise the more general law, and make it difficult to trace. Thus the south-west monsoon begins in the Arabian Sea with west and north-westerly winds, which draw round as the year advances to south-west and fall back again in the autumn by north-west to north. In the Bay of Bengal the strength of the south-west monsoon is rather from the south and south-east, being succeeded by north-east winds after October, which give place to northerly and north-westerly winds as the year advances. Among the islands of the Malay Archipelago the force of the monsoons is much interrupted, and the position of this region on the equator otherwise modifies the directions of the prevailing winds. The southerly summer winds of the Asiatic seas between the equator and the tropic do not extend to the coasts of Java, and the south-easterly trade winds are there developed in the usual manner. The China Sea is fully exposed to both monsoons, the normal directions of which nearly coincide with the centre of the channel between the continent of Asia and the eastern islands.

The south-west monsoon does not generally extend, in its character of a south-west wind, over the land. The current of air flowing in from over the sea is gradually diverted towards the area of least pressure, and at the same time is dissipated and loses much of its original force. The winds which pass northward over India blow as south-easterly and easterly winds over the north-eastern part of the Gangetic plain, and as south winds up the Indus. They seem almost entirely to have exhausted their northward velocity by the time they have reached the northern extremity of the great Indian plain; they are not felt on the table-lands of Afghanistan, and hardly penetrate into the Indus basin or the ranges of the Himalaya, by which mountains, and those which branch off from them into the Malay peninsula, they are prevented from continuing their progress in the direction originally imparted to them.

Among the more remarkable phenomena of the hotter seas of Asia must be noticed the revolving storms or cyclones, which are of frequent occurrence in the hot months in the Indian Ocean and China Sea, in which last they are known under the name of typhoon. The cyclones of the Bay of Bengal appear to originate over the Andaman and Nicobar islands, and are commonly propagated in a north-westward direction, striking the east coast of the Indian peninsula at various points, and then often advancing with an easterly tendency over the land, and passing with extreme violence across the delta of the Ganges. They occur in all the hot months, from June to October, and more rarely in November, and appear to be originated by adverse currents from the north meeting those of the south-west monsoon. The cyclones of the China Sea also occur in the hot months of the year, but they advance from north-east to south-west, though occasionally from east to west; they originate near the island of Formosa, and extend to about the 10th degree of N. lat. They are thus developed in nearly the same latitudes and in the same months as those of the Indian Sea, though their progress is in a different direction. In both cases, however, the storms appear to advance towards the area of greatest heat. In these storms the wind invariably circulates from north by west through south to east.

Rainfall.

The heated body of air carried from the Indian Ocean over southern Asia by the south-west monsoon comes up highly charged with watery vapour, and hence in a condition to release a large body of water as rain upon the land, whenever it is brought into circumstances which reduce its temperature in a notable degree. Such a reduction of temperature is brought about along the greater part of the coasts of India and of the Burmo-Siamese peninsula by the interruption of the wind current by continuous ranges of mountains, which force the mass of air to rise over them, whereby the air being rarefied, its specific capacity for heat is increased and its temperature falls, with a corresponding condensation of the vapour originally held in suspension.

This explanation of the principal efficient cause of the summer rains of south Asia is immediately based on an analysis of the complicated phenomena actually observed, and it serves to account for many apparent anomalies. The heaviest falls of rain occur along lines of mountain of some extent directly facing the vapour-bearing winds, as on the Western Ghats of India and the west coast of the Malay peninsula. The same results are found along the mountains at a distance from the sea, the heaviest rainfall known to occur anywhere in the world (not less than 600 in. in the year) being recorded on the Khasi range about 100 m. north-east of Calcutta, which presents an abrupt front to the progress of the moist winds flowing up from the Bay of Bengal. The cessation of the rains on the southern border of Baluchistan, west of Karachi, obviously arises from the projection of the south-east coast of Arabia, which limits the breadth of the south-west monsoon air current and the length of the coast-line directly exposed to it. The very small and irregular rainfall in Sind and along the Indus is to be accounted for by the want of any obstacle in the path of the vapour-bearing winds, which, therefore, carry the uncondensed rain up to the Punjab, where it falls on the outer ranges of the western Himalaya and of Afghanistan.

The diurnal mountain winds are very strongly marked on the Himalaya, where they probably are the most active agents in determining the precipitation of rain along the chain—the monsoon currents, as before stated, not penetrating among the mountains. The formation of dense banks of cloud in the afternoon, when the up wind is strongest, along the southern face of the snowy ranges of the Himalaya, is a regular daily phenomenon during the hotter months of the year, and heavy rain, accompanied by electrical discharges, is the frequent result of such condensation.

Too little is known of the greater part of Asia to admit of any more being said with reference to this part of the subject, than to

mention a few facts bearing on the rainfall. In northern Asia there is a generally equal rainfall of 19 to 29 in. between the Volga and the Lena in Manchuria and northern China, rather more considerable increase in Korea, Siam and Japan. At Tiflis the yearly fall is 22 in.; on the Caspian about 7 or 8 in.; on the Sea of Aral 5 or 6 in. In south-western Siberia it is 12 or 14 in., diminishing as we proceed eastward to 6 or 7 in. at Barnaul, and to 5 or 6 in. at Urga in northern Mongolia. In eastern Siberia it is about 15 to 20 in. In China we find about 23 in. to be the fall at Peking; while at Canton, which lies nearly on the northern tropic and the region of the south-west monsoon is entered, the quantity is increased to 78 in. At Batavia in Java the fall is about 78 in.; at Singapore it is nearly 100 in. The quantity increases considerably on that part of the coast of the Malay peninsula which is not sheltered from the south-west by Sumatra. On the Tenasserim and Burmese coast falls of more than 200 in. are registered, and the quantity is here nowhere less than 75 or 80 in., which is about the average of the eastern part of the delta of the Ganges, Calcutta standing at about 64 in. On the hills that flank Bengal on the east the fall is very great. On the Khasi hills, at an elevation of about 4500 ft., the average of ten years is more than 550 in. As much as 150 in. has been measured in one month, and 610 in. in one year. On the west coast of the Indian peninsula the fall at the sea-level varies from about 75 to 100 in., and at certain elevations on the mountains more than 250 in. is commonly registered, with intermediate quantities at intervening localities. On the east coast the fall is far less, nowhere rising to 50 in., and towards the southern apex of the peninsula being reduced to 25 or 30 in. Ceylon shows from 60 to 80 in. As we recede from the coast the fall diminishes, till it is reduced to about 25 or 30 in. at the head of the Gangetic plain. The tract along the Indus to within 60 or 80 m. of the Himalaya is almost rainless, 6 or 8 in. being the fall in the southern portion of the Punjab. On the outer ranges of the Himalaya the yearly fall amounts to about 200 in. on the east in Sikkim, and gradually diminishes on the west, where north of the Punjab it is about 70 or 80 in. In the interior of the chain the rain is far less, and the quantity of precipitation is so small in Tibet that it can be hardly measured. It is to the greatly reduced fall of snow on the northern faces of the highest ranges of the Himalaya that is to be attributed the higher level of the snow-line, a phenomenon which was long a cause of discussion.

In Afghanistan, Persia, Asia Minor and Syria, winter and spring appear to be the chief seasons of condensation. In other parts of Asia the principal part of the rain falls between May and September, that is, in the hottest half of the year. In the islands under the equator the heaviest fall is between October and February. (R.S.)

Flora and Fauna

The general assemblage of animals and plants found over northern Asia resembles greatly that found in the parts of Europe which are adjacent and have a similar climate. Siberia, north of the 50th parallel, has a climate not much differing from a similarly situated portion of Europe, though the winters are more severe and the summers hotter. The rainfall, though moderate, is still sufficient to maintain the supply of water in the great rivers that traverse the country to the Arctic Sea, and to support an abundant vegetation. A similar affinity exists between the life of the southern parts of Europe and that in the zone of Asia extending from the Mediterranean across to the Himalaya and northern China. This belt, which embraces Asia Minor, northern Persia, Afghanistan, and the southern slopes of the Himalaya, from its elevation has a temperate climate, and throughout it the rainfall is sufficient to maintain a vigorous vegetation, while the summers, though hot, and the winters, though severe, are not extreme. The plants and animals along it are found to have a marked similarity of character to those of south Europe, with which region the zone is virtually continuous.

The extremely dry and hot tracts which constitute an almost unbroken desert from Arabia, through south Persia and Baluchistan, to Sind, are characterized by considerable uniformity in the types of life, which closely approach to those of the neighbouring hot and dry regions of Africa. The region of the heavy periodical summer rains and high temperature, which comprises India, the Indo-Chinese peninsula, and southern China, as well as the western part of the Malay Archipelago, is also marked by much similarity in the plants and animals throughout its extent. The area between the southern border of Siberia and the margin of the temperate alpine zone of the Himalaya and north China, comprising what are commonly called central Asia, Turkestan, Mongolia and western Manchuria, is an almost rainless region, having winters of extreme severity and summers of intense heat. Its animals and plants have a special character suited to the peculiar climatal conditions, more closely allied to those of the adjacent northern Siberian tract than of the other bordering regions. The south-eastern parts of the Malay Archipelago have much in common with the Australian continent, to which they adjoin, though their affinities are chiefly Indian. North China and Japan also have many forms of life in common. Much still remains to be done in the exploration of China and eastern Asia; but it is known that many of the special forms of this region extend to the Himalaya, while others clearly indicate a connexion with North America.

The foregoing brief review of the principal territorial divisions according to which the forms of life are distributed in Asia, indicates how close is the dependence of this distribution on climatic conditions, and this will be made more apparent by a somewhat fuller account of the main features of the flora and fauna.

Flora.—The flora of the whole of northern Asia is in essentials the same as that of northern Europe, the differences being due rather to variations of species than of genera. The absence of the oak and of all heaths east of the Ural may be noticed. Pines, larch, birch are the principal trees on the mountains; willow, alders and poplars on the lower ground. The northern limit of the pine in Siberia is about 70° N. *Northern Asia.*

Along the warm temperate zone, from the Mediterranean to the Himalaya, extends a flora essentially European in character. Many European species reach the central Himalaya, though few are known in its eastern parts. The genera common to the Himalaya and Europe are much more abundant, and extend throughout the chain, and to all elevations. There is also a corresponding diffusion of Japanese and Chinese forms along this zone, these being most numerous in the eastern Himalaya, and less frequent in the west.

The truly tropical flora of the hotter and wetter regions of eastern India is continuous with that of the Malayan peninsula and islands, and extends along the lower ranges of the Himalaya, gradually becoming less marked and rising to lower elevations as we go westward, where the rainfall diminishes and the winter cold increases.

The vegetation of the higher and therefore cooler and less rainy ranges of the Himalaya has greater uniformity of character along the whole chain, and a closer general approach to European forms is maintained; an increased number of species is actually identical, among these being found, at the greatest elevations, many alpine plants believed to be identical with species of the north Arctic regions. On reaching the Tibetan plateau, with the increased dryness the flora assumes many features of the Siberian type. Many true Siberian species are found, and more Siberian genera. Some of the Siberian forms, thus brought into proximity with the Indian flora, extend to the rainy parts of the mountains, and even to the plains of upper India. Assemblages of marine plants form another remarkable feature of Tibet, these being frequently met with growing at elevations of 14,000 to 15,000 ft. above the sea, more especially in the vicinity of the many salt lakes of those regions.

The vegetation of the hot and dry region of the south-west of the continent consists largely of plants which are diffused over Africa, Baluchistan and Sind; many of these extend into the hotter parts of India, and not a few common Egyptian plants are to be met with in the Indian peninsula.

The whole number of species of plants indigenous in the region of south-eastern Asia, which includes India and the Malayan peninsula and islands, from about the 65th to the 105th meridian, was estimated by Sir J. D. Hooker at 12,000 to 15,000. The principal orders, arranged according to their numerical importance, are as follows:—Leguminosae, Rubiaceae, Orchidaceae, Compositae, Gramineae, Euphorbiaceae, Acanthaceae, Cyperaceae and Labiatae. But within this region there is a very great variation between the vegetation of the more humid and the more arid regions, while the characteristics of the flora on the higher mountain ranges differ wholly from those of the plains. In short, we have a somewhat heterogeneous assemblage of tropical, temperate and alpine plants, as has been already briefly indicated, of which, however, the tropical are so far dominant as to give their character to the flora viewed as a whole. The Indian flora contains a more general and complete illustration of almost all the chief natural families of all parts of the world than any other country. Compositae are comparatively rare; so also Gramineae and Cyperaceae are in some places deficient, and Labiatae, Leguminosae and ferns in others. Euphorbiaceae and Scrophulariaceae and Orchidaceae are universally present, the last in specially large proportions. *Indian region.*

The perennially humid regions of the Malayan peninsula and western portion of the archipelago are everywhere covered with dense forest, rendered difficult to traverse by the thorny cane, a palm of the genus *Calamus*, which has its greatest development in this part of Asia. The chief trees belong to the orders of Terebinthaceae, Sapindaceae, Meliaceae, Clusiaceae, Dipterocarpaceae, Ternstroemiaceae, Leguminosae, laurels, oaks and figs, with Dilleniaceae, Sapotaceae and nutmegs. Bamboos and palms, with *Pandanus* and *Dracaena*, are also abundant. A similar forest flora extends along the mountains of eastern India to the Himalaya, where it ascends to elevations varying from 6000 to 7000 ft. on the east to 3000 or 4000 ft. on the west.

The arboreous forms which least require the humid and equable heat of the more truly tropical and equatorial climates, and are best able to resist the high temperatures and excessive drought of the northern Indian hot months from April to June, are certain Leguminosae, *Bauhinia*, *Acacia*, *Butea* and *Dalbergia*, *Bombax*, *Shorea*, *Nauclea*, *Lagerstroemia*, and *Bignonia*, a few bamboos and palms, with others which extend far beyond the tropic, and give a tropical aspect to the forest to the extreme northern border of the Indian plain.

Of the herbaceous vegetation of the more rainy regions may be noted the Orchidaceae, Orontiaceae, Scitamineae, with ferns and other

Cryptogams, besides Gramineae and Cyperaceae. Among these some forms, as among the trees, extend much beyond the tropic and ascend into the temperate zones on the mountains, of which may be mentioned *Begonia*, *Osbeckia*, various Cyrtandraceae, Scitamineae, and a few epiphytical orchids.

Of the orders most largely developed in south India, and more sparingly elsewhere, may be named Aurantiaceae, Dipterocarpaceae, Balsaminaceae, Ebenaceae, Jasmineae, and Cyrtandraceae; but of these few contain as many as 100 peculiar Indian species. *Nepenthes* may be mentioned as a genus specially developed in the Malayan area, and extending from New Caledonia to Madagascar; it is found as far north as the Khasi hills, and in Ceylon, but does not appear on the Himalaya or in the peninsula of India. The Balsaminaceae may be named as being rare in the eastern region and very abundant in the peninsula. A distinct connexion between the flora of the peninsula and Ceylon and that of eastern tropical Africa is observable not only in the great similarity of many of the more truly tropical forms, and the identity of families and genera found in both regions, but in a more remarkable manner in the likeness of the mountain flora of this part of Africa to that of the peninsula, in which several species occur believed to be identical with Abyssinian forms. This connexion is further established by the absence from both areas of oaks, conifers and cycads, which, as regards the first two families, is a remarkable feature of the flora of the peninsula and Ceylon, as the mountains rise to elevations in which both of them are abundant to the north and east. With these facts it has to be noticed that many of the principal forms of the eastern flora are absent or comparatively rare in the peninsula and Ceylon.

The general physiognomy of the Indian flora is mainly determined by the conditions of humidity of climate. The impenetrable shady forests of the Malay peninsula and eastern Bengal, of the west coast of the Indian peninsula, and of Ceylon, offer a strong contrast to the more loosely-timbered districts of the drier regions of central India and the north-western Himalaya. The forest areas of India include the dense vegetation and luxuriant growth of the Tarai jungles at the foot of the eastern Himalaya, and wide stretches of loosely-timbered country which are a prevailing feature in the Central Provinces and parts of Madras. Where the lowlands are highly cultivated they are adorned with planted wood, and where they are cut off from rain they are nearly completely desert.

The higher mountains rise abruptly from the plains; on their slopes, clothed below almost exclusively with the more tropical forms, a vegetation of a warm temperate character, chiefly evergreen, soon begins to prevail, comprising Magnoliaceae, Ternstroemiaceae, subtropical Rosaceae, rhododendron, oak, *Ilex*, *Symplocos*, Lauraceae, *Pinus longifolia*, with mountain forms of truly tropical orders, palms, *Pandanus*, *Musa*, *Vitis*, *Vernonia*, and many others. On the east the vegetation of the Himalaya is most abundant and varied. The forest extends, with great luxuriance, to an elevation of 12,000 ft., above which the sub-alpine region may be said to begin, in which rhododendron scrub often covers the ground up to 13,000 or 14,000 ft. Only one pine is found below 8000 ft., above which several other Coniferae occur. Plantains, tree-ferns, bamboos, several *Calami*, and other palms, and *Pandanus*, are abundant at the lower levels. Between 4000 and 8000 ft. epiphytal orchids are very frequent, and reach even to 10,000 ft. Vegetation ascends on the drier and less snowy mountain slopes of Tibet to above 18,000 ft. On the west, with the drier climate, the forest is less luxuriant and dense, and the hill-sides and the valleys better cultivated. The warm mountain slopes are covered with *Pinus longifolia*, or with oaks and rhododendron, and the forest is not commonly dense below 8000 ft., excepting in some of the more secluded valleys at a low elevation. From 8000 to 12,000 ft., a thick forest of deciduous trees is almost universal, above which a sub-alpine region is reached, and vegetation as on the east continues up to 18,000 ft. or more. The more tropical forms of the east, such as the tree-ferns, do not reach west of Nepal. The cedar or deodar is hardly indigenous east of the sources of the Ganges, and at about the same point the forms of the west begin to be more abundant, increasing in number as we advance towards Afghanistan.

The cultivated plants of the Indian region include wheat, barley, rice and maize; various millets, *Sorghum*, *Penicillaria*, *Panicum* and *Eleusine*; many pulses, peas and beans; mustard and rape; ginger and turmeric; pepper and capsicum; several Cucurbitaceae; tobacco, *Sesamum*, poppy, *Crotolaria* and *Cannabis*; cotton, indigo and sugar; coffee and tea; oranges, lemons of many sorts; pomegranate, mango, figs, peaches, vines and plantains. The more common palms are *Cocos*, *Phoenix* and *Borassus*, supplying cocoa-nut and toddy. Indian agriculture combines the harvests of the tropical and temperate zones. North of the tropic the winter cold is sufficient to admit of the cultivation of almost all the cereals and vegetables of Europe, wheat being sown in November and reaped early in April. In this same region the summer heat and rain provide a thoroughly tropical climate, in which rice and other tropical cereals are freely raised, being as a rule sown early in July and reaped in September or October. In southern India, and the other parts of Asia and of the islands having a similar climate, the difference of the winter and summer half-years is not sufficient to admit of the proper cultivation of wheat or barley. The other cereals may be seen occasionally, where artificial irrigation is practised, in all stages of progress at all seasons of the year, though the operations of agriculture are, as a general rule, limited to the rainy months, when alone is the requisite supply of water commonly forthcoming.

The trees of India producing economically useful timber are comparatively few, owing to the want of durability of the wood, in the extremely hot and moist climate. The teak, *Tectona grandis*, supplies the finest timber. It is found in greatest perfection in the forests of the west coasts of Burma and the Indian peninsula, where the rainfall is heaviest, growing to a height of 100 or 150 ft., mixed with other trees and bamboos. The sal, *Shorea robusta*, a very durable wood, is most abundant along the skirts of the Himalaya from Assam to the Punjab, and is found in central India, to which the teak also extends. The sal grows to a large size, and is more gregarious than the teak. Of other useful woods found in the plains may be named the babool, *Acacia*; toon, *Cedrela*; and sissoo, *Dalbergia*. The only timber in ordinary use obtained from the Himalaya proper is the deodar, *Cedrus deodara*. Besides these are the sandalwood, *Santalum*, of southern India, and many sorts of bamboo found in all parts of the country. The cinchona has recently been introduced with complete success; and the mahogany of America reaches a large size, and gives promise of being grown for use as timber.

Western Asia.

The flora of the rainless region of south-western Asia is continuous with the desert flora of northern and eastern Africa, and extends from the coast of Senegal to the meridian of 75° E., or from the great African desert to the border of the rainless tract along the Indus and the southern parts of the Punjab. It includes the peninsula of Arabia, the shores of the Persian Gulf, south Persia, and Afghanistan and Baluchistan. On the west its limit is in the Cape Verde Islands, and it is partially represented in Abyssinia.

The more common plants in the most characteristic part of this region in southern Arabia are Capparidaceae, Euphorbiaceae, and a few Leguminosae, a *Reseda* and *Dipterygium*; palms, Polygonaceae, ferns, and other cryptogams, are rare. The number of families relative to the area is very small, and the number of genera and species equally restricted, in very many cases a single species being the only representative of an order. The aspect of the vegetation is very peculiar, and is commonly determined by the predominance of some four or five species, the rest being either local or sparingly scattered over the area. The absence of the ordinary bright green colours of vegetation is another peculiarity of this flora, almost all the plants having glaucous or whitened stems. Foliage is reduced to a minimum, the moisture of the plant being stored up in massive or fleshy stems against the long-continued drought. Aridity has favoured the production of spines as a defence from external attack, sharp thorns are frequent, and asperities of various sorts predominate. Many species produce gums and resins, their stems being encrusted with the exudations, and pungency and aromatic odour is an almost universal quality of the plants of desert regions.

The cultivated plants of Arabia are much the same as those of northern India—wheat, barley, and the common *Sorghum*, with dates and lemons, cotton and indigo. To these must be added coffee, which is restricted to the slopes of the western hills. Among the more mountainous regions of the south-western part of Arabia, known as Arabia Felix, the summits of which rise to 6000 or 7000 ft., the rainfall is sufficient to develop a more luxuriant vegetation, and the valleys have a flora like that of similarly situated parts of southern Persia, and the less elevated parts of Afghanistan and Baluchistan, partaking of the characters of that of the hotter Mediterranean region. In these countries aromatic shrubs are abundant. Trees are rare, and almost restricted to *Pistacia*, *Celtis* and *Dodonaea*, with poplars, and the date palm. Prickly forms of *Statice* and *Astragalus* cover the dry hills. In the spring there is an abundant herbaceous vegetation, including many bulbous plants, with genera, if not species, identical with those of the Syrian region, some of which extend to the Himalaya.

The flora of the northern part of Afghanistan approximates to that of the contiguous western Himalaya. *Quercus Ilex*, the evergreen oak of southern Europe, is found in forests as far east as the Sutlej, accompanied with other European forms. In the higher parts of Afghanistan and Persia Boraginaceae and thistles abound; gigantic Umbelliferae, such as *Ferula*, *Galbanum*, *Dorema*, *Bubon*, *Peucedanum*, *Prangos*, and others, also characterize the same districts, and some of them extend into Tibet.

The flora of Asia Minor and northern Persia differs but little from that of the southern parts of Europe. The mountains are clothed, where the fall of rain is abundant, with forests of *Quercus*, *Fagus*, *Ulmus*, *Acer*, *Carpinus* and *Corylus*, and various Coniferae. Of these the only genus that is not found on the Himalaya is *Fagus*. Fruit trees of the plum tribe abound. The cultivated plants are those of southern Europe.

Eastern Asia.

The vegetation of the Malayan Islands is for the most part that of the wetter and hotter region of India; but the greater uniformity of the temperature and humidity leads to the predominance of certain tropical forms not so conspicuous in India, while the proximity of the Australian continent has permitted the partial diffusion of Australian types which are not seen in India. The liquidambar and nutmeg may be noticed among

the former; the first is one of the most conspicuous trees in Java, on the mountains of the eastern part of which the casuarina, one of the characteristic forms of Australia, is also abundant. Rhododendrons occur in Borneo and Sumatra, descending to the level of the sea. On the mountains of Java there appears to be no truly alpine flora; *Saxifraga* is not found. In Borneo some of the temperate forms of Australia appear on the higher mountains. On the other islands similar characteristics are to be observed, Australian genera extending to the Philippines, and even to southern China.

The analysis of the Hong Kong flora indicates that about three-fifths of the species are common to the Indian region, and nearly all the remainder are either Chinese or local forms. The number of species common to southern China, Japan and northern Asia is small. The cultivated plants of China are, with a few exceptions, the same as those of India. South China, therefore, seems, botanically, hardly distinct from the great Indian region, into which many Chinese forms penetrate, as before noticed. The flora of north China, which is akin to that of Japan, shows manifest relation to that of the neighbouring American continent, from which many temperate forms extend, reaching to the Himalaya, almost as far as Kashmir. Very little is known of the plants of the interior of northern China, but it seems probable that a complete botanical connexion is established between it and the temperate region of the Himalaya.

The vegetation of the dry region of central Asia is remarkable for the great relative number of Chenopodiaceae, *Salicornia* and other salt plants being common; Polygonaceae also are abundant; leafless forms being of frequent occurrence, which gives the vegetation a very remarkable aspect. Peculiar forms of Leguminosae also prevail, and these, with many of the other plants of the southern and drier regions of Siberia, or of the colder regions of the desert tracts of Persia and Afghanistan, extend into Tibet, where the extreme drought and the hot (nearly vertical) sun combine to produce a summer climate not greatly differing from that of the plains of central Asia.

Central Asia.

Fauna.—The zoological provinces of Asia correspond very closely with the botanical. The northern portion of Asia, as far south as the Himalaya, is not zoologically distinct from Europe, and these two areas, with the strip of Africa north of the Atlas, constitute the Palaearctic region of Dr Sclater, whose zoological primary divisions of the earth have met with the general approval of naturalists. The south-eastern portion of Asia, with the adjacent islands of Sumatra, Java, Borneo and the Philippines, form his Indian region. The extreme south-west part of the continent constitutes a separate zoological district, comprising Arabia, Palestine and southern Persia, and reaching, like the hot desert botanical tract, to Baluchistan and Sind; it belongs to what Dr Sclater calls the Ethiopian region, which extends over Africa, south of the Atlas. Celebes, Papua, and the other islands east of Java beyond Wallace's line, fall within the Australian region.

Zoological regions.

Nearly all the mammals of Europe also occur in northern Asia, where, however, the Palaearctic fauna is enriched by numerous additional species. The characteristic groups belong mostly to forms which are restricted to cold and temperate regions. Consequently the Quadrumana, or monkeys, are nearly unrepresented, a single species occurring in Japan, and one or two others in northern China and Tibet. Insectivorous bats are numerous, but the frugivorous division of this order is only represented by a single species in Japan. Carnivora are also numerous, particularly the frequenters of cold climates, such as bears, weasels, wolves and foxes. Of the Insectivora numerous forms of moles, shrews and hedgehogs prevail. The Rodents are also well represented by various squirrels, mice and hares. Characteristic forms of this order in northern Asia are the marmots (*Arctomys*) and the pikas, or tailless hares (*Lagomys*). The great order of Ungulata is represented by various forms of sheep, as many as ten or twelve wild species of *Ovis* being met with in the mountain chains of Asia; and more sparingly by several peculiar forms of antelope, such as the saiga (*Saiga tatarica*), and the *Gazella gutturosa*, or yellow sheep. Coming to the deer, we also meet with characteristic forms in northern Asia, especially those belonging to the typical genus *Cervus*. The musk deer (*Moschus*) is also quite restricted to northern Asia, and is one of its most peculiar types.

Mammals and birds.

The ornithology of northern Asia is even more closely allied to that of Europe than the mammal fauna. Nearly three-fourths of the well-known species of Europe extend through Siberia into the islands of the Japanese empire. Here again we have an absence of all tropical forms, and a great development of groups characteristic of cold and temperate regions. One of the most peculiar of these is the genus *Phasianus*, of which splendid birds all the species are restricted in their wild state to northern Asia. The still more magnificently clad gold pheasants (*Thaumalea*), and the eared pheasants (*Crossoptilon*), are also confined to certain districts in the mountains of north-eastern Asia. Amongst the *Passeres*, such forms as the larks, stone-chats, finches, linnets and grosbeaks are well developed, and exhibit many species.

The mammal fauna of the Indian region of Asia is much more highly developed than that of the Palaearctic. The Quadrumana are represented by several peculiar genera, amongst which are *Semnopithecus*, *Hylobates* and *Simia*. Two peculiar forms of the Lemurine group are also met with. Both the insectivorous and frugivorous divisions of the bats are well represented. Amongst the Insectivora very peculiar forms are found, such as *Gymnura* and *Tupaia*. The Carnivora are likewise numerous; and this region may be considered as the true home of the tiger, though this animal has wandered far north into the Palaearctic division of Asia. Other characteristic Carnivora are civets, various ichneumons, and the benturong (*Arctictis*). Two species of bears are likewise restricted to the Indian region. In the order of Rodents squirrels are very numerous, and porcupines of two genera are met with. The Indian region is the home of the Indian elephant—one of the two sole remaining representatives of the order Proboscidea. Of the Ungulates, four species of rhinoceros and one of tapir are met with, besides several peculiar forms of the swine family. The Bovidae, or hollow-horned ruminants, are represented by several genera of antelopes, and by species of true *Bos*—such as *B. sondaicus*, *B. frontalis* and *B. bubalus*. Deer are likewise numerous, and the peculiar group of chevrotains (*Tragulus*) is characteristic of the Indian region. Finally, this region affords us representatives of the order Edentata, in the shape of several species of *Manis*, or scaly ant-eater.

The assemblage of birds of the Indian region is one of the richest and most varied in the world, being surpassed only by that of tropical America. Nearly every order, except that of the Struthiones or ostriches, is well represented, and there are many peculiar genera not found elsewhere, such as *Buceros*, *Harpactes*, *Lophophorus*, *Euplocamus*, *Pavo* and *Ceriornis*. The *Phasianidae* (exclusive of true *Phasianus*) are highly characteristic of this region, as are likewise certain genera of barbets (*Megalaema*), parrots (*Palaeornis*), and crows (*Dendrocitta*, *Urocissa* and *Cissa*). The family *Eurylaemidae* is entirely confined to this part of Asia.

The Ethiopian fauna plays but a subordinate part in Asia, intruding only into the south-western corner, and occupying the desert districts of Arabia and Syria, although some of the characteristic species reach still farther into Persia and Sind, and even into western India. The lion and the hunting-leopard, which may be considered as, in this epoch at least, Ethiopian types, extend thus far, besides various species of jerboa and other desert-loving forms.

In the birds, the Ethiopian type is shown by the prevalence of larks and stone-chats, and by the complete absence of the many peculiar genera of the Indian region.

The occurrence of mammals of the Marsupial order in the Molucca Islands and Celebes, while none have been found in the adjacent islands of Java and Borneo, lying on the west of Wallace's line, or in the Indian region, shows that the margin of the Australian region has here been reached. The same conclusion is indicated by the absence from the Moluccas and Celebes of various other Mammals, Quadrumana, Carnivora, Insectivora and Ruminants, which abound in the western part of the Archipelago. Deer do not extend into New Guinea, in which island the genus *Sus* appears to have its eastern limit. A peculiar form of baboon, *Cynopithecus*, and the singular ruminant, *Anoa*, found in Celebes, seem to have no relation to Asiatic animals, and rather to be allied to those in Africa.

The birds of these islands present similar peculiarities. Those of the Indian region abruptly disappear at, and many Australian forms reach but do not pass, the line above spoken of. Species of birds akin to those of Africa also occur in Celebes.

Of the marine orders of Sirenia and Cetacea the Dugong, *Halicore*, is exclusively found in the Indian Ocean; and a dolphin, *Platanista*, peculiar to the Ganges, ascends that river to a great distance from the sea.

Of the sea fishes of Asia, among the Acanthopterygii, or spiny-rayed fishes, the *Percidae*, or perches, are largely represented; the genus *Serranus*, which has only one species in Europe, is very numerous in Asia, and the forms are very large. Other allied genera are abundant, and extend from the Indian seas to eastern Africa. The Squamipennes, or scaly-finned fishes, are principally found in the seas of southern Asia, and especially near coral reefs. The *Mullidae*, or red mullets, are largely represented by genera differing from those of Europe. The *Polynemidae*, which range from the Atlantic through the Indian Ocean to the Pacific, supply animals from which isinglass is prepared; one of them, the mango-fish, esteemed a great delicacy, inhabits the seas from the Bay of Bengal to Siam. The *Sciaenidae* extend from the Bay of Bengal to China, but are not known to the westward. The *Stromateidae*, or pomfrets, resemble the dory, a Mediterranean form, and extend to China and the Pacific. The sword fishes, *Xiphiidae*, the lancet fishes, *Acanthuridae*, and the scabbard fishes, *Trichuridae*, are distributed through the seas of south Asia. Mackerels of various genera abound, as well as gobies, blennies and mullets.

Fishes.

Among the Anacanthini, the cod family so well known in Europe shows but one or two species in the seas of south Asia, though the soles and allied fishes are numerous along the coasts. Of the Physostomi, the siluroids are abundant in the estuaries and muddy waters; the habits of some of these fishes are remarkable, such as that of the males carrying the ova in their mouths till the young are hatched. The small family of *Scopelidae* affords the gelatinous *Harpodon*, or bumalo. The gar-fish and flying-fishes are numerous, extending into the seas of Europe. The *Clupeidae*, or herrings, are most abundant; and anchovies, or sardines, are found in shoals, but at irregular and uncertain intervals. The marine eels, *Muraenidae*, are more numerous towards the Malay Archipelago than in the Indian

seas. Forms of sea-horses (*Hippocampus*), pipe-fishes (*Syngnathus*), fife-fishes (*Sclerodermus*), and sun-fish, globe-fish, and other allied forms of *Gymnodontes*, are not uncommon.

Of the cartilaginous fishes, Chondropterygii, the true sharks and hammer-headed sharks, are numerous. The dog-fish also is found, one species extending from the Indian seas to the Cape of Good Hope. The saw-fishes, *Pristidae*, the electrical rays, *Torpedinae*, and ordinary rays and skates, are also found in considerable numbers.

The fresh waters of southern Asia are deficient in the typical forms of the Acanthopterygii, and are chiefly inhabited by carp, siluroids, simple or spined eels, and the walking and climbing fishes. The *Siluridae* attain their chief development in tropical regions. Only one *Silurus* is found in Europe, and the same species extends to southern Asia and Africa. The *Salmonidae* are entirely absent from the waters of southern Asia, though they exist in the rivers that flow into the Arctic Ocean and the neighbouring parts of the northern Pacific, extending perhaps to Formosa; and trout, though unknown in Indian rivers, are found beyond the watershed of the Indus, in the streams flowing into the Caspian. The *Cyprinidae*, or carp, are largely represented in southern Asia, and there grow to a size unknown in Europe; a *Barbus* in the Tigris has been taken of the weight of 300 lb. The chief development of this family, both as to size and number of forms, is in the mountain regions with a temperate climate; the smaller species are found in the hotter regions and in the low-lying rivers. Of the *Clupeidae*, or herrings, numerous forms occur in Asiatic waters, ascending the rivers many hundred miles; one of the best-known of Indian fishes, the hilsa, is of this family. The sturgeons, which abound in the Black Sea and Caspian, and ascend the rivers that fall into them, are also found in Asiatic Russia, and an allied form extends to southern China. The walking or climbing fishes, which are peculiar to south-eastern Asia and Africa, are organized so as to be able to breathe when out of the water, and they are thus fitted to exist under conditions which would be fatal to other fishes, being suited to live in the regions of periodical drought and rain in which they are found.

Insects.

The insects of all southern Asia, including India south of the Himalaya, China, Siam and the Malayan Islands, belong to one group; not only the genera, but even the species are often the same on the opposite sides of the Bay of Bengal. The connexion with Africa is marked by the occurrence of many genera common to Africa and India, and confined to those two regions, and similarities of form are not uncommon there in cases in which the genera are not peculiar. Of Coleopterous insects known to inhabit east Siberia, nearly one-third are found in western Europe. The European forms seem to extend to about 30° N., south of which the Indo-Malayan types are met with, Japan being of the Europeo-Asiatic group. The northern forms extend generally along the south coast of the Mediterranean up to the border of the great desert, and from the Levant to the Caspian.

Domesticated animals.

Of the domesticated animals of Asia may first be mentioned the elephant. It does not breed in captivity, and is not found wild west of the Jumna river in northern India. The horse is produced, in the highest perfection in Arabia and the hot and dry countries of western Asia. Ponies are most esteemed from the wetter regions of the east, and the hilly tracts. Asses are abundant in most places, and two wild species occur. The horned cattle include the humped oxen and buffaloes of India, and the yak of Tibet. A hybrid between the yak and Indian cattle, called zo, is commonly reared in Tibet and the Himalaya. Sheep abound in the more temperate regions, and goats are universally met with; both of these animals are used as beasts of burden in the mountains of Tibet. The reindeer of northern Siberia call also for special notice; they are used for the saddle as well as for draught. (R. S.)

Ethnology

Racial types.

Asia, including its outlying islands, has become the dwelling-place of all the great families into which the races of men have been divided. By far the largest area is occupied by the Mongolian group. These have yellow-brown skins, black eyes and hair, flat noses and oblique eyes. They are short in stature, with little hair on the body and face. In general terms they extend, with modifications of character probably due to admixture with other types and to varying conditions of life, over the whole of northern Asia as far south as the plains bordering the Caspian Sea, including Tibet and China, and also over the Indo-Malayan peninsula and Archipelago, excepting Papua and some of the more eastern islands.

Next in numerical importance to the Mongolians are the races which have been called by Professor Huxley *Melanochroic* and *Xanthochroic*. The former includes the dark-haired people of southern Europe, and extends over North Africa, Asia Minor, Syria to south-western Asia, and through Arabia and Persia to India. The latter race includes the fair-haired people of northern Europe, and extends over nearly the same area as the Melanochroi, with which race it is greatly intermixed. The Xanthochroi have fair skins, blue eyes and light hair; and others have dark skins, eyes and hair, and are of a slighter frame. Together they constitute what were once called the Caucasian races. The Melanochroi are not considered by Huxley to be one of the primitive modifications of mankind, but rather to be the result of the admixture of the Xanthochroi with the Australoid type, next to be mentioned.

The third group is that of the Australoid type. Their hair is dark, generally soft, never woolly. The eyes and skin are dark, the beard often well developed, the nose broad and flat, the lips coarse, and jaws heavy. This race is believed to form the basis of the people of the Indian peninsula, and of some of the hill tribes of central India, to whom the name Dravidian has been given, and by its admixture with the Melanochroic group to have given rise to the ordinary population of the Indian provinces. It is also probable that the Australoid family extends into south Arabia and Egypt.

The last group, the Negroid, is represented by the races to which has been given the name of *Negrito*, from the small size of some of them. They are closely akin to the negroes of South Africa, and possess the characteristic dark skins, woolly but scanty beard and body hair, broad flat noses, and projecting lips of the African; and are diffused over the Andaman Islands, a part of the Malay peninsula, the Philippines, Papua, and some of the neighbouring islands. The Negritos appear to be derived from a mixture of the true Negro with the Australoid type.

Mongolians.

The distribution of the Mongolian group in Asia offers no particular difficulty. There is complete present, and probably previous long-existing, geographical continuity in the area over which they are found. There is also considerable similarity of climate and other conditions throughout the northern half of Asia which they occupy. The extension of modified forms of the Mongolian type over the whole American continent may be mentioned as a remarkable circumstance connected with this branch of the human race.

The Mongolians of the northern half of Asia are almost entirely nomadic, hunters and shepherds or herdsmen. The least advanced of these, but far the most peaceful, are those that occupy Siberia. Farther south the best-known tribes are the Manchus, the Mongols proper, the Moguls and the Turks, all known under the name of Tatars, and to the ancients as Scythians, occupying from east to west the zone of Asia comprised between the 40th and 50th circles of N. lat. The Turks are Mahommedans; their tribes extend up the Oxus to the borders of Afghanistan and Persia, and to the Caspian, and under the name of Kirghiz into Russia, and their language is spoken over a large part of western Asia. Their letters are those of Persia. The Manchus and Mongols are chiefly Buddhist, with letters derived from the ancient Syriac. The Manchus are now said to be gradually falling under the influence of Chinese civilization, and to be losing their old nomadic habits, and even their peculiar language. The predatory habits of the Turkish, Mongolian and Manchu population of northern Asia, and their irruptions into other parts of the continent and into Europe, have produced very remarkable results in the history of the world.

The Chinese branch of the Mongolian family are a thoroughly settled people of agriculturists and traders. They are partially Buddhist, and have a peculiar monosyllabic, uninflected language, with writing consisting of symbols, which represent words, not letters.

The countries lying between India and the Mongolian are occupied by populations chiefly of the Mongolian and Chinese type, having languages fundamentally monosyllabic, but using letters derived from India, and adopting their religion, which is almost everywhere Buddhist, from the Indians. Of these may be named the Tibetans, the Burmese and the Siamese. Cochin-China is more nearly Chinese in all respects. It is known that to the Tibeto-Chinese modifications of the pure Mongolian type all the eastern Burmese tribes—Chins, Kachins, Shans, &c.—belong (as indeed do the Burmese themselves), and that a cognate race occupies the Himalaya to the eastern limits of Kashmir.

Some light has been thrown on the connexion between the Tibetan race and certain tribes of central India, the Bhils and Kols; and it seems more probable that these tribes are the remnants of a Mongolian race which first displaced a yet earlier Negroid population, and was then itself shouldered out by a Caucasian irruption, than that they entered India by any of the northern passages within historic times. Mongolian settlements have lately been found very much farther extended into the border countries of north-west India than has been hitherto recognized. The Mingals, who, conjointly with the Brahuis, occupy the hills south of Kalat to the limits of the Rajput province of Las Bela, claim Mongolian descent, and traces of a Mongolian colony have been found in Makran.

Malays.

The Malays, who occupy the peninsula and most of the islands of the Archipelago called after them, are Mongols apparently modified by their very different climate, and by the maritime life forced upon them by the physical conditions of the region they inhabit. As they are now known to us, they have undergone a process of partial civilization, first at the hands of the Brahminical Indians, from whom they borrowed a religion, and to some extent literature and an alphabet, and subsequently from intercourse with the Arabs, which has led to the adoption of Mahommedanism by most of them.

The name of Aryan has been given to the races speaking languages derived from, or akin to, the ancient form of Sanskrit, who now occupy the temperate zone extending from the Mediterranean, across the highlands of Asia Minor, Persia and Afghanistan, to

India. The races speaking the languages akin to the ancient Assyrian, which are now mainly represented by Arabic, have been called Semitic, and occupy the countries south-west of Persia, including Syria and Arabia, besides extending into North Africa. Though the languages of these races are very different they cannot be regarded as physically distinct, and they are both without doubt branches of the Melanochroi, modified by admixture with the neighbouring races, the Mongols, the Australoids and the Xanthochroi.

Aryans.

The Aryans of India are probably the most settled and civilized of all Asiatic races. This type is found in its purest form in the north and north-west, while the mixed races and the population referred to the Australoid type predominate in the peninsula and southern India. The spoken languages of northern India are very various, differing one from another in the sort of degree that English differs from German, though all are thoroughly Sanskritic in their vocables, but with an absence of Sanskrit grammar that has given rise to considerable discussion. The languages of the south are Dravidian, not Sanskritic. The letters of both classes of languages, which also vary considerably, are all modifications of the ancient Pali, and probably derived from the Dravidians, not from the Aryans. They are written from left to right, exception being made of Urdu or Hindostani, the mixed language of the Mahommedan conquerors of northern India, the character used for writing which is the Persian. From the river Sutlej and the borders of the Sind desert, as far as Burma and to Ceylon, the religion of the great bulk of the people of India is Hindu or Brahminical, though the Mahommedans are often numerous, and in some places even in a majority. West of the Sutlej the population of Asia may be said to be wholly Mahommedan with the exception of certain relatively small areas in Asia Minor and Syria, where Christians predominate. The language of the Punjab does not differ very materially from that of Upper India. West of the Indus the dialects approach more to Persian, which language meets Arabic and Turki west of the Tigris, and along the Turkoman desert and the Caspian. Through the whole of this tract the letters are used which are common to Persian, Arabic and Turkish, written from right to left.

Considerable progress has been made in the classification of the various races which occupy the continent to the west of the great Mongolian region. The ancient Sacae, or Scyths, are recognized in the Aryan population, who may be found in great numbers and in their purest form in the more inaccessible mountains and glens of the central highlands. These Tajiks (as they are usually called) form the underlying population of Persia, Baluchistan, Afghanistan and Badakshan, and their language (in the central districts of Asia) is found to contain words of Aryan or Sanskrit derivation which are not known in Persian. They have been for the most part dispossessed of their country by Turkish immigration and conquests, but they still retain their original intellectual superiority over the Turkish and other mixed tribes by which they are surrounded. Uzbegs and Kirghiz have but small affinity with the Mongol element of Asia. They are the representatives of those countless Turkish irruptions which have taken place through all history. Of the two divisions (Kara Kirghiz and Kassak Kirghiz) into which the Kirghiz tribes are divided by Russian authorities, the Kassak Kirghiz is the more closely allied to the Mongol type; the Kara Kirghiz, who are found principally in the valleys of the Tian-shan and Altai mountains, being unmistakably Turkish. The Kipchaks are only a Kirghiz clan. The language of the Kirghiz is Turki and their religion that of Mahomet. As a nomadic people they have great contempt for the Sarts, who represent the town dwellers of the tribe. The Kalmucks are a Buddhist and Mongolian people who originated in a confederacy of tribes dwelling in Dzungaria, migrated to Siberia, and settled on the Lower Volga. From thence they returned late in the 18th century to the reoccupation of their old ground in Kulja under the Chinese. The Turkoman is the purest form of the Turk element, and his language is the purest form of the Turkish tongue, which is represented at Constantinople by a comparatively mongrel, or mixed, dialect. Ethnographers have traced a connexion between the Turkoman of central Asia and the Teutonic races of Europe, based on a similarity of national customs and immemorial usage. Evidence of an original affinity between Turkoman and Rajput has also been found in the mutual possession by these races of a ruddy skin, so that as ethnographical inquiry advances the Turk appears to recede from his Mongolian affinities and to approach the Caucasian. Turks and Mongols alike were doubtless included under the term Scyth by the ancients, and as Tatars by more modern writers, insomuch that the Turkish dynasty at Delhi, founded by Baber, is usually termed the Mogul dynasty, although there can be no distinction traced between the terms Mogul and Mongol. The general results of recent inquiry into the ethnography of Afghanistan is to support the general correctness of Bellew's theories of the origin of the Afghan races. The claim of the Durani Afghan to be a true Ben-i-Israel is certainly in no way weakened by any recent investigation. The influence of Greek culture in northern India is fully recognized, and the distribution of Greek colonies previous to Alexander's time is attested by practical knowledge of the districts they were said to occupy. The *habitat* of the Nysaeana, and the identity of certain tribes of Kafiristan with the descendants of these pre-Alexandrian colonists from the west, are also well established. To this day hymns are unwittingly sung to Bacchus in the dales and glens of Kafiristan. The ethnographical status of the mixed tribes of the mountains that lie between Chitral and the Peshawar plains has been fairly well fixed by John Biddulph, and much patient inquiry in the vast fields of Baluchistan by Major Mockler, G. P. Tate and others has resulted in quite a new appreciation of the tribal origin of the great conglomeration of Baluch peoples.

Racial distribution.

The result of trans-border surveys to the north and west of India has been to establish the important geographical fact that it is by two gateways only, one on the north-west and one on the west of India, that the central Asiatic tides of immigration have flowed into the peninsula. The Kabul valley indicates the north-western entrance, and Makran indicates that on the west. By the Kabul valley route, which includes at its head the group of passes across the Hindu Kush which extend from the Khawak to the Kaoshan, all those central Asian hordes, be they Sacae, Yue-chi, Jats, Goths or Huns, who were driven towards the rich plains of the south, entered the Punjab. Some of them migrated from districts which belong to eastern Asia, but none of them penetrated into India by eastern passes. Such tides as set towards the Himalaya broke against their farther buttresses, leaving an interesting ethnographical flotsam in the northern valleys; but they never overflowed the Himalayan barrier. Later most of the historic invasions of India from central Asia followed the route which leads directly from Kabul to Peshawar and Delhi.

By the western gates of Makran prehistoric irruptions from Mesopotamia broke into the plains of Lower Sind, and either passed on towards the central provinces of India or were absorbed in the highlands south of Kalat. In later centuries the Arabs from the west reached the valley of the Indus by their western route, and there established a dynasty which lasted for 300 years. The identification of existing peoples with the various Scythic, Persian and Arab races who have passed from High Asia into the Indian borderland, has opened up a vast field of ethnographical inquiry which has hardly yet found adequate workers for its investigation. To such fields may be added the yet more complicated problems of those reflex waves which flowed backwards from India into the border highlands. (T. H. H.*)

History

1. The borders assigned to Asia on the west are somewhat arbitrary. The Urals indicate no real division of races, and in both Greek and Turkish times Asia Minor has been connected with the opposite shores of Europe rather than with the lands lying to the east. A juster view of early history is probably obtained by thinking of the countries round the Mediterranean as interacting on one another than by separating Palestine and Asia Minor as Asiatic.

2. The words "Asiatic" and "Oriental" are often used as if they denoted a definite and homogeneous type, but Russians resemble Asiatics in many ways, and Turks, Hindus, Chinese, &c., differ in so many important points that the common substratum is small. It amounts to this, that Asiatics stand on a higher level than the natives of Africa or America, but do not possess the special material civilization of western Europe. As far as any common mental characteristic can be assigned it is also somewhat negative, namely, that Asiatics have not the same sentiment of independence and freedom as Europeans. Individuals are thought of as members of a family, state or religion, rather than as entities with a destiny and rights of their own. This leads to autocracy in politics, fatalism in religion and conservatism in both. Hence, too, Asiatic history has large and simple outlines. Though longer chronologically than the annals of Europe, it is less eventful, less diversified and offers fewer personalities of interest. But the same conditions which render individual eminence difficult procure for it when once attained a more ready recognition, and the conquerors and prophets of Asia have had more power and authority than their parallels in Europe. Jenghiz Khan and Timur covered more ground than Napoleon, and no European has had such an effect on the world as Mahomet.

Asiatic characteristics.

3. Attention has often been called to the religious character of Asia. Not only the great religions of the world—Buddhism, Christianity, Islam—but those of secondary importance, such as Judaism, Parseeism, Taoism, are all Asiatic. No European race left to itself has developed anything more than an unsystematic paganism. It is true that Greek philosophy advanced far beyond this stage, but it produced nothing sufficiently popular to be called a religion.

Religion and civilization.

On the other hand Christianity, though Asiatic in its origin and essential ideas, has to a large extent taken its present form on European soil, and some of its most important manifestations—notably the Roman Church—are European reconstructions in which little of the Asiatic element remains. Christianity has made little way farther east then Asia Minor. Modern missions have made no great conquests there, and in earlier times the Nestorians and Jacobites who penetrated to central Asia, China and India, received respectful hearing, but never had anything like the success which attended Buddhism and Islam. Yet Buddhism has never made much impression west of India, and Islam is clearly repugnant to Europeans, for even when under Moslem rule (as in Turkey) they refuse to accept it in a far larger proportion than did the Hindus in similar circumstances. Hence there is clearly a deep-seated difference between the religious feelings of the two continents.

Since Asiatic records go back much farther than those of Europe, it is natural the Asia should be thought the birthplace of civilization. But this originality cannot be absolute, for, whatever may have been the relations of Babylonia and the Aryans, the latter brought civilization to India from the west, and it is not always clear whether similarity of government and institutions is the result of borrowing or of parallel development. Both in Europe and in Asia small feudal or aristocratic states tended to consolidate themselves into monarchies, but whereas in Europe from the early days of Rome onwards royalty has often been driven out and replaced temporarily or permanently by popular government, this change seems not to occur in Asia, where revolution means only a change of dynasty. The few cases where the government is not monarchical, as Arabia, seem to represent the persistence of every ancient conditions.

The contemplation of Asia suggests that progress is most rapid when accompanied by the migration of races or the transplantation of ideas and institutions. Thus Greece excelled the Eastern countries from whom she may have derived her civilization, and Buddhism had a far more brilliant career outside India than in it.

4. In many parts of southern Asia are found semi-barbarous races representing the earliest known stratum of population, such as the Veddahs of Ceylon, and various tribes in China and the Malay Archipelago. Some of them offer analogies to the Australians. This connexion, if true, must be very ancient, since it apparently goes back to a time when the distribution of land and water was other than at present. In northern Asia are found other aborigines, such as the Ainus of Japan and the so-called hyperborean races (Chukchis, &c.), but no materials are at present forthcoming for their history. There is some record of the migrations of the later races superimposed on these aborigines. The Chinese came from the west, though how far west is unknown: the Hindus and Persians from the north-west: the Burmese and Siamese from the north. We do not know if the Mongols, Turks, &c., had any earlier home than central Asia, but their extensive movements from that region are historical.

General historical outlines.

The antiquity of Asiatic history is often exaggerated. With the exception of Babylonia and Assyria, we can hardly even conjecture what was the condition of this continent much before 1500 B.C. At that period the Chinese were advancing along the Hwang-ho, and the Aryans were entering India from the north-west. Both were in conflict with earlier races. The influence of Babylonian civilization was probably widespread. Some connexion between Babylonia and China is generally admitted, and all Indian alphabets seem traceable to a Semitic original borrowed in the course of commerce from the Persian Gulf.

Apart from European conquests, the internal history of Asia in the last 2000 years is the result of the interaction of four main influences: (*a*) Chinese, (*b*) Indian, (*c*) Mahommedan, (*d*) Central Asian. Of these the first three represent different types of civilization: the fourth has little originality, but has been of great importance in affecting the distribution of races and political power.

(*a*) China has moulded the civilization of the eastern mainland and Japan, without much affecting the Malay Archipelago. In the sphere of direct influence fall Korea, Japan and Annam; in the outer sphere are Mongolia, Tibet, Siam, Cambodia and Burma, where Indian and Chinese influence are combined, the Indian being often the stronger. These countries, except Japan, have all been at some time at least nominal tributaries of China. Where Chinese influence had full play it introduced Confucianism, a special style in art and the Chinese system of writing. After the Christian era it was accompanied by Chinese Buddhism. The cumbrous Chinese script maintains itself in the Far East, but has not advanced west of China proper and Annam.

(*b*) Indian influence may be defined as Buddhism, if it is understood that Buddhism is not at all periods clearly distinguishable from Hinduism. Its sphere includes Indo-China, much of the Malay Archipelago, Tibet and Mongolia. Moreover, China and Japan themselves may be said to fall within this sphere, in view of the part which Buddhism has played in their development. The Buddhist influence is not merely religious, for it is always accompanied by Indian art and literature, and often by an Indian alphabet. Much of this art is Greek in origin, being derived from the Perso-Greek states on the north-west frontiers of India. Indian alphabets have spread to Tibet, Cambodia, Java and Korea. The history of Indian civilization in Indo-China and the Archipelago is still obscure, in spite of the existence of gigantic ruins, but it would appear that in some parts at least two periods must be distinguished, first the introduction of Hinduism (or mixed Hinduism and Buddhism), perhaps under Indian princes, and secondly a later and more purely ecclesiastical introduction of Sinhalese Buddhism, with its literature and art.

(*c*) Mahommedanism or Islam is perhaps the greatest transforming force which the world has seen. It has profoundly affected and to a large extent subjugated all western Asia including India, all eastern and northern Africa as well as Spain, and all eastern Europe. Its open advocacy of force attracts warlike races, and the intensity of its influence is increased by the fusion of secular and religious power, so that the Moslem Church is a Moslem state characterized by slavery, polygamy, and, subject to the autocracy of the ruler, by the theoretical equality of Moslems, who in political status are superior to non-Moslems. Thus, whenever the population of a Moslem country is of mixed belief, a ruling caste of Moslems is formed, as in Turkey at the present day and India under the Moguls. Islam is paramount in Turkey, Persia, Arabia and Afghanistan. India is the dividing line: Islam is strong in northern and central India, weaker in the south. But only one-fifth of the whole population is Moslem. Beyond India it has spread to Malacca and the Malay Archipelago, where it overwhelmed Hindu civilization, and reached the southern Philippines. But it made no progress in Indo-China or Japan; and though there is a large Moslem population in China the Chinese influence has been stronger, for alone of all Asiatics the Chinese have succeeded in forcing Islam to accept the ordinary limitations of a religion and to take its place as a creed parallel to Buddhism or any other.

Even more than Buddhism Islam has carried with it a special style of art and civilization. It is usually accompanied by the use of the Arabic alphabet, and in the languages of Moslem nations (notably Turkish, Persian, Hindustani and Malay) a large proportion of the vocabulary is borrowed from Arabic. Hindi and Hindustani, two forms of the same language as spoken by Hindus and Mahommedans respectively, are a curious example of how deeply religion may affect culture.

(*d*) The great part which central Asian tribes have played in history is obscured by the absence of any common name for them. Linguistically they can be divided into several groups such as Turks, Mongols and Huns, but they were from time to time united into states representing more than one group, and their armies were recruited, like the Janissaries, from all the military races in the neighbourhood. Soon after the Christian era central Asia began to boil over, and at least seven great invasions and more or less complete conquests can be ascribed to these tribes without counting minor movements. (i.) The early invasions of Europe by the Avars, Huns and Bulgarians.

(ii.) The invasion and temporary subjection of Russia by the Mongols, who penetrated as far west as Silesia. (iii.) The conquests of Timur. (iv.) The conquest of Asia Minor and eastern Europe by the Turks. (v.) The conquest of India by the Moguls. (vi.) The conquest of China by the Mongols under Kublai. (vii.) The later conquest of China by the Manchus. To these may be added numerous lesser invasions of India, China and Persia.

These tribes have a genius for warfare rather than for government, art or literature, and with few exceptions (*e.g.* the Moguls in India) have proved poor administrators. Apart from conquest their most important function has been to keep up communications in central Asia, and to transport religions and civilizations from one region to another. Thus they are mainly responsible for the introduction of Islam with its Arabic or Persian civilization into India and Europe, and in earlier times their movements facilitated the infiltration of Graeco-Bactrian civilization into India, besides maintaining communication between China and the West.

5. *Babylonia and Assyria.*—The movements mentioned above have been the chief factors of relatively modern Asiatic history, but in early times the centre of activity and culture lay farther west, in Babylonia and Assyria. These ancient states began to decline in the 7th century B.C., and on their ruins rose the Persian empire, which with various political metamorphoses continued to be an important power till the 7th century A.D., after which all western Asia was overwhelmed by the Moslem wave, and old landmarks and kingdoms were obliterated.

The materials for the study of their institutions and population are abundant, but lend themselves to discussion rather than to a summary of admitted facts. In the early history of south-western Asia the Semites form the most important ethnic group, which is primarily linguistic but also shares other remarkable characteristics. Two of the greatest religions of the world, Christianity and Islam, are Semitic in origin, as well as Judaism. In politics these races have been less successful in modern times, but the Semitic states of Babylonia and Assyria were once the principal centres for the development and distribution of civilization. It is generally agreed that this civilization can be traced back to an earlier race, the Sumero-Akkadians, whose language seems allied to the agglutinative idioms of central Asia. If this ancient civilized race was really allied to the ancestors of the Turks and Huns, it is a remarkable instance of how civilization thrives best by being transplanted at a certain period of growth. Still less is known of the early non-Aryan races of Asia Minor such as the Hittites and Alorodians. One hypothesis supposes that the shores of the Mediterranean were originally inhabited by a homogeneous race neither Aryan nor Semitic.

The earliest Sumerian records seem to be anterior to 4000 B.C. Shortly after that period Babylonia was invaded by Semites, who became the ruling race. The city of Babylon came to the fore as metropolis about 2285 B.C. under Khammurabi. Assyria was an offshoot of Babylonia lying to the north-west, and apparently colonized before the second millennium. While using the same language as the Babylonians, the Assyrians had an individuality which showed itself in art and religion. In the 9th and 8th centuries B.C. they became the chief power within their sphere and the suzerain of their parent Babylon. But they succumbed before the advance of the Medo-Persian power in 606 B.C., whereas it was not till 555 that Cyrus took Babylon. Assyria, being essentially a military power, disappeared with the destruction of Nineveh, but Babylon continued to exercise an influence on culture and religion for many centuries after the Persian conquest.

6. *China.*—This is the oldest of existing states, though its authentic history does not go back much beyond 1000 B.C. It is generally admitted that there was some connexion between the ancient civilizations of China and Babylonia, but its precise nature is still uncertain. It is clear, however, that the Chinese came from the west, and entered their present territory along the course of the Hwang-ho at an unknown period, possibly about 3000 B.C. In early historical times China consisted of a shifting confederacy of feudal states, but about 220 B.C. the state of Tsin or Chin (whence the name China) came into prominence, and succeeded in forming a homogeneous empire, which advanced considerably towards the south. The subsequent history of China is mainly a record of struggles with various tribes, commonly, but not very correctly, called Tatars. The empire was frequently broken up by successful incursions, or divided between rival dynasties, but at least twice became a great Asiatic power: under the Han dynasty (about 200 B.C.–A.D. 220), and the T'ang (A.D. 618–906). The dominions of the latter extended across central Asia to northern India, but were dismembered by the attacks of the Kitans, whence the name Cathay. China proper, minus these external provinces, was again united under the Sung dynasty (960–1127), but split into the northern (Tatar) and southern (Chinese) kingdoms. In the 13th century arose the Mongol power, and Kublai Khan conquered China. The Mongol dynasty lasted less than a century, but the Ming, the native Chinese dynasty which succeeded it, reigned for nearly 300 years and despatched expeditions which reached India, Ceylon and East Africa. In 1644 the Ming succumbed to the attacks of the Manchus, a northern tribe who captured Peking and founded the present imperial house.

Until the advent of Europeans, the Chinese were always in contact with inferior races. Whether they expanded at the expense of weak aboriginal tribes or were conquered by more robust invaders, Chinese civilization prevailed and assimilated alike the conquered and the conquerors. It is largely to this that we must ascribe the national conservatism and contempt for foreigners. The spirit of the Chinese polity is self-contained, anti-military and anti-sacerdotal. Rank is nominally determined by merit, as tested by competitive examinations. Society is conceived as regulated by mutual obligations, of which the duties of parents and children are the most important. The emperor is head of the state and the high priest, who sacrifices to Heaven on behalf of his people, but he can be deposed, and no divine right is inherent in certain families as in Japan and Turkey. On the contrary there have been 20 dynasties since the Christian era.

The most conspicuous figure in Chinese literature is Confucius (551–475 B.C.). Though he laid no claim to originality and merely sought to collect and systematize the traditions of antiquity, his influence in the Far East has been unbounded, and he must be pronounced one of the most powerful advocates of peace and humanity that have ever existed. Confucianism is an ethical rather than a religious system, and hence was able to co-exist, though not on very friendly terms, with Buddhism, which reached China about the 1st century A.D. and was the chief source of Chinese religious ideas, except the older ancestor worship. But they are not a religious people, and like many Europeans regard the church as a department of the state.

7. *Japan* appears to have been formerly inhabited by the Ainus, who have traditions of an older but unknown population, but was invaded in prehistoric times by a race akin to the Koreans, which was possibly mingled with Malay elements after occupying the southern part of the islands. Authentic history does not begin till about the 6th century A.D., when Chinese civilization and Buddhism were introduced. The government was originally autocratic, but as early as the 7th century the most characteristic feature of Japanese politics—the power of great families who overshadowed the throne—makes its appearance. We hear first of the Fujiwara family, and then of the rivalry between the houses of Taira and Minamoto. The latter prevailed, and in 1192 established the dual system of government under which the emperor or Mikado ruled only in name, and the real power was in the hands of a hereditary military chief called Shogun. Japan has never been invaded in historical times, but an attempt made by Kublai Khan to conquer it was successfully repulsed. The chief power then passed to the Ashikaga dynasty of Shoguns, who retained it for about 200 years and were distinguished for their patronage of the arts. The second half of the 16th century was a period of ferment and anarchy, marked by the arrival of the Portuguese

and the rise of some remarkable adventurers, one of whom, Hideyoshi, conquered Korea and apparently meditated the invasion of China. His plans were interrupted by his death, and his successor, Ieyasu, who shaped the social and political life of Japan for nearly 300 years (1603–1868), definitely decided on a policy of seclusion and isolation. All ideas of external conquest were abandoned, Christianity was forbidden, and Japan closed to foreigners, only the Dutch being allowed a strictly limited commerce. In 1854–1859 the Christian powers, beginning with the United States, successfully asserted their right to trade with Japan. The influx of new ideas provoked civil war, in which the already decadent Shogunate was abolished and the authority of the Mikado restored. Recognizing that their only chance of competing with Europeans was to fight them with their own weapons, the Japanese set themselves deliberately to assimilate the material civilization and to some extent the institutions of Europe, such as constitutional government. Their progress and success are without parallel. In 1895 they defeated the Chinese and ten years later the Russians. Their exceptional status among Asiatic nations has been recognized by treaties which, contrary to the general practice in non-Christian countries, place all foreigners in Japan under Japanese law.

This sudden development of the Japanese is perhaps the most important event of the second half of the 19th century, since it marks the rise of an Asiatic power capable of competing with Europe on equal terms. Their history is so different from that of the rest of Asia that it is not surprising if the result is different. The nation hardly came into existence till China and India had passed their prime, and remained secluded and free from the continual struggle against barbarian invaders, which drained the energies of its neighbours. It was left untouched by Mahommedanism, and for an unprecedentedly long period kept Europeans at bay without wasting its strength in hostilities. The military spirit was evolved, not in raids and massacres of the usual Asiatic type which create little but intense racial hatred, but in feuds between families and factions of the same race, which restrained ferocity and tended to create a temper like that of the feudal chivalry of Europe. On the other hand it is noticeable that the Japanese have little which is original in the way of religion, literature or philosophy. Unlike the Chinese and Indians, they have hitherto not had the smallest influence on the intellectual development of Asia, and though they have in the past sometimes shown themselves intensely nationalist and conservative, they have, compared with India and China, so little which is really their own that their assimilation of foreign ideas is explicable.

8. *Korea* received its civilization and religion from China, but differs in language, and to some extent in customs. An alphabet derived from Indian sources is in use as well as Chinese writing. The country was at most periods independent though nominally tributary to China. In the 16th century the Japanese occupied it for a short period, and in 1894 they went to war with China on account of her claims to suzerainty. In 1895 Korea was declared independent.

9. *India.*—The population of India comprises at least three strata: firstly, uncivilized aborigines, such as the Kols and Santhals, and secondly, the Dravidians (Tamils, Kanarese, &c.), who perhaps represent the earliest northern invaders, and appear to have attained some degree of culture on their own account. The most recent authorities are of opinion that the Kolarians and Dravidians represent a single physical type; but, whatever the historical explanation may be, they certainly have different languages and show different stages of civilization. In prehistoric times they were spread over the whole of India, but were driven to the centre and south of the peninsula by the third stratum of Aryans, and perhaps also by invasions of so-called Mongolian races from the north-west. No historical record has been preserved of these latter, but they appear to have profoundly affected the population of Bengal, which is believed to be Mongolo-Dravidian in composition. The Aryans appear to have been settled to the north of the Hindu Kush, and to have migrated south-eastwards about 1500 B.C. Their original home has been a subject of much discussion, but the view now prevalent is that they arose in southern Russia or Asia Minor, whence a section spread eastwards and divided into two closely related branches—the Hindus and Iranians. There were probably two successive Aryan immigrations, and the tradition of a struggle between them may be preserved in the *Mahābhārata*. The life of the ancient Aryans, as portrayed in their sacred songs, the *Rig Veda*, was quasi-nomadic and in many ways democratic, but by the 6th century B.C. settled states had been formed in the Ganges valley. They were absolute monarchies, but the power of the king was tempered by the extraordinary influence possessed by the hereditary sacerdotal class or Brahmans. The position of this class, which has remained till the present day, is connected with the institution of caste, a division of the population into groups founded partly on racial distinctions. The peaceful progress of Brahmanism was hindered by the doctrine of the Indian prince Gotama, called the Buddha, which grew into one of the greatest religions of the world. For many centuries the culture and development of the Hindus depended mainly on the interaction of the old Brahmanical religion and Buddhism. The latter was finally absorbed, and disappeared in India itself, but has spread Indian influence over the whole of eastern Asia, where it still flourishes.

In 326 B.C. Alexander invaded the Punjab. The immediate result was small, but the establishment of Perso-Greek kingdoms in central Asia had a powerful influence on Indian art and culture. It may also have helped to familiarize the Hindu mind with the idea of an empire, which appeared among them later than in other Asiatic countries. The first empire, called Maurya, reached its greatest extent in the time of Asoka (264–227 B.C.), who ruled from Afghanistan to Madras. He was a zealous Buddhist and gave the first example of a missionary religion, for by his exertions the faith was spread over all India and Ceylon. No Hindu empires have lasted long, and the Maurya dominions broke up fifty years after his death.

In the next period (*c.* 150 B.C.–A.D. 300) India was invaded from the north by tribes partly of Parthian and partly of Turki (Yue-chi, &c.) origin. Owing to the absence of dated records, the chronology of these invasions has not yet been set beyond dispute, but the most important was that of the Kushans, whose king Kanishka founded a state which comprised northern India and Kashmir. They were Buddhists, and it is probable that the Mahāyāna or northern form of Buddhism was due to an amalgamation of Gotama's doctrines with the ideas (largely Greek and Persian) which they brought with them. Much of Sivaism has probably the same origin. Another native empire, known as Gupta, rose on the ruins of the Kushan kingdom, and embraced nearly the whole peninsula, but it broke up in the 5th century, partly owing to the attacks of new northern invaders, the Huns. The Malava dynasty maintained Hindu civilization in the 6th century, and from 606 to 646 Harsha established a brief but brilliant empire in the north with its capital at Kanauj. This epoch is marked by the renaissance of Sanskrit literature and the gradual revival of Hinduism at the expense of Buddhism. But after Harsha Hindu history is lost in a maze of small and transitory states, incapable of resisting the ever advancing Mahommedan peril. As early as 712 the Arabs conquered Sind, and by the end of the 11th century the whole of northern India was in Moslem hands. Two periods may be distinguished, namely the Turki (1200–1526) and the Mogul empire. The former comprised several dynasties of mixed Turki and Iranian race, but was wanting in coherency. In the neighbourhood of the Moslem capitals, Islam spread rapidly, but in such districts as Rajputana and specially Vijayanagar (Mysore) Hindu civilization and religion maintained themselves.

In 1526 the Moguls descended on India from Transoxiana and seized the throne of Delhi. They never subjugated the south, but the empire which they founded in the north was for about two centuries, under such rulers as Akbar and Shah Jehan, one of the most brilliant which Asia has seen. After 1707 it began to decline: the governors became independent: a powerful

Mahratta confederacy arose in central India; Nadir Shah of Persia sacked Delhi; and Ahmed Shah made repeated invasions. A still more formidable danger, the power of the French and English, continued to increase. Amidst such confusion the authority of the Mogul empire rapidly disappeared, but it lasted as a name till the Mutiny (1857).

Indian history until Mahommedan times is marked by the unusual prominence of religious ideas, and is a record of intellectual development rather than of political events. Whatever national unity the Hindu peoples possessed came from the persistent and penetrating influence of the Brahman caste. Kings held a secondary position, and were generally regarded as adventitious tyrants, rather than as the heads and representatives of the nation. Even the great dynasties have left few traces, and it is with difficulty that the patient historian disinters the minor kingdoms from obscurity, but Indian religion, literature and art have influenced all Asia from Persia to Japan.

10. *Persia.*—The Persians, with whom are often coupled the Medes, appear to be pure Aryans in origin, and the earliest form of their language and religion offers remarkable analogies to the Vedas. It is reasonable to suppose that their ancestors and those of the Hindus at one time formed a single tribe somewhere in central Asia. The religion was remodelled by Zoroaster, who seems to be a historical character and to have lived about the 7th century B.C. About the same time they shook off the domination of Assyria. From the 6th century onwards their empire, then known as Median, began to expand at the expense of the surrounding states. They destroyed Nineveh in alliance with the Babylonians, and half a century later Cyrus took Babylon and founded the great dynasty of the Achaemenidae. The substitution of the Persian for the Median power, which took place with the advent of Cyrus, seems to indicate merely the pre-eminence of a particular tribe and not conquest by another race. The power of the Achaemenidae, when at its maximum, extended from the Oxus and Indus in the east to Thrace in the west and Egypt in the south, but fell before Greece, after lasting for rather more than 200 years. Darius and Xerxes were repulsed in their efforts to subjugate the Greek Peninsula, and Alexander the Great conquered their successor Darius III. in 329. But the greater part of the empire continued to exist under new masters, the Seleucids, as a Hellenistic power which was of great importance for the dissemination of Greek culture in the East. Bactria soon became independent under an Indo-Greek dynasty, and the blending of Greek, Persian, central Asiatic and Hindu influences had an important effect on the art and religion of India, and through India on all eastern Asia. About the same period (250 B.C.–A.D. 227) the Parthian empire arose under the Arsacids in Khorasan and the adjacent districts. The Parthians appear to have been a Turanian tribe who had adopted many Persian customs. They successfully withstood the Romans, and at one time their power extended from India to Syria. They succumbed to the Persian dynasty of the Sassanids, who ruled successfully for about four centuries, established the Zoroastrian faith as their state religion, and maintained a creditable conflict with the East Roman empire. But in the 7th century they were defeated by Heraclius, and shortly afterwards were annihilated before the first impetus of the Mahommedan conquest, which established Islam in Persia and the neighbouring lands, sweeping away old civilizations and boundaries. During the greater part of the Mahommedan period Persia has been ruled by troubled and short-lived dynasties. It attained a certain dignity and unity under Abbas Shah (1585–1628), but in later times was distracted and disorganized by Afghan invasions. The present dynasty, which is of Turkoman origin, dates from 1789.

The achievements of the Persians in art, literature and religion are by no means contemptible, but somewhat mixed and cosmopolitan. Owing to its position, the Persian state, when it from time to time became a conquering empire, overlapped Asia Minor, Babylon and India, and hence acted as an intermediary for transmitting art and ideas, sending for instance Greek sculpture to India and the cult of Mithra to western Europe. It is perhaps on account of this intermediate flavour that the literature of Persia—for instance the adaptations of Omar Khayyam—is more appreciated in Europe than that of other Oriental nations. On the other hand, the wars between Persia and Greece were recognized both at the time and afterwards as a struggle between Europe and Asia; the fact that both combatants were Aryans was not felt, and has no importance compared to the difference of continent.

11. *Jews.*—The Israelites appear to have been originally a nomadic tribe akin to the Arabs, whom they resemble in their want of political instinct and in their extraordinary religious genius. Among many remarkable qualities they have been distinguished from the earliest times by a species of commensalism, or power of living among other nations without becoming either socially merged or politically distinct. Their traditional history represents them as migrating to the borders of Egypt and living there for some centuries. After the exodus, which perhaps took place about 1300 B.C., they moved northwards again and founded a state of modest dimensions, which attained a short-lived unity under Solomon, but succumbed to internal dissensions and to the attacks of Assyria and Babylon. Shalmanezer destroyed the northern kingdom or Israel in 720, and following the practice of the times deported the majority of the population, whose traces became lost to history. There is no reason why their descendants should not be found to-day in various tribes, but the physical type commonly called Jewish is characteristic not so much of Israel as of western Asia generally. In 588 Nebuchadrezzar carried off the Jews in captivity, but after the Persian conquest of Babylonia they were allowed to return to Palestine in 538. Their institutions and ideas were probably considerably modified during this period. Babylon long continued to be a Jewish centre whence the Jews radiated to other countries. The restored state of Jerusalem lived for about six centuries in partial independence under Persian, Egyptian, Syrian and Roman rule, often showing an aggressively heroic attachment to its national customs, which brought it into collision with its suzerains, until the temple was destroyed by Titus in A.D. 70, and the country laid waste in the succeeding years. But long before this period the Jews of the Dispersion had become as important as the inhabitants of Palestine. From choice or compulsion large numbers settled in Egypt in the time of the Ptolemies, and added an appreciable element to Alexandrine culture, while gradual voluntary emigration established Jewish communities in Syria, Asia Minor, Greece and Italy, who facilitated the first spread of Christianity. In spite of chronic unpopularity and recurring persecutions they have spread over nearly all Europe. At the end of the 15th century they were expelled from Spain and many of the exiles moved eastwards. At present the largest numbers are to be found in the eastern parts of Europe. It is remarkable that though the Jews live in relative peace with Asiatics, the great majority of them prefer Europe as a residence.

12. *Arabs.*—The Arabs have hardly any history before the rise of Islam, although their name is mentioned by surrounding nations from the 9th century B.C. onwards. They appear to have had few states or kings, but rather tribes and chiefs. Their relationship to the Babylonians and Jews is indicated by linguistic and ethnological data. The language and writing of the Semites who, at an unknown period, settled in what is now Abyssinia, show affinities with those of South Arabia, and these Semites may have been immigrants into Africa from that region. It is plain from early Moslem literature that Persian, Christian and especially Jewish ideas had penetrated into Arabia.

With the rise of Mahommedanism occurred a sudden effervescence of the Arabs, who during some centuries threatened to impose not only their political authority but their civilization and new religion on the whole known world. They successfully invaded India and central Asia in the east, Spain and Morocco in the west. The Caliphate under the Omayyads of Damascus, and then the Abbasids of Bagdad, became the principal power in the nearer East. It had not, however, a sufficiently coherent organization for permanence; parts of it became independent,

others were first protected and then absorbed by the Turks. The Arab rule in Spain, which once threatened to overwhelm Europe and was turned back near Tours by Charles Martel, was distinguished by its tolerance and civilization, and lingered on till the 15th century.

The collapse of the political power of the Arabs was singularly complete. The Caliphate, though Arabian, was always geographically outside Arabia, and on its fall Arabia remained as it was before Islam, isolated and inaccessible. It is still one of the least known parts of the globe, and has hardly any political link with the outside, for the Arabs of northern Africa form separate states. But in spite of this total political collapse, Arabic religion and literature are still one of the greatest forces working in the western half of Asia, in northern Africa and to some extent in eastern Europe.

13. *Ceylon*, though geographically an annex of India, has not followed its fortunes historically. According to tradition it was invaded by an Aryan-speaking colony from the valley of the Ganges in the 6th century B.C. It received Buddhism from north India in the time of Asoka, and has had considerable importance as a centre of religious culture which has influenced Burma and Siam. Its medieval history consists of struggles between the native sovereigns and Tamil invaders. A powerful native dynasty reigned in the 12th century, but in 1408 the island was attacked by Chinese, and from 1505 onwards it was distracted by the attacks and squabbles of Europeans. It was partially subjugated, first by the Portuguese and then by the Dutch. In 1796 the Dutch were expelled by the English.

14. *Indo-China.*—This is an appropriate name for Burma, Siam, Cambodia, Annam, &c., for both in position and in civilization they lie between India and China. Indian influence is predominant as far as Cambodia (though with a Chinese tinge), Indian alphabets being employed and the Buddhism being of the Sinhalese type, but in Annam and Tongking the Chinese script and many Chinese institutions are in use. The population belongs to various races, and also comprises little-known wild tribes. (i.) Languages of the group known as Mōn-Annam are spoken in Annam and in Pegu, an ancient kingdom originally distinct from Burma though now confounded with it. This distribution seems to indicate that they once spread over the whole region, and were divided by the later advance of the Siamese and others. Until Annam was taken by the French, its history consisted of a struggle with the Chinese, who alternately asserted and lost their sovereignty. The Annamese are, however, a distinct race. Cochin China was once the seat of a kingdom called Champa, which appears to have had a hinduized Malay civilization and to have been subsequently absorbed by Annam. (ii.) The Burmese are linguistically allied to the Tibetans, and probably entered Burma from the north-west. The early history consists largely of conflicts between the Burmese and Talaings. The kingdom which was annexed by Britain in 1885 was founded about 1750 by Alompra, who united his countrymen and broke the power of the Talaings. He also invaded Siam. (iii.) The Khmers or Cambodians, whose languages appear to belong to the Mōn-Annam group, form a relatively ancient kingdom, much reduced in the last few centuries by the advance of the Siamese and now a French protectorate. Remarkable ruins dating from perhaps A.D. 800 to 1000 attest the former prevalence of strong Hindu influence. (iv.) The Siamese or Thai, who speak a monosyllabic language of the Chinese type, but written in an Indian alphabet, represent a late invasion from southern China, whence they descended about the 13th century.

15. *Malays.*—This widely-scattered race has no political union and its distribution is a puzzle for ethnography. At present it occupies the extremity of the Malay Peninsula, Java, Sumatra, Borneo, the Philippines and other islands of the Malay Archipelago as well as Madagascar, while the inhabitants of most islands in the South Seas, including New Zealand and Hawaii, speak languages which if not Malay have at least undergone a strong Malay influence. It would seem from this distribution that the Malays are not continental, but a seafaring race with exceptional powers of dispersal, who have spread over the ocean from some island centre—perhaps Java. The latest theory, however, is that there is a great linguistic group (which may or may not prove to correspond to an ethnic unity) comprising the Mundā, Mōnkhmer, Malay, Polynesian and Micronesian languages, and that the stream of immigration which distributed them started from the extreme west. Three periods can be traced in the history of the Asiatic Malays. In the first (in which such tribes as the Dyaks have remained) they were semi-barbarous. In the second, Hindu civilization reached the Malay Peninsula, Java, Sumatra and other islands. The presence of Hindu ruins, as well as of numerous Indian words and customs, testifies to the strength of this influence. It was, however, superseded by Islam, which spread to the Malay Archipelago and Peninsula before the 16th century. At the present time the Arabic alphabet is used on the mainland, but Indian alphabets in Java, Sumatra, &c.

16. *Tibet.*—This remote and mountainous country has a peculiar civilization. It has entirely escaped Islam, and though it is a nominal vassal of China, direct Chinese influence has not been strong. The most striking feature is the religion, a corrupt form of late Indian Buddhism, known as Lamaism, which, largely in consequence of the favour shown by Jenghiz Khan and his successors, has attained temporal power and developed into an ecclesiastical state curiously like the papacy.

17. *Mongols.*—Such civilization as the Mongols possess is a mixture of Chinese and Indian, the latter derived chiefly through Tibet, but their alphabet is a curious instance of transplantation. It is an adaptation of the Syriac writing introduced by the early Nestorian missionaries.

18. Almost all Asiatic countries have a literature, but it is often not indigenous and consists of foreign works, chiefly religious, read either in translations or the original. Thus with the exception of a little folklore the literature of Indo-China, Tibet, Mongolia, Korea and Manchuria is mainly Indian or Chinese. The chief original literatures are Chinese, Sanskrit, Pali, Arabic and Persian. The Japanese have produced few books of importance, and their compositions are chiefly remarkable as being lighter and more secular than is usual in Asia, but the older Chinese works take high rank both for their merits and the effect they have had. The extensive Sanskrit literature, which has reached in translations China, Japan and Java, is chiefly theological and poetical, history being conspicuously absent. India has also a considerable medieval and modern literature in various languages. Pali, though only a form of Hindu literature, has a separate history, for it died in India and was preserved in Ceylon, whence it was imported to Burma and Siam as the language of religion. The Pali versions of Buddha's discourses are among the most remarkable products of Asia. The literatures of all Moslem peoples are largely inspired by Arabic, which has produced a voluminous collection of works in prose and poetry. Persian, after being itself transformed by Arabic, has in its turn largely influenced all west Asiatic Moslem literature from Hindustani to Turkish.

Literature, art, science.

If one excepts the Old Testament, which is a product of the extreme west of Asia, it is remarkable how small has been the influence of Asiatic literature on Europe. Though Greek and Slavonic almost ceased to be written languages under Turkish rule, Europeans showed no disposition to replace them by Ottoman or Arabic literature.

Without counting subdivisions, there would seem to be three main schools of art in Asia at present—Chinese, Indian and Moslem. The first contains many original elements. It is feeblest in architecture and strongest in the branches demanding skill and care in a limited compass, such as painting, porcelain and enamel. It is the main inspiration of Japanese art, which, however, shows great originality in its treatment of borrowed themes. Both China and Japan have felt through Buddhism the influence of Indian art, which contains at least two elements—one indigenous and the other Greco-Persian. Unlike Chinese art it has a genius for architecture and sculpture rather than painting. Mahommedan art is also largely architectural and has affected

nearly all Moslem countries. Except that the use of Arabic inscriptions is one of its principal methods of decoration, it owes little to Arabia and much to Byzantium. The Persian variety of this art is more ornate, and less averse to representations of living beings. Both Moslem and Chinese art are closely connected with calligraphy, but Hindus rarely use writing for ornament.

In both art and literature modern Asia is inferior to the past more conspicuously than Europe.

As for science, astronomy was cultivated by the Babylonians at an early period, and it is probably from them that a knowledge of the heavenly bodies and their movements spread over Asia. Grammar and prosody were studied in India with a marvellous accuracy and minuteness several centuries before Christ. Mathematics were cultivated by the Chinese, Indians and Arabs, but nearly all the sciences based on the observation of nature, including medicine, have remained in a very backward condition. Much the same, however, might have been said of Europe until two centuries ago, and the scientific knowledge of the Arabs under the earlier Caliphates was equal or superior to that of any of their contemporaries. Histories and accounts of travels have been composed both in Arabic and Chinese.

19. It is only natural that Europe should have chiefly felt the influence of western Asia. Though Europeans may be indebted to China for some mechanical inventions, she was too distant to produce much direct effect, and the influence of India has been mainly directed towards the East. The resemblances between primitive Christianity and Buddhism appear to be coincidences, and though both early Greek philosophy and later Alexandrine ideas suggest Indian affinities, there is no clear connexion such as there is between certain aspects of Chinese thought and India.

Influence of Asia on other continents.

Any general statement as to the debt owed by early European civilizations to western Asia would at present be premature, for though important discoveries have been made in Crete and Babylonia the best authorities are chary of positive conclusions as to the relations of Cretan civilization to Egypt and Babylonia. Egyptian influence within the Aegean area seems certain, and the theory that Greek writing and systems for reckoning time are Babylonian in origin has not been disproved, though the history of the alphabet is more complex than was supposed.

In historic times Asia has attempted to assert her influence over Europe by a series of invasions, most of which have been repulsed. Such were the Persian wars of Greece, and perhaps one may add Hannibal's invasion of Italy, if the Carthaginians were Phoenicians transplanted to Africa. The Roman empire kept back the Persians and Parthians, but could not prevent a series of incursions by Avars, Huns, Bulgarians, and later by Mongols and Turks. Islam has twice obtained a footing in Europe, under the Arabs in Spain and under the Turks at Constantinople. The earlier Asiatic invasions were conducted by armies operating at a distance from their bases, and had little result, for the soldiery retired after a time (like Alexander from India), or more rarely (*e.g.* the Bulgarians) settled down without keeping up any connexion with Asia. The Turks, and to some extent the Arabs in Spain, were successful because they first conquered the parts of Asia and Africa adjoining Europe, so that the final invaders were in touch with Asiatic settlements. Though the Turks have profoundly affected the whole of eastern Europe, the result of their conquests has been not so much to plant Asiatic culture in Europe as to arrest development entirely, the countries under their rule remaining in much the same condition as under the moribund Byzantine empire.

In general, Europe has in historic times shown itself decidedly hostile to Asiatic institutions and modes of thought. It is only of recent years that the writings of Schopenhauer and the researches of many distinguished orientalists have awakened some interest in Asiatic philosophy.

The influence of Asia on Africa has been considerable, and until the middle of the 19th century greater than that of Europe. Some authorities hold that Egyptian civilization came from Babylonia, and that the so-called Hamitic languages are older and less specialized members of the Semitic family. The connexion between Carthage and Phoenicia is more certain, and the ancient Abyssinian kingdom was founded by Semites from south Arabia. The traditions of the Somalis derive them from the same region. The theory that the ruins in Mashonaland were built by immigrants from south Arabia is now discredited, but there was certainly a continuous stream of Arab migration to East Africa which probably began in pre-Moslem times and founded a series of cities on the coast. The whole of the north of Africa from Egypt to Morocco has been mahommedanized, and Mahommedan influence is general and fairly strong from Timbuktu to Lake Chad and Wadai. South of the equator, Arab slave-dealers penetrated from Zanzibar to the great lakes and the Congo during the second and third quarters of the 19th century, but their power, though formidable, has disappeared without leaving any permanent traces.

The relation to Asia of the pre-European civilizations of America is another of those questions which admit of no definite answer at present, though many facts support the theory that the semi-civilized inhabitants of Mexico and Central America crossed from Asia by Bering Straits and descended the west coast. Some authorities hold that Peruvian civilization had no connexion with the north and was an entirely indigenous product, but Kechua is in structure not unlike the agglutinative languages of central and northern Asia.

20. European influence on Asia has been specially strong at two epochs, firstly after the conquests of Alexander the Great, and secondly from the 16th century onwards. Alexander's conquests resulted in the foundation of Perso-Greek kingdoms in Asia, which not only hellenized their own area but influenced the art and religion of India and to some extent of China. Then follows a long period in which eastern Europe was mainly occupied in combating Asiatic invasions, and had little opportunity of Europeanizing the East. Somewhat later the Crusades kept up communication with the Levant, and established there the power of the Roman Church, somewhat to the detriment of oriental Christianity, but intercourse with farther Asia was limited to the voyages of a few travellers. Looking at eastern Europe and western Asia only, one must say that Asiatic influences have on the whole prevailed hitherto (though perhaps the tide is turning), for Islam is paramount in this region and European culture at a low ebb. But the case is quite different if one looks at the two continents as a whole, for improvement in means of communication has brought about strange vicissitudes, and western Europe has asserted her power in middle and eastern Asia.

Influence of Europe on Asia.

In the 16th century a new era began with the discovery by the Portuguese of the route to India round the Cape, and the naval powers of Europe started one after another on careers of oriental conquest. The movement was maritime and affected the nations in the extreme west of Europe rather than those nearer Asia, who were under the Turkish yoke. Also the parts of Asia affected were chiefly India and the extreme East. The countries west of India, being less exposed to naval invasion, remained comparatively untouched. It will thus be seen that European (excluding Russian) power in Asia is based almost entirely on improved navigation. There was no attempt to overwhelm whole empires by pouring into them masses of troops, but commerce was combined with territorial acquisition, and a continuity of European interest secured by the presence of merchants and settlers. The course of oriental conquest followed the events of European politics, and the possessions of European powers in the East generally changed hands according to the fortunes of their masters at home. Portugal was first on the scene, and in the 16th century established a considerable littoral empire on the coasts of East Africa, India and China, fragments of which still remain, especially Goa, where Portuguese influence on the natives was considerable. Before the century was out the Dutch appeared as the successful rivals of the Portuguese, but the real struggle for supremacy in southern Asia took place between France and England about 1740–1783. Both entered India as commercial companies, but the disorganized condition of the Mogul empire necessitated the use

of military force to protect their interests, and allured them to conquest. The companies gradually undertook the financial control of the districts where they traded and were recognized by the natives as political powers. The ultimate victory of England seems due less to any particular aptitude for dealing with oriental problems than to a better command of the seas and to considerations of European politics. At the end of the Napoleonic wars Portugal had Macao and Goa, Holland Java, Sumatra and other islands, France some odds and ends in India, while England emerged with Hong Kong, Singapore, Ceylon and a free hand in India. Guided by such administrators as Warren Hastings, the East India Company had assumed more and more definitely the functions of government for a great part of India. In 1809 its exclusive trading rights were taken away by Parliament, but its administrative status was thus made clearer, and when after the mutiny of 1857 it was desirable to define British authority in India there seemed nothing unnatural in declaring it to be a possession of the crown.

Another category of European possessions in Asia comprises those acquired towards the end of the 19th century, such as Indo-China (France), Burma and Wei-Hai-Wei (Britain), and Kiao-Chow (Germany). Whereas the earlier conquests were mostly the results of large half-conscious national movements working out their destinies in the East, these later ones were annexations deliberately planned by European cabinets. It seemed to be assumed that Asia was to be divided among the powers of Europe, and each was anxious to get its share or more.

The advance of Russia in Asia is entirely different from that of the other powers, since it has taken place by land and not by sea. Though the geographical extent of Russian territory and influence is enormous, she has always moved along the line of least resistance. She is a moderately strong empire lying to the north of the great Moslem states, and having for neighbours a series of very weak principalities or semi-civilized tribes. The conquest of Siberia and central Asia presented no real difficulties: Persia and Constantinople were left on one side, and Russia was defeated as soon as she was opposed by a vigorous power in the Far East. As the Russian possessions in Asia are continuous with European Russia, it is only natural that they should have been russified far more thoroughly than the British possessions have been anglicized.

There has been great difference of opinion as to the extent to which Alexander's conquests influenced Asia, and it is equally hard to say what is the effect now being produced by Europe. Clearly such alterations as the construction of railways in nearly all parts of the continent, and the establishment of peace over formerly disturbed areas like India, are of enormous importance, and must change the life of the people. But the mental constitution of Asiatics is less easily modified than their institutions, and even Japan has assimilated European methods rather than European ideas. (C. El.)

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ASIA, in a restricted sense, the name of the first Roman province east of the Aegean, formed (133 B.C.) out of the kingdom left to the Romans by the will of Attalus III. Philometor, king of Pergamum. It included Mysia, Lydia, Caria and Phrygia, and therefore, of course, Aeolis, Ionia and the Troad. In 84 B.C., on the close of the Mithradatic War, Sulla reorganized the province, forming 40 *regiones* for fiscal purposes, and it was later divided into *conventus*. From 80 to 50 B.C. the upper Maeander valley and all Phrygia, except the extreme north, were detached and added to Cilicia. In 27 B.C. Asia was made a senatorial province under a pro-consul. As the wealthiest of Roman provinces it had most to gain by the *pax Romana*, and therefore welcomed the empire, and established and maintained the most devout cult of Augustus by means of the organization known as the *Koinon* or Commune, a representative council, meeting in the various *metropoleis*. In this cult the emperor came to be associated with the common worship of the Ephesian Artemis. By the reorganization of Diocletian, A.D. 297, Asia was broken up into several small provinces, and one of these,

of which the capital was Ephesus, retained the name of the original province (see Asia Minor).

ASIA MINOR, the general geographical name for the peninsula, forming part of the empire of Turkey, on the extreme west of the continent of Asia, bounded on the N. by the Black Sea, on the W. by the Aegean, and on the S. by the Mediterranean, and at its N.W. extremity only parted from Europe by the narrow straits of the Bosporus and Dardanelles. On the east, no natural boundary separates it from the Armenian plateau; but, for descriptive purposes, it will suffice to take a line drawn from the southern extremity of the Giaour Dagh, east of the Gulf of Alexandretta along the crest of that chain, then along that of the eastern Taurus to the Euphrates near Malatia, then up the river, keeping to the western arm till Erzingan is reached, and finally bending north to the Black Sea along the course of the Churuk Su, which flows out west of Batum. This makes the Euphrates the main eastern limit, with radii to the north-east angle of the Levant and the south-east angle of the Black Sea, and roughly agrees with the popular conception of Asia Minor as a geographical region. But it must be remembered that this term was not used by classical geographers (it is first found in Orosius in the 5th century A.D.), and is not in local or official use now. It probably arose in the first instance from a vague popular distinction between the continent itself and the Roman province of "Asia" (*q.v.*), which at one time included most of the peninsula west of the central salt desert (*Axylon*). The name *Anatolia*, in the form *Anadol*, is used by natives for the western part of the peninsula (*cis Halym*) and not as including ancient Cappadocia and Pontus. Before the reconstitution of the provinces as *vilayets* it was the official title of the principal *eyalet* of Asia Minor, and was also used more generally to include all the peninsular provinces over which the beylerbey of Anadoli, whose seat was at Kutaiah, had the same paramount military jurisdiction which the beylerbey of "Rumili" enjoyed in the peninsular provinces of Europe. The term "Anatolia" appears first in the work of Constantine Porphyrogenitus (10th century).

The greatest length of Asia Minor, as popularly understood, is along its north edge, 720 m. Along the south it is about 650 m. The greatest breadth is 420 m. from C. Kerembé to C. Anamur; but at the waist of the peninsula, between the head of the Gulf of Alexandretta and the southernmost bight of the Black Sea (at Ordu), it is not quite 300 m. The greater portion of Asia Minor consists of a plateau rising gradually from east to west, 2500 ft. to 4500 ft.; east of the Kizil Irmak (Halys), the ground rises more sharply to the highlands of Armenia (*q.v.*). On the south the plateau is buttressed by the Taurus range, which stretches in a broken irregular line from the Aegean to the Persian frontier. On the north the plateau is supported by a range of varying altitude, which follows the southern coast of the Black Sea and has no distinctive name. On the west the edge of the plateau is broken by broad valleys, and the deeply indented coast-line throws out long rocky promontories towards Europe. On the north, excepting the deltas formed by the Kizil and Yeshil Irmaks, there are no considerable coast plains, no good harbours except Sinope and Vona, and no islands. On the west there are narrow coast plains of limited extent, deep gulfs, which offer facilities for trade and commerce, and a fringe of protecting islands. On the south are the isolated plains of Pamphylia and Cilicia, the almost land-locked harbours of Marmarice, Makri and Kekova, the broad bay of Adalia, the deep-seated gulf of Alexandretta (Iskanderun), and the islands of Rhodes with dependencies, Castelorizo and Cyprus.

Mountains.—The Taurus range, perhaps the most important feature in Asia Minor, runs the whole length of the peninsula on the south, springing east of Euphrates in the Armeno-Kurdish highlands, and being prolonged into the Aegean Sea by rocky promontories and islands. It attains in Lycia an altitude of 10,500 ft., and in the Bulgar Dagh (Cilicia) of over 10,000 ft. The average elevation is about 7000 ft. East of the Bulgar Dagh the range is pierced by the Sihun and Jihun rivers, and their tributaries, but its continuity is not broken. The principal passes across the range are those over which Roman or Byzantine roads ran:—(1) from Laodicea to Adalia (Attalia), by way of the Khonas pass and the valley of the Istanoz Chai; (2) from Apamea or from Pisidian Antioch to Adalia, by Isbarta and Sagalassus; (3) from Laranda, by Coropissus and the upper valley of the southern Calycadnus, to Germanicopolis and thence to Anemourium or Kelenderis; (4) from Laranda, by the lower Calycadnus, to Claudiopolis and thence to Kelenderis or Seleucia; (5) from Iconium or Caesarea Mazaca, through the Cilician Gates (Gulek Boghaz, 3300 ft.) to Tarsus; (6) from Caesarea to the valley of the Sarus and thence to Flaviopolis on the Cilician Plain; (7) from Caesarea over Anti-Taurus by the Kuru Chai to Cocysus (Geuksun) and thence to Germanicia (Marash). Large districts on the southern slopes of the Taurus chain are covered with forests of oak and fir, and there are numerous *yailas* or grassy "alps," with abundant water, to which villagers and nomads move with their flocks during the summer months.

Anti-Taurus is a term of rather vague and doubtful application. (*a*) Some have regarded it as meaning the more or less continuous range which buttresses up the central plateau on the north, parallel to the Taurus. (*b*) Others take it to mean the line of heights and mountain peaks which separates the waters running to the Black Sea and the Anatolian plateau from those falling to the Persian Gulf and the Mediterranean. This has its origin in the high land, near the source of the Kizil Irmak, and thence runs south-west towards the volcanic district of Mt. Argaeus, which, however, can hardly be regarded as orographically one with it. After a low interval it springs up again at its southern extremity in the lofty sharp-peaked ridge of Ala Dagh (11,000 ft.), and finally joins Taurus. (*c*) South of Sivas a line of bare hills connects this chain with another range of high forest-clad mountains, which loses itself southwards in the main mass of Taurus, and is held to be the true Anti-Taurus by geographers. It throws off, in the latitude of Kaisarieh, a subsidiary range, the Binboa Dagh, which separates the waters of the Sihun from those of the Jihun. The principal passes are those followed by the old roads:—(1) from Sebasteia to Tephrike and the upper valley of the western Euphrates; (2) from Sebasteia to Melitene, by way of the pass of Delikli Tash and the basin of the Tokhma Su; (3) from Caesarea to Arabissus, by the Kuru Chai and the valley of Cocysus (Geuksun). The range of Amanus (Giaour Dagh) is separated from the mass of Taurus by the deep gorge of the Jihun, whence it runs south - south - west to Ras el - Khanzir, forming the limit between Cilicia and Syria, various parts bearing different names, as Elma Dagh above Alexandretta. It attains its greatest altitude in Kaya Duldul (6500 ft.), which rises abruptly from the bed of the Jihun, and it is crossed by two celebrated passes:—(1) the Amanides Pylae (Baghche Pass), through which ran the road from the Cilician Plain to Apamea-Zeugma, on the Euphrates; (2) the Pylae Syriae or "Syrian Gates" (Beilan Pass), through which passed the great Roman highway from Tarsus to Syria. On the western edge of the plateau several short ranges, running approximately east and west, rise above the general level:—Sultan Dagh (6500 ft.); Salbacus-Cadmus (8000 ft.); Messogis (3600 ft.); Latmus (6000 ft.); Tmolus (5000 ft.); Dindymus (8200 ft.); Ida (5800 ft.); and the Mysian Olympus (7600 ft.). The valleys of the Maeander, Hermus and Caicus facilitate communication between the plateau and the Aegean, and the descent to the Sea of Marmora along the valleys of the Tembris and Sangarius presents no difficulties. The northern border range, though not continuous, rises steadily from the west to its culmination in the Galatian Olympus (Ilkaz Dagh), south of Kastamuni. East of the Kizil Irmak there is no single mountain chain, but there are several short ranges with elevations sometimes exceeding 9000 ft. The best routes from the plateau to the Black Sea were followed by the Roman roads from Tavium and Sebasteia to Sinope and Amisus, and those from Sebasteia to Cotyora and Cerasus-Pharnacia, which at first ascend the upper Halys. Several minor ranges rise above the level of the eastern plateau, and in the south groups of volcanic peaks and cones extend for about 150 m. from Kaisarieh (Caesarea) to Karaman. The most important are Mt. Argaeus (Erjish Dagh, 13,100 ft.) above Kaisarieh itself, the highest peak in Asia Minor; Ali Dagh (6200 ft.); Hassan Dagh (8000 ft.); Karaja Dagh; and Kara Dagh (7500 ft.). On the west of the plateau evidences of volcanic activity are to be seen in the district of Kula (Katakekaumene), coated with recent erupted matter, and in the numerous hot springs of the Lycus, Maeander, and other valleys. Earthquakes are frequent all over the peninsula, but especially in the south-east and west, where the Maeander valley and the Gulf of Smyrna are notorious seismic foci. The centre of the plateau is occupied by a vast treeless plain, the *Axylon* of the Greeks, in which lies a large salt lake, Tuz Geul. The plain is fertile where cultivated, fairly supplied with deep wells, and in many places covered with good pasture. Enclosed between the Taurus and Amanus ranges and the sea are the fertile plains of Cilicia Pedias, consisting in great part of a rich, stoneless loam, out of which rise rocky crags that are crowned with the ruins of Greco-Roman and Armenian strongholds, and of Pamphylia, partly alluvial soil, partly travertine, deposited by the Taurus rivers.

Rivers.—The rivers of Asia Minor are of no great importance. Some do not flow directly to the sea; others find their way to the coast through deep rocky gorges, or are mere torrents; and a few only are navigable for boats for short distances from their mouths. They cut so deep into the limestone formation of the plateau as to over-drain it, and often they disappear into swallow holes (*duden*) to reappear lower down. The most important rivers which flow to the Black Sea are the following:—the Boas (Churuk Su) which rises near Baiburt, and flows out near Batum; the Iris (Yeshil Irmak), with its tributaries the Lycus (Kelkit Irmak), which rises on the Armenian plateau, the Chekerek Irmak, which has its source near Yuzgat, and the Tersakan Su; the Halys (Kizil Irmak) is the longest river in Asia Minor, with its tributaries the Delije Irmak (Cappadox), which flows through the eastern part of Galatia, and the Geuk Irmak, which has its sources in the mountains above Kastamuni. With

the exception of Sivas, no town of importance lies in the valley of the Kizil Irmak throughout its course of over 600 m. The Sangarius (Sakaria) rises in the Phrygian mountains and, after many changes of direction, falls into the Black Sea, about 80 m. east of the Bosporus. Its tributaries are the Pursak Su (Tembris), which has its source in the Murad Dagh (Dindymus), and, after running north to Eski-shehr, flows almost due east to the Sakaria, and the Enguri Su, which joins the Sakaria a little below the junction of the Pursak. To the Black Sea, about 40 m. east of Eregli, also flows the Billaeus (Filiyas Chai). Into the Sea of Marmora run the Rhyndacus(Edrenos Chai) and the Macestus (Susurlu Chai), which unite about 12 m. from the sea. The most celebrated streams of the Troad are the Granicus (Bigha Chai) and the Scamander (Menderes Su), both rising in Mt. Ida (Kaz Dagh). The former flows to the Sea of Marmora; the latter to the Dardanelles. The most northerly of the rivers that flow to the Aegean is the Caicus (Bakir Chai), which runs past Soma, and near Pergamum, to the Gulf of Chanderli. The Hermus (Gediz Chai) has its principal sources in the Murad Dagh, and, receiving several streams on its way, runs through the volcanic district of Katakekaumene to the broad fertile valley through which it flows past Manisa to the sea, near Lefke. So recently as about 1880 it discharged into the Gulf of Smyrna, but the shoals formed by its silt-laden waters were so obstructive to navigation that it was turned back into its old bed. Its principal tributaries are—the Phrygius (Kum Chai), which receives the waters of the Lycus (Gürduk Chai), and the Cogamus (Kuzu Chai), which in its upper course is separated from the valley of the Maeander by hills that were crossed by the Roman road from Pergamum to Laodicea. The Caystrus (Kuchuk Menderes) flows through a fertile valley between Mt. Tmolus and Messogis to the sea near Ephesus, where its silt has filled up the port. The Maeander (Menderes Chai) takes its rise in a celebrated group of springs near Dineir, and after a winding course enters the broad valley, through which it "meanders" to the sea. Its deposits have long since filled up the harbours of Miletus, and converted the islands which protected them into mounds in a swampy plain. Its principal tributaries are the Glaucus, the Senarus (Banaz Chai), and the Hippurius, on the right bank. On the left bank are the Lycus (Churuk Su), which flows westwards by Colossae through a broad open valley that affords the only natural approach to the elevated plateau, the Harpasus (Ak Chai), and the Marsyas (China Chai). The rivers that flow to the Mediterranean, with two exceptions, rise in Mt. Taurus, and have short courses, but in winter and spring they bring down large bodies of water. In Lycia are the Indus (Gereniz Chai), and the Xanthus (Eshen Chai). The Pamphylian plain is traversed by the Cestrus (Ak Su), the Eurymedon (Keupri Su), and the Melas (Menavgat Chai), which, where it enters the sea, is a broad, deep stream, navigable for about 6 m. The Calycadnus (Geuk Su) has two main branches which join near Mut and flow south-east, and enter the sea, a deep rapid river, about 12 m. below Selefke. The Cydnus (Tersous or Tarsus Chai) is formed by the junction of three streams that rise in Mt. Taurus, and one of these flows through the narrow gorge known as the Cilician Gates. After passing Tarsus, the river enters a marsh which occupies the site of the ancient harbour. The Cydnus is liable to floods, and its deposits have covered Roman Tarsus to a depth of 20 ft. The Sarus (Sihun) is formed by the junction of the Karmalas (Zamanti Su), which rises in Uzun Yaila, and the Sarus (Saris), which has its sources in the hills to the south of the same plateau. The first, after entering Mt. Taurus, flows through a deep chasm walled in by lofty precipices, and is joined in the heart of the range by the Saris. Before reaching the Cilician Plain the river receives the waters of the Kerkhun Su, which cuts through the Bulgar Dagh, and opens a way for the roads from the Cilician Gates to Konia and Kaisarieh. After passing Adana, to which point small craft ascend, the Sihun runs south-west to the sea. There are, however, indications that at one period it flowed south-east to join the Pyramus. The Pyramus (Jihun) has its principal source in a group of large springs near Albistan; but before it enters Mt. Taurus it is joined by the Sogutli Irmak, the Khurman Su and the Geuk Su. The river emerges from Taurus, about 7 m. west of Marash, and here it is joined by the Ak Su, which rises in some small lakes south of Taurus. The Jihun now enters a remarkable defile which separates Taurus from the Giaour Dagh, and reaches the Cilician Plain near Budrun. From this point it flows west, and then south-west past Missis, until it makes a bend to discharge its waters south of Ayas Bay. The river is navigable as far as Missis. The only considerable tributary of the Euphrates which comes within our region is the Tokhma Su, which rises in Uzun Yaila and flows south-east to the main river not far from Malatia. In the central and southern portions of the plateau the streams either flow into salt lakes, where their waters pass off by evaporation, or into freshwater lakes, which have no visible outlets. In the latter cases the waters find their way beneath Taurus in subterranean channels, and reappear as the sources of rivers flowing to the coast. Thus the Ak Geul supplies the Cydnus, and the Beishehr, Egirdir and Kestel lakes feed the rivers of the Pamphylian plain.

Lakes.—The salt lakes are Tuz Geul (anc. *Tatta*), which lies in the great central plain, and is about 60 m. long and 10 to 30 m. broad in winter, but in the dry season it is hardly more than a saline marsh; Buldur Geul, 2900 ft. above sea-level; and Aji-tuz Geul, 2600 ft. The freshwater lakes are Beishehr Geul (anc. *Karalis*), 3770 ft., a fine sheet of water 30 m. long, which discharges south-east to the Soghla Geul; Egirdir Geul (probably anc. *Limnae*, a name which included the two bays of Hoiran and Egirdir, forming the lake), 2850 ft., which is 30 m. long, but less broad than Beishehr and noted for the abundance and variety of its fish. In the north-west portion of Asia Minor are Isnik Geul (L. Ascania), Abullionte Geul (L. Apollonia), and Maniyas Geul (L. Miletopolis).

Springs.—Asia Minor is remarkable for the number of its thermal and mineral springs. The most important are:—Yalova, in the Ismid sanjak; Brusa, Chitli, Terje and Eskishehr, in the Brusa vilayet; Tuzla, in the Karasi; Cheshme, Ilija, Hierapolis (with enormous alum deposits), and Alashehr, in the Aidin; Terzili Hammam and Iskelib in the Angora; Boli in the Kastamuni; and Khavsa, in the Sivas. Many of these were famous in antiquity and occur in a list given by Strabo. The Maeander valley is especially noted for its hot springs.

Geology.—The central plateau of Asia Minor consists of nearly horizontal strata, while the surrounding mountain chains form a complex system, in which the beds are intensely folded. Around the coast flat-lying deposits of Tertiary age are found, and these often extend high up into the mountain region. The deposits of the central, or Lycaonian, plateau consist of freshwater marls and limestones of late Tertiary or Neogene age. Along the south-eastern margin, in front of the Taurus, stands a line of great volcanoes, stretching from Kara-Dagh to Argaeus. They are now extinct, but were probably active till the close of the Tertiary period. On its southern side the plateau is bounded by the high chains of the Taurus and the Anti-Taurus, which form a crescent with its convexity facing southwards. Devonian and Carboniferous fossils have been found in several places in the Anti-Taurus. Limestones of Eocene or Cretaceous age form a large part of the Taurus, but the interior zone probably includes rocks of earlier periods. The folding of the Anti-Taurus affects the Eocene but not the Miocene, while in the Taurus the Miocene beds have been elevated, but without much folding, to great heights. North of the Lycaonian plateau lies another zone of folding which may be divided into the East Pontian and West Pontian arcs. In the east a well-defined mountain system runs nearly parallel to the Black Sea coast from Batum to Sinope, forming a gentle curve with its convexity facing southwards. Cretaceous limestones and serpentine take a large part in the formation of these mountains, while even the Oligocene is involved in the folds. West of Sinope Cretaceous beds form a long strip parallel to the shore line. Carboniferous rocks occur at Eregli (Heraclea Pontica), where they have been worked for coal. Devonian fossils have been found near the Bosporus and Carboniferous fossils at Balia Maden in Mysia. Triassic, Jurassic and Cretaceous beds form a band south of the Sea of Marmora, probably the continuation of the Mesozoic band of the Black Sea coast. Farther south there are zones of serpentine, and of crystalline and schistose rocks, some of which are probably Palaeozoic. The direction of the folds of this region is from west to east, but on the borders of Phrygia and Mysia they meet the north-westerly extension of the Taurus folds and bend around the ancient mass of Lydia. Marine Eocene beds occur near the Dardanelles, but the Tertiary deposits of this part of Asia Minor are mostly freshwater and belong to the upper part of the system. In western Mysia they are much disturbed, but in eastern Mysia they are nearly horizontal. They are often accompanied by volcanic rocks, which are mainly andesitic, and they commonly lie unconformably upon the older beds. In the western part of Asia Minor there are several areas of ancient rocks about which very little is known. The Taurus folds here meet another system which enters the region from the Aegean Sea.

Climate.—The climate is varied, but systematic observations are wanting. On the plateau the winter is long and cold, and in the northern districts there is much snow. The summer is very hot, but the nights are usually cool. On the north coast the winter is cold, and the winds, sweeping across the Black Sea from the steppes of Russia, are accompanied by torrents of rain and heavy falls of snow. East of Samsun, where the coast is partially protected by the Caucasus, the climate is more moderate. In summer the heat is damp and enervating, and, as Trebizond is approached, the vegetation becomes almost subtropical. On the south coast the winter is mild, with occasional frosts and heavy rain; the summer heat is very great. On the west coast the climate is moderate, but the influence of the cold north winds is felt as far south as Smyrna, and the winter at that place is colder than in corresponding latitudes in Europe. A great feature of summer is the *inbat* or north wind, which blows almost daily, often with the force of a gale, off the sea from noon till near sunset.

Products, &c.—The mineral wealth of Asia Minor is very great, but few mines have yet been opened. The minerals known to exist are—alum, antimony, arsenic, asbestos, boracide, chrome, coal, copper, emery, fuller's earth, gold, iron, kaolin, lead, lignite, magnetic iron, manganese, meerschaum, mercury, nickel, rock-salt, silver, sulphur and zinc. The vegetation varies with the climate, soil and elevation. The mountains on the north coast are clothed with dense forests of pine, fir, cedar, oak, beech, &c. On the Taurus range the forests are smaller, and there is a larger proportion of pine. On the west coast the ilex, plane, oak, valonia oak, and pine predominate. On the plateau willows, poplars and chestnut trees grow near the

streams, but nine-tenths of the country is treeless, except for scrub. On the south and west coasts the fig and olive are largely cultivated. The vine yields rich produce everywhere, except in the higher districts. The apple, pear, cherry and plum thrive well in the north; the orange, lemon, citron and sugar-cane in the south; styrax and mastic in the south-west; and the wheat lands of the Sivas vilayet can hardly be surpassed. The most important vegetable productions are—cereals, cotton, gum tragacanth, liquorice, olive oil, opium, rice, saffron, salep, tobacco and yellow berries. Silk is produced in large quantities in the vicinity of Brusa and Amasia, and mohair from the Angora goat all over the plateau. The wild animals include bear, boar, chamois, fallow red and roe deer, gazelle, hyena, ibex, jackal, leopard, lynx, mouflon, panther, wild sheep and wolf. The native reports of a maneless lion in Lycia (*arslan*) are probably based on the existence of large panthers. Amongst the domestic animals are the buffalo, the Syrian camel, and a mule camel, bred from a Bactrian sire and Syrian mother. Large numbers of sheep and Angora goats are reared on the plateau, and fair horses are bred on the Uzun Yaila; but no effort is made to improve the quality of the wool and mohair or the breed of horses. Good mules can be obtained in several districts, and small hardy oxen are largely bred for ploughing and transport. The larger birds are the bittern, great and small bustard, eagle, francolin, goose; giant, grey and red-legged partridge, sand grouse, pelican, pheasant, stork and swan. The rivers and lakes are well supplied with fish, and the mountain streams abound with small trout.

The principal manufactures are:—Carpets, rugs, cotton, tobacco, mohair and silk stuffs, soap, wine and leather. The exports are:—Cereals, cotton, cotton seed, dried fruits, drugs, fruit, gall nuts, gum tragacanth, liquorice root, maize, nuts, olive oil, opium, rice, sesame, sponges, storax, timber, tobacco, valonia, walnut wood, wine, yellow berries, carpets, cotton yarn, cocoons, hides, leather, mohair, silk, silk stuffs, rugs, wax, wool, leeches, live stock, minerals, &c. The imports are:—Coffee, cotton cloths, cotton goods, crockery, drysalteries, fezzes, glass-ware, haberdashery, hardware, henna, iron-ware, jute, linen goods, manufactured goods, matches, petroleum, salt, sugar, woollen goods, yarns, &c.

Communications.—There are few metalled roads, and those that exist are in bad repair, but on the plateau light carts can pass nearly everywhere. The lines of railway now open are:—(1) From Haidar Pasha to Ismid, Eski-shehr and Angora; (2) from Mudania to Brusa; (3) from Eski-shehr to Afium-Kara-hissar, Konia and Bulgurli, east of Eregli (the first section of the Bagdad railway). These lines are worked by the German *Gesellschaft der anatolischen Eisenbahnen*. (4) From Smyrna to Manisa, Ala-shehr and Afium Kara-hissar, with a branch line from Manisa to Soma. This line is worked by a French company. (5) From Smyrna to Aidin and Dineir, with branches to Odemish, Tireh, Sokia, Denizli, Ishekli, Seidi Keui and Bouja, constructed and worked by an English company. (6) From Mersina to Tarsus and Adana, an English line under a control mainly French. There are two competing routes for the eastern trade—one running inland from Constantinople (Haidar Pasha), the other from Smyrna. The first is connected by ferry with the European railway system; the second with the great sea routes from Smyrna to Trieste, Marseilles and Liverpool. The right to construct all railways in Armenia and north-eastern Asia Minor has been conceded to Russia, and the Germans have a virtual monopoly of the central plateau.

Ethnology.—None of the conquering races that invaded Asia Minor, whether from the east or from the west, wholly expelled or exterminated the race in possession. The vanquished retired to the hills or absorbed the victors. In the course of ages race distinction has been almost obliterated by fusion of blood; by the complete Hellenization of the country, which followed the introduction of Christianity; by the later acceptance of Islam; and by migrations due to the occupation of cultivated lands by the nomads. It will be convenient here to adopt the modern division into Moslems, Christians and Jews:—(*a*) *Moslems.* The Turks never established themselves in such numbers as to form the predominant element in the population. Where the land was unsuitable for nomad occupation the agricultural population remained, and it still retains some of its original characteristics. Thus in Cappadocia the facial type of the non-Aryan race is common, and in Galatia there are traces of Gallic blood. The Zeibeks of the west and south-west are apparently representatives of the Carians and Lycians; and the peasants of the Black Sea coast range of the people of Bithynia, Paphlagonia and Pontus. Wherever the people accepted Islam they called themselves Turks, and a majority of the so-called "Turks" belong by blood to the races that occupied Asia Minor before the Seljuk invasion. Turkish and Zaza-speaking Kurds (see KURDISTAN) are found in the Angora and Sivas vilayets. There are many large colonies of Circassians and smaller ones of Noghai (Nogais), Tatars, Georgians, Lazis, Cossacks, Albanians and Pomaks. East of Boghaz Keui there is a compact population of Kizilbash, who are partly descendants of Shia Turks transplanted from Persia and partly of the indigenous race. In the Cilician plain there are large settlements of Nosairis who have migrated from the Syrian mountains (see SYRIA). The nomads and semi-nomads are, for the most part, representatives of the Turks, Mongols and Tatars who poured into the country during the 350 years that followed the defeat of Romanus. Turkomans are found in the Angora and Adana vilayets; Avshars, a tribe of Turkish origin, in the valleys of Anti-Taurus; and Tatars in the Angora and Brusa vilayets; Yuruks are most numerous in the Konia vilayet. They speak Turkish and profess to be Moslems, but have no mosques or imams. The Turkomans have villages in which they spend the winter, wandering over the great plains of the interior with their flocks and herds during the summer. The Yuruks on the contrary are a truly nomad race. Their tents are made of black goats' hair and their principal covering is a cloak of the same material. They are not limited to the milder districts of the interior, but when the harvest is over, descend into the rich plains and valleys near the coast. The Chepmi and Takhtaji, who live chiefly in the Aidin vilayet, appear to be derived from one of the early races. (*b*) *Christians.* The Greeks are in places the descendants of colonists from Greece, many of whom, *e.g.* in Pamphylia and the Smyrna district, are of very recent importation; but most of them belong by blood to the indigenous races. These people became "Greeks" as being subjects of the Byzantine empire and members of the Eastern Church. On the west coast, in Pontus and to some extent of late in Cappadocia, and in the mining villages, peopled from the Trebizond Greeks, the language is Romaic; on the south coast and in many inland villages (*e.g.* in Cappadocia) it is either Turkish, which is written in Greek characters, or a Greco-Turkish jargon. In and near Smyrna there are large colonies of Hellenes. Armenians are most numerous in the eastern districts, where they have been settled since the great migration that preceded and followed the Seljuk Invasion. There are, however, Armenians in every large town. In central and western Asia Minor they are the descendants of colonists from Persia and Armenia (see ARMENIA). (*c*) The *Jews* live chiefly on the Bosporus; and in Smyrna, Rhodes, Brusa and other western towns. *Gypsies*—some Moslem, some Christian—are also numerous, especially in the south.

History.—Asia Minor owes the peculiar interest of its history to its geographical position. "Planted like a bridge between Asia and Europe," it has been from the earliest period a battle-ground between the East and the West. The central plateau (2500 to 4500 ft.), with no navigable river and few natural approaches, with its monotonous scenery and severe climate, is a continuation of central Asia. The west coast, with its alternation of sea and promontory, of rugged mountains and fertile valleys, its bright and varied scenery, and its fine climate, is almost a part of Europe. These conditions are unfavourable to permanence, and the history of Asia Minor is that of the march of hostile armies, and rise and fall of small states, rather than that of a united state under an independent sovereign. At a very early period Asia Minor appears to have been occupied by non-Aryan tribes or races which differed little from each other in religion, language and social system. During the past generation much light has been thrown upon one of these races—the "Hittites" or "Syro-Cappadocians," who, after their rule had passed away, were known to Herodotus as "White Syrians," and whose descendants can still be recognized in the villages of Cappadocia.[1] The centre of their power is supposed to have been Boghaz Keui (see PTERIA), east of the Halys, whence roads radiated to harbours on the Aegean, to Sinope, to northern Syria and to the Cilician plain. Their strange sculptures and inscriptions have been found at Pteria, Euyuk, Fraktin, Kiz Hissar (Tyana), Ivriz, Bulgar, Muden and other places between Smyrna and the

[1] The people, Moslem and Christian, are physically one and appear to be closely related to the modern Armenians. This relationship is noticeable in other districts, and the whole original population of Asia Minor has been characterized as Proto-Armenian or Armenoid.

Euphrates (see HITTITES). When the great Aryan immigration from Europe commenced is unknown, but it was dying out in the 11th and 10th centuries B.C. In Phrygia the Aryans founded a kingdom, of which traces remain in various rock tombs, forts and towns, and in legends preserved by the Greeks. The Phrygian power was broken in the 9th or 8th century B.C. by the Cimmerii, who entered Asia Minor through Armenia; and on its decline rose the kingdom of Lydia, with its centre at Sardis. A second Cimmerian invasion almost destroyed the rising kingdom, but the invaders were expelled at last by Alyattes, 617 B.C. (see SCYTHIA). The last king, Croesus (? 560–546 B.C.) carried the boundaries of Lydia to the Halys, and subdued the Greek colonies on the coast. The date of the foundation of these colonies cannot be fixed; but at an early period they formed a chain of settlements from Trebizond to Rhodes, and by the 8th century B.C. some of them rivalled the splendour of Tyre and Sidon. Too jealous of each other to combine, and too demoralized by luxury to resist, they fell an easy prey to Lydia; and when the Lydian kingdom ended with the capture of Sardis by Cyrus, 546 B.C. they passed, almost without resistance, to Persia. Under Persian rule Asia Minor was divided into four satrapies, but the Greek cities were governed by Greeks, and several of the tribes in the interior retained their native princes and priest-dynasts. An attempt of the Greeks to regain their freedom was crushed, 500–494 B.C., but later the tide turned and the cities were combined with European Greeks into a league for defence against the Persians. The weakness of Persian rule was disclosed by the expedition of Cyrus and the Ten Thousand Greeks, 402 B.C.; and in the following century Asia Minor was invaded by Alexander the Great (*q.v.*), 334 B.C. (See GREECE; PERSIA; IONIA.)

The wars which followed the death of Alexander eventually gave Asia Minor to Seleucus, but none of the Seleucid kings was able to establish his rule over the whole peninsula. Rhodes became a great maritime republic, and much of the south and west coast belonged at one time or another to the Ptolemies of Egypt. An independent kingdom was founded at Pergamum, 283 B.C., which lasted until Attalus III., 133 B.C., made the Romans his heirs. Bithynia became an independent monarchy, and Cappadocia and Paphlagonia tributary provinces under native princes. In southern Asia Minor the Seleucids founded Antioch, Apamea, Attalia, the Laodiceas and Seleuceias, and other cities as centres of commerce, some of which afterwards played an important part in the Hellenization (see HELLENISM) of the country, and in the spread of Christianity. During the 3rd century, 278–277 B.C., certain Gallic tribes crossed the Bosporus and Hellespont, and established a Celtic power in central Asia Minor. They were confined by the victories of Attalus I. of Pergamum, *c.* 232 B.C., to a district on the Sangarius and Halys to which the name Galatia was applied; and after their defeat by Manlius, 189 B.C., they were subjected to the suzerainty of Pergamum (see GALATIA).

The defeat of Antiochus the Great at Magnesia, 190 B.C., placed Asia Minor at the mercy of Rome; but it was not until 133 that the first Roman province, Asia, was formed to include only western Anatolia, without Bithynia. Errors in policy and in government facilitated the rise of Pontus into a formidable power under Mithradates, who was finally driven out of the country by Pompey, and died 63 B.C. Under the settlement of Asia Minor by Pompey, Bithynia-Pontus and Cilicia became provinces, whilst Galatia and Cappadocia were allowed to retain nominal independence for over half a century more under native kings, and Lycia continued an autonomous League. A long period of tranquillity followed, during which the Roman dominion grew, and all Asia Minor was divided into two provinces. The boundaries were often changed; and about A.D. 297, in Diocletian's reorganization of the empire, the power of the great military commands was broken, and the provinces were made smaller and united in groups called dioceses. A great change followed the introduction of Christianity, which spread first along the main roads that ran north and west from the Cilician Gates, and especially along the great trade route to Ephesus. In some districts it spread rapidly, in others slowly. With its advance the native languages and old religions gradually disappeared, and at last the whole country was thoroughly Hellenized, and the people united by identity of language and religion.

At the close of the 6th century Asia Minor had become wealthy and prosperous; but centuries of peace and over-centralization had affected the *moral* of the people and weakened the central government. During the 7th century the provincial system broke down, and the country was divided into *themes* or military districts. From 616 to 626 Persian armies swept unimpeded over the land, and Chosroes (Khosrau) II. pitched his camp on the shore of the Bosporus. The victories of Heraclius forced Chosroes to retire; but the Persians were followed by the Arabs, who, advancing with equal ease, laid siege to Constantinople, A.D. 668. It almost appeared as if Asia Minor would be annexed to the dominion of the Caliph. But the tide of conquest was stemmed by the iconoclast emperors, and the Arab expeditions, excepting those of Harun al-Rashid, 781 and 806, and of el-Motasim, 838, became simply predatory raids. In the 10th century the Arabs were expelled. They never held more than the districts along the main roads, and in the intervals of peace the country rapidly recovered itself. But a more dangerous enemy was soon to appear on the eastern border.

In 1067 the Seljuk Turks ravaged Cappadocia and Cilicia; in 1071 they defeated and captured the emperor Romanus Diogenes, and in 1080 they took Nicaea. One branch of the Seljuks founded the empire of Rum, with its capital first at Nicaea and then at Iconium. The empire, which at one time included nearly the whole of Asia Minor, with portions of Armenia and Syria, passed to the Mongols when they defeated the sultan of Rum in 1243, and the sultans became vassals of the Great Khan. The Seljuk sultans were liberal patrons of art, literature and science, and the remains of their public buildings and tombs are amongst the most beautiful and most interesting in the country. The marches of the Crusaders across Asia Minor left no permanent impression. But the support given by the Latin princes to the Armenians in Cilicia facilitated the growth of the small warlike state of Lesser Armenia, which fell in 1375 with the defeat and capture of Leo VI. by the Mameluke sultan of Egypt. The Mongols were too weak to govern the country they had conquered, and the vassalage of the last sultan of Rum, who died in 1307, was only nominal. On his death the Turkoman governors of his western provinces drove out the Mongols and asserted their independence. A contest for supremacy followed, which eventually ended in favour of the Osmanli Turks of Brusa. In 1400 Sultan Bayezid I. held all Asia Minor west of the Euphrates; but in 1402 he was defeated and made prisoner by Timur, who swept through the country to the shores of the Aegean. On the death of Timur Osmanli supremacy was re-established after a prolonged struggle, which ended with the annexation by Mahommed II. (1451–1481) of Karamania and Trebizond, and the abandonment of the last of the Italian trading settlements which had studded the coast during the 13th and 14th centuries. The later history of Asia Minor is that of the Turkish empire. The most important event was the advance (1832–1833) of an Egyptian army, under Ibrahim Pasha, through the Cilician Gates to Konia and Kutaiah.

The defeat of the emperor Romanus (1071) initiated a change in the condition of Asia Minor which was to be complete and lasting. A long succession of nomad Turkish tribes, pressing forward from central Asia, wandered over the rich country in search of fresh pastures for their flocks and herds. They did not plunder or ill-treat the people, but they cared nothing for town life or for agricultural pursuits, and as they passed onward they left the country bare. Large districts passed out of cultivation and were abandoned to the nomads, who replaced wheeled traffic by the pack horse and the camel. The peasants either became nomads themselves or took refuge in the towns or the mountains. The Mongols, as they advanced, sacked towns and laid waste the agricultural lands. Timur conducted his campaigns with a ruthless disregard of life and property. Entire Christian communities were massacred, flourishing towns were

ASIA MINOR
Scale, 1:5,375,000
English Miles
0 10 20 30 40 50 100 150
Railways
Konia-Bagdad Railway
Capitals of Vilayets &c.
BLACK SEA
MEDITERRANEAN SEA
AEGEAN SEA
TURKEY
Constantinople
SEA OF MARMORA
Bosporus
Dardanelles
Gallipoli
Samothrace
Imbros
Lemnos
Lesbos (Mytilene)
Chios
SAMOS
Icaria
Patmos
Leros
Calymnos
Cos
Amorgos
Rhodes
Carpathus
Casos
CRETE
Sinope (Sinub)
Kastamuni
Marsivan
Amasia
Tokat
Siwas (Sivas)
Angora (Ancyra)
Eski-Shehr
Siwri-Hissar
Kutaiah
Bergama (Pergamum)
Akhissar
Manisa
Smyrna
Ai-Shehr
Odemish
Aidin
Denizli
Buldur
Izbarta
Konia (Iconium)
Nev-Shehr
Akseral (Archelais)
Kaisarieh (Caesarea Mazaca)
Kir-Shehr
Kiz-Hissar (Tyana)
Karaman (Laranda)
Adana
Tarsus
Mersina
Alexandretta (Iskanderun)
Aleppo (Haleb)
Antioch (Antakia)
Latakia (Laodicea)
Hama
Homs
Tarabolus (Tripolis)
Nicosia
Famagusta
Larnaca
CYPRUS
Limasol
Kelenderis
Seleukia (Selencia)
Anamur (Anemourium)
Rhodes
Bay of Adalia
Gulf of Alexandretta
Gulf of Smyrna
Gulf of Chanderli
Gulf of Saros
Gulf of Cos
Sea of Marmora (Propontis)
Sea of Kyrenia
Sea of Syria
PAPHLAGONIA
BITHYNIA
ANATOLIA
GALATIA
CARIA
LYDIA
PISIDIA
PAMPHYLIA
CILICIA
Taurus Mts
Anti Taurus Mts
ARMENIA
MESOPOTAMIA
Ilkaz Dagh
Olympus
Murad Su
Sakaria (Sangarius)
Halys (Kizil Irmak)
Iris (Yeshil Irmak)
Euphrates
Orontes
Sihun (Sarus)
Jihun (Pyramus)
Tigris
Trebizond
Reference to Vilayets &c.
ANATOLIA 1 Archipelago, 3 Bigha, 3 Brusa, 4 Aidin (Smyrna) 5 Ismid, 6 Kastamuni, 7 Angora. 8 Konia, 9 Trebizond, 10 Sivas, 11 Adana. ARMENIA 12 Erzerum, 13 Kharput (Mamuret-el-Aziz), 14 Bitlis. 15 Diarbekr. SYRIA 16 Aleppo, 17 Beirut, 18 Syria.
A 26° B 28° C 30° D 32° E 34° F 36° G 38° H 40° I
Longitude East 34° of Greenwich
1 2 3 4 5
44° 42° 40° 38° 36°

completely destroyed, and all Asia Minor was ravaged. From these disasters the country never recovered, and the last traces of Western civilization disappeared with the enforced use of the Turkish language and the wholesale conversions to Islam under the earliest Osmanli sultans. The recent large increase of the Greek population in the western districts, the construction of railways, and the growing interests of Germany and Russia on the plateau seem, however, to indicate that the tide is again turning in favour of the West.

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ASIENTO, or ASSIENTO (from the verb *asentar*, to place, or establish), a Spanish word meaning a farm of the taxes, or contract. The farmer or contractor is called an *asentista*. The word acquired a considerable notoriety in English and American history, on account of the "Asiento Treaty" of 1713. Until 1702 the Spanish government had given the contract for the supply of negroes to its colonies in America to the Genoese. But after the establishment of the Bourbon dynasty in 1700, a French company was formed which received the exclusive privilege of the Spanish-American slave trade for ten years—from September 1702 to 1712. When the peace of Utrecht was signed the British government insisted that the monopoly should be given to its own subjects. By the terms of the Asiento treaty signed on the 16th of March 1713, it was provided that British subjects should be authorized to introduce 144,000 slaves in the course of thirty years, at the rate of 4800 per annum. The privilege was to expire on the 1st of May 1743. British subjects were also authorized to send one ship of 500 tons per annum, laden with manufactured goods, to the fairs of Porto Bello and La Vera Cruz. Import duties were to be paid for the slaves and goods. This privilege was conveyed by the British government to the South Sea Company, formed to work it. The privilege, to which an exaggerated value was attached, formed the solid basis of the notorious fit of speculative fever called the South Sea Bubble. Until 1739 the trade in blacks went on without interruption, but amid increasingly angry disputes between the Spanish and the British governments. The right to send a single trading ship to the fairs of Porto Bello or La Vera Cruz was abused. Under pretence of renewing her provisions she was followed by tenders which in fact carried goods. Thus there arose what was in fact a vast contraband trade. The Spanish government established a service of revenue boats (*guarda costas*) which insisted on searching all English vessels approaching the shores of the Spanish colonies. There can be no doubt that the smugglers were guilty of many piratical excesses, and that the *guarda costas* often acted with violence on mere suspicion. After many disputes, in which the claims of the British government were met by Spanish counter claims, war ensued in 1739. When peace was made at Aix-la-Chapelle in 1748 Spain undertook to allow the asiento to be renewed for the four years which were to run when war broke out in 1739. But the renewal for so short a period was not considered advantageous, and by the treaty of El Retiro of 1750, the British government agreed to the recession of the Asiento treaty altogether on the payment by Spain of £100,000.

A very convenient account of the Asiento Treaty, and of the trade which arose under it, will be found in Malachy Postlethwayt's *Universal Dictionary of Trade and Commerce* (London, 1751), *s.v.*

ASIR, a district in western Arabia, lying between 17° 30′ and 21° N., and 40° 30′ and 45° E.; bounded N. by Hejaz, E. by Nejd, S. by Yemen and W. by the Red Sea. Like Yemen, it consists of a lowland zone some 20 or 30 m. in width along the coast, and of a mountainous tract, falling steeply on the west and merging into a highland plateau which slopes gradually to the N.E. towards the Nejd steppes. Its length along the coast is about 230 m., and its breadth from the coast to El Besha about 180. The lowland, or Tehama, is hot and barren; the principal places in it are Kanfuda, the chief port of the district, Marsa Hali and El Itwad, smaller ports farther south. The mountainous tract has probably an average altitude of between 6000 and 7000 ft., with a temperate climate and regular rainfall, and is fertile and populous. The valleys are well watered and produce excellent crops of cereals and dates. The best-known are the Wadi Taraba and the W. Besha, both running north-east towards the W. Dawasir in Nejd. Taraba, according to John Lewis Burckhardt, is a considerable town, surrounded by palm groves and gardens, and watered by numerous rivulets, and famous for its long resistance to Mehemet Ali's forces in 1815. Five or six days' journey to the south-east is the district of Besha, the most important position between Sana and Taif. Here Mehemet Ali's army, amounting to 12,000 men, found sufficient provisions to supply it during a fortnight's halt. The Wadi Besha is a broad valley abounding with streams containing numerous hamlets scattered over a tract some six or eight hours' journey in length. Its principal affluent, the W. Shahran, rises 120 m. to the south and runs through the fertile district of Khamis Mishet, the highest in Asir. The Zahran district lies four days west of Besha on the crest of the main range: the principal place is Makhwa, a large town and market, from which grain is exported in considerable quantities to Mecca. Farther south is the district of Shamran. Throughout the mountainous country the valleys are well watered and cultivated, with fortified villages perched on the surrounding heights. Juniper forests are said to exist on the higher mountains. Three or four days' journey east and south-east of Besha are the encampments of the Bani Kahtan, one of the most ancient tribes of Arabia; their pastures extend into the adjoining district of Nejd, where they breed camels in large numbers, as well as a few horses.

The inhabitants are a brave and warlike race of mountaineers, and aided by the natural strength of their country they have

hitherto preserved their independence. Since the beginning of the 19th century they have been bigoted Wahhabis, though previously regarded by their neighbours as very lax Mahommedans; during Mehemet Ali's occupation of Nejd their constant raids on the Egyptian communications compelled him to send several punitive expeditions into the district, which, however, met with little success. Since the reconquest of Yemen by the Turks, they have made repeated attempts to subjugate Asir, but beyond occupying Kanfuda, and holding one or two isolated points in the interior, of which Ibha and Manadir are the principal, they have effected nothing.

The chief sources of information regarding Asir are the notes made by J. L. Burckhardt at Taif in 1814 and those of the French officers with the Egyptian expeditions into the country from 1814 to 1837. No part of Arabia would better repay exploration.

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ASISIUM (mod. *Assisi*), an ancient town of Umbria, in a lofty situation about 15 m. E.S.E. of Perusia. As an independent community it had already begun to use Latin as well as Umbrian in its inscriptions (for one of these recording the chief magistrates —*marones*—see *C.I.L.* xi. 5390). It became a *municipium* in 90 B.C., but, though numerous inscriptions (*C.I.L.* xi. 5371-5606) testify to its importance in the Imperial period, it is hardly mentioned by our classical authorities. Scanty traces of the ancient city walls may be seen; within the town the best-preserved building is the so-called temple of Minerva, with six Corinthian columns of travertine, now converted into a church, erected by Gaius and Titus Caesius in the Augustan era. It fronted on to the ancient forum, part of the pavement of which, with a base for the equestrian statues of Castor and Pollux (as the inscription upon it records) has been laid bare beneath the present Piazza Vittorio Emanuele. The remains of the amphitheatre, in *opus reticulatum*, may be seen in the north-east corner of the town; and other ancient buildings have been discovered. Asisium was probably the birthplace of Propertius. (T. As.)

ASKABAD, or ASKHABAD, a town of Russian central Asia, capital of the Transcaspian province, 345 m. by rail S.E. of Krasnovodsk and 594 from Samarkand, situated in a small oasis at the N. foot of the Kopet-dagh range. It has a public library and a technical railway school; also cotton-cleaning works, tanneries, brick-works, and a mineral-water factory. The trade is valued at £250,000 a year. The population, 2500 in 1881, when the Russians seized it, was 19,428 in 1897, one-third Persians, many of them belonging to the Babi sect.

ASKAULES (Gr. *ἀσκαύλης* [?] from *ἀσκός*, bag, *αὐλός*, pipe), probably the Greek word for bag-piper, although there is no documentary authority for its use. Neither it nor *ἄσκαυλος* (which would naturally mean the bag-pipe) has been found in Greek classical authors, though J. J. Reiske—in a note on Dio Chrysostom, *Orat.* lxxi. *ad fin.*, where an unmistakable description of the bag-pipe occurs ("and they say that he is skilled to write, to work as an artist, and to play the pipe with his mouth, on the bag placed under his arm-pits")—says that *ἀσκαύλης* was the Greek word for bag-piper. The only actual corroboration of this is the use of *ascaules* for the pure Latin *utricularius* in Martial x. 3. 8. Dio Chrysostom flourished about A.D. 100; it is therefore only an assumption that the bag-pipe was known to the classical Greeks by the name of *ἄσκαυλος*. It need not, however, be a matter of surprise that among the highly cultured Greeks such an instrument as the bag-pipe should exist without finding a place in literature. It is significant that it is not mentioned by Pollux (*Onomast.* iv. 74) and Athenaeus (*Deipnos.* iv. 76) in their lists of the various kinds of pipes.

See articles AULOS and BAG-PIPE; art. "Askaules" in Pauly-Wissowa, *Realencyclopädie.*

ASKE, ROBERT (d. 1537), English rebel, was a country gentleman who belonged to an ancient family long settled in Yorkshire, his mother being a daughter of John, Lord Clifford. When in 1536 the insurrection called the "Pilgrimage of Grace" broke out in Yorkshire, Aske was made leader; and marching with the banner of St Cuthbert and with the badge of the "five wounds," he occupied York on the 16th of October and on the 20th captured Pontefract Castle, with Lord Darcy and the archbishop of York, who took the oath of the rebels. He caused the monks and nuns to be reinstated, and refused to allow the king's herald to read the royal proclamation, announcing his intention of marching to London to declare the grievances of the commons to the sovereign himself, secure the expulsion of counsellors of low birth, and obtain restitution for the church. The whole country was soon in the hands of the rebels, a military organization with posts from Newcastle to Hull was established, and Hull was provided with cannon. Subsequently Aske, followed by 30,000 or 40,000 men, proceeded towards Doncaster, where lay the duke of Norfolk with the royal forces, which, inferior in numbers, would probably have been overwhelmed had not Aske persuaded his followers to accept the king's pardon, and the promise of a parliament at York and to disband. Soon afterwards he received a letter from the king desiring him to come secretly to London to inform him of the causes of the rebellion. Aske went under the guarantee of a safe-conduct and was well received by Henry. He put in writing a full account of the rising and of his own share in it; and, fully persuaded of the king's good intentions, returned home on the 8th of January 1537, bringing with him promises of a visit from the king to Yorkshire, of the holding of a parliament at York, and of free elections. Shortly afterwards he wrote to the king warning him of the still unquiet state not only of the north but of the midlands, and stating his fear that more bloodshed was impending. The same month he received the king's thanks for his action in pacifying Sir Francis Bigod's rising. But his position was now a difficult and a perilous one, and a few weeks later the attitude of the government towards him was suddenly changed. The new rising had given the court an excuse for breaking off the treaty and sending another army under Norfolk into Yorkshire. Possibly in these fresh circumstances Aske may have given cause for further suspicions of his loyalty, and in his last confession he acknowledged that communications to obtain aid had been opened with the imperial ambassador and were contemplated with Flanders. But it is more probable that the government had from the first treacherously affected to treat him with confidence to secure the secrets of the rebels and to effect his destruction. In March Norfolk congratulated Cromwell on the successful accomplishment of his task, having persuaded Aske to go to London on false assurances of security. He was arrested in April, tried before a commission at Westminster, and sentenced to death for high treason on the 17th of May; and on the 28th of June he was taken back to Yorkshire, being paraded in the towns and country through which he passed. He was hanged at York in July, expressing repentance for breaking the king's laws, but declaring that he had promise of pardon both from Cromwell and from Henry. It is related that his servant, Robert Wall, died of grief at the thought of his master's approaching execution. Aske was a real leader, who gained the affection and confidence of his followers; and his sudden rise to greatness and his choice by the people point to abilities that have not been recorded.

See *Henry VIII. and the English Monasteries*, by F. A. Gasquet (1906); *Letters and Papers of the Reign of Henry VIII.*, vols. xi. and xii.; *English Histor. Review*, v. 330, 550 (account of the rebellion, examination and answers to interrogations); *Chronicle of Henry VIII.*, tr. by M. A. S. Hume (1889); Whitaker's *Richmondshire*, i. 116 (pedigree of the Askes).

ASKEW, or ASCUE, **ANNE** (1521?–1546), English Protestant martyr, born at Stallingborough about 1521, was the second daughter of Sir William Askew (d. 1540) of South Kelsey, Lincoln, by his first wife Elizabeth, daughter of Thomas Wrottesley. Her elder sister, Martha, was betrothed by her parents to Thomas Kyme, a Lincolnshire justice of the peace, but she died before marriage, and Anne was induced or compelled to take her place. She is said to have had two children by Kyme, but religious differences and incompatibility of temperament soon estranged the couple. Kyme was apparently an unimaginative man of the world, while Anne took to Bible-reading with zeal, became convinced of the falsity of the doctrine

of transubstantiation, and created some stir in Lincoln by her disputations. According to Bale and Foxe her husband turned her out of doors, but in the privy council register she is said to have "refused Kyme to be her husband without any honest allegation." She had as good a reason for repudiating her husband as Henry VIII. for repudiating Anne of Cleves. In any case, she came to London and made friends with Joan Bocher, who was already known for heterodoxy, and other Protestants. She was examined for heresy in March 1545 by the lord mayor, and was committed to the Counter prison. Then she was examined by Bonner, the bishop of London, who drew up a form of recantation which he entered in his register. This fact led Parsons and other Catholic historians to state that she actually recanted, but she refused to sign Bonner's form without qualification. Two months later, on the 24th of May, the privy council ordered her arrest. On the 13th of June 1545, she was arraigned as a sacramentarian under the Six Articles at the Guildhall; but no witness appeared against her; she was declared not guilty by the jury and discharged after paying her fees.

The reactionary party, which, owing to the absence of Hertford and Lisle and to the presence of Gardiner, gained the upper hand in the council in the summer of 1546, were not satisfied with this repulse; they probably aimed at the leaders of the reforming party, such as Hertford and possibly Queen Catherine Parr, who were suspected of favouring Anne, and on the 18th of June 1546 Anne was again arraigned before a commission including the lord mayor, the duke of Norfolk, St John, Bonner and Heath. No jury was empanelled and no witnesses were called; she was condemned, simply on her confession, to be burnt. On the same day she was called before the privy council with her husband. Kyme was sent home into Lincolnshire, but Anne was committed to Newgate, "for that she was very obstinate and heady in reasoning of matters of religion." On the following day she was taken to the Tower and racked; according to Anne's own statement, as recorded by Bale, the lord chancellor, Wriothesley, and the solicitor-general, Rich, worked the rack themselves; but she "would not convert for all the pain" (Wriothesley, *Chronicle* i. 168). Her torture, disputed by Jardine, Lingard and others, is substantiated not only by her own narrative, but by two contemporary chronicles, and by a contemporary letter (*ibid.*; *Narratives of the Reformation*, p. 305; Ellis, *Original Letters*, 2nd Ser. ii. 177). For four weeks she was left in prison, and at length on the 16th of July, she was burnt at Smithfield in the presence of the same persecuting dignitaries who had condemned her to death.

AUTHORITIES.—Bale's two tracts, printed at Marburg in November 1546 and January 1547, are the basis of Foxe's account. See also *Acts of the Privy Council* (1542–1547), pp. 424, 462; Wriothesley's *Chron.* i. 155, 167-169; *Narratives of the Reformation*, passim; Gough's *Index to Parker Soc. Publications*; Burnet's *Hist. of the Reformation*; Dixon's *Hist. of the Church of England*; *Dict. Nat. Biogr.* (A. F. P.)

AṢMAʿĪ [Abū Saʿīd ʿAbd ul-Malik ibn Quraib] (*c.* 739–831), Arabian scholar, was born of pure Arab stock in Baṣra and was a pupil there of Abū ʿAmr ibn ul-ʿAlā. He seems to have been a poor man until by the influence of the governor of Baṣra he was brought to the notice of Harūn al-Rashīd, who enjoyed his conversation at court and made him tutor of his son. He became wealthy and acquired property in Baṣra, where he again settled for a time; but returned later to Bagdad, where he died in 831. Aṣmaʿī was one of the greatest scholars of his age. From his youth he stored up in his memory the sacred words of the Koran, the traditions of the Prophet, the verses of the old poets and the stories of the ancient wars of the Arabs. He was also a student of language and a critic. It was as a critic that he was the great rival of Abū ʿUbaida (*q.v.*). While the latter followed (or led) the Shuʿūbite movement and declared for the excellence of all things not Arabian, Aṣmaʿī was the pious Moslem and avowed supporter of the superiority of the Arabs over all peoples, and of the freedom of their language and literature from all foreign influence. Some of his scholars attained high rank as literary men. Of Aṣmaʿī's many works mentioned in the catalogue known as the *Fihrist*, only about half a dozen are extant. Of these the *Book of Distinction* has been edited by D. H. Müller (Vienna, 1876); the *Book of the Wild Animals* by R. Geyer (Vienna, 1887); the *Book of the Horse*, by A. Haffner (Vienna, 1895); the *Book of the Sheep*, by A. Haffner (Vienna, 1896).

For life of Aṣmaʿī, see Ibn Khallikān, *Biographical Dictionary*, translated from the Arabic by McG. de Slane (Paris and London, 1842), vol. ii. pp. 123-127. For his work as a grammarian, G. Flügel, *Die grammatischen Schulen der Araber* (Leipzig, 1862), pp. 72-80. (G. W. T.)

ASMARA, the capital of the Italian colony of Eritrea, N.E. Africa. It is built on the Hamasen plateau, near its eastern edge, at an elevation of 7800 ft., and is some 40 m. W.S.W. in a direct line of the seaport of Massawa. Pop. (1904) about 9000, including the garrison of 300 Italian soldiers, and some 1000 native troops. The European civil population numbers over 500; the rest of the inhabitants are chiefly Abyssinians. There is a small Mahommedan colony. The town is strongly fortified. The European quarter contains several fine public buildings, including the residence of the governor, club house, barracks and hospital. Fort Baldissera is built on a hill to the south-west of the town and is considered impregnable.

Asmara, an Amharic word signifying "good pasture place," is a town of considerable antiquity. It was included in the maritime province of northern Abyssinia, which was governed by a viceroy who bore the title of Bahar-nagash (ruler of the sea). By the Abyssinians the Hamasen plateau was known as the plain of the thousand villages. Asmara appears to have been one of the most prosperous of these villages, and to have attained commercial importance through being on the high road from Axum to Massawa. When Werner Munzinger (*q.v.*) became French consul at Massawa, he entered into a scheme for annexing the Hamasen (of which Asmara was then the capital) to France, but the outbreak of the war with Germany in 1870 brought the project to nought (cf. A. B. Wylde, *Modern Abyssinia*, 1901). In 1872 Munzinger, now in Egyptian service, annexed Asmara to the khedivial dominions, but in 1884, owing to the rise of the mahdi, Egypt evacuated her Abyssinian provinces and Asmara was chosen by Ras Alula, the representative of the negus Johannes (King John), as his headquarters. Shortly afterwards the Italians occupied Massawa, and in 1889 Asmara (see ABYSSINIA: *History*). In 1900 the seat of government was transferred from Massawa to Asmara, which in its modern form is the creation of the Italians. It is surrounded by rich agricultural lands, cultivated in part by Italian immigrants, and is a busy trading centre. A railway from Massawa to Asmara was completed as far as Ghinda, at the foot of the plateau, in 1904. At Medrizien, 6 m. north of Asmara, are gold-mines which have been partially worked.

See G. Dainelli, *In Africa. Lettere dall' Eritrea* (Bergamo, 1908); R. Perini, *Di qua dal Mareb* (Florence, 1905).

ASMODEUS, or ASHMEDAI, an evil demon who appears in later Jewish tradition as "king of demons." He is sometimes identified with Beelzebub or Apollyon (Rev. ix. 11). In the Talmud he plays a great part in the legends concerning Solomon. In the apocryphal book of Tobit (iii. 8) occurs the well-known story of his love for Sara, the beautiful daughter of Raguel, whose seven husbands were slain in succession by him on their respective bridal nights. At last Tobias, by burning the heart and liver of a fish, drove off the demon, who fled to Egypt. From the part played by Asmodeus in this story, he has been often familiarly called the genius of matrimonial unhappiness or jealousy, and as such may be compared with Lilith. Le Sage makes him the principal character in his novel *Le Diable boiteux*. Both the word and the conception seem to have been derived originally from the Persian. The name has been taken to mean "covetous." It is in any case no doubt identical with the demon Aēshma of the Zend-Avesta and the Pahlavi texts. But the meaning is not certain. It is generally agreed that the second part of the name Asmodeus is the same as the Zend *daēwa*, *dēw*, "demon." The first part may be equivalent to Aēshma, the impersonation of anger. But W. Baudissin (Herzog-Hauck, *Realencyklopädie*) prefers to derive it from *ish*, to drive, set in motion; whence *ish-mīn*, driving, impetuous.

The legend of Asmodeus is given fully in the *Jewish Encyclopaedia*, s.v. See also the articles in the *Encyclopaedia Biblica*, Hastings' *Dictionary of the Bible*, and Herzog-Hauck, *Realencyklopädie*.

ASMONEUS, or ASAMONAEUS (so Josephus), great-grandfather of Mattathias, the father of Judas Maccabaeus. Nothing more is known of him, and the name is only given by Josephus (not in 1 Macc. ii. 1). But the dynasty was known to Josephus and the Mishna (once) as "the sons (race) of the Asamonaeans (of A.)"; and the Targum of 1 Sam. ii. 4 has "the house of the Hashmoneans who were weak, signs were wrought for them and strength." If not the founder, Asmoneus was probably the home of the family (cf. Heshmon, Jos. xv. 27).

See Schurer, *Geschichte des jüdischen Volkes*, i. 248 N; art. "Maccabees," § 2, in *Ency. Biblica.* (J. H. A. H.)

ASNIÈRES, a town of northern France, in the department of Seine, on the left bank of the Seine, about 1½ m. N.N.W. of the fortifications of Paris. Pop. (1906) 35,883. The town, which has grown rapidly in recent years, is a favourite boating centre for the Parisians. The industries include boat-building and the manufacture of colours and perfumery.

ASOKA, a famous Buddhist emperor of India who reigned from 264 to 228 or 227 B.C. Thirty-five of his inscriptions on rocks or pillars or in caves still exist (see INSCRIPTIONS: *Indian*), and they are among the most remarkable and interesting of Buddhist monuments (see BUDDHISM). Asoka was the grandson of Chandragupta, the founder of the Maurya (Peacock) dynasty, who had wrested the Indian provinces of Alexander the Great from the hands of Seleucus, and he was the son of Bindusāra, who succeeded his father Chandragupta, by a lady from Champā. The Greeks do not mention him and the Brahmin books ignore him, but the Buddhist chronicles and legends tell us much about him. The inscriptions, which contain altogether about five thousand words, are entirely of religious import, and their references to worldly affairs are incidental. They begin in the thirteenth year of his reign, and tell us that in the ninth year he had invaded Kalinga, and had been so deeply impressed by the horrors involved in warfare that he had then given up the desire for conquest, and devoted himself to conquest by "religion." What the religion was is explained in the edicts. It is purely ethical, independent alike of theology and ritual, and is the code of morals as laid down in the Buddhist sacred books for laymen. He further tells us that in the ninth year of his reign he formally joined the Buddhist community as a layman, in the eleventh year he became a member of the order, and in the thirteenth he "set out for the Great Wisdom" (the *Sambodhi*), which is the Buddhist technical term for entering upon the well-known, eightfold path to Nirvana. One of the edicts is addressed to the order, and urges upon its members and the laity alike the learning and rehearsal of passages from the Buddhist scriptures. Two others are proclamations commemorating visits paid by the king, one to the dome erected over the ashes of Konāgamana, the Buddha, another to the birthplace of Gotama, the Buddha (*q.v.*). Three very short ones are dedications of caves to the use of an order of recluses. The rest either enunciate the religion as explained above, or describe the means adopted by the king for propagating it, or acting in accordance with it. These means are such as the digging of wells, planting medicinal herbs, and trees for shade, sending out of missionaries, appointment of special officers to supervise charities, and so on. The missionaries were sent to Kashmir, to the Himalayas, to the border lands on the Indus, to the coast of Burma, to south India and to Ceylon. And the king claims that missions sent by him to certain Greek kingdoms that he names had resulted in the folk there conforming themselves to his religion. The extent of Asoka's dominion included all India from the thirteenth degree of latitude up to the Himalayas, Nepal, Kashmir, the Swat valley, Afghanistan as far as the Hindu Kush, Sind and Baluchistan. It was thus as large as, or perhaps somewhat larger than, British India before the conquest of Burma. He was undoubtedly the most powerful sovereign of his time and the most remarkable and imposing of the native rulers of India. "If a man's fame," says Köppen, "can be measured by the number of hearts who revere his memory, by the number of lips who have mentioned, and still mention him with honour, Asoka is more famous than Charlemagne or Caesar." At the same time it is probable that, like Constantine's patronage of Christianity, his patronage of Buddhism, then the most rising and influential faith in India, was not unalloyed with political motives, and it is certain that his vast benefactions to the Buddhist cause were at least one of the causes that led to its decline.

See also *Asoka*, by Vincent Smith (Oxford, 1901); *Inscriptions de Piyadasi*, by E. Senart (Paris, 1891); chapters on Asoka in T. W. Rhys Davids's *Buddhism* (20th ed., London, 1903), and *Buddhist India* (London, 1903); V. A. Smith, *Edicts of Asoka* (1909). (T. W. R. D.)

ASOLO (anc. *Acelum*), a town of Venetia, Italy, in the province of Treviso, about 19 m. N.W. direct from the town of Treviso, and some 10 m. E. of Bassano by road. Pop. (1901) 5847. It is well situated on a hill, 690 ft. above sea-level. Remains of Roman baths and of a theatre have been discovered in the course of excavation (*Notizie degli scavi*, 1877, 235; 1881, 205; 1882, 289), and the town was probably a *municipium*. It became an episcopal see in the 6th century. It was to Asolo that Catherine Cornaro, queen of Cyprus, retired on her abdication. Here she was visited by Pietro Bembo, who conceived here his *Dialoghi degli Asolani*, and by Andrea Navagero (Naugerius). Paulus Manutius was born here. The village of Masèr is 4½ m. to the E., and near it is the Villa Giacomelli, erected by Palladio, containing frescoes by Paolo Veronese, executed in 1566–1568 for Marcantonio Barbaro of Venice, and ranking among his best works.

ASOR (Hebr. for "ten"), an instrument "of ten strings" mentioned in the Bible, about which authors are not agreed. The word occurs only three times in the Bible, and has not been traced elsewhere. In Psalm xxxiii. 2 the reference is to "kinnor, nebel and asor"; in Psalm xcii. 3, to "nebel and asor"; in Psalm cxliv. to "nebel-asor." In the English version *asor* is translated "an instrument of ten strings," with a marginal note "omit" applied to "instrument." In the Septuagint, the word being derived from a root signifying "ten," the Greek is ἐν δεκαχορδῷ or ψαλτήριον δεκάχορδον, in the Vulgate *in decachordo psalterio*. Each time the word *asor* is used it follows the word *nebel* (see PSALTERY), and probably merely indicates a variant of the nebel, having ten strings instead of the customary twelve assigned to it by Josephus (*Antiquities*, vii. 12. 3).

See also Mendel and Reissmann, *Musikalisches Conversations-Lexikon*, vol. i. (Berlin, 1881); Sir John Stainer, *The Music of the Bible*, pp. 35-37; Forkel, *Allgemeine Geschichte der Musik*, Bd. i. p. 133 (Leipzig, 1788). (K. S.)

ASP (*Vipera aspis*), a species of venomous snake, closely allied to the common adder of Great Britain, which it represents throughout the southern parts of Europe, being specially abundant in the region of the Alps. It differs from the adder in having the head entirely covered with scales, shields being absent, and in having the snout somewhat turned up. The term "Asp" (ἀσπίς) seems to have been employed by Greek and Roman writers, and by writers generally down to comparatively recent times, to designate more than one species of serpent; thus the asp, by means of which Cleopatra is said to have ended her life, and so avoided the disgrace of entering Rome a captive, is now generally supposed to have been the cerastes, or horned viper (*Cerastes cornutus*), of northern Africa and Arabia, a snake about 15 in. long, exceedingly venomous, and provided with curious horn-like protuberances over each eye, which give it a decidedly sinister appearance. The snake, however, to which the word "asp" has been most commonly applied is undoubtedly the haje of Egypt, the *spy-slange* or spitting snake of the Boers (*Naja haje*), one of the very poisonous *Elarinae*, from 3 to 4 ft. long, with the skin of its neck loose, so as to render it dilatable at the will of the animal, as in the cobra of India, a species from which it differs only in the absence of the spectacle-like mark on the back of the neck. Like the cobra, also, the haje has its fangs extracted by the jugglers of the country, who afterwards train it to perform various tricks. The asp (*Pethen*, פֶּתֶן) is mentioned in various parts of the Old Testament. This name is twice translated "adder," but as nothing is told of it beyond its poisonous character and the intractability of its disposition, it is impossible accurately to determine the species.

ASPARAGINE, $C_4H_8N_2O_3$, a naturally occurring base, found in plants belonging to the natural orders Leguminosae and

Cruciferae. It occurs in two optically active forms, namely, as laevo-asparagine and dextro-asparagine. Laevo-asparagine was isolated in 1805 by L. N. Vauquelin. A. Piutti (*Gazz. chim. Ital.*, 1887, 17, p. 126; 1888, 18, p. 457) synthesized the asparagines from the monomethyl ester of inactive aspartic acid by heating it with alcoholic ammonia. In this way a mixture of the two asparagines was obtained, which were separated by picking out the hemihedral crystals.

$$HOOC\cdot CH\cdot NH_2\cdot CH_2\cdot COOC_2H_5+NH_3 = C_2H_5OH+HOOC\cdot CH\cdot NH_2\cdot CH_2\cdot CONH_2.$$

Laevo-asparagine is slightly soluble in cold water and readily soluble in hot water. It crystallizes in prisms, containing one molecule of water of crystallization, the anhydrous form melting at 234–235° C. Nitrous acid converts it into malic acid, $HOOC\cdot CHOH\cdot CH_2\cdot COOH$. It is laevo-rotatory in aqueous or in alkaline solution, and dextro-rotatory in acid solution (L. Pasteur, *Ann.Chim. Phys.*, 1851 [2], 31, p. 67). Dextro-asparagine was first found in 1886 in the shoots of the vetch (Piutti). It forms rhombic crystals possessing a sweet taste. It is dextro-rotatory in aqueous or alkaline solution, and laevo-rotatory in acid solution.

Hydrolysis by means of acids or alkalis converts the asparagines into aspartic acid; whilst on heating with water in a sealed tube they are converted into ammonium aspartate. The constitution of the asparagines has been determined by A. Piutti (*Gazz. chim. Ital.*, 1888, 18, p. 457).

ASPARAGUS, a genus of plants (nat. ord. Liliaceae) containing more than 100 species, and widely distributed in the temperate and warmer parts of the Old World; it was introduced from Europe into America with the early settlers. The name is derived from the Greek ἀσπάραγος or ἀσφάραγος, the origin of which is obscure. *Sperage* or *sparage* was the form in use from the 16th to 18th centuries, cf. the modern Italian *sparagio*. The vulgar corruption *sparrow-grass* or *sparagrass* was in accepted popular use during the 18th century, "asparagus" being considered pedantic. The plants have a short, creeping, underground stem from which spring slender, branched, aerial shoots. The leaves are reduced to minute scales bearing in their axils tufts of green, needle-like branches (the so-called *cladodes*), which simulate, and perform the functions of, leaves. In one section of the genus, sometimes regarded as a distinct genus *Myrsiphyllum*, the cladodes are flattened. The plants often climb or scramble, in which they are helped by the development of the scale-leaves into persistent spines. The flowers are small, whitish and pendulous; the fruit is a berry.

Several of the climbing species are grown in greenhouses for their delicate, often feathery branches, which are also valuable for cutting; the South African *Asparagus plumosus* is an especially elegant species. The so-called smilax, much used for decoration, is a species of the *Myrsiphyllum* section, *A. medeoloides*, also known as *Myrsiphyllum asparagoides*. The young shoots of *Asparagus officinalis* have from very remote times been in high repute as a culinary vegetable, owing to their delicate flavour and diuretic virtues. The plant, which is a native of the north temperate zone of the Old World, grows wild on the south coast of England; and on the waste steppes of Russia it is so abundant that it is eaten by cattle like grass. In common with the marsh-mallow and some other plants, it contains asparagine or aspartic acidamide. The roots of asparagus were formerly used as an aperient medicine, and the fruits were likewise employed as a diuretic. Under the name of Prussian asparagus, the spikes of an allied plant, *Ornithogalum pyrenaicum*, are used in some places. The diuretic action is extremely feeble, and neither the plant nor asparagine is now used medicinally.

Asparagus is grown extensively in private gardens as well as for market. The asparagus prefers a loose, light, deep, sandy soil; the depth should be 3 ft., the soil being well trenched, and all surplus water got away. A considerable quantity of well-rotted dung or of recent seaweed should be laid in the bottom of the trench, and another top-dressing of manure should be dug in preparatory to planting or sowing. The beds should be 3 ft. or 5 ft. wide, with intervening alleys of 2 ft., the narrower beds taking two rows of plants, the wider ones three rows. The beds should run east and west, so that the sun's rays may strike against the side of the bed. In some cases the plants are grown in equidistant rows 3 to 4 ft. apart. Where the beds are made with plants already prepared, either one-year-old or two-year-old plants may be used, for which a trench should be cut sufficient to afford room for spreading out the roots, the crowns being all kept at about 2 in. below the surface. Planting is best done in April, after the plants have started into growth. To prevent injury to the roots, it is, however, perhaps the better plan to sow the seeds in the beds where the plants are to remain. To experience the finest flavour of asparagus, it should be eaten immediately after having been gathered; if kept longer than one day, or set into water, its finer flavour is altogether lost. If properly treated, asparagus beds will continue to bear well for many years. The asparagus grown at Argenteuil, near Paris, has acquired much notoriety for its large size and excellent quality. The French growers plant in trenches instead of raised beds. The most common method of forcing asparagus is to prepare, early in the year, a moderate hot-bed of stable litter with a bottom heat of 70°, and to cover it with a common frame. After the heat of fermentation has somewhat subsided, the surface of the bed is covered with a layer of light earth or exhausted tan-bark, and in this the roots of strong mature plants are closely placed. The crowns of the roots are then covered with 3 to 6 in. of soil. A common three-light frame may hold 500 or 600 plants, and will afford a supply for several weeks. After planting, linings are applied when necessary to keep up the heat, but care must be taken not to scorch the roots; air must be occasionally admitted. Where there are pits heated by hot water or by the tank system, they may be advantageously applied to this purpose. A succession of crops must be maintained by annually sowing or planting new beds.

The "asparagus-beetle" is the popular name for two beetles, the "common asparagus beetle" (*Crioceris asparagi*) and the "twelve-spotted" (*C. duodecimpunctata*), which feed on the asparagus plant. *C. asparagi* has been known in Europe since early times, and was introduced into America about 1856; the rarer *C. duodecimpunctata* (sometimes called the "red" to distinguish it from the "blue" species) was detected in America in 1881. For an admirable account of these pests see F. H. Chittenden, *Circular 102 of the U. S. Dep. of Agriculture, Bureau of Entomology*, May 1908.

The "asparagus-stone" is a form of apatite, simulating asparagus in colour.

ASPASIA, an Athenian courtesan of the 5th century B.C., was born either at Miletus or at Megara, and settled in Athens, where her beauty and her accomplishments gained for her a great reputation. Pericles, who had divorced his wife (445), made her his mistress, and, after the death of his two legitimate sons, procured the passing of a law under which his son by her was recognized as legitimate. It was the fashion, especially among the comic poets, to regard her as the adviser of Pericles in all his political actions, and she is even charged with having caused the Samian and Peloponnesian wars (Aristoph. *Acharn.* 497). Shortly before the latter war, she was accused of impiety, and nothing but the tears and entreaties of Pericles procured her acquittal. On the death of Pericles she is said to have become the mistress of one Lysicles, whom, though of ignoble birth, she raised to a high position in the state; but, as Lysicles died a year after Pericles (428), the story is unconvincing. She was the chief figure in the dialogue *Aspasia* by Aeschines the Socratic, in which she was represented as criticizing the manners and training of the women of her time (for an attempted reconstruction of the dialogue see P. Natorp in *Philologus*, li. p. 489, 1892); in the *Menexenus* (generally ascribed to Plato) she is a teacher of rhetoric, the instructress of Socrates and Pericles, and a funeral oration in honour of those Athenians who had given their lives for their country (the authorship of which is attributed to Aspasia) is repeated by Socrates; Xenophon (*Oecon.* iii. 14) also speaks of her in favourable terms, but she is not mentioned by Thucydides. In opposition to this view, Wilamowitz-Möllendorff

(*Hermes*, xxxv. 1900) regards her simply as a courtesan, whose personality would readily become the subject of rumour, favourable or unfavourable. There is a bust bearing her name in the Pio Clementino Museum in the Vatican.

See Le Conte de Bièvre, *Les Deux Aspasies* (1736); J. B. Capefigue, *Aspasie et le siècle de Périclès* (1862); L. Becq de Fouquières, *Aspasie de Milet* (1872); H. Houssaye, *Aspasie, Cléopâtre, Théodora* (1899); R. Hamerling, *Aspasia* (a romance; Eng. trans. by M. J. Safford, New York, 1882); J. Donaldson, *Woman* (1907). Also PERICLES.

ASPASIUS, a Greek peripatetic philosopher, and a prolific commentator on Aristotle. He flourished probably towards the close of the 1st century A.D., or perhaps during the reign of Antoninus Pius. His commentaries on the *Categories*, *De Interpretatione*, *De Sensu*, and other works of Aristotle are frequently referred to by later writers, but have not come down to us. Commentaries on Plato, mentioned by Porphyry in his life of Plotinus, have also been lost. Commentaries on books 1–4, 7 (in part), and 8 of the *Nicomachean Ethics* are preserved; that on book 8 was printed with those of Eustratius and others by Aldus Manutius at Venice in 1536. They were partly (2–4) translated into Latin by Felicianus in 1541, and have frequently been republished, but their authenticity has been disputed. The most recent edition is by G. Heylbut in *Commentaria in Aristotelem Graeca*, xix. 1 (Berlin, 1889).

Another ASPASIUS, in the 3rd century A.D., was a Roman sophist and rhetorician, son or pupil of the rhetorician Demetrianus. He taught rhetoric in Rome, and filled the chair of rhetoric founded by Vespasian. He was secretary to the emperor Maximin. His orations, which are praised for their style, are lost.

ASPEN, an important section of the poplar genus (*Populus*) of which the common aspen of Europe, *P. tremula*, may be taken as the type,—a tall fast-growing tree with rather slender trunk, and grey bark becoming rugged when old. The roundish leaves, toothed on the margin, are slightly downy when young, but afterwards smooth, dark green on the upper and greyish green on the lower surface; the long slender petioles, much flattened towards the outer end, allow of free lateral motion by the lightest breeze, giving the foliage its well-known tremulous character. By their friction on each other the leaves give rise to a rustling sound. It is supposed that the mulberry trees (*Becaim*) mentioned in 1 Chronicles xiv. 14, 15 were really aspen trees. The flowers, which appear in March and April, are borne on pendulous hairy catkins, 2–3 in. long; male and female catkins are, as in the other species of the genus, on distinct trees.

The aspen is found in moist places, sometimes at a considerable elevation, 1600 ft. or more, in Scotland. It is an abundant tree in the northern parts of Britain, even as far as Sutherland, and is occasionally found in the coppices of the southern counties, but in these latter habitats seldom reaches any large size; throughout northern Europe it abounds in the forests,—in Lapland flourishing even in 70° N. lat., while in Siberia its range extends to the Arctic Circle; in Norway its upper limit is said to coincide with that of the pine; trees exist near the western coast having stems 15 ft. in circumference. The wood of the aspen is very light and soft, though tough; it is employed by coopers, chiefly for pails and herring-casks; it is also made into butchers' trays, pack-saddles, and various articles for which its lightness recommends it; sabots are also made of it in France, and in medieval days it was valued for arrows, especially for those used in target practice; the bark is used for tanning in northern countries; cattle and deer browse greedily on the young shoots and abundant suckers. Aspen wood makes but indifferent fuel, but charcoal prepared from it is light and friable, and has been employed in gunpowder manufacture. The powdered bark is sometimes given to horses as a vermifuge; it possesses likewise tonic and febrifugal properties, containing a considerable amount of salicin. The aspen is readily propagated either by cuttings or suckers, but has been but little planted of late years in Britain. *P. trepida*, or *tremuloides*, is closely allied to the European aspen, being chiefly distinguished by its more pointed leaves; it is a native of most parts of Canada and the United States, extending northwards as far as Great Slave Lake. The wood is soft and neither strong nor durable; it burns better in the green state than that of most trees, and is often used by the hunters of the North-West as fuel; split into thin layers, it was formerly employed in the United States for bonnet and hat making. It is largely manufactured into wood-pulp for paper-making. The bark is of some value as a tonic and febrifuge. *P. grandidentata*, the large-leaved American aspen, has ovate or roundish leaves deeply and irregularly serrated on the margin. The wood is light, soft and close-grained, but not strong. In northern New England and Canada it is largely manufactured into wood-pulp; it is occasionally used in turnery and for wooden-ware.

ASPENDUS (mod. *Balkis Kalé*, or, more anciently in the native language, ESTVEDYS (whence the adjective *Estvedijys* on coins), an ancient city of Pamphylia, very strongly situated on an isolated hill on the right bank of the Eurymedon at the point where the river issues from the Taurus. The sea is now about 7 m. distant, and the river is navigable only for about 2 m. from the mouth; but in the time of Thucydides ships could anchor off Aspendus. Really of pre-Hellenic date, the place claimed to be an Argive colony. It derived wealth from great *salines* and from a trade in oil and wool, to which the wide range of its admirable coinage bears witness from the 5th century B.C. onwards. There Alcibiades met the satrap Tissaphernes in 411 B.C., and thence succeeded in getting the Phoenician fleet, intended to co-operate with Sparta, sent back home. The Athenian, Thrasybulus, after obtaining contributions from Aspendus in 389, was murdered by the inhabitants. The city bought off Alexander in 333, but, not keeping faith, was forcibly occupied by the conqueror. In due course it passed from Pergamene to Roman dominion, and according to Cicero, was plundered of many artistic treasures by Verres. It was ranked by Philostratus the third city of Pamphylia, and in Byzantine times seems to have been known as Primopolis, under which name its bishop signed at Ephesus in A.D. 431. In medieval times it was evidently still a strong place, but it has now sunk, in the general decay of Pamphylia, to a wretched hamlet.

The ruins still extant are very remarkable, and, with the noble Roman theatre, the finest in the world, have earned for the place (as is the case with certain other great monuments) a legendary connexion with Solomon's Sheban queen. On the summit of the hillock, surrounded by a wall with three gates, lie the remains of the city. The public buildings round the forum can all be traced, and parts of them are standing to a considerable height. They consist of a fine nympheum on the north with a covered theatre behind it, covered market halls on the west, and a peristyle hall and a basilica on the east. In the plain below are large thermae, and ruins of a splendid aqueduct. But all else seems insignificant beside the huge theatre, half hollowed out of the north-east flank of the hill. This was first published by C. F. M. Texier in 1849, and has now been completely planned, &c., by Count Lanckoronski's expedition in 1884. It is built of local conglomerate and is in marvellous preservation. Erected to the honour of the emperors Marcus Aurelius and L. Verus by the architect Zeno, for the heirs of a local Roman citizen (as an inscription repeated over both portals attests), its auditorium has a circuit of 313·17 feet. There are forty tiers of seating, divided by one *diazoma*, and crowned by an arched gallery of rather later date, repaired in places with brick. This auditorium held 7500 spectators. The seats are not perfect, but so nearly so as to appear practically intact. The wooden stage has, of course, perished, but all its supporting structures are in place, and the great scena wall stands to its full height, and produces a magnificent impression whether from within or from without. Inwardly it was decorated with two orders of columns one above the other, with rich entablatures, much of which survives. In the *tympanum* is a relief of Bacchus (wrongly supposed to be of a female, and called the Bal-Kis, *i.e.* "Honey Girl"). The position of the sounding board above the stage is apparent. Under the forepart of the auditorium, built out from the hill, are immense vaults. The whole structure was enclosed within one great wall, pierced with numerous windows. This structure was probably put to some ecclesiastical Byzantine use, as certain mutilated heads of saints appear upon it; and later it became a fortress

and received certain additions. It is now under the care of the local *aghd* and not allowed to be plundered for building stone.

See C. Lanckoronski, *Villes de la Pamphylie et de la Pisidie*, i. (1890). (D. G. H.)

ASPER, AEMILIUS, Latin grammarian, possibly lived in the 2nd century A.D. He wrote commentaries on Terence, Sallust and Virgil. Numerous fragments of the last show that as both critic and commentator he possessed good judgment and taste. They are printed in Keil, *Probi in Vergilii Bucolica Commentarius* (1848); see also Suringar, *Historia Critica Scholiastarum Latinorum* (1834); Gräfenhan, *Geschichte der klassischen Philologie im Alterthum*, iv. (1843–1850). Two short grammatical treatises, extant under the name of Asper, and of very little value, have nothing to do with the commentator, but belong to a much later date—the time of Priscian (6th century). Both are printed in Keil, *Grammatici Latini*. See also Schanz, *Geschichte der römischen Litteratur*, § 598.

ASPER, HANS (1499–1571), Swiss painter, was born and died at Zürich. He wrought in a great variety of styles, but excelled chiefly in flower and fruit pieces, and in portrait-painting. Many of his pictures have perished, but his style may be judged from the illustrations to Gessner's *Historia Animalium*, for which he is said to have furnished the designs, and from portraits of Zwingli and his daughter Regula Gwalter, which are preserved in the public library of Zürich. It has been usual to class Asper among the pupils and imitators of Holbein, but an inspection of his works is sufficient to show that this is a mistake. Though Asper was held in high reputation by his fellow-citizens, who elected him a member of the Great Council, and had a medal struck in his honour, he seems to have died in poverty.

ASPERGES ("thou wilt sprinkle," from the Latin verb *aspergere*), the ceremony of sprinkling the people with holy water before High Mass in the Roman Catholic Church, so called from the first word of the verse (Ps. iv. 9) *Asperges me, Domini, hyssopo et mundabor*, with which the priest begins the ceremony. The brush used for sprinkling is an aspergill (*aspergillum*), or aspersoir, and the vessel for this water an *aspersorium*. The act of sprinkling the water is called *aspersion*.

ASPERN-ESSLING, BATTLE OF (1809), a battle fought on the 21st and 22nd of May 1809 between the French and their allies under Napoleon and the Austrians commanded by the archduke Charles (see NAPOLEONIC CAMPAIGNS). At the time of the battle Napoleon was in possession of Vienna, the bridges over the Danube had been broken, and the archduke's army was on and about the Bisamberg, a mountain near Korneuburg, on the left bank of the river. The first task of the French was the crossing of the Danube. Lobau, one of the numerous islands which divide the river into minor channels, was selected as the point of crossing, careful preparations were made, and on the night of the 19th-20th of May the French bridged all the channels from the right bank to Lobau and occupied the island. By the evening of the 20th great masses of men had been collected there and the last arm of the Danube, between Lobau and the left bank, bridged. Masséna's corps at once crossed to the left bank and dislodged the Austrian outposts. Undeterred by the news of heavy attacks on his rear from Tirol and from Bohemia, Napoleon hurried all available troops to the bridges, and by daybreak on the 21st, 40,000 men were collected on the Marchfeld, the broad open plain of the left bank, which was also to be the scene of the battle of Wagram. The archduke did not resist the passage; it was his intention, as soon as a large enough force had crossed, to attack it before the rest of the French army could come to its assistance. Napoleon had, of course, accepted the risk of such an attack, but he sought at the same time to minimize it by summoning every available battalion to the scene. His forces on the Marchfeld were drawn up in front of the bridges facing north, with their left in the village of Aspern (Gross-Aspern) and their right in Essling (or Esslingen). Both places lay close to the Danube and could not therefore be turned; Aspern, indeed, is actually on the bank of one of the river channels. But the French had to fill the gap between the villages, and also to move forward to give room for the supports to form up. Whilst they were thus engaged the archduke moved to the attack with his whole army in five columns. Three under Hiller, Bellegarde and Hohenzollern were to converge upon Aspern, the other two, under Rosenberg, to attack Essling. The Austrian cavalry was in the centre, ready to move out against any French cavalry which should attack the heads of the columns. During the 21st the bridges became more and more unsafe, owing to the violence of the current, but the French crossed without intermission all day and during the night.

The battle began at Aspern; Hiller carried the village at the first rush, but Masséna recaptured it, and held his ground with the same tenacity as he had shown at Genoa in 1800. The French infantry, indeed, fought on this day with the old stubborn bravery which it had failed to show in the earlier battles of the year. The three Austrian columns fighting their hardest through the day were unable to capture more than half the village; the rest was still held by Masséna when night fell. In the meanwhile nearly all the French infantry posted between the two villages and in front of the bridges had been drawn into the fight on either flank. Napoleon therefore, to create a diversion, sent forward his centre, now consisting only of cavalry, to charge the enemy's artillery, which was deployed in a long line and firing into Aspern. The first charge of the French was repulsed, but the second attempt, made by heavy masses of cuirassiers, was more serious. The French horsemen, gallantly led, drove off the guns, rode round Hohenzollern's infantry squares, and routed the cavalry of Lichtenstein, but they were unable to do more, and in the end they retired to their old position. In the meanwhile Essling had been the scene of fighting almost as desperate as that of Aspern. The French cuirassiers made repeated charges on the flank of Rosenberg's force, and for long delayed the assault, and in the villages Lannes with a single division made a heroic and successful resistance, till night ended the battle. The two armies bivouacked on their ground, and in Aspern the French and Austrians lay within pistol shot of each other. The latter had fought fully as hard as their opponents, and Napoleon realized that they were no longer the professional soldiers of former campaigns. The spirit of the nation was in them and they fought to kill, not for the honour of their arms. The emperor was not discouraged, but on the contrary renewed his efforts to bring up every available man. All through the night more and more French troops were put across.

At the earliest dawn of the 22nd the battle was resumed. Masséna swiftly cleared Aspern of the enemy, but at the same time Rosenberg stormed Essling at last. Lannes, however, resisted desperately, and reinforced by St Hilaire's division, drove Rosenberg out. In Aspern Masséna had been less fortunate, the counter-attack of Hiller and Bellegarde being as completely successful as that of Lannes and St Hilaire. Meantime Napoleon had launched a great attack on the Austrian centre. The whole of the French centre, with Lannes on the right and the cavalry in reserve, moved forward. The Austrian line was broken through, between Rosenberg's right and Hohenzollern's left, and the French squadrons poured into the gap. Victory was almost won when the archduke brought up his last reserve, himself leading on his soldiers with a colour in his hand. Lannes was checked, and with his repulse the impetus of the attack died out all along the line. Aspern had been lost, and graver news reached Napoleon at the critical moment. The Danube bridges, which had broken down once already, had at last been cut by heavy barges, which had been set adrift down stream for the purpose by the Austrians. Napoleon at once suspended the attack. Essling now fell to another assault of Rosenberg, and though again the French, this time part of the Guard, drove him out, the Austrian general then directed his efforts on the flank of the French centre, slowly retiring on the bridges. The retirement was terribly costly, and but for the steadiness of Lannes the French must have been driven into the Danube, for the archduke's last effort to break down their resistance was made with the utmost fury. Only the complete exhaustion of both sides put an end to the fighting. The French lost 44,000 out of 90,000 successively engaged, and amongst the

killed were Lannes and St Hilaire. The Austrians, 75,000 strong, lost 23,360. Even this, the first great defeat of Napoleon, did not shake his resolution. The beaten forces were at last withdrawn safely into the island. On the night of the 22nd the great bridge was repaired, and the army awaited the arrival of reinforcements, not in Vienna, but in Lobau.

See sketch map in article WAGRAM.

ASPHALT, or ASPHALTUM. The solid or semi-solid kinds of bitumen (*q.v.*) were termed ἄσφαλτος by the Greeks; and by some ancient classical writers the name of *pissasphaltum* (πίσσα, pitch) was also sometimes employed. The asphalt of the Dead Sea (known as *Lacus Asphaltites*) received considerable notice from early travellers, and Diodorus the historian states that the inhabitants of the surrounding parts were accustomed to collect it for use in Egypt for embalming. In common with other forms of bitumen, asphalt is very widely distributed geographically and occurs in greater or less quantity in rocks of all ages. There is some divergence in the views expressed as to the precise manner of its production, but it may certainly be said that the principal asphalt deposits are merely the result of the evaporation and oxidation of liquid petroleum which has escaped from outcropping strata. The celebrated Pitch Lake of Trinidad was long regarded as the largest deposit of asphalt in existence, but it is said to be exceeded in area, if not in depth also, by one in Venezuela. The Trinidad "Lake" has an area of 99·3 acres, and is sufficiently firm in places to support a team of horses. The deposit is worked with picks to a depth of a foot or two, and the excavations soon become filled up by the plastic material flowing in from below and hardening. The depth of the deposit is not accurately known. The surface is not level but is composed of irregularly tumescent masses of various sizes, each said to be subject to independent motion, whereby the interior of each rises and flows centrifugally towards the edges. As the spaces between them are always filled with water, these masses are prevented from coalescing. The softer parts of the lake constantly evolve gas, which is stated to consist largely of carbon dioxide and sulphuretted hydrogen, and the pitch, which is honeycombed with gas-cavities, continues to exhibit this action for some time after its removal from the lake. The working of the deposit is in the hands of the New Trinidad Asphalt Company, who hold the concession up to the year 1930 on payment to the government of a minimum royalty of £10,000 a year. A circular line of tramway, supported on palm-leaves, has been laid on the lake to facilitate the removal of the asphalt. Very large quantities are exported for paving and other purposes, the annual shipments amounting to about 130,000 tons from the lake and about 30,000 tons from other properties. The amount of asphalt in the lake has been estimated at 158,400 tons for each foot of depth, and if the average depth be taken at 20 ft. this would give a total of 3,168,000 tons; but in 1908, though 1,885,000 tons had been removed in the previous thirty-five years, there was but little evidence of reduction in the quantity. The Venezuelan deposit already referred to is in the state of Bermudez, and the area of it is reported to be more than 1000 acres. The asphalt of Cuba is a well-known article of commerce, of which 7252 tons was exported to the United States in 1902. The principal deposits are near the harbour of Cardenas (70 ft. thick), in the Pinar del Rio, near Havana (18 ft. thick), at Canas Tomasita (105 ft. thick); and a specially pure variety near Vuelta.

The comparative composition of Trinidad and Cuba asphalt is given in the following table:—

	Refined Trinidad, Melting point 185° F.	Refined Cuba (soft), Melting point 115° F.	Refined Cuba (hard), Melting point 160° F.
Water	0·17	0·13	0·11
Volatile bitumen	51·81	64·03	8·34
Sulphur	10·00	8·35	8·92
Ash (earthy matter)	28·30	19·51	16·60
Fixed carbon	9·72	7·98	66·03
	100·00	100·00	100·00

The chemical composition of Trinidad asphalt has been given as:—

C.	H.	N.	O.	S.
80·32	6·30	0·50	1·40	11·48

The following is a comparison of Trinidad and Venezuela (Bermudez) asphalt:—

	Refined Trinidad.	Refined Bermudez.
Specific gravity at 60° F.	1·373	1·071
Bitumen soluble in carbon bisulphide	61·507 %	92·22 %
Mineral matter (ash)	34·51 ,,	1·50 ,,
Non-bituminous organic matter	3·983 ,,	1·28 ,,
Portion of total bitumen soluble in alcohol	8·24 ,,	11·66 ,,
Portion of total bitumen soluble in ether	80·01 ,,	81·63 ,,
Loss at 212° F.	0·65 ,,	1·37 ,,
,, 400° F. in ten hours	7·98 ,,	17·80 ,,
Loss at 400° on total bitumen	12·811 ,,	18·308 ,,
Evolution of sulphuretted hydrogen at	410° F.	none at 437° F.
Softening-point	160° F.	,, 113° F.
Flowing-point	192° F.	,, 150° F.

Asphalt in its purest forms is generally black or blackish brown in colour, and is frequently brittle at ordinary temperatures. Apart from its principal use in the manufacture of paving materials, it is largely employed in building as a "damp-course" and as a water-excluding coating for concrete floors, as well as in the manufacture of roofing-felt. It also enters largely into the composition of black varnish. The material chiefly used in the construction of asphalt roadways is an asphaltic or bituminous limestone found in the Val de Travers, canton of Neuchâtel; in the neighbourhood of Seyssel, department of Ain; at Limmer, near the city of Hanover; and elsewhere. The proportion of bitumen present in asphalt rock usually ranges from 7 to 20%, but it is found that rock containing more than 11% cannot be satisfactorily used for street pavements, and it is accordingly customary to mix the richer and poorer varieties in fine powder in such respective quantities that the proportion of bitumen present is from 9 to 10%. The richer rock is utilized as a source of asphalt "mastic," which is employed for footpaths, floors, roofs, &c. Excellent foundations for steam-hammers, dynamos and high-speed engines are made of asphaltic concrete. (B. R.)

ASPHODEL (*Asphodelus*), a genus of the lily order (Liliaceae), containing seven species in the Mediterranean region. The plants are hardy herbaceous perennials with narrow tufted radical leaves and an elongated stem bearing a handsome spike of white or yellow flowers. *Asphodelus albus* and *A. fistulosus* have white flowers and grow from 1½ to 2 ft. high; *A. ramosus* is a larger plant, the large white flowers of which have a reddish-brown line in the middle of each segment. Bog-asphodel (*Narthecium ossifragum*), a member of the same family, is a small herb common in boggy places in Britain, with rigid narrow radical leaves and a stem bearing a raceme of small golden yellow flowers.

In Greek legend the asphodel is the most famous of the plants connected with the dead and the underworld. Homer describes it as covering the great meadow (ἀσφόδελος λειμών), the haunt of the dead (*Od.* xi. 539, 573; xxiv. 13). It was planted on graves, and is often connected with Persephone, who appears crowned with a garland of asphodels. Its general connexion with death is due no doubt to the greyish colour of its leaves and its yellowish flowers, which suggest the gloom of the underworld and the pallor of death. The roots were eaten by the poorer Greeks; hence such food was thought good enough for the shades (cf. Hesiod, *Works and Days*, 41; Pliny, *Nat. Hist.* xxi. 17 [68]; Lucian, *De luctu*, 19). The asphodel was also supposed to be a remedy for poisonous snake-bites and a specific against sorcery; it was fatal to mice, but preserved pigs from disease. The Libyan nomads made their huts of asphodel stalks (cf. Herod. iv. 190).

No satisfactory derivation of the word is suggested. The English word "daffodil" is a perversion of "asphodel," formerly written "affodil." The *d* may come from the French *fleur d'affodille*. It is no part of the word philologically.

See Pauly-Wissowa, *Realencyclopädie*, s.v.; H. O. Lenz, *Botanik der alten Griechen und Römer* (1859); J. Murr, *Die Pflanzenwelt in der griechischen Mythologie* (1890).

ASPHYXIA (Gr. ἀ- priv., σφύξις, a pulse), a term in medicine, literally signifying loss of pulsation, which is applied to describe the arrestment of the function of respiration from some hindrance to the entrance of air into the lungs. (See RESPIRATORY SYSTEM: *Pathology*.)

ASPIC (French, from Lat. *aspis*), an asp or viper found in Egypt whose bite is supposed to cause a swift and easy death, hence poetically a term for any venomous snake. From association, perhaps, with the coldness of the aspic (as in the French proverb, *froid comme un aspic*), the word is used for a savoury jelly containing meat, fish or eggs, &c. It is also the botanical name of the *Lavandula spica*, or spikenard, from which a white, aromatic and highly inflammable oil is distilled, called *huile d'aspic*.

ASPIDISTRA, a small genus of the lily order (Liliaceae), native of the Himalayas, China and Japan. *Aspidistra lurida* is a favourite pot-plant, bearing large green or white-striped leaves on an underground stem, and small dark purplish, cup-shaped flowers close to the ground.

ASPIROTRICHACEAE (O. Bütschli), an order of Ciliate Infusoria, characterized by an investment, general or partial, of nearly uniform cilia, without any distinct adoral wreath, and one or two adoral endoral undulating membranes. With the Gymnostomaceae it formed the Holotricha of Stein.

ASPIROZ, MANUEL DE (1836–1905), Mexican statesman and diplomatist, was born at Puebla, and educated at the university of Mexico, where he took his degree in 1855. He took part in the war against the emperor Maximilian, and in 1867, on the establishment of the republic, was appointed assistant secretary of state for foreign affairs. In 1873 he became Mexican consul at San Francisco, where he remained till his election to the Senate in 1875. He was professor of jurisprudence at the college of Puebla from 1883 to 1890, when he was again appointed assistant secretary of foreign affairs. From 1899 till he died in 1905 he was Mexican ambassador to the United States. Among his writings may be mentioned; *Código de extranjeria de los Estados-Unidos Mexicanos* (1876), and *La liberdad civil como base del derecho internacional privado* (1896).

ASPROMONTE, a mountain of Calabria, Italy, rising behind Reggio di Calabria, the west extremity of the Sila range. The highest point is 6420 ft. and the slopes are clad with forest. Here Garibaldi was wounded and taken prisoner by the Italian troops under Pallavicini in 1862.

ASQUITH, HERBERT HENRY (1852–), English statesman, son of Joseph Dixon Asquith, was born at Morley, Yorkshire, on the 12th of September 1852. He came of a middle-class Yorkshire family of pronounced Liberal and Nonconformist views, and was educated under Dr Edwin Abbott at the City of London school, from which he went as a scholar to Balliol, Oxford; there he had a distinguished career, taking a first-class in classics, winning the Craven scholarship and being elected a fellow of his college. He was president of the Union, and impressed all his contemporaries with his intellectual ability, Dr Jowett himself confidently predicting his signal success in any career he adopted. On leaving Oxford he went to the bar, and as early as 1890 became a K.C. In 1887 he unsuccessfully defended Mr R. B. Cunninghame Graham and Mr John Burns for their share in the riot in Trafalgar Square; and in 1889 he was junior to Sir Charles (afterwards Lord) Russell as counsel for the Irish Nationalists before the Parnell Commission—an association afterwards bitterly commented upon by Mr T. Healy in the House of Commons (March 30, 1908). But though he attained a fair practice at the bar, and was recognized as a lawyer of unusual mental distinction and clarity, his forensic success was not nearly so conspicuous as that of some of his contemporaries. His ambitions lay rather in the direction of the House of Commons. He had taken a prominent part in politics as a Liberal since his university days, especially in work for the Eighty Club, and in 1886 was elected member of parliament for East Fife, a seat which he retained in subsequent elections. Mr Gladstone was attracted by his vigorous ability as a speaker, and his evidence of sound political judgment; and in August 1892, though comparatively unknown to the general public, he was selected to move the vote of want of confidence which overthrew Lord Salisbury's government, and was made home secretary in the new Liberal ministry. At the Home Office he proved his capacity as an administrator; he was the first to appoint women as factory inspectors, and he was responsible for opening Trafalgar Square to Labour demonstrations; but he firmly refused to sanction the proposed amnesty for the dynamiters, and he was violently abused by extremists on account of the shooting of two men by the military at the strike riot at Featherstone in August 1893. It was he who coined the phrase (Birmingham, 1894) as to the government's "ploughing the sands" in their endeavour to pass Liberal legislation with a hostile House of Lords. His Employers' Liability Bill 1893 was lost because the government refused to accept the Lords' amendment as to "contracting-out." His suspensory bill, with a view to the disestablishment of the church in Wales, was abortive (1895), but it served to recommend him to the Welsh Nationalists as well as to the disestablishment party in England and Scotland. During his three years of office he more than confirmed the high opinion formed of his abilities.

The Liberal defeat in 1895 left him out of office for eleven years. He had married Miss Helen Melland in 1877, and was left with a family when she died in 1891; in 1894, however, he had married again, his second wife being the accomplished Miss Margaret ("Margot") Tennant, daughter of the wealthy ironmaster, Sir Charles Tennant, Bart., a lady well known in London society as a member of the côterie known as "Souls," and commonly identified as the original of Mr E. F. Benson's *Dodo* (1893). On leaving the Home Office in 1895, Mr Asquith decided to return to his work at the bar, a course which excited much comment, since it was unprecedented that a minister who had exercised judicial functions in that capacity should take up again the position of an advocate; but it was obvious that to maintain the tradition was difficult in the case of a man who had no sufficient independent means. During the years of Unionist ascendancy Mr Asquith divided his energies between his legal work and politics; but his adhesion to Lord Rosebery (*q.v.*) as a Liberal Imperialist at the time of the Boer War, while it strengthened his position in the eyes of the public, put him in some difficulty with his own party, led as it was by Sir Henry Campbell-Bannerman (*q.v.*), who was identified with the "pro-Boer" policy. He was one of the founders of the Liberal League, and his courageous definiteness of view and intellectual vigour marked him out as Lord Rosebery's chief lieutenant if that statesman should ever return to power. He thus became identified with the Roseberyite attitude towards Irish Home Rule; and, while he continued to uphold the Gladstonian policy in theory, in practice the Irish Nationalists felt that very little could be expected from his advocacy. In spite of his Imperialist views, however, he did much to smooth over the party difficulties, and when the tariff-reform movement began in 1903, he seized the opportunity for rallying the Liberals to the banner of free-trade and championing the "orthodox" English political economy, on which indeed he had been a lecturer in his younger days. During the critical years of Mr Chamberlain's crusade (1903–1906) he made himself the chief spokesman of the Liberal party, delivering a series of speeches in answer to those of the tariff-reform leader; and his persistent following and answering of Mr Chamberlain had undoubted effect. He also made useful party capital out of the necessity for financial retrenchment, owing to the large increase in public expenditure, maintained by the Unionist government even after the Boer War was over;

and his mastery of statistical detail and argument made his appointment as chancellor of the exchequer part of the natural order of things when in December 1905 Mr Balfour resigned and Sir Henry Campbell-Bannerman (*q.v.*) became prime minister.

During Sir Henry Campbell-Bannerman's premiership, Mr Asquith gradually rose in political importance, and in 1907 the prime minister's ill-health resulted in much of the leadership in the Commons devolving on the chancellor of the exchequer. At first the party as a whole had regarded him somewhat coldly. And his unbending common-sense, and sobriety of criticism in matters which deeply interested the less academic Radicals who were enthusiasts for extreme courses, would have made the parliamentary situation difficult but for the exceptional popularity of the prime minister. In the autumn of 1907, however, as the latter's retention of office became more and more improbable, it became evident that no other possible successor had equal qualifications. The session of 1908 opened with Mr Asquith acting avowedly as the prime minister's deputy, and the course of business was itself of a nature to emphasize his claims. After two rather humdrum budgets he was pledged to inaugurate a system of old-age pensions (forming the chief feature of the budget of 1908, personally introduced by him at the beginning of May), and his speech in April on the Licensing Bill was a triumph of clear exposition, though later in the year, after passing the Commons, it was thrown out by the Lords. On the 5th of April it was announced that Sir Henry Campbell-Bannerman had resigned and Mr Asquith been sent for by the king. As the latter was staying at Biarritz, the unprecedented course was followed of Mr Asquith journeying there for the purpose, and on the 8th he resigned the chancellorship of the exchequer and kissed hands as prime minister. The names of the new cabinet were announced on the 13th. The new appointments were: Lord Tweedmouth as lord president of the council (instead of the admiralty); Lord Crewe as colonial secretary (instead of lord president of the council); Mr D. Lloyd George, chancellor of the exchequer (transferred from the Board of Trade); Mr R. McKenna, first lord of the admiralty (instead of minister of education); Mr Winston Churchill, president of the Board of Trade; and Mr Walter Runciman, minister of education. Lord Elgin ceased to be colonial secretary, but Lord Loreburn (lord chancellor), Lord Ripon (lord privy seal), Mr H. Gladstone (Home Office), Sir E. Grey (foreign affairs), Mr Haldane (War Office), Mr Sinclair (secretary for Scotland; created in 1909 Lord Pentland), Mr Burns (Local Government Board), Lord Carrington (Board of Agriculture), Mr Birrell (Irish secretary), Mr S. Buxton (postmaster-general), Mr L. Harcourt (commissioner of works), Mr John Morley (India) and Sir Henry Fowler (duchy of Lancaster) retained their offices, the two latter being created peers. The Budget (see LLOYD GEORGE) was the sole feature of political interest in 1909, and its rejection in December by the Lords led to the general election of January 1910, which left the Liberals and Unionists practically equal, with the Labour and Irish parties dominating the situation (L. 275, U. 273, Lab. 40, I. 82). Mr Asquith was in a difficult position, but the ministry remained in office; and he had developed a concentration of forces with a view to attacking the veto of the House of Lords (see PARLIAMENT), when the death of the king in May caused a suspension of hostilities. A conference between the leaders on both sides was arranged, to discuss whether any compromise was possible, and controversy was postponed to an autumn session. (H. CH.)

ASS (O.E. *assa*; Lat. *asinus*), a common name (the synonym "donkey" is supposed to be derived either by analogy from "monkey," or from the Christian name Duncan; cf. Neddy, Jack, Dicky, &c.) for different varieties of the sub-genus *Asinus*, belonging to the horse tribe, and especially for the domestic ass; it differs from the horse in its smaller size, long ears, the character of its tail, fur and markings, and its proverbial dulness and obstinacy. The ancient Egyptians symbolized an ignorant person by the head and ears of an ass, and the Romans thought it a bad omen to meet one. In the middle ages the Germans of Westphalia made the ass the symbol of St Thomas, the incredulous apostle; the boy who was last to enter school on St Thomas' day was called the "Ass Thomas" (Gubernatis's *Zoological Mythology*, i. 362). The foolishness and obstinacy of the ass has caused the name to be transferred metaphorically to human beings; and the fifth proposition of Book i. of Euclid is known as the *Pons Asinorum*, bridge of asses.

ASS, FEAST OF THE, formerly a festival in northern France, primarily in commemoration of the biblical flight into Egypt, and usually held on the 14th of January. A girl with a baby at her breast and seated on an ass splendidly caparisoned was led through the town to the church, and there placed at the gospel side of the altar while mass was said. The ceremony degenerated into a burlesque in which the ass of the flight became confused with Balaam's ass. So scandalous became the popular revels associated with it, that the celebration was prohibited by the church in the 15th century. (See FOOLS, FEAST OF.)

ASSAB, a bay and port on the African shore of the Red Sea, 60 m. N. of the strait of Bab-el Mandeb. Assab Bay was the first territory acquired by Italy in Africa. Bought from the sultan of Raheita in 1870, it was not occupied until 1880. (See ERITREA, and ITALY: *History*.)

ASSAM, a former province of British India, which was amalgamated in 1905 with "Eastern Bengal and Assam" (*q.v.*). Area 56,243 sq. m.; pop. (1901) 6,126,343. The province of Assam lies on the N.E. border of Bengal, on the extreme frontier of the Indian empire, with Bhutan and Tibet beyond it on the N., and Burma and Manipur on the E. It comprises the valleys of the Brahmaputra and Surma rivers, together with the mountainous watershed which intervenes between them. It is situated between 24° 0′ and 28° 17′ N. lat., and between 89° 46′ and 97° 5′ E. long. It is bounded on the N. by the eastern section of the great Himalayan range, the frontier tribes from west to east being successively Bhutias, Akas, Daphlas, Miris, Abors and Mishmis; on the N.E. by the Mishmi hills, which sweep round the head of the Brahmaputra valley; on the E. by the unexplored mountains that mark the frontier of Burma, by the hills occupied by the independent Naga tribes and by the state of Manipur; on the S. by the Lushai hills, the state of Hill Tippera, and the Bengal district of Tippera; and on the W. by the Bengal districts of Mymensingh and Rangpur, the state of Kuch Behar and Jalpaiguri district.

Natural Divisions.—Assam is naturally divided into three distinct tracts, the Brahmaputra valley, the Surma valley and the hill ranges between the two. The Brahmaputra valley is an alluvial plain, about 450 m. in length, with an average breadth of 50 m., lying almost east and west. To the north is the main chain of the Himalayas, the lower ranges of which rise abruptly from the plain; to the south is the great elevated plateau or succession of plateaus known as the Assam range. The various portions of this range are called by the names of the tribes who inhabit them—the Garo, the Khasi, the Jaintia, the North Cachar and the Naga hills. The range as a whole is joined at its eastern extremity by the Patkai to the Himalayan system, and by the mountains of Manipur to the Arakan Yoma. The highest points in the range are Nokrek peak (4600 ft.) in the Garo hills, Shillong peak (6450 ft.) in the Khasi-Jaintia hills, and Japva peak (nearly 10,000 ft.) in the Naga hills. South of the range comes the third division of the province, the Surma valley, comprising the two districts of Cachar and Sylhet. The Surma valley is much smaller than the Brahmaputra valley, covering only 7506 against 24,283 sq. m.; its mean elevation is much lower and its rivers are more sluggish.

Physical Aspects.—Assam is a fertile series of valleys, with the great channel of the Brahmaputra (literally, *the Son of Brahma*) flowing down its middle, and an infinite number of tributaries and watercourses pouring into it from the mountains on either side. The Brahmaputra spreads out in a sheet of water several miles broad during the rainy season, and in its course through Assam forms a number of islands in its bed. Rising in the Tibetan plateau, far to the north of the Himalayas, and skirting round their eastern passes not far from the Yang-tsze-kiang and the great river of Cambodia, it enters Assam by a series of waterfalls and rapids, amid vast boulders and accumulations of rocks. The gorge, situated in Lakhimpur

district, through which the southernmost branch of the Brahmaputra enters, has from time immemorial been held in reverence by the Hindus. It is called the Brahmakunda or Parasuramkunda; and although the journey to it is both difficult and dangerous, it is annually visited by thousands of devotees. After a rapid course westwards down the whole length of the Assam valley, the Brahmaputra turns sharply to the south, spreading itself over the alluvial districts of the Bengal delta, and, after several changes of name, ends its course of 1800 m. in the Bay of Bengal. Its first tributaries in Assam, after crossing the frontier, are the Kundil and the Digaru, flowing from the Mishmi hills on the north, and the Tengapani and Dihing, which take their rise on the Singpho hills to the south-east. Shortly afterwards it receives the Dibang, flowing from the north-east; but its principal confluent is the Dihong, which, deriving its origin, under the name of the Tsangpo, from a spot in the vicinity of the source of the Sutlej, flows in a direction precisely opposite to that river, and traversing the tableland of Tibet, at the back of the great Himalaya range, falls into the Brahmaputra in 27° 48′ N. lat., 95° 26′ E. long., after a course of nearly 1000 m. Doubts were long entertained whether the Dihong could be justly regarded as the continuation of the Tsangpo, but these were practically set at rest by the voyage of F. J. Needham in 1886. Below the confluence, the united stream flows in a south-westerly direction, forming the boundary between the districts of Lakhimpur and Darrang, situated on its northern bank, and those of Sibsagar and Nowgong on the south; and finally bisecting Kamrup, it crosses over the frontier of the province and passes into Bengal. In its course it receives on the left side the Dihing, a river having its rise at the south-eastern angle of the province; and lower down, on the opposite side, it parts with a considerable offset termed the Buri Lohit, which, however, reunites with the Brahmaputra 60 m. below the point of divergence, bearing with it the additional waters of the Subansiri, flowing from Tibet. A second offset, under the name of the Kalang river, rejoins the parent stream a short distance above the town of Gauhati. The remaining rivers are too numerous to be particularized. The streams of the south are not rapid, and have no considerable current until May or June. Among the islands formed by the intersection and confluence of the rivers is Majuli, or the Great Island, as it is called by way of pre-eminence. This island extends 55 m. in length by about 10 in breadth, and is formed by the Brahmaputra on the south-east and the Buri Lohit river on the north-west. In the upper part of the valley, towards the gorge where the Brahmaputra enters, the country is varied and picturesque, walled in on the north and east by the Himalayas, and thickly wooded from the base to the snow-line. On either bank of the Brahmaputra a long narrow strip of plain rises almost imperceptibly to the foot of the hills. Gigantic reeds and grasses occupy the low lands near the banks of the great river; expanses of fertile rice-land come next; a little higher up, dotted with villages encircled by groves of bamboos and fruit trees of great size and beauty, the dark forests succeed, covering the interior table-land and mountains. The country in the vicinity of the large rivers is flat, and impenetrable from dense tangled jungle, with the exception of some very low-lying tracts which are either permanent marshes or are covered with water during the rains. Jungle will not grow on these depressions, and they are covered either with water, reeds, high grasses or rice cultivation. On or near such open spaces are collected all the villages. As the traveller proceeds farther down the valley, the country gradually opens out into wide plains. In the western district of Kamrup the country forms one great expanse, with a few elevated tracts here and there, varying from 200 to 800 ft. in height.

Soils.—The soil is exceedingly rich and well adapted to all kinds of agricultural purposes, and for the most part is composed of a rich black loam reposing on a grey sandy clay, though occasionally it exhibits a light yellow clayey texture. The land may be divided into three great classes. The first division is composed of hills, the largest group within the valley being that of the Mikir Mountains, which stand out upon the plain. Another set of hills project into the valley at Gauhati. But these latter are rather prolongations of spurs from the Khasi chain than isolated groups belonging to the plains. The other hills are all isolated and of small extent. The second division of the lands is the well-raised part of the valley whose level lies above the ordinary inundations of the Brahmaputra. The channels of some of the hill streams, however, are of so little depth that the highest lands in their neighbourhood are liable to sudden floods. On the north bank of the great river, lands of this sort run down the whole length of the valley, except where they are interrupted by the beds of the hill streams. The breadth of these plains is in some places very trifling, whilst in others they comprise a tract of many miles, according to the number and the height of the rocks or hills that protect them from the aberrations of the river. The alluvial deposits of the Brahmaputra and of its tributary streams may be considered as the third general division of lands in Assam. These lands are very extensive, and present every degree of fertility and elevation, from the vast *chars* of pure sand, subject to annual inundations, to the firm islands, so raised by drift-sand and the accumulated remains of rank vegetable matter, as no longer to be liable to flood. The rapidity with which wastes, composed entirely of sand newly washed forward by the current during floods, become converted into rich pasture is astonishing. As the freshets begin to lessen and retire into the deeper channels, the currents form natural embankments on their edges, preventing the return of a small portion of water which is thus left stagnant on the sands, and exposed to the action of the sun's rays. It slowly evaporates, leaving a thin crust of animal and vegetable matter. This is soon impregnated with the seeds of the *Saccharum spontaneum* and other grasses that have been partly brought by the winds and partly deposited by the water. Such places are frequented by numerous flocks of aquatic birds, which resort thither in search of fish and mollusca. As vegetation begins to appear, herds of wild elephants and buffaloes are attracted by the supply of food and the solitude of the newly-formed land, and in their turn contribute to manure the soil.

Geology.—Geographically the Assam hills lie in the angle between the Himalayas and the Burmese ranges, but geologically they belong to neither. The older rocks are like those of Bengal, and the newer beds show no sign of either the Himalayan or the Burmese folding—on the top of the plateau they are nearly horizontal, but along the southern margin they are bent sharply downwards in a simple monoclinal fold. The greater part of the mass is composed of gneiss and schists. The Sylhet traps near the southern margin are correlated with the Rajmahal traps of Bengal. The older rocks are overlaid unconformably by Cretaceous beds, consisting chiefly of sandstones with seams of coal, the whole series thinning rapidly towards the north and thus indicating the neighbourhood of the old shore-line. The fossils are very similar to those of the South Indian Cretaceous, but very different from those of the corresponding beds in the Nerbudda valley. The overlying Tertiary series includes nummulitic beds and valuable seams of coal.

The border ranges of the east and south of Assam belong to the Burmese system of mountain chains (see BURMA), and consist largely of Tertiary beds, including the great coal seams of Upper Assam. The Assam valley is covered by the alluvial deposits of the Brahmaputra.

Of the mineral productions by far the most valuable is coal. Compared with the Gondwana coal of the peninsula of India the Tertiary coal seams of Assam are remarkable for their purity and their extraordinary thickness. The "Thick Seam" of Margherita, in Upper Assam, averages 50 ft., and in some places reaches as much as 80 ft. The average percentage of ash in 27 assays of Assam coal was 3·8 as against 16·3 in 17 assays of Raniganj coal. The coal seams are commonly associated with petroleum springs. Gold is found in the alluvial deposits, but the results of exploration have not been very promising.

Earthquakes.—Assam is liable to earthquakes. There was a severe earthquake in Cachar on the 10th of January 1869, a severe shock in Shillong and Gauhati in September 1875, and one in Silchar in October 1882; but by far the severest shock known is that which occurred on the evening of 12th June 1897. The area of this seismic disturbance extended over north-eastern India, from Manipur to Sikkim; but the focus was in the Khasi and Garo hills. In the station of Shillong every masonry building was levelled to the ground. Throughout the country bridges were shattered, roads were broken up like ploughed fields, and the beds of rivers were dislocated. In the hills there were terrible landslips, which wrecked the little Cherrapunji railway and caused 600 deaths. The total mortality recorded was 1542, including two Europeans at Shillong. The levels of the country were so affected that the towns of Goalpara and Barpeta became almost uninhabitable during the rains.

Fauna.—The zoology of Assam presents some interesting features. Wild elephants abound and commit many depredations, entering villages in large herds, and consuming everything suitable to their tastes. Many are caught by means of female elephants previously tamed, and trained to decoy males into the snares prepared for subjecting them to captivity. A considerable number are tamed and exported from Assam every year. Many are killed every year in the forests for the sake of the ivory which they furnish. The government *keddah* establishment from Dacca captures large numbers of elephants in the province, and the right of hunting is also sold by auction to private bidders. The annual catch of the latter averages about two hundred. The rhinoceros is found in the denser parts of the forests and generally in swampy places. This animal is hunted and killed for its skin and its horn. The skin affords the material for the best shields. The horn is sacred in the eyes of the natives. Contrary to the usual belief, it is stated that, if caught young, the rhinoceros is easily tamed and becomes strongly attached to his keeper. Tigers abound, and though many are annually destroyed for the sake of the government reward, their numbers seem scarcely, if at all, to diminish. Leopards and bears are numerous; and the sand-badger, the *Arctonyx collaris* of Cuvier, a small animal somewhat resembling a bear, but having the snout, eyes and tail of a hog, is found. Among the most formidable animals known is the wild buffalo or *gaur* which is of great size, strength and fierceness. The fox and the jackal exist, and the wild hog is very abundant. Goats, deer of various kinds, hares, and two or three species of antelope are found, as are monkeys in great variety. The porcupine, the squirrel, the civet cat, the ichneumon and the otter are common. The birds are too various to admit of enumeration. Wild game is plentiful; pheasants, partridges, snipe and water-fowl of many descriptions make the country a tempting field for the sportsman. Vultures and other birds of prey are met with.

Crocodiles (commonly called alligators) swarm in all parts of the Brahmaputra, and are very destructive to the fish, of which hundreds of varieties are found, and which supply a valuable article of food. The most destructive of the *ferae naturae*, as regards human life, are, however, the snakes. Of these, several poisonous species exist, including the cobra and karait (*Naja tripudians* and *Bungarus caeruleus*). The bite of a fairly-grown healthy serpent of either of these species is deadly; and it is ascertained that more deaths occur from snake-bite than from all the other wild beasts put together. Among the non-poisonous serpents the python ranks first. This is an enormous boa-constrictor of great length and weight, which drops upon his prey from the branch of a tree, or steals upon it in the thick grass. He kills his victim by rolling himself round the body till he breaks its ribs, or suffocates it by one irresistible convolution round its throat. He seldom or never attacks human beings unless in self-defence, and loss of life from this cause is scarcely ever reported.

Agriculture.—The principal and almost the only food-grain of the plains portion of the province is rice. The production of this staple is carried on generally under the same conditions as in Bengal; but the times of sowing and reaping and the names given to the several crops vary much in different parts of the province. In 1901–1902 out of a total cultivated area of 1,736,000 acres, there were 1,194,000 acres under rice. In addition jute is grown to a considerable extent in Goalpara and Sylhet; cotton is grown in large quantities along the slopes of the Assam range. Rubber is grown in government plantations and is also brought in by the hill tribes; while lac, mustard and potatoes are also produced.

Tea Plantations.—The most important article of commerce produced in Assam is tea. The rice crop covers a very great proportion of the cultivated land, but it is used for local consumption, and the Brahmaputra valley does not produce enough for its own consumption, large quantities being imported for the coolies. The tea plantations are the one great source of wealth to the province, and the necessities of tea cultivation are the chief stimulants to the development of Assam. The plant was discovered in 1823 by Mr Robert Bruce, who had proceeded thither on a mercantile exploration. The country, however, then formed part of the Burmese dominions. But war with this monarchy shortly afterwards broke out, and a brother of the first discoverer, happening to be appointed to the command of a division of gunboats employed in some part of the operations, followed up the pursuit of the subject, and obtained several hundred plants and a considerable quantity of seed. Some specimens were ultimately forwarded to the superintendent of the botanic garden at Calcutta. In 1832 Captain F. Jenkins was deputed by the governor-general of India, Lord William Bentinck, to report upon the resources of the country, and the tea plant was brought to his especial notice by Mr Bruce; in 1834 a minute was recorded by the governor-general on the subject, in which it is stated that his attention had been called to it in 1827 before his departure from England. In accordance with the views of that minute, a committee was appointed to prosecute inquiries, and to promote the cultivation of the plant. Communications were opened with China with a view to obtain fresh plants and seeds, and a deputation, composed of gentlemen versed in botanical studies, was despatched to Assam. Some seeds were obtained from China; but they proved to be of small importance, as it was clearly ascertained by the members of the Assam deputation that both the black and the green tea plants were indigenous here, and might be multiplied to any extent; another result of the Chinese mission, that of procuring persons skilled in the cultivation and manufacture of black tea, was of more material benefit. Subsequently, under Lord Auckland, a further supply of Chinese cultivators and manufacturers was obtained—men well acquainted with the processes necessary for the production of green tea, as the former set were with those requisite for black. In 1838 the first twelve chests of tea from Assam were received in England. They had been injured in some degree on the passage, but on samples being submitted to brokers, and others of long experience and tried judgment, the reports were highly favourable. It was never, however, the intention of government to carry on the trade, but to resign it to private adventure as soon as the experimental course could be fairly completed. Mercantile associations for the culture and manufacture of tea in Assam began to be formed as early as 1839; and in 1849 the government disposed of their establishment, and relinquished the manufacture to the ordinary operation of commercial enterprise. In 1851 the crop of the principal company was estimated to produce 280,000 lb. Since then the enterprise has rapidly developed. Tea is now cultivated in all the plains district of the provinces. When the industry was first established, the land which was supposed to be best for the plant was hill or undulating ground; but now it has been found in the Surma valley that with good drainage the heaviest crops of tea can be raised from low-lying land, even such as formerly supported rice cultivation. At the close of the year 1905 there were 942 gardens in all, with 422,335 acres, and employing 464,912 coolies. The majority of gardens are owned by Europeans, 405,486 acres belonging to them as against 16,849 to Indians. The total out-turn for the province in 1905 was 193,556,047 lb. Between 1893 and 1898 there was a great extension of tea cultivation, with the result that the industry began to suffer from the congestion that follows over-production. Also to meet the requirements of the industry, an enormous number of coolies had to be brought into the province from other parts of India, and in recent years the supply of labour has begun to fall off, causing a rise in the cost of production. For these reasons there was a crisis in the tea industry of Assam, which was relieved to some extent by the reduction of the English duty on tea in 1906.

Tea-Garden Coolies.—The labour required on the tea gardens is almost entirely imported, as the natives of the province are too prosperous to do such work. During the decade 1891–1901, 596,856 coolies were imported, or about a tenth of the total population of the province. The importation of coolies is controlled by an elaborate system of legislation, which provides for the registration of contracts, the medical inspection of coolies during the journey, and supervision over rates of pay, &c., on the gardens. The first labour act was passed in 1863, and since then the law on the subject has been changed by successive enactments. The measure now in force is called Act VI. of 1901. Under this act the maximum term of the labour contract is fixed at four years, and a minimum monthly wage is laid down, the payment of which, however, is contingent on the completion of a daily task by the labourer. Labourers under contract deserting are liable to fine and imprisonment, and, subject to certain restrictions, may be arrested without warrant by their employers. In addition to the labourers engaged under this act, a large number are employed under contract enforceable by Act XIII. of 1859, which provides penalties for breach of the contract, but does not allow of the arrest of deserters without warrant. Neither does this act regulate in any way the terms of the contract, nor contain any special provisions for the protection of the labourer. Many labourers on the conclusion of their first engagement under Act VI. of 1901 enter into renewed contracts under Act XIII. of 1859. In 1905 there were in all 664,296 labourers, and 24,209 fresh importations, of whom 62 % chose the old act.

Railways.—The Assam-Bengal railway runs from the seaport of Chittagong to the Surma valley, and thence across the hills to Dibrugarh, at the head of the Brahmaputra valley, with a branch to Gauhati lower down the Brahmaputra. The hill section of this line was found exceedingly difficult of construction, and extensive damage was done by the earthquake of 1897; but it is now complete. This railway is financed by the government, though worked by a company, and therefore ranks as a state line. At the end of 1904 its open mileage was 576 m. There are several short lines of light railway or tramway in the province. The most important is the Dibru-Sadiya railway, at the head of the Brahmaputra valley, with a branch to the coal-fields.

Trade.—The external trade of Assam is conducted partly by steamer, partly by native boat, and to a small extent by rail. In the Brahmaputra valley steamers carry as much as 86 % of the exports, and 94% of the imports. In the Surma valley native boats carry about 43% of both. In 1904–1905 the total exports were valued at 726 lakhs of rupees. The chief items were tea, rice in the husk, oil-seeds, tea-seed, timber, coal and jute. The imports were valued at 457 lakhs of rupees. The chief items were cotton piece-goods, rice not in the husk, sugar, grain and pulse, salt, iron and steel, tobacco, cotton twist and yarn, and brass and copper. No less than two-thirds of the total trade is conducted with Calcutta. The trans-frontier trade is insignificant; and most of it is conducted with the Bengal state of Hill Tippera. The trade through Chittagong is increasing owing to the opening of the hill-section of the Assam-Bengal railway, which gives direct communication between the districts of Upper Assam and the port of Chittagong, and the incorporation of that port in the new province of Eastern Bengal and Assam.

Inhabitants.—The total population of Assam, according to the census of 1901, was 6,126,343, of whom 3,429,099 were Hindus, 1,581,317 Mahommedans and 1,068,334 Animists. The number of foreigners in the population due to immigration by the tea-garden coolies was 775,844. But in spite of this immigration the rate of increase in the population was only 5·9 % in the decade, and with the immigrants deducted 1·36 %. Amongst native-born Assamese during the decade there was a serious decrease in Nowgong and some other districts, due to *kalaazar* and other diseases. The Assamese are an interesting race, of distinct origin from the neighbouring Bengalis. A large proportion of them derive their origin from tribes who came from the Himalayan ranges, from Burma or from the Chinese frontier. The most important of these are the Ahoms or Ahams, an offshoot of the Shan race of northern Burma. They were the last conquerors of Assam before the Burmese, and they long preserved their ancient traditions, habits and institutions. Hinduism first made its encroachments among their kings and nobility. Several generations ago they gave up eating beef, and they are now completely Hinduized, except in a few remote recesses of Assam. Hinduism has also impressed its language

upon the province, and the vernacular Assamese possesses a close affinity to Bengali, with the substitution of *s* for the Bengali *ch*, of a guttural *h* for the Bengali *h* or *sh*, and a few other dialectic changes. Indeed, so close was the resemblance that for a time Bengali was used as the court and official language of the province under British rule. But with the development of the country the Assamese tongue asserted its claims to be treated as a distinct vernacular, and a resolution of government (1873) re-established it as the language of official life and public business.

The Assam peasant, living in a half-populated province, and surrounded by surplus land, is indolent, good-natured and, on the whole, prosperous. He raises sufficient food for his wants with very little labour, and, with the exception of a few religious ceremonies, he has no demand made upon him for money, saving the light rental of his fields. Under the peaceful influences of British rule, he has completely lost his ancient warlike instincts, and forgotten his predatory habits. In complexion he is a shade or two fairer than the Bengali. His person is in general short and robust, but devoid of the grace and flexibility of the Hindu. A flat face, with high cheek-bones, presents a physiognomy resembling the Chinese, and suggests no idea of beauty. His hair is abundant, black, lank and coarse, but the beard is scanty, and usually plucked out, which gives him an effeminate appearance. The women form a striking contrast to the men; there is more of feminine beauty in them than is commonly seen in the women of Bengal, with a form and feature somewhat approaching the European. The habits of life of the Assamese peasantry are pre-eminently domestic. Great respect is paid to old age; when parents are no longer capable of labour they are supported by their children, and scarcely any one is allowed to become a burden to the public. They have also in general a very tender regard for their offspring, and are generous and kind to their relations. They are hospitable to people of their own caste, but to no others. The use of opium is very general.

Hill Tribes.—The hill and frontier tribes of Assam include the Nagas, Singphos, Daphlas, Miris, Khamtis, Mishmis, Abors, &c., nearly all of whom, excepting the Nagas, are found near the frontiers of Lakhimpur district. The principal of these, in point of numbers, are the Nagas, who inhabit the hills and forests along the eastern and south-eastern frontier of Assam. They reside partly in the British district of the Naga hills and partly in independent territory under the political control of the deputy-commissioner of the adjoining districts. They cultivate rice, cotton, yams and Indian corn, and prepare salt from the brine springs in their hills. The different tribes of Nagas are independent of and unconnected with one another, and are often at war with each other. The Singphos are another of the main population of the same race, who occupy in force the hilly country between the Patkai and Chindwin rivers, and are nominally subject to Burma. The Akas, Daphlas, Miris, Abors, Mishmis and Khamtis are described under separate headings. Under regulation V. of 1873, an inner line has been laid down in certain districts, up to which the protection of British authority is guaranteed, and beyond which, except by special permission, it is not lawful for British subjects to go. This inner line has been laid down in Darrang towards the Bhutias, Akas and Daphlas; in Lakhimper towards the Daphlas, Miris, Abors, Mishmis, Khamtis, Singphos and Nagas; and in Sibsagar towards the Nagas. The inner line formerly maintained along the Lushai border has since 1895 been allowed to fall into desuetude, but Lushais visiting Cachar are required to take out passes from the superintendent of the Lushai hills. The line is marked at intervals by frontier posts held by military police and commanding the roads of access to the tract beyond; and any person from the plains who has received permission to cross the line has to present his pass at these posts.

History.—Assam was the province of Bengal which remained most stubbornly outside the limits of the Mogul empire and of the Mahommedan polity in India. Indeed, although frequently overrun by Mussulman armies, and its western districts annexed to the Mahommedan vice-royalty of Bengal, the province maintained an uncertain independence till its invasion by the Burmese towards the end of the 18th century, and its final cession to the British in 1826. It seems to have been originally included, along with the greater part of north-eastern Bengal, in the old Hindu territory of Kamrup. Its early legends point to great religious revolutions between the rival rites of Krishna and Siva as a source of dynastic changes. Its roll of kings extends deep into pre-historic times, but the first rajah capable of indentification flourished about the year 76 A.D. Kamrup, the Pragjotishpur of the ancient Hindus, was the capital of a legendary king Narak, whose son Bhagadatta distinguished himself in the great war of the *Mahābhārata*.

When Hsüan Tsang visited the country in A.D. 640, a prince named Kumar Bhaskara Barman was on the throne. The people are described as being of small stature with dark yellow complexions; they were fierce in appearance, but upright and studious. Hinduism was the state religion, and the number of Buddhists was very small. The soil was deep and fertile, and the towns were surrounded by moats with water brought from rivers or banked-up lakes. Subsequently we read of Pal rulers in Assam. It is supposed that these kings were Buddhist and belonged to the Pal dynasty of Bengal. Although the whole of Kamrup appears from time to time to have been united into one kingdom under some unusually powerful monarch, it was more often split up into numerous petty states; and for several centuries the Koch, the Ahom and the Chutia powers contested for the Assam valley. In the early part of the 13th century the Ahoms or Ahams, from northern Burma and the Chinese frontiers, poured into the eastern districts of Assam, founded a kingdom, and held it firmly for several centuries. The Ahoms were Shans from the ancient Shan kingdom of Pong. Their manners, customs, religion and language were, and for a long time continued to be, different from those of the Hindus; but they found themselves compelled to respect the superior civilization of this race, and slowly adopted its customs and language. The conversion of their king Chuchengpha to Hinduism took place in the year A.D. 1655, and all the Ahoms of Assam gradually followed his example. In medieval history, the Assamese were known to the Mussulman population as a warlike, predatory race, who sailed down the Brahmaputra in fleets of innumerable canoes, plundered the rich districts of the delta, and retired in safety to their forests and swamps. As the Mahommedan power consolidated itself in Bengal, repeated expeditions were sent out against these river pirates of the north-east. The physical difficulties which an invading force had to contend with in Assam, however, prevented anything like a regular subjugation of the country; and after repeated efforts, the Mussulmans contented themselves with occupying the western districts at the mouth of the Assam valley. The following details will suffice for the history of a struggle in which no great political object was attained, and which left the Assamese still the same wild and piratical people as when their fleets of canoes first sallied forth against the Bengal delta. In 1638, during the reign of the emperor Shah Jahan, the Assamese descended the Brahmaputra, and pillaged the country round the city of Dacca; they were expelled by the governor of Bengal, who retaliated upon the plunderers by ravaging Assam. During the civil wars between the sons of Shah Jahan, the king of Assam renewed his predatory incursions into Bengal; upon the termination of the contest, Aurangzeb determined to avenge these repeated insults, and despatched a considerable force for the regular invasion of the Assamese territory (1660–1662). His general, Mir Jumla, defeated the rajah, who fled to the mountains, and most of the chiefs made their submission to the conqueror. But the rains set in with unusual violence, and Mir Jumla's army was almost annihilated by famine and sickness. Thus terminated the last expedition against Assam by the Mahommedans, whose fortunes in this country were never prosperous. A writer of the Mahommedan faith says:—"Whenever an invading army has entered their territories, the Assamese have sheltered themselves in strong posts, and have distressed the enemy by stratagems, surprises and alarms, and by cutting off their provisions. If these means failed, they have declined a battle in the field, but

have carried the peasants into the mountains, burned the grain and left the country desert. But when the rainy season has set in upon the advancing enemy, they have watched their opportunity to make excursions and vent their rage; the famished invaders have either become their prisoners or been put to death. In this manner powerful and numerous armies have been sunk in that whirlpool of destruction, and not a soul has escaped." The same writer states that the country was spacious, populous and hard to be penetrated; that it abounded in dangers; that the paths and roads were beset with difficulties; and that the obstacles to conquest were more than could be expressed. The inhabitants, he says, were enterprising, well-armed and always prepared for battle. Moreover, they had lofty forts, numerously garrisoned and plentifully provided with warlike stores; and the approach to them was opposed by thick and dangerous jungles, and broad and boisterous rivers. The difficulties in the way of successful invasion are of course not understated, as it was the object of the writer to exalt the prowess and perseverance of the faithful. He accounts for their temporary success by recording that " the Mussulman hordes experienced the comfort of fighting for their religion, and the blessings of it reverted to the sovereignty of his just and pious majesty." The short-lived triumph of the Mussulmans might, however, have warranted a less ambitious tone. About the middle of the 17th century the chief became a convert to Hinduism. By what mode the conversion was effected does not clearly appear, but whatever were the means employed, it seems that the decline of the country commenced about the same period. Internal dissensions, invasion and disturbances of every kind convulsed the province, and neither prince nor people enjoyed security. Late in the 18th century some interference took place on the part of the British government, then conducted by Lord Cornwallis; but the successor of that nobleman, Sir John Shore, adopting the non-intervention policy, withdrew the British force, and abandoned the country to its fate. Its condition encouraged the Burmese to depose the rajah, and to make Assam a dependency of Ava. The extension of their encroachments on a portion of the territory of the East India Company compelled the British government to take decisive steps for its own protection. Hence arose the series of hostilities with Ava known in Indian history as the first Burmese War, on the termination of which by treaty in February 1826, Assam remained a British possession. In 1832 that portion of the province denominated Upper Assam was formed into an independent native state, and conferred upon Purandhar Singh, the ex-rajah of the country; but the administration of this chief proved unsatisfactory, and in 1838 his principality was reunited with the British dominions. After a period of successful administration and internal development, under the lieutenant-governor of Bengal, it was erected into a separate chief-commissionership in 1874.

In 1886 the eastern Dwars were annexed from Bhutan; and in 1874 the district of Goalpara, the eastern Dwars and the Garo hills were incorporated in Assam. In 1898 the southern Lushai hills were transferred from Bengal to Assam, and the north and south Lushai hills were amalgamated as a district of Assam, and placed under the superintendent of the Lushai hills. Frontier troubles occasionally occur with the Akas, Daphlas, Abors and Mishmis along the northern border, arising out of raids from the independent territory into British districts. In October 1905 the whole province of Assam was incorporated in the new province of Eastern Bengal and Assam.

See E. A. Gait, *The History of Assam* (1906).

ASSAMESE, the Indo-Aryan language spoken in the Assam valley. In 1901 the number of its speakers was 1,350,846. It is closely related to Bengali and Oriya, forming with them and with Bihari the Eastern Group of the Indo-Aryan vernaculars. For further particulars see BENGALI.

ASSAROTTI, OTTAVIO GIOVANNI BATTISTA (1753–1829), the founder of schools for the education of deaf-mutes in Italy, was born at Genoa in 1753. After qualifying himself for the church, he entered the society of the Pietists, " Scuole Pie," who devoted themselves to the training of the young. His superior learning caused him to be appointed to lecture on theology to the students of the order. In 1801 he heard of the Abbé Sicard's training of deaf-mutes in Paris, and resolved to try something similar in Italy. He began with one pupil, and had by degrees collected a small number round him, when, in 1805, Napoleon, hearing of his endeavours, ordered a convent to be given him for a school-house, and funds for supporting twelve scholars to be taken from the convent revenues. This order was scarcely attended to till 1811, when it was renewed, and in the following year Assarotti, with a considerable number of pupils, took possession of the new school. Here he continued, with the exception of a short interval in 1814, till his death in 1829. A pension, which had been awarded him by the king of Sardinia, he bequeathed to his scholars.

ASSARY, or ASSARION, a Roman copper coin, the " farthing " of Matthew x. 29.

ASSASSIN (properly *Hashīshīn*, from *Hashish*, the opiate made from the juice of hemp leaves), a general term for a secret murderer, originally the name of a branch of the Shiite sect (see SHIITES), known as Ismaʿīlites, founded by Ḥassan (ibn) Ṣabbāḥ at the end of the 11th century, and from that time active in Syria and Persia until crushed in the 13th century by the Mongols under Hulaku (Hulagu) in Persia, and by the Mameluke Bibars in Syria. The father of Ḥassan Ṣabbāḥ, a native of Khorasan, and a Shiite, had been frequently compelled to profess Sunnite orthodoxy, and from prudential motives had sent his son to study under an orthodox doctor at Nishapur. Here Ḥassan made the acquaintance of Nizām-ul-Mulk, afterwards vizier of the sultan Malik-Shah (see SELJUKS). During the reign of Alp-Arslan he remained in obscurity, and then appeared at the court of Malik-Shah, where he was at first kindly received by his old friend the vizier. Ḥassan, who was a man of great ability, tried to supplant him in the favour of the sultan, but was outwitted and compelled to take his departure from Persia. He went to Egypt (1078–79), and, on account of his high reputation, was received with great honour by the lodge at Cairo. He soon stood so high in the caliph Mostanṣir's favour as to excite against him the jealousy of the chief general, and a cause of open enmity soon arose. The caliph had nominated first one and then another of his sons as his successor, and in consequence a party division took place among the leading men. Ḥassan, who adopted the cause of Nizār, the eldest son, found his enemies too strong for him, and was forced to leave Egypt. After many adventures he reached Aleppo and Damascus, and after a sojourn there, settled near Kuhistan (Kohistan). He gradually spread his peculiar modification of Ismaʿīlite doctrine, and, having collected a considerable number of followers, formed them into a secret society. In 1090 he obtained, by stratagem, the strong mountain fortress of Alamūt in Persia, and, removing there with his followers, settled as chief of the famous society afterwards called the Assassins.

The speculative principles of this body were identical with those of the Ismaʿīlites, but their external policy was marked by one peculiar and distinctive feature—the employment of secret " assassination " against all enemies. This practice was introduced by Ḥassan, and formed the essential characteristic of the sect. In organization they closely resembled the western lodge at Cairo. At the head was the supreme ruler, the *Sheik-al-Jabal* (*Jebel*), *i.e.* Chief, or, as it is commonly translated, Old Man of the Mountains. Under him were three *Dāʿi-al-Kirbāl*, or, as they may be called, grand priors, who ruled the three provinces over which the sheik's power extended. Next came the body of *Dāʿis*, or priors, who were fully initiated into all the secret doctrines, and were the emissaries of the faith. Fourth were the *Refiqs*, associates or fellows, who were in process of initiation, and who ultimately advanced to the dignity of *dāʿis*. Fifth came the most distinctive class, the *Fedais* (*i.e.* the devoted ones), who were the guards or assassins proper. These were all young men, and from their ranks were selected the agents for any deed of blood. They were kept uninitiated, and the blindest obedience was exacted from and yielded by them. When the sheik required the services of any of them, the selected *fedais*

were intoxicated with the *hashish*. When in this state they were introduced into the splendid gardens of the sheik, and surrounded with every sensual pleasure. Such a foretaste of paradise, only to be granted by their supreme ruler, made them eager to obey his slightest command; their lives they counted as nothing, and would resign them at a word from him. Finally, the sixth and seventh orders were the *Lāsiqs*, or novices, and the common people. Hassan well knew the efficacy of established law and custom in securing the obedience of a mass of people; accordingly, upon all but the initiated, the observances of Islam were rigidly enforced. As for the initiated, they knew the worthlessness of positive religion and morality; they believed in nothing, and scoffed at the practices of the faithful.

The Assassins soon began to make their power felt. One of their first victims was Hassan's former friend, Nizam-ul-Mulk, whose son also died under the dagger of a secret murderer. The death by poison of the sultan Malik-Shah was likewise ascribed to this dreaded society, and contributed to increase their evil fame. Sultan Sinjar, his successor, made war upon them, but he was soon glad to come to terms with enemies against whose operations no precaution seemed available. After a long and prosperous rule Hassan died at an advanced age in 1124. He had previously slain both his sons, one on suspicion of having been concerned in the murder of a *dā'i* at Kuhistan, the other for drinking wine, and he was therefore compelled to name as his successor his chief *dā'i*, Kia-Busurg-Omid.

During the fourteen years' reign of this second leader, the Assassins were frequently unfortunate in the open field, and their castles were taken and plundered; but they acquired a stronghold in Syria, while their numerous murders made them an object of dread to the neighbouring princes, and spread abroad their evil renown. A long series of distinguished men perished under the daggers of the *fedais;* even the most sacred dignity was not spared. The caliph Mostarshid was assassinated in his tent, and not long after, the caliph Rāshid suffered a similar fate. Busurg-Omid was succeeded by his son Mahommed I., who, during the long period of twenty-five years, ruthlessly carried out his predecessor's principles. In his time Massiat became the chief seat of the Syrian branch of the society. Mahommed's abilities were not great, and the affections of the people were drawn towards his son Hassan, a youth of great learning, skilled in all the wisdom of the initiated, and popularly believed to be the promised Imam become visible on earth. The old sheik prevented any attempt at insurrection by slaying 250 of Hassan's adherents, and the son was glad to make submission. When, however, he attained the throne, he began to put his views into effect. On the 17th of the month Ramadan, 1164, he assembled the people and disclosed to them the secret doctrines of the initiated; he announced that the doctrines of Islam were now abolished, that the people might give themselves up to feasting and joy. Soon after, he announced that he was the promised Imam, the caliph of God upon earth. To substantiate these claims he gave out that he was not the son of Mahommed, but was descended from Nizār, son of the Egyptian caliph Mostansir, and a lineal descendant of Isma'īl. After a short reign of four years Hassan was assassinated by his brother-in-law, and his son Mahommed II. succeeded. One of his first acts was to slay his father's murderer, with all his family and relatives; and his long rule, extending over a period of forty-six years, was marked by many similar deeds of cruelty. He had to contend with many powerful enemies, especially with the great Atabeg sultan Nureddīn, and his more celebrated successor, Saladin, who had gained possession of Egypt after the death of the last Fatimite caliph, and against whom even secret assassination seemed powerless. During his reign, also, the Syrian branch of the society, under their *dā'i*, Sinan, made themselves independent, and remained so ever afterwards. It was with this Syrian branch that the Crusaders made acquaintance; and it appears to have been their emissaries who slew Count Raymund of Tripoli and Conrad of Montferrat.

Mahommed II. died from the effects of poison, administered, it is believed, by his son, Jelaleddīn Hassan III., who succeeded. He restored the old form of doctrine—secret principles for the initiated, and Islam for the people—and his general piety and orthodoxy procured for him the name of the new Mussulman. During his reign of twelve years no assassinations occurred, and he obtained a high reputation among the neighbouring princes. Like his father, he was removed by poison, and his son, 'Ala-ed-dīn Mahommed III., a child of nine years of age, weak in mind and body, was placed on the throne. Under his rule the mild principles of his father were deserted, and a fresh course of assassination entered on. In 1255, after a reign of thirty years, 'Ala-ed-dīn was slain, with the connivance of his son, Rukneddīn, the last ruler of the Assassins. In the following year Hulaku (Hulagu), brother of the Tatar, Mangu Khan, invaded the hill country of Persia, took Alamūt and many other castles, and captured Rukneddīn (see MONGOLS). He treated him kindly, and, at his own request, sent him under escort to Mangu. On the way, Rukneddīn treacherously incited the inhabitants of Kirdkuh to resist the Tatars. This breach of good faith was severely punished by the khan, who ordered Rukneddīn to be put to death, and sent a messenger to Hulaku (Hulagu) commanding him to slay all his captives. About 12,000 of the Assassins were massacred, and their power in Persia was completely broken. The Syrian branch flourished for some years longer, till Bibars, the Mamelūke sultan of Egypt, ravaged their country and nearly extirpated them. Small bodies of them lingered about the mountains of Syria, and are believed still to exist there. Doctrines somewhat similar to theirs are still to be met with in north Syria.

See J. von Hammer, *Geschichte der Assassinen* (1818); S. de Sacy, *Mémoires de l'Institut*, iv. (1818), who discusses the etymology fully: *Calcutta Review*, vols. lv., lvi.; A. Jourdain in Michaud's *Histoire des Croisades*, ii. pp. 465-484, and trans. of the Persian historian Mirkhond in *Notices et extraits des manuscrits*, xiii. pp. 143 sq.; cf. R. Dozy, *Essai sur l'histoire de l'Islamisme* (Leiden and Paris, 1879), ch. ix. (G. W. T.)

ASSAULT (from Lat. *ad*, to or on, and *saltare*, to leap), in English law, "an attempt or offer with force or violence to do corporal hurt to another, as by striking at another with a stick or other weapon, or without a weapon, though the party misses his aim." Notwithstanding ancient opinions to the contrary, it is now settled that mere words, be they ever so provoking, will not constitute an assault. Coupled with the attempt or threat to inflict corporal injury, there must in all cases be the means of carrying the threat into effect. A *battery* is more than a threat or attempt to injure the person of another; the injury must have been inflicted, but it makes no difference however small it may be, as the law does not "draw the line between degrees of violence," but "totally prohibits the first and lowest stage of it." Every battery includes an assault. A common assault is a misdemeanour, and is punishable by imprisonment with or without hard labour to the extent of one year, and if it occasions bodily harm, with penal servitude for three years, or imprisonment to the extent of two years, with or without hard labour. There are various different kinds of assaults which are provided against by particular enactments of parliament, such as the Offences against the Person Act 1861, the Prevention of Crimes Act 1871, &c.; and there are also certain aggravated assaults for which the punishment is severer than for common assault, as an assault with intent to murder, with intent to commit a rape, &c. In certain cases an assault and battery is sometimes justifiable, as in the case where a person in authority, as a parent or schoolmaster, inflicts moderate punishment upon a child, or in certain cases of self-defence, or in defence of one's goods and chattels. An assault may be both a tort and a crime, giving a civil action for damages to the person injured, as well as being the subject of a criminal prosecution.

United States.—The general principles applicable throughout the United States are the same as in England. Riding a horse threateningly near a person; or riding a bicycle against another (*Mercer* v. *Corbin*, 117 Indiana Rep. 450); waking one from sleep to present a milk bill (*Richmond* v. *Fiske*, 160 Mass. 34), are assaults. A minor is liable for damages for an assault (*Hildreth* v. *Hancock*, 156 Illinois Rep. 618). In Texas it has

been held that an assault with a knife is not necessarily an aggravated assault (*Warren* v. *State*, 3 S.W. 240), and an axe is not necessarily a "deadly weapon" with which to assault (*Gladney* v. *State*, 12 S.W. 868), and the State must prove that it would be likely to produce death or serious bodily injury (*Melton* v. *State*, 17 S.W. 257). Neither a pistol nor brass knuckles are necessarily deadly weapons; the State must show their size or manner of use in making the assault (*Ballard* v. *State*, 13 S.W. 674; *Miles* v. *State*, 5 S.W. 250). But in 1903 a pistol was held by the Texas Supreme Court to be a deadly weapon if not used simply as a club (*Lockland* v. *State*, 73 S.W. 1054), and the same court held in 1904 that a pistol is a deadly weapon (*Pace* v. *State*, 79 S.W. 531), and so the assault was an aggravated assault. In North Carolina it has been held that an axe is *ex vi termini* a "deadly weapon" (*State* v. *Shields*, 110 N.C. 49).

ASSAYE, a village of Hyderabad or the Nizam's Dominions, in southern India, just beyond the Berar frontier. The place is celebrated as the site of a battle fought on the 23rd of September 1803 between the combined Mahratta forces under Sindhia and the rajah of Berar and the British under Major-General Wellesley, afterwards the duke of Wellington. The Mahratta force consisted of 50,000 men, supported by 100 pieces of cannon served by French artillerymen, and entrenched in a strong position. Against this the English had but a force of 4500 men, which, however, after a severe struggle, gained the most complete victory that ever crowned British valour in India. Of the enemy 12,000 were killed and wounded; and General Wellesley lost 1657—one-third of his little force—killed and wounded. Assaye is 261 m. north-west of Hyderabad.

ASSAYING. To "assay" (or "essay"; Fr. *essayer*) is in general to try, or attempt, so to make trial or test. In a restricted sense the term assaying is applied in metallurgy to the determination of the amount of gold or silver in ores or alloys; in this article, however, it will be used in a wider technical signification, and will include a description of the methods for the quantitative determination of those elements in ores which affect their value in metallurgical operations. It would be impossible to give in detail here all the precautions necessary for the successful use of the methods, and the descriptions will therefore be confined to the principles involved and the general manner in which they are applied to secure the desired results.

Gold and Silver.—Ores containing gold or silver are almost invariably assayed in the dry way; that is, by fusion with appropriate fluxes and ultimate separation of the elements in the metallic form. One of the customs which has grown out of our peculiar system of weights is the form of statement of the results of such an assay. Instead of expressing the amounts of gold and silver in percentages of the weight of ore, they are expressed in ounces to the ton, the ounce being the troy ounce and the ton that of 2000 avoirdupois pounds. To simplify calculation and to enable the assayer to use the metric system of weights employed in all chemical calculations, the "assay ton" ("A.T." = 29·166 grammes) has been devised, which bears the same relation to the ton of 2000 lb avoirdupois that one milligram does to the troy ounce; when one assay ton of ore is used, each milligram of gold or silver found represents one ounce to the ton.

The assay of an ore for gold or silver consists of two operations. In the first the gold or silver is made to combine or alloy with metallic lead, the other constituents of the ore being separated from the lead as slag. In the second, the lead button containing the gold or silver is cupelled and the resulting gold or silver button is weighed. The first is conducted in one of two ways, known respectively as the crucible method and the scorification method. The crucible method is generally used for ores containing gold in small amounts and for certain classes of silver ores. The amount of ore taken for assay is generally one-half "A.T.," but in very low-grade ores one, two, and sometimes even four "A.T.s" are used. In the scorification method one-tenth of an "A.T." is the amount commonly taken. While in both methods the same result is sought, the means employed are quite different. In the scorification method the ore is mixed in the scorifier (a shallow dish of burned clay) with from ten to twenty times its weight of granulated metallic lead (test lead) and a little borax glass, and heated in a muffle, the front of which is at first closed. When the lead melts and begins to oxidize, the lead oxide, or so-called litharge, combines with or dissolves the non-metallic and readily oxidizable constituents of the ore, while the gold and silver alloy with the lead. As the slag thus formed flows off to the sides of the scorifier, the assay clears and the melted metallic lead forms an "eye" in the middle. The door of the muffle is then opened and the current of air which is drawn over the scorifier rapidly oxidizes the lead, while the melted litharge gradually closes over the metal. When the "eye" has quite disappeared the door is closed and the temperature raised to make the slag very liquid. The scorifier is taken from the muffle in a pair of tongs and the contents poured into a mould, the lead forming a button in the bottom while the slag floats on top. When cold, the contents of the mould are taken out and the lead button hammered into the form of a cube, the slag, which is glassy and brittle, separating readily from the metal, which is then ready for cupellation. In the crucible method the ore is mixed with from once to twice its weight of flux, which varies in composition, but of which the following may be taken as a type:—

Sodium bicarbonate	8 parts.
Potassium carbonate	3 ,,
Powdered borax	4 ,,
Flour	1 ,,
Litharge	9 ,,

The mixture is charged into a round clay crucible from 100 mm. to 125 mm. high, and heated either in a muffle or in a crucible furnace at a gradually increasing heat for forty or fifty minutes. At the expiration of this time, when the charge should be perfectly liquid and in a tranquil state of fusion, the crucible is removed from the furnace and the contents are poured into a mould. The resulting lead button hammered into shape and carefully cleansed from slag is ready for the cupel. If the button is too large for cupellation, or if it is hard, it may be scorified either alone or mixed with test lead before cupellation. The character and amount of the flux necessarily depend upon the character of the ore, the object being to concentrate in the lead button all the gold and silver while dissolving and carrying off in the slag the other constituents of the ore. Under the most favourable conditions there is a slight loss of gold and silver in the fusion, the scorification and the cupellation, both by absorption in the slag and by actual volatilization and absorption in the cupel. In ores containing much copper, this metal is largely concentrated in the lead button, making it hard, and necessitating repeated scorifications and, in some cases, a preliminary removal of the copper by solution of the ore in nitric acid. This leaves the gold in the insoluble residue, which is filtered off, and the silver in the solution is thrown down by hydrochloric acid. The resulting precipitate of silver chloride is filtered, and the residue and the precipitate are scorified together. Ores containing much arsenic or sulphur are generally roasted at a low heat and the assay is made on the roasted material.

The process of cupellation is briefly as follows:—The gold alloy is fused with a quantity of lead, and a little silver if silver is already present. The resulting alloy, which is called the *lead button*, is then submitted to fusion on a very porous support, made of bone-ash, and called a *cupel*. The fusion being effected in a current of air, the lead oxidizes. The heat is sufficient to keep the resulting lead oxide fused, and the porous cupel has the property of absorbing melted lead oxide without taking up any of the metallic globule, exactly in the same way that blotting-paper will absorb water whilst it will not touch a globule of mercury. The heat being continued, and the current of air always passing over the surface of the melted lead button, and the lead oxide being sucked up by the cupel as fast as it is formed, the metallic globule rapidly diminishes in size until at last all the lead has been got rid of. Now, if this were the only action, little good would have been gained, for we should simply have put lead into the gold alloy, and then taken it out again; but another action goes on whilst the lead is oxidizing in the current

of air. Other metals, except the silver and gold, also oxidize, and are carried by the melted litharge into the cupel. If the lead is therefore rightly proportioned to the standard of alloy, the resulting button will consist of only gold and silver, and these are separated by the operation of *parting*, which consists in boiling the alloy (after rolling it to a thin plate) in strong nitric acid, which dissolves the silver and leaves the gold as a coherent sponge. To effect this parting properly, the proportion of silver to gold should be as 3 to 1. The operation by which the alloy is brought to this standard is termed *quartation* or *inquartation*, and consists in fusing the alloy in a cupel with lead and the quantity of fine silver or fine gold necessary to bring it to the desired composition.

Lead.— The " dry " or fire assay for lead is largely used for the valuation of lead ores, although it is being gradually replaced by volumetric methods. One part of the ore is mixed with from three to five parts of a flux of the following composition:—

Potassium carbonate	40·6 %
Sodium bicarbonate	31·3 ,,
Borax	15·6 ,,
Flour	12·5 ,,

The mixture is charged into a clay crucible and heated for twenty minutes at a good red heat. When the mixture has been in a tranquil state of fusion for a few minutes it is poured into a mould. When cold, the button is hammered, cleaned carefully from slag, and weighed. The proportion is calculated from the amount of ore used, and the result is expressed in parts in a hundred or percentage of the ore. Various impurities, such as copper, antimony and sulphur, go into the lead button, so that the result is generally too high. The most accurate method for the determination of lead in ores is the gravimetric method, in which it is weighed as lead sulphate after the various impurities have been separated. Nearly all lead ores contain more or less sulphur; and as in the process of solution in nitric acid this is oxidized to sulphuric acid which unites with the lead to form the very insoluble lead sulphate, it is simpler to add sulphuric acid to convert all the lead into sulphate and then evaporate until the nitric acid is expelled. The salts of iron, copper, &c., are then dissolved in water and filtered from the insoluble silica, lead sulphate, and calcium sulphate, which are washed with dilute sulphuric acid. The insoluble matter is treated with a hot solution of alkaline ammonium acetate, which dissolves the lead sulphate, the other materials being separated by filtration. The lead sulphate, re-precipitated in the filtrate by an excess of sulphuric acid and alcohol, is then filtered on an asbestos felt in a Gooch crucible, washed with dilute sulphuric acid and alcohol, ignited, and weighed. Lead sulphate contains 68·30 % of metallic lead.

There are several volumetric methods for assaying lead ores, but the best known is that based on the precipitation of lead by ammonium molybdate in an acetic acid solution. The lead sulphate, obtained as described above and dissolved in ammonium acetate, is acidulated with acetic acid diluted with hot water and heated to boiling-point. A standardized solution of ammonium molybdate is then added from a burette. As long as the solution contains lead, the addition of the molybdate solution causes a precipitation of white lead molybdate. An excess of the precipitant is shown by a drop of the solution imparting a yellow colour to a solution of tannin, prepared by dissolving one part of tannin in 300 of water; drops of this solution are placed on a white porcelain plate, and as the precipitant is added to the lead solution a drop of the latter is removed from time to time on a glass stirring-rod and added to one of the drops on the porcelain plate. The appearance of a yellow colour shows that all the lead has been precipitated and that the solution contains an excess of molybdate. From the reading of the burette the lead is calculated. The molybdate solution should be of such a strength that 1 cc. will precipitate 0·01 gramme of lead. It is standardized by dissolving a weighed amount of lead sulphate in ammonium acetate and proceeding as described above.

Zinc.—Chemically the ores of zinc consist of the silicates, carbonates, oxides, and sulphides of zinc associated with other metals, some of which complicate the methods of assay. The most modern and the most generally accepted method is volumetric, and is based on the reaction between zinc chloride and potassium ferrocyanide, by which insoluble zinc ferrocyanide and soluble potassium chloride are formed; the presence of the slightest excess of potassium ferrocyanide is shown by a brownish tint being imparted by the solution to a drop of uranium nitrate. The ore (0·5 gramme) is digested with a mixture of potassium nitrate and nitric acid. A saturated solution of potassium chlorate in strong nitric acid is added, and the mass evaporated to dryness. It is then heated with a mixture of ammonium chloride and ammonia, filtered and washed with a hot dilute solution of the same mixture. The filtrate diluted to 200 cc. is carefully neutralized with hydrochloric acid, and excess of 6 cc. of the strong acid is added, and the solution saturated with hydrogen sulphide, which precipitates the copper and cadmium, metals which would otherwise interfere. Without filtering, the standard solution is added from a burette, and from time to time a drop of the solution is removed on the glass stirring-rod and added to a drop or two of a strong solution of uranium nitrate, previously placed on a white porcelain plate. The appearance of a brown tint in one of these tests shows the end of the reaction. When cadmium is not present the copper may be precipitated by boiling the acidulated ammoniacal solution with test lead and titrating, as before described, without removing the lead and copper from the solution. The ferrocyanide solution is standardized by dissolving 1 gramme of pure zinc in 6 cc. of hydrochloric acid, adding ammonium chloride, and titrating as before. This method is modified in practice by the character of the ores, carbonates and silicates free from sulphides being decomposed by hydrochloric acid, with the addition of a little nitric acid.

Copper.— The fire assay for copper ores was abandoned years ago and the electrolytic method took its place; this in turn is now largely replaced by volumetric methods. In the electrolytic method from 0·5 to 5 grammes of ore are treated in a flask or beaker, with a mixture of 10 cc. of nitric and 10 cc. of sulphuric acid, until thoroughly decomposed. When this liquid is cold it is diluted with cold water, heated until all the soluble salts are dissolved, transferred to a tall, narrow beaker, and diluted to about 150 cc. The electrodes are attached to a frame connected with the battery and the beaker is placed on a stool, which can be raised so that the electrodes are immersed in the liquid and reach the bottom of the beaker. The electrodes consist of two cylinders of platinum (placed one inside the other) about 75 mm. high, the smaller of the two 37 mm. and the larger 50 mm. in diameter, both pierced with 10 to 12 holes 5 mm. in diameter, evenly distributed over the surfaces to facilitate diffusion of the liquids. The surfaces of the cylinders are roughened with a sand blast to increase the areas and make the deposited metals adhere more firmly. Each cylinder has a platinum wire fused to the upper circumference to connect with a clamp from which a wire leads to the proper pole of the battery. The smaller cylinder is generally the negative electrode on which the copper is deposited. The framework carrying the clamps is arranged so that a number of determinations may be made at one time, the wires from the clamps running from a rheostat, so arranged that currents of any strength may be used simultaneously. The cylinder, having been carefully weighed, is placed in position, the beaker containing the solution is adjusted, and the current passed until all the copper is precipitated. This generally requires from two to twelve hours. The cylinders are then removed from the solution and washed with distilled water, the one holding the deposited copper being washed with alcohol, dried and weighed; the increase in weight represents the copper contents of the ore. The deposited copper should be firmly adherent and bright rosy red in colour. Silver, arsenic and cadmium, if present, are precipitated with the copper and affect the accuracy of the results; they should be removed by special methods.

Volumetric methods are more expeditious and require less apparatus. The potassium cyanide method is based on the fact that, when potassium cyanide is added to an ammoniacal solution of a salt of copper, the insoluble copper cyanide is

formed, the end of the reaction being indicated by the disappearance of the blue colour of the solution. One gramme of the ore is treated in a flask with a mixture of nitric and sulphuric acids and evaporated until all the nitric acid is expelled. After cooling a little, water is added, and then a few grammes of aluminium foil free from copper. On this foil the copper in the solution is all precipitated by electrolytic action in a few minutes, and the aluminium is dissolved by the addition of an excess of sulphuric acid. Water is added, and as soon as the gangue and copper particles have settled the clear solution is decanted, and the residue washed several times in the same way. The copper is then dissolved in 5 cc. of nitric acid; if silver is present a drop or two of hydrochloric acid is added, the solution diluted to about 50 cc., and filtered. To the filtrate (or, if no silver is present, to the diluted nitric acid solution) 10 cc. of ammonia are added, and a standard solution of potassium cyanide is run in from a burette until the blue colour has nearly disappeared. The solution is filtered to get rid of the precipitate, and the titration is finished in the nearly clear filtrate, which should be always about 200 cc. in volume. The titration is complete when the blue colour is so faint that it is almost imperceptible after the flask has been vigorously shaken. The potassium cyanide solution is standardized by dissolving 0·5 gramme of pure copper in 5 cc. of nitric acid, diluting, adding 10 cc. of ammonia, and titrating exactly as described above.

When potassium iodide is added to a solution of cupric acetate, the reaction $(Cu(C_2H_3O_2)_2 + 2KI = CuI + 2K(C_2H_3O_2) + I$ takes place; that is, for each atom of copper one atom of iodine is liberated. If a solution of sodium thiosulphate (hyposulphite) is added to this solution, hydriodic acid, sodium iodide and tetrathionate are formed; and if a little starch solution has been added, the end of the reaction is indicated by the disappearance of the blue colour, due to the iodide of starch. The amount of iodine liberated is therefore a measure of the copper in the solution, and when the sodium thiosulphate has been carefully standardized the method is extremely accurate. The ore is treated as described in the cyanide method until the copper precipitated by the aluminium foil has been washed and dissolved in 5 cc. of nitric acid; then 0·25 gramme of potassium chlorate is added, and the solution boiled nearly dry to oxidize any arsenic present to arsenic acid. The solution is cooled, 50 cc. water added, then 5 cc. ammonia, and the solution is boiled for five minutes. Next 5 cc. of glacial acetic acid are added, the solution cooled, and 5 cc. of a solution of potassium iodide (300 grammes to the litre) and the standard solution of sodium thiosulphate run in from a burette until the brown colour has nearly disappeared. A few drops of starch solution are then added, and when the blue colour has nearly vanished a drop or two of methyl orange makes the end reaction very sharp. The thiosulphate solution is standardized by dissolving 0·3 to 0·5 gramme of pure copper in 3 cc. of nitric acid, adding 50 cc. of water and 5 cc. of ammonia, and titrating as above after the addition of 5 cc. of glacial acetic acid and 5 cc. of the potassium iodide solution.

Iron.—The methods used in the assay for iron are volumetric, and are all based on the property possessed by certain reagents of oxidizing iron from the ferrous to the ferric state. Two salts are in common use for this purpose, potassium permanganate and potassium bichromate. It is necessary in the first place, after the ore is in solution, to reduce all the iron to the ferrous condition; then the carefully standardized solution of the oxidizing reagent is added until all the iron is in the ferric state, the volume of the standard solution used being the measure of the iron contained in the ore. The end of the reaction when potassium permanganate is employed is known by the change in colour of the solution. As the solution of potassium permanganate, which is deep red in colour, is dropped into the colourless iron solution, it is quickly decolorized while the iron solution gradually assumes a yellowish tinge, the first drop of the permanganate solution in excess giving it a pink tint. With potassium bichromate solution, which is yellow, the iron solution becomes green from the chromium chloride or sulphate formed, and the end of the reaction is determined by removing a drop of the solution on the stirring-rod and adding it to a drop of a dilute solution of potassium ferricyanide on a white tile. So long as the solution contains a ferrous salt, the drop on the tile changes to blue; hence the absence of a blue coloration indicates the complete oxidation of all the ferrous salt and the end of the reaction. One gramme of ore is usually taken for assay and treated in a small flask or beaker with 10 cc. of hydrochloric acid. All the iron in the ore generally dissolves upon heating, and a white residue is left. Occasionally this residue contains a small amount of iron in a difficultly soluble form; in that case the solution is slightly diluted with water and filtered into a larger flask. The residue in the filter is ignited and fused with a little sodium carbonate and nitrate, or with sodium peroxide. The product is treated with water, filtered, and the residue dissolved in hydrochloric acid and added to the main solution. This solution, which should not exceed 50 cc. or 75 cc. in volume, contains the iron in the ferric state and is ready for reduction.

In the reduction by metallic zinc, about 3 grammes of granulated or foliated zinc are placed in the flask, which is closed with a small funnel; when the iron is reduced, add 10 cc. of sulphuric acid, and as soon as all the zinc is dissolved the solution is ready for titration. In the reduction by stannous chloride the solution of the ore in the flask is heated to boiling, and a strong solution of stannous chloride is added until the solution is completely decolorized; then 60 cc. of a solution of mercuric chloride (50 grammes to the litre) are run in and the contents of the flask poured into a dish containing 600 cc. of water and 60 cc. of a solution containing 200 grammes of manganous sulphate, 1 litre of phosphoric acid (1·3 sp. gr.), 400 cc. of sulphuric acid, and 1600 cc. of water. The solution is then ready for titration with the standard permanganate solution.

The permanganate or bichromate solution is standardized by dissolving 0·5 of a gramme of pure iron wire in a flask, in hydrochloric acid, oxidizing it with a little potassium chlorate, boiling off all traces of chlorine, deoxidizing by one of the methods described above, and titrating with the solution. As the wire always contains impurities, the absolute amount of iron in the wire must be determined and the correction made accordingly. Pure oxalic acid may also be used, which, in the presence of sulphuric acid, is oxidized by the standard solution according to the reaction:—

$$5(H_2C_2O_4{,}2H_2O) + 3H_2SO_4 + 2KMnO_4 = 10CO_2 + 2MnSO_4 + K_2SO_4 + 18H_2O$$

The reaction in case of ferrous sulphate is:—

$$10FeSO_4 + 2KMnO_4 + 8H_2SO_4 = 5Fe_2(SO_4)_3 + K_2SO_4 + 2MnSO_4 + 8H_2O;$$

that is, the same amount of potassium permanganate is required to oxidize 5 molecules of oxalic acid that is necessary to oxidize 10 molecules of iron in the form of ferrous sulphate to ferric sulphate, or 63 parts by weight of oxalic acid equal 56 parts by weight of metallic iron. Ammonium ferrous sulphate may also be used; it contains one-seventh of its weight of iron. (A. A. B.)

ASSEGAI, or ASSAGAI (from Berber-Arab *as-zahayah*, through Portuguese *azagaia*), a weapon for throwing or hurling, a light spear or javelin made of wood and pointed with iron, particularly the spear used by the Zulu and other Kaffir tribes of South Africa. In addition to the long-handled assegai there is a shorter weapon for use at close quarters.

ASSELIJN, HANS (1610–1660), Dutch painter, was born at Diepen, near Amsterdam. He received instruction from Esaias Vandevelde (1587–1630), and distinguished himself particularly in landscape and animal painting, though his historical works and battle pieces are also admired. He travelled much in France and Italy, and modelled his style greatly after Bamboccio (Peter Laer). He was one of the first Dutch painters who introduced a fresh and clear manner of painting landscapes in the style of Claude Lorraine, and his example was speedily followed by other artists. Asselijn's pictures were in high estimation at Amsterdam, and several of them are in the museums of that city. Twenty-four, painted in Italy, were engraved.

ASSEMANI, the name of a Syrian Maronite family of famous Orientalists.

1. Joseph Simon, a Maronite of Mount Lebanon, was born in 1687. When very young he was sent to the Maronite college in Rome, and was transferred thence to the Vatican library. In 1717 he was sent to Egypt and Syria to search for valuable MSS., and returned with about 150 very choice ones. The success of this expedition induced the pope to send him again to the East in 1735, and he returned with a still more valuable collection. On his return he was made titular archbishop of Tyre and librarian of the Vatican library. He instantly began to carry into execution most extensive plans for editing and publishing the most valuable MS. treasures of the Vatican. His two great works are the *Bibliotheca Orientalis Clementino-Vaticana rec. manuscr. codd. Syr., Arab., Pers., Turc., Hebr., Samarit., Armen., Aethiop., Graec., Aegypt., Iber., et Malab., jussu et munif. Clem. XI.* (Rome, 1719–1728), 9 vols. folio, and *Ephraemi Syri opera omnia quae extant, Gr., Syr., et Lat.*, 6 vols. folio (Rome, 1737–1746). Of the *Bibliotheca* the first three vols. only were completed. The work was to have been in four parts—(1) Syrian and allied MSS., orthodox, Nestorian and Jacobite; (2) Arabian MSS., Christian and Mahommedan; (3) Coptic, Aethiopic, Persian and Turkish MSS.; and (4) Syrian and Arabian MSS. not distinctively theological; only the first part was completed, but extensive preparations were made for the others. There is a German abridgment by A. F. Pfeiffer.

2. Joseph Aloysius, brother of Joseph Simon, and professor of Oriental languages at Rome. He died in 1782. Besides aiding his brother in his literary labours, he published, in 1749–1760, *Codex Liturgicus Ecclesiae Universae in xv. libris* (this is incomplete), and *Comment. de Catholicis sive Patriarchis Chaldaeorum et Nestorianorum* (Rome, 1775).

3. Stephen Evodius, nephew of Joseph Simon and Joseph Aloysius, was the chief assistant of his uncle Joseph Simon in his work in the Vatican library. He was titular archbishop of Apamea in Syria, and held several rich prebends in Italy. His literary labours were very extensive. His two most important works were a description of certain valuable MSS. in his *Bibliothecae Mediceo-Laurentianae et Palatinae codd. manuscr. Orientalium Catalogus* (Flor. 1742), fol., and his *Acta SS. Martyrum Orientalium.* He made several translations from the Syrian, and in conjunction with his uncle he began the *Bibliothecae Apostol. Vatic. codd. manusc. Catal., in tres partes distributus.* Only three vols. were published, and the fire in the Vatican library in 1768 consumed the manuscript collections which had been prepared for the continuation of the work.

4. Simon, grandnephew of Joseph Simon, was born at Tripoli in 1752, and was professor of Oriental languages in Padua. He died in 1820. He is best known by his masterly detection of the literary imposture of Vella, which claimed to be a history of the Saracens in Syria.

ASSEMBLY, UNLAWFUL, the term used in English law for an assembly of three or more persons with intent to commit a crime by force, or to carry out a common purpose (whether lawful or unlawful), in such a manner or in such circumstances as would in the opinion of firm and rational men endanger the public peace or create fear of immediate danger to the tranquillity of the neighbourhood. In the Year Book of the third year of Henry VII.'s reign assemblies were referred to as not punishable unless *in terrorem populi domini regis.* It has been suggested (Criminal Code Commission, 1879) that legislation first became necessary at a time when it was usual for those landed proprietors who were on bad terms with one another to go to market at the head of bands of armed retainers (Statute of Northampton, 1328, 2 Edw. III. c. 3). An assembly, otherwise lawful, is not made unlawful if those who take part in it know beforehand that there will probably be organized opposition to it, and that it may cause a breach of the peace (*Beatty* v. *Gillbanks*, 1882, 9 Q. B. D. 308). All persons may, and must if called upon to do so, assist in dispersing an unlawful assembly (*Redford* v. *Birley*; 1822, 1 St. Tr. n.s.1215; *R.* v. *Pinney*, 1831, 3 St. Tr. n.s. 11). An assembly which is lawful cannot be rendered unlawful by proclamation unless the proclamation is one authorized by statute (*R.* v. *Fursey*, 1833, 3 St. Tr. n.s. 543, 567; *R.* v. *O'Connell*, 1831, 2 St. Tr. n.s. 629, 656; see also the Prevention of Crimes [Ireland] Act 1887). Meetings for training or drilling, or military movements, are unlawful assemblies unless held under lawful authority from the crown, the lord-lieutenant, or two justices of the peace (Unlawful Drilling Act 1820, s. 11).

An unlawful assembly which has made a motion towards its common purpose is termed a *rout*, and if the unlawful assembly should proceed to carry out its purpose, *e.g.* begin to demolish a particular enclosure, it becomes a riot (*q.v.*). All three offences are misdemeanours in English law, punishable by fine and imprisonment. The common law as to unlawful assembly extends to Ireland, subject to the special legislation referred to under the title Riot. The law of Scotland includes unlawful assembly under the same head as rioting.

British Dominions Abroad.—The law of the British colonies as a general rule as to unlawful assemblies follows the common law of England. The definitions in the Criminal Codes of Canada (1892, s. 79) and Queensland (1899, s. 61) are substantially the same as the common-law definition above given. Under the Indian Penal Code (s. 141) an assembly of five or more persons is designated an unlawful assembly if the common object of the persons composing that assembly is—(1) to overawe by criminal force, or show of criminal force, the legislative or executive government of India, or the government of any presidency or any lieutenant-governor, or any public servant in the exercise of the lawful power of such public servant; (2) to resist the execution of any law or of any legal process; (3) to commit any mischief or" criminal trespass " or other offence; (4) by means of criminal force or show of criminal force to any person, to take or obtain possession of any property, or to deprive any person of the enjoyment of a right of way, or of the use of water, or other corporeal right of which he is in possession or enjoyment, or to enforce any right or supposed right; or (5) by means of criminal force or show of criminal force, to compel any person to do what he is not legally bound to do, or to omit to do what he is legally entitled to do (see Mayne, *Ind. Cr. Law*, ed. 1896, p. 480). In South Africa and Mauritius the law on this subject is derived from the Roman Dutch and French law (see Riot.)

United States.—The common-law definition of unlawful assembly is accepted in the United States subject to the special legislation of the constituent states. The New York Penal Code (s. 451) declares that whenever three or more persons being assembled attempt or threaten any act tending towards a breach of the peace or injury to person or property, or any unlawful act, such assembly is unlawful (see Bishop, *Amer. Crim. Law*, 8th ed., 1892, vol. i. s. 534, vol. ii. s. 1256).

ASSEN, the capital of the province of Drente, Holland, 16 m. by rail S. of Groningen, at the junction of the two canals which run north and south to Groningen and Meppel respectively. Pop. (1900) 11,329. It is partly surrounded by a small forest belonging to the state. Assen possesses schools (a gymnasium and burgher school), a chamber of commerce, a museum of antiquities and a court-house. Peat-cutting forms a considerable industry. Many prehistoric remains found in the neighbourhood are in the museum at Leiden. Until the 19th century Assen was a small place built round the convent in which Otto II. (of Lippe), bishop of Utrecht, was murdered after being taken prisoner at Koevorden in 1237.

ASSER, or Asserius Menevensis (d. *c.* 910), English bishop, and author of a life of Alfred the Great, was a native of the western part of Wales, and was related to Nobis, bishop of St David's. He became a monk at St David's, and having acquired some reputation for learning, he was invited by King Alfred to his court. The king met the monk at Denu (probably East or West Dean, near Seaford in Sussex), but Asser did not at once accept the invitation of Alfred, and returned to Wales to consult his colleagues. He then agreed to spend six months of each year with the king and six months in his own land; but his first stay at the royal court extended to eight months, and it is probable

that the annual visit to Wales was curtailed if not altogether discontinued. It is difficult to fix the date of Asser's arrival in England, but it was probably about 885. He assisted the king in his studies, received from him the monasteries of Congresbury and Banwell, and sometime later "Exeter and its diocese in Saxonland and Cornwall." He became bishop of Sherborne before 900, and his death is recorded in the Anglo-Saxon Chronicle under the date 910, although it is possible that it occurred a year or two earlier. The scanty details of Asser's life are taken from his biography of Alfred, from which it is inferred that he was acquainted with one or two Frankish biographies, and possibly had visited the continent of Europe.

Asser's work, *Annales rerum gestarum Alfredi magni*, was written about 893, and consists of a chronicle of English history from 849 to 887, and an account of Alfred's life, largely drawn from personal knowledge, down to 887. The only manuscript of which there is any record dates from about 1000, and was destroyed by fire in 1731. From this manuscript an edition was printed in 1574 under the direction of Matthew Parker, archbishop of Canterbury; but this contained many interpolations and alterations which were copied by subsequent editors. The text has since been the subject of careful study, and the edition edited by W. H. Stevenson (Oxford, 1904) distinguishes between the original work of Asser and the later additions. Some doubt has been cast upon the authenticity of the work, especially by T. Wright in the *Biographia Britannica literaria* (London, 1842), who ascribes the life to a monk of St Neots; but the latest scholarship regards it as the work of Asser, although all the difficulties which surround the authorship have not been removed. The life was largely used by subsequent chroniclers, among others by Florence of Worcester, Simeon of Durham, Roger of Hoveden, and William of Malmesbury.

See W. H. Stevenson, Introduction to Asser's *Life of King Alfred* (Oxford, 1904); R. Pauli, Introduction to *König Aelfred* (Berlin, 1851).

ASSESSMENT, (from Lat. *assessare*, to sit beside, to judge), a term expressing either an official valuation of income or property for purposes of taxation, or the amount so determined (see TAXATION and VALUATION). It is also applied to the amount of damages fixed by a jury in a court of law (see DAMAGES).

An *assessment committee* is a statutory committee appointed under the Union Assessment Acts 1862, 1880, for the purpose of making out the valuation lists upon which the poor-law rate is based.

An *assessment policy*, in life insurance, is a policy issued at a fixed premium, the excess of which over the portion necessary to meet current claims and expenses goes to form a reserve fund which is devoted to various forms of benefit for the policy-holders. See INSURANCE and FRIENDLY SOCIETIES.

ASSESSOR (Lat. *assessare, assidere*, to sit by), a Roman term originally applied to a trained lawyer who sat beside a governor of a province or other magistrate, to instruct him in the administration of the laws (see Roll, *De assessoribus magistratuum Romanorum*, Leipzig, 1872). The system is still exemplified in Scotland, where it is usual in the larger towns for municipal magistrates, in the administration of their civil jurisdiction, to have the aid of professional assessors. In England, by the Judicature Act 1873, the court of appeal and the High Court may in any cause or matter call in the aid of assessors. The Patents Act 1907 makes special provision for assessors in patent and trade-mark cases. By the Supreme Court of Judicature Act 1891 the House of Lords may, in appeals in admiralty actions, call in the aid of assessors, while in the admiralty division of the High Court it is usual for the Elder Brethren of Trinity House to assist as nautical assessors. In admiralty cases in the county courts, too, the judge is frequently assisted by assessors of "nautical skill and experience" (County Court Admiralty Jurisdiction Act 1868). In the ecclesiastical courts assessors assist the bishop in proceedings under the Church Discipline Act 1840, s. 11, while under the Clergy Discipline Act 1892, s. 2, they assist the chancellor in determining questions of fact. By the Appellate Jurisdiction Act 1876, s. 14, the king in council may make rules for the attendance of archbishops and bishops as assessors in the hearing of ecclesiastical cases by the judicial committee of the privy council.

The term "assessor" is also very generally applied to persons appointed to ascertain and fix the value of rates, taxes, &c., and in this sense the word is used in the United States.

In France and in all European countries where the civil law system prevails, the term *assesseur* is applied to those assistant judges who, with a president, compose a judicial court.

In Germany an *Assessor*, or *Beisitzer*, is a member of the legal profession who has passed four years in actual practice and become qualified for the position of a judge.

ASSETS (from the O. Nor. Fr. *assetz*, mod. Fr. *assez*, "enough"), in English law, strictly the property of a debtor in the hands of his representative sufficient for the satisfaction of his creditors or legatees. Thus the property of a bankrupt is termed his assets and is the fund out of which his liabilities must be paid. All property of the debtor is assets, and it is not necessary that it should have been reduced into possession by him.

The creditors of a debtor are either secured or unsecured. A secured creditor, *e.g.* a mortgagee, has a prior claim to be paid his debt out of his security. If on realization of the security there is a balance after paying the debt, such balance becomes assets for the unsecured creditors; if there is a deficit, then the creditor becomes an unsecured creditor for such deficit. The unsecured creditors were formerly divided into creditors by specialty and by simple contract, the first being creditors secured by instrument under seal who ranked in priority to simple contract creditors. But by Hinde Palmer's Act [the Executors Act] 1869 all unsecured creditors rank alike.

Assets are divisible into legal assets and equitable assets, and the former class is again divisible into assets real and personal. These distinctions, though formerly of great importance, have now lost most of their meaning, but it is necessary briefly to describe the nature of these divisions and their consequences. The distinction between assets legal and equitable depends entirely upon the remedy open to the creditor to recover his debt and in no way upon the nature of the property from which the debt is sought to be recovered. If the creditor had to sue the executor of a debtor at law to obtain payment out of the property, that property was legal assets; but if the only remedy open to the creditor to get at the property was to bring an action in chancery for the administration of the estate, then the assets were equitable.

Legal assets, as has been said, were divided into real and personal assets. The personal assets were those which devolved *virtute officii* on the executor or administrator; such assets are since Hinde Palmer's Act available equally for specialty and simple contract creditors. The real assets consisted of those descending to the heir or devised to a devisee, and were at law only liable for specialty debts. However, by the Land Transfer Act 1897 it is provided that the real estate of a deceased shall devolve upon the executor and "shall be administered in the same manner . . . and with the same incidents as if it were personal estate." The distinction, therefore, between assets real and personal has practically ceased to exist, and only continues in regard to such property as is not included in the act, the most important of which is land held in copyhold.

The equitable assets were treated otherwise. In the eyes of equity all unsecured creditors stand upon the same footing, and a creditor suing for administration of the estate sued on behalf of himself and all other creditors of the estate, and the distinction between specialty and simple contract creditors was ignored. Land was not at law liable to satisfy simple contract creditors; but if a testator expressly charged it with payment of his debts or devised it to his executors upon trust to pay his debts, equity treated it as equitable assets and so made it available to satisfy simple contract creditors; and finally by an act of 1833 it was provided that real estate should in all cases be assets to be administered by equity for the benefit of simple contract creditors as well as creditors by specialty. It will be seen therefore that, generally speaking, all creditors have now the same remedies against the executors

either at law or in equity. The only property as to which these distinctions at all survive is that not touched by the Land Transfer Act 1897.

The act of 1833 just mentioned does not, however, deal with legacies, which continue to be payable only out of personalty unless they are expressly charged upon the realty by the testator; it has been contended that the effect of the Land Transfer Act 1897 has been to alter this and make the realty assets for the purpose of paying legacies, but this view is believed to be unsound.

It is necessary for the representative so to distribute the assets that any fund primarily liable shall bear its proper burden, and that as far as possible all debts and legacies may be paid; this is said to be "marshalling the assets," and a few examples of the principal cases of marshalling will make this clear. If the personalty is exhausted in satisfying the creditors the legatees are left without a fund from which to be paid. But inasmuch as the creditor could have got paid out of the realty, as well as the personalty, it is not fair that the legatee should suffer by the creditor's choice, and he will therefore get payment from the real estate. So again if one legacy is charged upon the real estate and another is not, then if the former be paid out of the personalty the latter will stand in its place and be paid from the real estate.

Finally it shall be noticed that an insolvent estate may be administered in bankruptcy. In such a case the law of bankruptcy regulates the order in which the assets are divided among the creditors (see BANKRUPTCY), but by the Judicature Act 1875, it is provided that an insolvent estate may be administered in the chancery division, and in such a case "the same rules shall prevail and be observed as to the respective rights of secured and unsecured creditors and as to the debts and liabilities provable and as to the valuation of annuities and future and contingent liabilities respectively as may be in force for the time being under the law of bankruptcy." This clause must be construed strictly, and it is only in the three cases specifically mentioned that the rules of bankruptcy will be imported into the administration of an insolvent estate by the chancery division.

In a less strict sense, the term "assets," or "an asset," is used derivatively as a synonym for any property, or as opposed to "liabilities." Cecil Rhodes once spoke of the British flag as a "great commercial asset" in South Africa, meaning merely that the imperial connexion was a source of strength and credit.

ASSIDEANS (the Anglicized form, derived through the Greek, of the Hebrew *Ḥasidim*, "the pious"), the name of a party or sect which stood out against the Hellenization of the Jews in the 2nd century B.C. After the massacre of those who fled from the forces of Antiochus Epiphanes and would not resist on the sabbath, Mattathias (or Judas) decided to set aside the law and was joined by a company of Assideans, brave men of Israel every one, who offered themselves willingly for the law (1 Macc. ii. 42, cf. 2 Macc. viii. 1). On the appointment of Alcimus (162 B.C.), "a descendant of Aaron" as high-priest, "the Assideans were the first who sought peace" (1 Macc. vii. 13 f.); but the treacherous murder of sixty of them (*ib.* 16) threw them back into the arms of Judas. According to 2 Macc. xiv., Alcimus identified them with the whole party of the rebels, of which they were only one, though the most important, section.

See Schurer, *Geschichte des jüdischen Volkes*, i. 203; art. in *Jewish Encyclopaedia*, s.v. "Ḥasidim" (S. M. Dubnow). (J. H. A. H.)

ASSIGNATS (from Lat. *assignatus*, assigned), a form of paper-money issued in France from 1789 to 1796. Assignats were so termed, as representing land *assigned* to the holders.

The financial strait of the French government in 1789 was extreme. Coin was scarce, loans were not taken up, taxes had ceased to be productive, and the country was threatened with imminent bankruptcy. In this emergency assignats were issued to provide a substitute for a metallic currency. They were originally of the nature of mortgage bonds on the national lands. These lands consisted of the church property confiscated, on the motion of Mirabeau, by the Constituent Assembly on the 2nd of November 1789, and the crown lands, which had been taken over by the nation on the 7th of October (see FRENCH REVOLUTION).

The assignats were first to be paid to the creditors of the state. With these the creditors could purchase national land, the assignats having, for this purpose, the preference over other forms of money. If the creditor did not care to purchase land, it was supposed that he could obtain the face-value for them from those who desired land. Those assignats which were returned to the state as purchase-money were to be cancelled, and the whole issue, it was argued, would consequently disappear as the national lands were distributed.

A first issue was made of 400,000,000 francs' worth of assignats, each note being of 100 francs' value and bearing interest daily at a rate of 5%. They were to be redeemed by the product of the sales, and from certain other sources, at the rate of 120,000,000 francs in 1791, 100,000,000 francs in 1792, 80,000,000 francs in 1793 and 1794, and the surplus in 1795. The success of the issue was undoubted, and, possibly, if the assignats had been restricted, as Mirabeau at first desired, to the extent of one-half the value of the lands sold, they would not have shared the usual fate of inconvertible paper money. Mirabeau was a strenuous advocate of the assignats. "They represent," he said, "real property, the most secure of all possessions, the soil on which we tread." "There cannot be a greater error than the fear so generally prevalent as to the over-issue of assignats . . . reabsorbed progressively in the purchase of the national domains, this paper-money can never become redundant."

In 1790 the interest was reduced to 3%, and as the treasury had again become exhausted, a further issue was decided upon; it was also decreed that the assignats were to be accepted as legal tender, all public departments being instructed to receive them as the equivalent of metallic money. This second issue amounted to 800,000,000 francs and carried no interest. It was solemnly declared in the decree authorizing the issue that the maximum issue was never to exceed twelve hundred millions. This pledge, however, was soon broken, and further issues brought the total up to 3,750,000,000 francs. The consequence of these further issues was instant depreciation, and the note of 100 francs nominal value sank to less than 20 francs coin. Recourse was then had to protective legislation. The first step was to decree the penalty of six years' imprisonment against any person who should sell specie for a more considerable quantity of assignats, or who should stipulate a different price for commodities according as the payment was to be made in specie or in assignats. For the second offence the penalty was to be twenty years' imprisonment (August 1, 1793), for which the death penalty was ultimately substituted (May 10, 1794). This severe provision was, however, repealed after the fall of Robespierre. Notwithstanding these precautions, the value of assignats still declined, till the proportion to specie had become that of six to one. Then came the passing by the Convention on the 3rd of May 1793 of the absurd "maximum." The decree required all farmers and corn-dealers to declare the quantity of corn in their possession and to sell it only in recognized markets. No person was to be allowed to lay in more than one month's supply. A maximum price was fixed, above which no one was to buy or sell under severe penalties. These measures were soon stultified by further issues, and by June 1794 the total number of assignats aggregated nearly 8,000,000,000, of which only 2,464,000,000 had returned to the treasury and been destroyed. The extension of the "maximum" to all commodities only increased the confusion. Trade was paralysed and all manufacturing establishments were closed down. Attempts by the Convention to increase the value of the assignats were of no avail. Too many causes operated in favour of their depreciation: the enormous issue, the uncertainty as to their value if the Revolution should fail, the relation they bore to both specie and commodities, which retained their value and refused to be exchanged for a money of constantly diminishing purchasing power. Even

between the assignats themselves there were differences. The royal assignats, which had been issued under Louis XVI., had depreciated less than the republican ones. They were worth from 8 to 15% more, a fact due to the hope that in case of a counter-revolution they would be less likely to be discredited.

The Directory was guilty of even greater abuses in dealing with the assignats. By 1796 the issues had reached the enormous figure of 45,500,000,000 francs, and even this gigantic total was swollen still more by the numerous counterfeits introduced into France from the neighbouring countries. The assignats had now become totally valueless—the abolition of the "maximum" the previous year (1795) had produced no effect, and, though, by various payments into the treasury, the total number had been reduced to about 24,000,000,000 francs, their face-value was about 30 to 1 of coin. At this value they were converted into 800,000,000 francs of land-warrants, or *mandats territoriaux*, which were to constitute a mortgage on all the lands of the republic. These *mandats* were no more successful than the assignats, and even on the day of their issue were at a discount of 82%. They had an existence of six months, and were finally received back by the state at about the seventieth part of their face-value in coin.

AUTHORITIES.—L. A. Thiers, *Histoire de la révolution française*, gives a full and graphic account of the assignats, the causes of their depreciation, &c.; J. Garnier, *Traité des Finances* (1862); J. Bresson, *Histoire financière de la France* (1829); R. Stourm, *Les Finances de l'ancien régime et de la révolution* (1885); F. A. Walker, *Money* (1891); Henry Higgs, in the *Cambridge Modern History*, vol. viii. (1904). (T. A. I.)

ASSIGNMENT, ASSIGNATION, ASSIGNEE (from Lat. *assignare*, to mark out), terms which, as derivatives of the verb "to assign," are of frequent technical use in law. To assign is to make over, and the term is generally used to express a transference by writing, in contradistinction to a transference by actual delivery. In England the usual expression is assignment, in Scotland it is assignation. The person making over is called the *assignor* or *cedent*; the recipient, the *assign* or *assignee*. An assignee may be such either *by deed*, as when a lessee assigns his lease to another, or *in law*, as when property devolves upon an executor. The law as to assignment in connexion with each particular subject, as the assignment of a chose in action, assignment in contract, of dower, of errors, of a lease, &c., will be found under the respective headings. In a colloquial sense, "assignation" means a secretly contrived meeting between lovers.

ASSINIBOIA, a name formerly applied to two districts of Canada, but not now held by any. (1) A district formed in 1835 by the Hudson's Bay Company, having in it Fort Garry at the junction of the Red and Assiniboine rivers in Rupert's Land, North America. It extended over a circular area, with a radius of 50 m. from Fort Garry. It was governed by a local council nominated by the Hudson's Bay Company. It ceased to exist when Rupert's Land was transferred to Canada in 1870. (2) A district of the North-west Territories, which was given definite existence by an act of the Dominion parliament in 1875. Assiniboia extended from the western boundary of Manitoba (99° W. in 1875, and 101° 25′ W. in 1881) to 111° W., and from 49° N. to 52° N. The name was a misnomer, as it barely touched the Assiniboine river. To the north of the district lay the district of Saskatchewan, so that when the two were united by the Dominion act of 1905, they were somewhat changed in boundaries and the name Saskatchewan was given to the new province. The derivation of Assiniboia is from two Ojibway words, *assini* meaning a stone, and the termination "to cook by roasting"; from these came a name first applied to a Dakota or Sioux tribe living on the Upper Red river; afterwards when this tribe separated from the Dakotas, its name was given to the branch of the Red river which the tribe visited, the river being known as the Assiniboine and the tribe as Assiniboin.

ASSINIBOIN ("Stone-Cookers"), a tribe of North American Indians of Siouan stock. Their name (see above) is said to refer to their method of boiling water by dropping red-hot stones into it. Their former range was between the Missouri and the middle Saskatchewan on both sides of the Canadian frontier. In 1904 there were 1234 in the United States, all on reservations in Montana; and in 1902 there were 1371 in Canada.

See *Handbook of American Indians*, ed. F. W. Hodge (Washington, 1907).

ASSISE (from the Fr., derived from Lat. *assidere*, to sit beside), a geological term for two or more beds of rock united by the occurrence of the same characteristic species or genera.

ASSISI (anc. *Asisium*), a town and episcopal see of Umbria, Italy, in the province of Perugia, 15 m. E.S.E. by rail from the town of Perugia. Pop. (1901) town, 5338; commune, 17,240. The town occupies a fine position on a mountain (1345 ft. above sea-level) with a view over the valleys of the Tiber and Topino. It is mainly famous in connexion with St Francis, who was born here in 1182, and returned to die in 1226. The Franciscan monastery and the lower and upper church of St Francis were begun immediately after his canonization in 1228, and completed in 1253, being fine specimens of Gothic architecture. The crypt was added in 1818, when the sarcophagus containing his remains was discovered. The lower church contains frescoes by Cimabue, Giotto and others, the most famous of which are those over the high altar by Giotto, illustrating the vows of the Franciscan order; while the upper church has frescoes representing scenes from the life of St Francis (probably by Giotto and his contemporaries) on the lower portion of the walls of the nave, and scenes from Old and New Testament history by pupils of Cimabue on the upper. The church of Santa Chiara (St Clare), the foundress of the Poor Clares, with its massive lateral buttresses, fine rose-window, and simple Gothic interior, was begun in 1257, four years after her death. It contains the tomb of the saint and 13th-century frescoes and pictures. Santa Maria Maggiore is also a good Gothic church. The cathedral (San Rufino) has a fine façade with three rose-windows of 1140; the interior was modernized in 1572. The town is dominated by the medieval castle (1655 ft.), built by Cardinal Albornoz (1367) and added to by Popes Pius II. and Paul III. Two miles to the east in a ravine below Monte Subasio is the hermitage *delle Carceri* (2300 ft.), partly built, partly cut out of the solid rock, given to St Francis by Benedictine monks as a place of retirement. Below the town to the south-west, close to the station, is the large pilgrimage church of Santa Maria degli Angeli, begun in 1569 by Pope Pius V., with Vignola as architect; but not completed until 1640. It contains the original oratory of St Francis and the cell in which he died. Adjacent is the garden in which the saint's thornless roses bloom in May. Half a mile outside the town to the south-east is the convent of San Damiano, erected by St Francis, of which St Clare was first abbess.

In the early middle ages Assisi was subject to the dukes of Spoleto; but in the 11th century it seems to have been independent. It became involved, however, in the disputes of Guelphs and Ghibellines, and was frequently at war with Perugia. It was sacked by Perugia and the papal troops in 1442, and even after that continued to be the prey of factions. The place is now famous as a resort of pilgrims, and is also important for the history of Italian art. The poet Metastasio was born here in 1698.

See L. Duff-Gordon, *Assisi* ("Mediaeval Towns" series, London, 1900). For ancient history see ASISIUM. (T. As.)

ASSIUT, or SIUT, capital of a province of Upper Egypt of the same name, and the largest and best-built town in the Nile Valley south of Cairo, from which it is distant 248 m. by rail. The population rose from 32,000 in 1882 to 42,000 in 1900. Assiut stands near the west bank of the Nile across which, just below the town, is a barrage, completed in 1902, consisting of an open weir, 2733 ft. long, and over 100 bays or sluices, each 16½ ft. wide, which can be opened or closed at will. At the western end of the barrage begins the Ibrahimia canal, the feeder of the Bahr Yusuf, the largest irrigation canal of Egypt. The Ibrahimia canal is skirted by a magnificent embankment planted with shady trees leading from the river to the town. There are several bazaars, baths and handsome mosques, one noted for its lofty minaret, and here the American Presbyterian mission has established a college for both sexes. Assiut is famous for its red and black pottery and for ornamental wood and ivory work,

which find a ready market all over Egypt. It is one of the chief centres of the Copts. Here also is the northern terminus of the caravan route across the desert, which, passing through the Kharga oasis, goes south-west to Darfur. It is known as the Arbain, or forty days road, from the time occupied on the journey. Assiut (properly Asyût) is the successor of the ancient Lycopolis (Eg. Siôout), capital of the 13th nome of Upper Egypt. Here were worshipped two canine gods (see ANUBIS), Ophois (Wepwoi) being the principal god of the city, while Anubis apparently presided over the necropolis. No ruins are visible, the mounds of the old city being for the most part hidden under modern buildings; but the slopes of the limestone hills behind it are pierced with an infinity of rock-cut tombs, some of which were large and decorated with sculptures, paintings and long inscriptions. The archaeological commission of the *Description de l'Egypte* visited them in 1799, when the walls of many of the large tombs were still almost intact; in the first half of the 19th century (and to some extent later) an immense amount of destruction was caused by blasting for stone. Three of the tombs illustrate one of the darkest periods in Egypt's history, when the princes of Siut played a leading part in the struggle between Heracleopolis and Thebes (Dyns. IX.-XI.); another, of the XIIth Dynasty, contains a remarkable inscription detailing the contracts made by the nomarch with the priests of the temples of Ophois and Anubis for perpetual services at his tomb (see Breasted, *Ancient Records of Egypt, Historical Documents*, vol. i. pp. 179, 258). Remains of the mummies of dogs and similar animals sacred to these deities are scattered among the debris on the hillside in abundance. Lycopolis was the birthplace of Plotinus, the founder of Neo-Platonism (A.D. 205–270). From the 4th century onwards its grottoes were the dwellings of Christian hermits, amongst whom John of Lycopolis was the most celebrated. (F. Ll. G.)

ASSIZE, or ASSISE (Lat. *assidere*, to sit beside; O. Fr. *assire*, to sit, *assis*, seated), a legal term, meaning literally a "session," but in fact, as Littleton has styled it, a *nomen aequivocum*, meaning sometimes a jury, sometimes the sittings of a court, and sometimes the ordinances of a court or assembly.

It originally signified the form of trial by a jury of sixteen persons, which eventually superseded the barbarous judicial combat; this jury was named the grand assize and was sworn to determine the right of seisin of land (see EVIDENCE). The grand assize was abolished in 1833; but the term assize is still applicable to the jury in criminal causes in Scotland.

In the only sense in which the word is not now almost obsolete, assize means the periodical session of the judges of the High Court of Justice, held in the various counties of England, chiefly for the purposes of gaol delivery and trying causes at *nisi prius*. Previous to Magna Carta (1215) writs of assize had all to be tried at Westminster, or to await trial in the locality in which they had originated at the septennial circuit of the justices in eyre; but, by way of remedy for the great consequent delay and inconvenience, it was provided by this celebrated act that the assizes of *mort d'ancestor* and *novel disseisin* should be tried annually by the judges in every county. By successive enactments, the civil jurisdiction of the justices of assize was extended, and the number of their sittings increased, till at last the necessity of repairing to Westminster for judgment in civil actions was almost obviated to country litigants by an act, passed in the reign of Edward I., which provided that the writ summoning the jury to Westminster should also appoint a time and place for hearing such causes within the county of their origin. The date of the alternative summons to Westminster was always subsequent to the former date, and so timed as to fall in the vacation preceding the Westminster term; and thus "*Unless before*," or *nisi prius*, issues came to be dealt with by the judges of assize before the summons to Westminster could take effect. The *nisi prius* clause, however, was not then introduced for the first time. It occurs occasionally in writs of the reign of Henry III. The royal commissions to hold the assizes are—(1) general, (2) special. The general commission is issued twice a year to the judges of the High Court of Justice, and two judges are generally sent on each circuit. It covers commissions—(1) of oyer and terminer, by which they are empowered to deal with treasons, murders, felonies, &c. This is their largest commission; (2) of *nisi prius* (*q.v.*); (3) of gaol delivery, which requires them to try every prisoner in gaol, for whatsoever offence committed; (4) of the peace, by which all justices must be present at their county assizes, or else suffer a fine. Special commissions are granted for inquest in certain causes and crimes. See also the articles CIRCUIT; JURY.

Assizes, in the sense of ordinances or enactments of a court or council of state, as the "assize of bread and ale," the "assize of Clarendon," the "assize of arms," are important in early economic history. As early as the reign of John the observance of the *assisae venalium* was enforced, and for a period of 500 years thereafter it was considered no unimportant part of the duties of the legislature to regulate by fixed prices, for the protection of the lieges, the sale of bread, ale, fuel, &c. (see ADULTERATION). Sometimes in city charters the right to assize such articles is specially conceded. Regulations of this description were beneficial in the repression of fraud and adulteration. Assizes are sometimes used in a wider legislative connexion by early chroniclers and historians—the "assisae of the realme," *e.g.* occasionally meaning the organic laws of the country. For the "assizes of Jerusalem" see CRUSADES.

The term assize, originally applying to an assembly or court, became transferred to actions before the court or the writs by which they were instituted. The following are the more important.

Assize of darrien presentment, or last presentation, was a writ directed to the sheriff to summon an assize or jury to enquire who was the last patron that presented to a church then vacant, of which the plaintiff complained that he was deforced or unlawfully deprived by the defendant. It was abolished in 1833 and the action of *quare impedit* (*q.v.*) substituted. But by the Common Law Procedure Act 1860, no *quare impedit* can be brought, so that an action in the king's bench of the High Court was substituted for it.

Assize of *mort d'ancestor* was a writ which lay where a plaintiff complained of an "abatement" or entry upon his freehold, effected by a stranger on the death of the plaintiff's father, mother, brother, sister, uncle, aunt, &c. It was abolished in 1833.

Assize of *novel disseisin* was an action to recover lands of which the plaintiff had been "disseised" or dispossessed. It was abolished in 1833. See Pollock and Maitland, *Hist. Eng. Law*.

Assize, clerk of, an officer "who writes all things judicially done by the justices of assizes in their circuits." He has charge of the commission, and takes recognizances, records, judgments and sentences, grants certificates of conviction, draws up orders, &c. By the Clerks of Assize Act 1869 he must either have been for three years a barrister or solicitor in actual practice, or have acted for three years in the capacity of subordinate officer of a clerk of assize on circuit.

United States.—There are no assize courts in the United States; it is not the custom for supreme court judges of the states to go on circuit, but the judges of the United States Supreme Court do sit as members of the United States circuit courts in the several states periodically throughout the year. These courts are not assize courts, but are federal as distinguished from state courts, and have a special and limited jurisdiction. In the several states the highest court is divided into departments, in each of which there are courts presided over by supreme court judges residing in that department, thus avoiding the assize court or circuit-going system.

ASSMANNSHAUSEN, a village of Germany, in the Prussian province of Hesse-Nassau, on the right bank of the Rhine and the railway from Frankfort-on-Main to Niederlahnstein. Pop. 1100. It has a lithium spring, baths and a *Kurhaus*, and is famed for its red wine (*Assmannshäuser*), which resembles light Burgundy. From here a railway ascends the Niederwald.

ASSOCIATE (Lat. *associatus*, from *ad*, to, and *sociare* to join), one who is united with another, and so generally a companion; in particular a subordinate member of an institution or society,

as an associate of the Royal Academy, or one holding a degree in a learned society lower than that of fellow. In English law the associates are officers of the supreme court, whose duties are to draw up the list of causes, enter verdicts, hand the records to the parties, &c., and generally to conduct the business of trials. By the Judicature (Officers) Act 1879 they were styled masters of the supreme court, but the office is now amalgamated with the crown office department, of which they are clerks.

ASSOCIATION OF IDEAS, or MENTAL ASSOCIATION, a term used in psychology to express the conditions under which representations arise in consciousness, and also for a principle put forward by an important historical school of thinkers to account generally for the facts of mental life. Modern physiological psychology has so altered the approach to this subject that much of the older discussion has become antiquated, but it may be recapitulated here for historical purposes.

Earlier Theory.—In the long and erudite Note D**, appended by Sir W. Hamilton to his edition of Reid's *Works*, many anticipations of modern statements on association are cited from the works of ancient or medieval thinkers; and for Aristotle, in particular, the glory is claimed of having at once originated the doctrine and practically brought it to perfection.[1] As translated by Hamilton, but without his interpolations, the classical passage from the *De Memoria et Reminiscentia* runs as follows:—

"When, therefore, we accomplish an act of reminiscence, we pass through a certain series of precursive movements, until we arrive at a movement on which the one we are in quest of is habitually consequent. Hence, too, it is that we hunt through the mental train, excogitating from the present or some other, and from similar or contrary or coadjacent. Through this process reminiscence takes place. For the movements are, in these cases, sometimes at the same time, sometimes parts of the same whole, so that the subsequent movement is already more than half accomplished."

The passage is obscure, but it does at all events indicate the various principles commonly termed contiguity, similarity and contrast. Similar principles are stated by Zeno the Stoic, by Epicurus (see Diog. Laert. vii. § 52, x. § 32), and by St Augustine (*Confessions*, x. c. 19). Aristotle's doctrine received a more or less intelligent expansion and illustration from the ancient commentators and the schoolmen, and in the still later period of transition from the age of scholasticism to the time of modern philosophy, prolonged in the works of some writers far into the 17th century, Hamilton adduced not a few philosophical authorities who gave prominence to the general fact of mental association—the Spaniard Ludovicus Vives (1492–1540) especially being most exhaustive in his account of memory.

In Hobbes's psychology much importance is assigned to what he called, variously, the succession, sequence, series, consequence, coherence, train of imaginations or thoughts in mental discourse. But not before Hume is there express question as to what are the distinct principles of association. John Locke had, meanwhile, introduced the phrase "Association of Ideas" as the title of a supplementary chapter incorporated with the fourth edition of his *Essay*, meaning it, however, only as the name of a principle accounting for the mental peculiarities of individuals, with little or no suggestion of its general psychological import. Of this last Hume had the strongest impression; he reduced the principles of association to three—Resemblance, Contiguity in time and place, Cause and (or) Effect. Dugald Stewart put forward Resemblance, Contrariety, and Vicinity in time and place, though he added, as another obvious principle, accidental coincidence in the sounds of words, and further noted three other cases of relation, namely, Cause and Effect, Means and End, Premisses and Conclusion, as holding among the trains of thought under circumstances of special attention. Reid, preceding Stewart, was rather disposed to make light of the subject of association, vaguely remarking that it seems to require no other original quality of mind but the power of habit to explain the spontaneous recurrence of trains of thinking, when become familiar by frequent repetition (*Intellectual Powers*, p. 387).

Hamilton's own theory of mental reproduction, suggestion or association is a development, greatly modified, of the doctrine expounded in his *Lectures on Metaphysics* (vol. ii. p. 223, seq.), which reduced the principles of association first to two—Simultaneity and Affinity, and these further to one supreme principle of Redintegration or Totality. In the ultimate scheme he posits no less than four general laws of mental succession concerned in reproduction: (1) *Associability* or possible co-suggestion (all thoughts of the same mental subject are associable or capable of suggesting each other); (2) *Repetition* or direct remembrance (thoughts coidentical in modification, but differing in time, tend to suggest each other); (3) *Redintegration*, direct remembrance or reminiscence (thoughts once coidentical in time, are, however, different as mental modes, again suggestive of each other, and that in the mutual order which they originally held); (4) *Preference* (thoughts are suggested not merely by force of the general subjective relation subsisting between themselves, they are also suggested in proportion to the relation of interest, from whatever source, in which they stand to the individual mind). Upon these follow, as special laws:—A, Primary—modes of the laws of Repetition and Redintegration—(1) law of Similars (Analogy, Affinity); (2) law of Contrast; (3) law of Coadjacency (Cause and Effect, &c.); B, Secondary—modes of the law of Preference, under the law of Possibility—(1) laws of Immediacy and Homogeneity; (2) law of Facility.

The Associationist School.—This name is given to the English psychologists who aimed at explaining all mental acquisitions, and the more complex mental processes generally under laws not other than those which have just been set out as determining simple reproduction. Hamilton, though professing to deal with reproduction only, formulates a number of still more general laws of mental succession—law of Succession, law of Variation, law of Dependence, law of Relativity or Integration (involving law of Conditioned), and, finally, law of Intrinsic or Objective Relativity—as the highest to which human consciousness is subject; but it is in a sense quite different that the psychologists of the so-called Associationist School intend their appropriation of the principle or principles commonly signalized. As far as can be judged from imperfect records, they were anticipated to some extent by the experientialists of ancient times, both Stoic and Epicurean (cf. Diogenes Laertius, as above). In the modern period, Hobbes is the first thinker of permanent note to whom this doctrine may be traced. Though, in point of fact, he took anything but an exhaustive view of the phenomena of mental succession, yet, after dealing with trains of imagination, or what he called mental discourse, he sought in the higher departments of intellect to explain reasoning as a discourse in words, dependent upon an arbitrary system of marks, each associated with, or standing for, a variety of imaginations; and, save for a general assertion that reasoning is a reckoning—otherwise, a compounding and resolving—he had no other account of knowledge to give. The whole emotional side of mind, or, in his language, the passions, he, in like manner, resolved into an expectation of consequences based on past experience of pleasures and pains of sense. Thus, though he made no serious attempt to justify his analysis in detail, he is undoubtedly to be classed with the associationists of the next century. They, however, were wont to trace their psychological theory no further back than to Locke's *Essay*. Bishop Berkeley was driven to posit expressly a principle of suggestion or association in these terms:—"That one idea may suggest another to the mind, it will suffice that they have been observed to go together, without any demonstration of the necessity of their coexistence, or so much as knowing what it is that makes them so to coexist" (*New Theory of Vision*, § 25); and to support the obvious application of the principle to the case of the sensations of sight and touch before him, he constantly urged that association of sound and sense of language which the later school has always put in the foreground, whether as illustrating the principle in general or in explanation of the supreme importance of language for knowledge. It was natural, then, that Hume, coming after Berkeley, and assuming Berkeley's results, though he reverted to the larger inquiry of Locke, should be more explicit in his reference to association; but he was original also, when he spoke of it as a "kind of attraction which in the mental world will be found to have as extraordinary effects as in the natural, and to show itself in as many and as various forms" (*Human Nature*, i. 1, § 4). Other inquirers about the same time conceived of association with this breadth of view, and set themselves to track, as psychologists, its effects in detail.

David Hartley in his *Observations on Man*, published in 1749 (eleven years after the *Human Nature*, and one year after the better-known *Inquiry*, of Hume), opened the path for all the investigations of like nature that have been so characteristic of English psychology. A physician by profession, he sought to combine with an elaborate theory of mental association a minutely detailed hypothesis as to the corresponding action of the nervous system, based upon the suggestion of a vibratory motion within the nerves thrown out by Newton in the last paragraph of the *Principia*. So far, however, from promoting the acceptance of the psychological theory, this physical hypothesis proved to have rather the opposite effect, and it began to be dropped by Hartley's followers (as F. Priestley, in his abridged edition of the *Observations*, 1775) before it was seriously impugned from without. When it is studied in the original, and not taken upon the report of hostile critics, who would not, or could not understand it, no little importance must still be accorded to the first attempt, not seldom a curiously felicitous one, to carry through that parallelism of the physical and psychical, which since then has come to count for more and more in the science of mind. Nor should it be forgotten that Hartley himself, for all his paternal interest in the doctrine of vibrations, was careful to keep separate from its fortunes the cause of his other doctrine of mental association. Of this the point lay in no mere restatement, with new precision, of a principle of coherence among "ideas," but in its being taken as a clue by which

[1] There are, however, distinct anticipations of the theory in Plato (*Phaedo*), as part of the doctrine of ἀνάμνησις; thus we find the idea of Simmias recalled by the picture of Simmias (similarity), and that of a friend by the sight of the lyre on which he played (contiguity).

to follow the progressive development of the mind's powers. Holding that mental states could be scientifically understood only as they were analysed, Hartley sought for a principle of synthesis to explain the complexity exhibited not only in trains of representative images, but alike in the most involved combinations of reasonings and (as Berkeley had seen) in the apparently simple phenomena of objective perception, as well as in the varied play of the emotions, or, again, in the manifold conscious adjustments of the motor system. One principle appeared to him sufficient for all, running, as enunciated for the simplest case, thus: "Any sensations A, B, C, &c., by being associated with one another a sufficient number of times, get such a power over the corresponding ideas (called by Hartley also vestiges, types, images) *a*, *b*, *c*, &c., that any one of the sensations A, when impressed alone, shall be able to excite in the mind *b*, *c*, &c., the ideas of the rest." To render the principle applicable in the cases where the associated elements are neither sensations nor simple ideas of sensations, Hartley's first care was to determine the conditions under which states other than these simplest ones have their rise in the mind, becoming the matter of ever higher and higher combinations. The principle itself supplied the key to the difficulty, when coupled with the notion, already implied in Berkeley's investigations, of a coalescence of simple ideas of sensation into one complex idea, which may cease to bear any obvious relation to its constituents. So far from being content, like Hobbes, to make a rough generalization to all mind from the phenomena of developed memory, as if these might be straightway assumed, Hartley made a point of referring them, in a subordinate place of their own, to his universal principle of mental synthesis. He expressly put forward the law of association, endued with such scope, as supplying what was wanting to Locke's doctrine in its more strictly psychological aspect, and thus marks by his work a distinct advance on the line of development of the experiential philosophy.

The new doctrine received warm support from some, as Law and Priestley, who both, like Hume and Hartley himself, took the principle of association as having the like import for the science of mind that gravitation had acquired for the science of matter. The principle began also, if not always with direct reference to Hartley, yet, doubtless, owing to his impressive advocacy of it, to be applied systematically in special directions, as by Abraham Tucker (1768) to morals, and by Archibald Alison (1790) to aesthetics. Thomas Brown (d. 1820) subjected anew to discussion the question of theory. Hardly less unjust to Hartley than Reid or Stewart had been, and forward to proclaim all that was different in his own position, Brown must yet be ranked with the associationists before and after him for the prominence he assigned to the associative principle in sense-perception (what he called external affections of mind), and for his reference of all other mental states (internal affections) to the two generic capacities or susceptibilities of Simple and Relative Suggestion. He preferred the word Suggestion to Association, which seemed to him to imply some prior connecting process, whereof there was no evidence in many of the most important cases of suggestion, nor even, strictly speaking, in the case of contiguity in time where the term seemed least inapplicable. According to him, all that could be assumed was a general constitutional tendency of the mind to exist successively in states that have certain relations to each other, of itself only, and without any external cause or any influence previous to that operating at the moment of the suggestion. Brown's chief contribution to the general doctrine of mental association, besides what he did for the theory of perception, was, perhaps, his analysis of voluntary reminiscence and constructive imagination—faculties that appear at first sight to lie altogether beyond the explanatory range of the principle. In James Mill's *Analysis of the Phenomena of the Human Mind* (1829), the principle, much as Hartley had conceived it, was carried out, with characteristic consequence, over the psychological field. With a much enlarged and more varied conception of association, Alexander Bain re-executed the general psychological task, while Herbert Spencer revised the doctrine from the new point of view of the evolution-hypothesis. John Stuart Mill made only occasional excursions into the region of psychology proper, but sought, in his *System of Logic* (1843), to determine the conditions of objective truth from the point of view of the associationist theory, and, thus or otherwise being drawn into general philosophical discussion, spread wider than any one before him its repute.

The Associationist School has been composed chiefly of British thinkers, but in France also it has had distinguished representatives. Of these it will suffice to mention Condillac, who professed to explain all knowledge from the single principle of association (*liaison*) of ideas, operating through a previous association with signs, verbal or other. In Germany, before the time of Kant, mental association was generally treated in the traditional manner, as by Wolff. Kant's inquiry into the foundations of knowledge, agreeing in its general purport with Locke's, however it differed in its critical procedure, brought him face to face with the newer doctrine that had been grafted on Locke's philosophy; and to account for the fact of synthesis in cognition, in express opposition to associationism, as represented by Hume, was, in truth, his prime object, starting, as he did, from the assumption that there was that in knowledge which no mere association of experiences could explain. To the extent, therefore, that his influence prevailed, all inquiries made by the English associationists were discounted in Germany. Notwithstanding, under the very shadow of his authority a corresponding, if not related, movement was initiated by J. F. Herbart. Peculiar, and widely different from anything conceived by the associationists, as Herbart's metaphysical opinions were, he was at one with them, and at variance with Kant, in assigning fundamental importance to the psychological investigation of the development of consciousness, nor was his conception of the laws determining the interaction and flow of mental presentations and representations, when taken in its bare psychological import, essentially different from theirs. In F. E. Beneke's psychology also, and in more recent inquiries conducted mainly by physiologists, mental association has been understood in its wider scope, as a general principle of explanation.

The associationists differ not a little among themselves in the statement of their principle, or, when they adduce several principles, in their conception of the relative importance of these. Hartley took account only of Contiguity, or the repetition of impressions synchronous or immediately successive; the like is true of James Mill, though, incidentally, he made an express attempt to resolve the received principle of Similarity, and through this the other principle of Contrast, into his fundamental law—law of Frequency, as he sometimes called it, because upon frequency, in conjunction with vividness of impressions, the strength of association, in his view, depended. In a sense of his own, Brown also, while accepting the common Aristotelian enumeration of principles, inclined to the opinion that "all suggestion may be found to depend on prior co-existence, or at least on such proximity as is itself very probably a modification of coexistence," provided account be taken of "the influence of emotions and other feelings that are very different from ideas, as when an analogous object suggests an analogous object by the influence of an emotion which each separately may have produced before, and which is, therefore, common to both." To the contrary effect, Spencer maintained that the fundamental law of all mental association is that presentations aggregate or cohere with their like in past experience, and that, besides this law, there is in strictness no other, all further phenomena of association being incidental. Thus in particular, he would have explained association by Contiguity as due to the circumstance of imperfect assimilation of the present to the past in consciousness. A. Bain regarded Contiguity and Similarity logically, as perfectly distinct principles, though in actual psychological occurrence blending intimately with each other, contiguous trains being started by a first (it may be, implicit) representation through Similarity, while the express assimilation of present to past in consciousness is always, or tends to be, followed by the revival of what was presented in contiguity with that past.

The highest philosophical interest, as distinguished from that which is more strictly psychological, attaches to the mode of mental association called Inseparable. The coalescence of mental states noted by Hartley, as it had been assumed by Berkeley, was farther formulated by James Mill in these terms:—

"Some ideas are by frequency and strength of association so closely combined that they cannot be separated; if one exists, the other exists along with it in spite of whatever effort we make to disjoin them."—(*Analysis of the Human Mind*, 2nd ed. vol. i. p. 93.)

J. S. Mill's statement is more guarded and particular:—

"When two phenomena have been very often experienced in conjunction, and have not, in any single instance, occurred separately either in experience or in thought, there is produced between them what has been called inseparable, or, less correctly, indissoluble, association; by which is not meant that the association must inevitably last to the end of life— that no subsequent experience or process of thought can possibly avail to dissolve it; but only that as long as no such experience or process of thought has taken place, the association is irresistible; it is impossible for us to think the one thing disjoined from the other."—(*Examination of Hamilton's Philosophy*, 2nd ed. p. 191.)

It is chiefly by J. S. Mill that the philosophical application of the principle has been made. The first and most obvious application is to so-called necessary truths—such, namely, as are not merely analytic judgments but involve a synthesis of distinct notions. Again, the same thinker sought to prove Inseparable Association the ground of belief in an external objective world. The former application, especially, is facilitated, when the experience through which the association is supposed to be constituted is understood as cumulative in the race, and transmissible as original endowment to individuals—endowment that may be expressed either, subjectively, as latent intelligence, or, objectively, as fixed nervous connexions. Spencer, as before suggested, is the author of this extended view of mental association.

Modern Criticism.—Of recent years the associationist theory has been subjected to searching criticism, and it has been maintained by many writers that the laws are both unsatisfactorily expressed and insufficient to explain the facts. Among the most vigorous and comprehensive of these investigations is that of F. H. Bradley in his *Principles of Logic* (1883). Having admitted the psychological fact of mental association, he attacks the theories of Mill and Bain primarily on the ground that they purport to give an account of mental life as a whole, a metaphysical doctrine of existence. According to this doctrine, mental activity is ultimately reducible to

particular feelings, impressions, ideas, which are disparate and unconnected, until chance Association brings them together. On this assumption the laws of Association naturally emerge in the following form:—(1) The *law of Contiguity.*—"Actions, sensations and states of feeling, occurring together or in close connexion, tend to grow together, or cohere, in such a way that, when any one of them is afterwards presented to the mind, the others are apt to be brought up in idea" (A. Bain, *Senses and Intellect*, p. 327). (2) The *law of Similarity.*—"Present actions, sensation, thoughts or emotions tend to revive their like among previous impressions or states" (A. Bain, *ibid.* 457. Compare J. S. Mill, *Logic*, ii. p. 440, 9th ed.). The fundamental objection to (1) is that ideas and impressions once experienced do not recur; they are particular existences, and, as such, do not persevere to recur or be presented. So Mill is wrong in speaking of two impressions being "frequently experienced." Bradley claims thus to reduce the law to "When we have experienced (or even thought of) several pairs of impressions (simultaneous or successive), which pairs are like one another; then whenever an idea occurs which is like all the impressions on one side of these pairs, it tends to excite an idea which is like all the impressions on the other side." This statement is destructive of the title of the law, because it appears that what were contiguous (the impressions) are not associated, and what are associated (the ideas) were not contiguous; in other words, the association is not due to contiguity at all.

Proceeding to the law of Similarity (which in Mill's view is at the back of association by contiguity), and having made a similar criticism of its phrasing, Bradley maintains that it involves an even greater absurdity; if two ideas are to be recognized as similar, they must both be present in the mind; if one is to call up the other, one must be absent. To the obvious reply that the similarity is recognized *ex post facto*, and not while the former idea is being called up, Bradley replies simply that such a view reduces the law to the mere statement of a phenomenon and deprives it of any explanatory value, though he hardly makes it clear in what sense this necessarily invalidates the law from a psychological point of view. He further points out with greater force that in point of fact mere similarity is not the basis of ordinary cases of mental reproduction, inasmuch as in any given instance there is more difference than similarity between the ideas associated.

Bradley himself bases association on identity plus contiguity:—"Any part of a single state of mind tends, if reproduced, to re-instate the remainder," or "any element tends to reproduce those elements with which it has formed one state of mind." This law he calls by the name "redintegration," understood, of course, in a sense different from that in which Hamilton used it. The radical difference between this law and those of Mill and Bain is that it deals not with particular units of thoughts but with universals or identity between individuals. In any example of such reproduction the universal appears in a particular form which is more or less different from that in which it originally existed.

Psychophysical Researches.—Bradley's discussion deals with the subject purely from the metaphysical side, and the total result practically is that association occurs only between universals. From the point of view of empirical psychologists Bradley's results are open to the charge which he made against those who impugned his view of the law of similarity, namely that they are merely a statement—not in any real sense an explanation. The relation between the mental and the physical phenomena of association has occupied the attention of all the leading psychologists (see PSYCHOLOGY). William James holds that association is of "objects" not of "ideas," is between "things thought of"—so far as the word stands for an effect. "So far as it stands for a cause it is between processes in the brain." Dealing with the law of Contiguity he says that the "most natural way of accounting for it is to conceive it as a result of the laws of habit in the nervous system; in other words to ascribe it to a physiological cause." Association is thus due to the fact that when a nerve current has once passed by a given way, it will pass more easily by that way in future; and this fact is a physical fact. He further seeks to maintain the important deduction that the only primary or ultimate law of association is that of neural habit.

The objections to the associationist theory are summed up by G. F. Stout (*Analytic Psychol.*, vol. ii. pp. 47 seq.) under three heads. Of these the first is that the theory as stated, *e.g.* by Bain, lays far too much stress on the mere connexion of elements hitherto entirely separate; whereas, in fact, every new mental state or synthesis consists in the development or modification of a pre-existing state or psychic whole. Secondly, it is quite false to regard an association as merely an aggregate of disparate units; in fact, the *form* of the new idea is quite as important as the elements which it comprises. Thirdly, the phraseology used by the associationists seems to assume that the parts that go to form the whole retain their identity unimpaired; in fact, each part or element is *ipso facto* modified by the very fact of its entering into such combination.

The experimental methods now in vogue have to a large extent removed the discussion of the whole subject of association of ideas, depending in the case of the older writers on introspection, into a new sphere. In such a work as E. B. Titchener's *Experimental Psychology* (1905), association is treated as a branch of the study of mental reactions, of which association reactions are one division.

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ASSONANCE (from Lat. *adsonare* or *assonare*, to sound to or answer to), a term defined, in its prosodical sense, as "the corresponding or riming of one word with another in the accented vowel and those which follow it, but not in the consonants" (*New English Dictionary*, Oxford). In other words, assonance is an improper or imperfect form of rhyme, in which the ear is satisfied with the incomplete identity of sound which the vowel gives without the aid of consonants. Much rustic or popular verse in England is satisfied with assonance, as in such cases as

"And pray who gave thee that jolly red *nose*?
Cinnamon, Ginger, Nutmeg and *Cloves*,"

where the agreement between the two *o's* permits the ear to neglect the discord between *s* and *v*. But in English these instances are the result of carelessness or blunted ear. It is not so in several literatures, such as in Spanish, where assonance is systematically cultivated as a literary ornament. It is an error to confound alliteration,—which results from the close juxtaposition of words beginning with the same sound or letter,—and assonance, which is the repetition of the same vowel-sound in a syllable at points where the ear expects a rhyme. The latter is a more complicated and less primitive employment of artifice than the former, although they have often been used to intensify the effect of each other in a single couplet. Assonance appears, nevertheless, to have preceded rhyme in several of the European languages, and to have led the way towards it. It is particularly observable in the French poetry which was composed before the 12th century, and it reached its highest point in the "Chanson de Roland," where the sections are distinguished by the fact that all the lines in a *laisse* or stanza close with the same vowel-sound. When the ear of the French became more delicate, and pure rhyme was introduced, about the year 1120, assonance almost immediately retired before it and was employed no more, until recent years, when several French poets have re-introduced assonance in order to widen the scope of their effects of sound. It held its place longer in Provençal and some other Romance literatures, while in Spanish it has retained its absolute authority over rhyme to the present day. It has been observed that in the Romance languages the ear prefers the correspondence of vowels, while in the Teutonic languages the preference is given to consonants. This distinction is felt most strongly in Spanish, where the satisfaction in *rimas asonantes* is expressed no less in the most elaborate works of the poets and dramatists than in the rough ballads of the people. The nature of the language here permits the full value of the corresponding vowel-sounds to be appreciated, whereas in English—and even in German, where, however, a great deal of assonant poetry exists—the divergence of the consonants easily veils or blunts the similarity of sound. Various German poets of high merit, and in particular Tieck and Heine, have endeavoured to obviate this difficulty, but without complete success. Occasionally they endeavour, as English rhymers have done, to mix pure rhyme with assonance, but the result of this in almost all cases is that the assonances, &c., which make a less strenuous appeal to the ear, are drowned and lost in the stress of the pure rhymes. Like alliteration, assonance is a very frequent and very effective ornament of prose style, but such correspondence in vowel-sound is usually accidental and involuntary, an instinctive employment of the skill of the writer. To introduce it with a purpose, as of course must be done in

poetry, has always been held to be a most dangerous practice in prose. Assonance as a conscious art, in fact, is scarcely recognized as legitimate in English literature. (E. G.)

ASSUAN, or ASWAN, a town of Upper Egypt on the east bank of the Nile, facing Elephantine Island below the First Cataract, and 590 m. S. of Cairo by rail. It is the capital of a province of the same name—the southernmost province of Egypt. Population (1907) 16,128. The principal buildings are along the river front, where a broad embankment has been built. Popular among Europeans as a winter health resort and tourist centre, Assuan is provided with large modern hotels (one situated on Elephantine Island), and there is an English church. South-east of the railway station are the ruins of a temple built by Ptolemy Euergetes, and still farther south are the famous granite quarries of Syene. On Elephantine Island are an ancient nilometer and other remains, including a granite gateway built under Alexander the Great at the temple of the local ram-headed god Chnubis or Chnumis (Eg. Khnum), perhaps on account of his connexion with Ammon (*q.v.*); two small but very beautiful temples of the XVIIIth Dynasty were destroyed there about 1820. In the hill on the opposite side of the river are tombs of the VIth to XIIth dynasties, opened by Lord Grenfell in 1885–1886. The inscriptions show that they belonged to frontier-prefects whose expeditions into Nubia, &c., are recorded in them. Three and a half miles above the town, at the beginning of the Cataract, the Assuan Dam stretches across the Nile. This great engineering work was finished in December 1902 (see IRRIGATION: *Egypt*; and NILE). Above the dam the Nile presents the appearance of a vast lake. Consequent on the rise of the water-level several islands have been wholly and others partly submerged, among the latter Philae (*q.v.*). On the east bank opposite Philae is the village of Shellal, southern terminus of the Egyptian railway system and the starting point of steamers for the Sudan.

In ancient times the chief city, called Yēb, capital of the frontier nome, the first of the Upper Country, was on the island of Elephantine, guarding the entrance to Egypt. But, owing to the cataract, the main route for traffic with the south was by land along the eastern shore. Here, near the granite quarries—whence was obtained the material for many magnificent monuments—there grew up another city, at first dependent on and afterwards successor to the island town. This city was called *Swan*, the Mart, whence came the Greek *Syene* and Arabic *Aswan*. Syene is twice mentioned (as Sevench) in the prophecies of Ezekiel, and papyri, discovered on the island, and dated in the reigns of Artaxerxes and Darius II. (464–404 B.C.), reveal the existence of a colony of Jews, with a temple to Yahu (Yahweh, Jehovah), which had been founded at some time before the conquest of Egypt by Cambyses in 523 B.C. They also mention the great frontier garrison against the Ethiopians, referred to by Herodotus. Syene was one of the bases used by Eratosthenes in his calculations for the measurement of the earth. In Roman times Syene was strongly garrisoned to resist the attacks of the desert tribes. Thither, in virtual banishment, Juvenal was sent as prefect by Domitian. In the early days of Christianity the town became the seat of a bishopric, and numerous ruins of Coptic convents are in the neighbourhood. Syene appears also to have flourished under its first Arab rulers, but in the 12th century was raided and ruined by Bedouin and Nubian tribes. On the conquest of Egypt by the Turks in the 16th century, Selim I. placed a garrison here, from whom, in part, the present townsmen descend. As the southern frontier town of Egypt proper, Assuan in times of peace was the entrepôt of a considerable trade with the Sudan and Abyssinia, and in 1880 its trade was valued at £2,000,000 annually. During the Mahdia (1884–1898) Assuan was strongly garrisoned by Egyptian and British troops. Since the defeat of the khalifa at Omdurman and the fixing (1899) of the Egyptian frontier farther south, the military value of Assuan has declined.

For the Jewish colony see A. H. Sayce and A. E. Cowley, *Aramaic Papyri discovered at Assuan* (Oxford, 1906); E. Sachau, *Drei Aramäische papyrus-Urkunden aus Elephantine* (Berlin, 1907). For the dam see W. Willcocks, *The Nile Reservoir Dam at Assuan* (London, 1901). (F. Ll. G.)

ASSUMPSIT ("he has undertaken," from Lat. *assumere*), a word applied to an action for the recovery of damages by reason of the breach or non-performance of a simple contract, either express or implied, and whether made orally or in writing. *Assumpsit* was the word always used in pleadings by the plaintiff to set forth the defendant's undertaking or promise, hence the name of the action. Claims in actions of *assumpsit* were ordinarily divided into (*a*) common or *indebitatus assumpsit*, brought usually on an implied promise, and (*b*) special *assumpsit*, founded on an express promise. *Assumpsit* as a form of action became obsolete after the passing of the Judicature Acts 1873 and 1875. (See further CONTRACT; PLEADING and TORT.)

ASSUMPTION, FEAST OF. The feast of the "Assumption of the blessed Virgin Mary" (Lat. *festum assumptionis, dormitionis, depositionis, pausationis B. V. M.*; Gr. κοίμησις or ἀνάληψις τῆς θεοτόκου) is a festival of the Christian Church celebrated on the 15th of August, in commemoration of the miraculous ascent into heaven of the mother of Christ. The belief on which this festival rests has its origin in apocryphal sources, such as the εἰς τὴν κοίμησιν τῆς ὑπεραγίας δεσποίνης ascribed to the Apostle John, and the *de transitu Mariae*, assigned to Melito, bishop of Sardis, but actually written about A.D. 400. Pope Gelasius I. (492–496) included them in the list of apocryphal books condemned by the *Decretum de libris recipiendis et non recipiendis;* but they were accepted as authentic by the pseudo-Dionysius (*de nominbus divinis c.* 3), whose writings date probably from the 5th century, and by Gregory of Tours (d. 593 or 594). The latter in his *De gloria martyrum* (i. 4) gives the following account of the miracle: As all the Apostles were watching round the dying Mary, Jesus appeared with His angels and committed the soul of His Mother to the Archangel Michael. Next day, as they were carrying the body to the grave, Christ again appeared and carried it with Him in a cloud to heaven, where it was reunited with the soul. This story is much amplified in the account given by St John of Damascus in the homilies *In dormitionem Mariae*, which are still read in the Roman Church as the lesson during the octave of the feast. According to this the patriarchs and Adam and Eve also appear at the death-bed, to praise their daughter, through whom they had been rescued from the curse of God; a Jew who touches the body loses both his hands, which are restored to him by the Apostles; and the body lies three days in the grave without corruption before it is taken up into heaven.

The festival is first mentioned by St Andrew of Crete (*c.* 650), and, according to the Byzantine historian Nicephorus Callistus (*Hist. Eccles.* xvii. 28), was first instituted by the Emperor Maurice in A.D. 582. From the East it was borrowed by Rome, where there is evidence of its existence so early as the 7th century. In the Gallican Church it was only adopted at the same time as the Roman liturgy. But though the festival thus became incorporated in the regular usage of the Western Church, the belief in the resurrection and bodily assumption of the Virgin has never been defined as a dogma and remains a "pious opinion," which the faithful may reject without imperilling their immortal souls, though not apparently—to quote Melchior Cano (*De Locis Theolog.* xii. 10)—without "insolent temerity," since such rejection would be contrary to the common agreement of the Church. By the reformed Churches, including the Church of England, the festival is not observed, having been rejected at the Reformation as being neither primitive nor founded upon any "certain warrant of Holy Scripture."

See Herzog-Hauck, *Realencyklopädie* (ed. 3), s. "Maria"; Mgr. L. Duchesne, *Christian Worship* (Eng. trans., London, 1904); Wetzer and Welte, *Kirchenlexikon*, s. "Marienfeste"; The *Catholic Encyclopaedia* (London and New York, 1907, &c.), s. "Apocrypha," "Assumption."

ASSUR (Auth. Vers. *Asshur*), a Hebrew name, occurring in many passages of the Old Testament, for the land and dominion of Assyria.[1] The *country* of Assyria, which in the Assyro-Babylonian literature is known as *mat Aššur* (*ki*), "land of Assur," took its name from the ancient city of *Aššur*, situated at the

[1] The name Assur is not connected with the Asshur of 1 Chron. ii. 24; ii. 45. Note that it is customary to spell the god-name *Ašur* and the country-name *Aššur*.

southern extremity of Assyria proper, whose territory, soon after the first Assyrian settlement, was bounded on the N. by the Zagros mountain range in what is now Kurdistan and on the S. by the lower Zab river. The kingdom of Assyria, which was the outgrowth of the primitive settlement on the site of the city of Assur, was developed by a probably gradual process of colonization in the rich vales of the middle Tigris region, a district watered by the Tigris itself and also by several tributary streams, the chief of which was the lower Zab.[1]

It seems quite evident that the *city* of Assur was originally founded by Semites from Babylonia at quite an early, but as yet undetermined date. In the prologue to the law-code of the great Babylonian monarch Khammurabi (*c.* 2250 B.C.), the cities of Nineveh and Assur are both mentioned as coming under that king's beneficent influence. Assur is there called *A-usar(ki)*,[2] in which combination the ending *-ki* ("land territory") proves that even at that early period there was a province of Assur more extensive than the city proper. It is probable that this non-Semitic form *A-usar* means "well watered region,"[3] a most appropriate designation for the river settlements of Assyria. The problem as to the meaning of the name Assur is rendered all the more confusing by the fact that the city and land are also called *Aššur* (as well as *A-usar*), both by the Khammurabi records[4] and generally in the later Assyrian literature. Furthermore, the god- and country-name *Assur* also occurs at a late date in Assyrian literature in the forms *An-šar*, *An-šar* (*ki*), which form[5] was presumably read *Assur*. In the Creation tablet, the heavens personified collectively were indicated by this term *An-šar*, "host of heaven," in contradistinction to the earth = *Ki-šar*, "host of earth." In view of this fact, it seems highly probable that the late writing *An-sar* for *Assur* was a more or less conscious attempt on the part of the Assyrian scribes to identify the peculiarly Assyrian deity *Asur* (see ASSUR, the god, below) with the Creation deity An-sar. On the other hand, there is an epithet *Ašir* or Ashir ("overseer") applied to several gods and particularly to the deity *Ašur*, a fact which introduced a third element of confusion into the discussion of the name *Assur*. It is probable then that there is a triple popular etymology in the various forms of writing the name *Aššur*; viz. *A-usar*,[6] *An-šar* and the stem *ašāru*, all of which is quite in harmony with the methods followed by the ancient Assyro-Babylonian philologists.[7]

See also A. H. Layard, *Discoveries in the Ruins of Nineveh and Babylon* (1853); G. Smith, *Assyrian Discoveries* (1875); R. W. Rogers, *History of Babylonia and Assyria*, i. 297; ii. 13; ii. 30, 76, 102; J. F. M'Curdy, *History, Prophecy and the Monuments*, §§ 74, 171 f., 247, 258, 283; 57, 59 f. (on the god). (J. D. PR.)

ASSUR, the primitive capital of Assyria, now represented by the mounds of Kaleh Sherghat (Qal'at Shergat) on the west bank of the Tigris, nearly midway between the Upper and Lower Zab. It is still doubtful (see discussion on the name in the preceding article) whether the national god of Assyria took his name from that of the city or whether the converse was the case. It is most probable, however, that it was the city which was deified (see Sayce, *Religion of Ancient Egypt and Babylonia*, 1902, pp. 366, 367). Sir A. H. Layard, through his assistant Hormuzd Rassam, devoted two or three days to excavating on the site, but owing to the want of pasturage and the fear of Bedouin attacks he left the spot after finding a broken clay cylinder containing the annals of Tiglath-Pileser I., and for many years no subsequent efforts were made to explore it. In 1904, however, a German expedition under Dr W. Andrae began systematic excavations, which have led to important results. The city originally grew up round the great temple of the god Assur, the foundation of which was ascribed to the High-priest Uspia. For many centuries Assur and the surrounding district, which came accordingly to be called the land of Assur (*Assyria*), were governed by high-priests under the suzerainty of Babylonia. With the decay of the Babylonian power the high-priests succeeded in making themselves independent kings, and Assur became the capital of an important kingdom. It was already surrounded by a wall of crude brick, which rested on stone foundations and was strengthened at certain points by courses of burnt brick. A deep moat was dug outside it by Tukulti-Inaristi or Tukulti-Masu (about 1270 B.C.), and it was further defended on the land side by a *salkhu* or outwork. In the 15th century B.C. it was considerably extended to the south in order to include a "new town" which had grown up there. The wall was pierced by "the gate of Assur," "the gate of the Sun-god," "the gate of the Tigris," &c., and on the river side was a quay of burnt brick and limestone cemented with bitumen. The temples were in the northern part of the city, together with their lofty towers, one of which has been excavated. Besides the temple of Assur there was another great temple dedicated to Anu and Hadad, as well as the smaller sanctuaries of Bel, Ishtar, Merodach and other deities. After the rise of the kingdom, palaces were erected separate from the temples; the sites of those of Hadad-nirari I., Shalmaneser I., and Assur-nazir-pal have been discovered by the German excavators, and about a dozen more are referred to in the inscriptions. Even after the rise of Nineveh as the capital of the kingdom and the seat of the civil power, Assur continued to be the religious centre of the country, where the king was called on to reside when performing his priestly functions. The city survived the fall of Assyria, and extensive buildings as well as tombs of the Parthian age have been found upon the site.

See *Mitteilungen der deutschen Orient-Gesellschaft* (1904–1906). (A. H. S.)

ASSUR, ASUR, or ASHUR, the chief god of Assyria, was originally the patron deity of the city of Assur on the Tigris, the ancient capital of Assyria from which as a centre the authority of the *patesis* (as the rulers were at first called) spread in various directions. The history of Assyria (*q.v.*) can now be traced back approximately to 2500 B.C., though it does not rise to political prominence until *c.* 2000 B.C. The name of the god is identical with that of the city, though an older form A-shir, signifying "leader," suggests that a differentiation between the god and the city was at one time attempted. Though the origin of the form Ashur (or Assur) is not certain, it is probable that the name of the god is older than that of the city (see discussion on the name above).

The title *Ashir* was given to various gods in the south, as Marduk and Nebo, and there is every reason to believe that it represents a direct transfer with the intent to emphasize that Assur is the "leader" or head of the pantheon of the north. He is in fact to all intents and purposes of the north. Originally like Marduk a solar deity with the winged disk—the disk always typifying the sun[8]—as his symbol, he becomes as Assyria develops into a military power a god of war, indicated by the attachment of the figure of a man with a bow to the winged disk. While the cult of the other great gods and goddesses of Babylonia was transferred to Assyria, the worship of Assur so overshadowed that of the rest as to give the impression of a decided tendency towards the absorption of all divine powers by the one god. Indeed, the other gods, Sin, Shamash (Samas), Adad, Ninib and Nergal, and even Ea, take on the warlike traits of Assur in the epithets and descriptions given of them in the annals and votive inscriptions of Assyrian rulers to such an extent as to make them appear like little Assurs by the side of the great one. Marduk alone retains a large measure of his independence as a

[1] Cf. Rassam, *Asshur and the Land of Nimrod*, 250-251, and many other works.

[2] Robert Harper, *Code of Hammurabi*, pp. 6-7, lines 55-58.

[3] Thus already Delitzsch, *Wo lag das Paradies?* p. 252. The element *a* means "water," and in *u-sar* it is probable that *u* also means "water," while *sar* is "park, district." See Prince, *Materials for a Sumerian Lexicon*, s.v. *usar*.

[4] The name appears as *Aš-šur(ki)* and *Aš-šu-ur(ki)*. See King, *Letters and Inscriptions of Hammurabi*, iv. p. 23, obv. 27; and Nägel, *Beiträge zur Assyriologie*, iv. p. 404; also *Cun. Texts from Bab. Tablets*, vi. pl. 19, line 7.

[5] Meissner-Rost, *Bauinschrift Sanheribs*, K. 5413a; K. 1306, rev. 16.

[6] See on this entire subject, Morris Jastrow, Jr., *Journal Amer. Orient. Soc.*, xxiv. pp. 282-311; also *Die Religion Bab. u. Assyr.*, pp. 207 ff.

[7] On the philological methods of the ancient Babylonian priesthood, see Prince, *Materials for a Sumerian Lexicon*, Introduction.

[8] See Prince, *Journ. Bibl. Lit.*, xxii. 35.

concession on the part of the Assyrians to the traditions of the south, for which they always manifested a profound respect. Even during the period that the Assyrian monarchs exercised complete sway over the south, they rested their claims to the control of Babylonia on the approval of Marduk, and they or their representatives never failed to perform the ceremony of "taking the hand" of Marduk, which was the formal method of assuming the throne in Babylonia. Apart from this concession, it is Assur who pre-eminently presides over the fortunes of Assyria.[1] In his name, and with his approval as indicated by favourable omens, the Assyrian armies march to battle. His symbol is carried into the thick of the fray, so that the god is actually present to grant assistance in the crisis, and the victory is with becoming humility invariably ascribed by the kings "to the help of Assur." With the fall of Assyria the rule of Assur also comes to an end, whereas it is significant that the cult of the gods of Babylonia—more particularly of Marduk—survives for several centuries the loss of political independence through Cyrus' capture of Babylonia in 539 B.C. The name of Assur's temple at Assur, represented by the mounds of Kalch Sherghat, was known as E-khar-sag-gal-kur-kurra, *i.e.* "House of the great mountain of the lands." Its exact site has been determined by excavations conducted at Kalch Sherghat since 1903 by the German Oriental Society. The name indicates the existence of the same conception regarding sacred edifices in Assyria as in Babylonia, where we find such names as E-Kur ("mountain house") for the temple of Bel (*q.v.*) at Nippur, and E-Saggila ("lofty house") for Marduk's (*q.v.*) temple at Babylon and that of Ea (*q.v.*) at Eridu, and in view of the general dependence of Assyrian religious beliefs as of Assyrian culture in general, there is little reason to doubt that the name of Assur's temple represents a direct adaptation of such a name as E-Kur, further embellished by epithets intended to emphasize the supreme control of the god to whom the edifice was dedicated. The foundation of the edifice can be traced back to Uspia (Ushpia), *c.* 2000 B.C., and may turn out to be even older. Besides the chief temple, the capital contained temples and chapels to Anu, Adad, Ishtar, Marduk, Gula, Sin, Shamash, so that we are to assume the existence of a sacred precinct in Assur precisely as in the religious centres of the south. On the removal of the seat of residence of the Assyrian kings to Calah (*c.* 1300 B.C.), and then in the 8th century to Nineveh, the centre of the Assur cult was likewise transferred, though the sanctity of the old seat at Assur continued to be recognized. At Nineveh, which remained the capital till the fall of the Assyrian empire in 606 B.C., Assur had as his rival Ishtar, who was the real patron deity of the place, but a reconciliation was brought about by making Ishtar the consort of the chief god. The combination was, however, of an artificial character, and the consciousness that Ishtar was in reality an independent goddess never entirely died out. She too, like Assur, was viewed as a war deity, and to such an extent was this the case that at times it would appear that she, rather than Assur, presided over the fortunes of the Assyrian armies. (M. JA.)

ASSUR-BANI-PAL ("Assur creates a son"), the *grand monarque* of Assyria, was the prototype of the Greek Sardanapalus, and appears probably in the corrupted form of Asnapper in Ezra iv. 10. He had been publicly nominated king of Assyria (on the 12th of Iyyar) by his father Esar-haddon, some time before the latter's death, Babylonia being assigned to his twin-brother Samas-sum-yukin, in the hope of gratifying the national feeling of the Babylonians. After Esar-haddon's death in 668 B.C. the first task of Assur-bani-pal was to finish the Egyptian campaign. Tirhakah, who had reoccupied Egypt, fled to Ethiopia, and the Assyrian army spent forty days in ascending the Nile from Memphis to Thebes. Shortly afterwards Necho, the satrap of Sais, and two others were detected intriguing with Tirhakah; Necho and one of his companions were sent in chains to Nineveh, but were there pardoned and restored to their principalities. Tirhakah died 667 B.C., and his successor Tandaman (Tanuat-Amon) entered Upper Egypt, where a general revolt against Assyria took place, headed by Thebes. Memphis was taken by assault and the Assyrian troops driven out of the country. Tyre seems to have revolted at the same time. Assur-bani-pal, however, lost no time in pouring fresh forces into the revolted province. Once more the Assyrian army made its way up the Nile, Thebes was plundered, and its temples destroyed, two obelisks being carried to Nineveh as trophies (see Nahum iii. 8). Meanwhile the siege of insular Tyre was closely pressed; its water-supply was cut off, and it was compelled to surrender. Assur-bani-pal was now at the height of his power. The land of the Mannā (Minni), south-east of Ararat, had been wasted, its capital captured by the Assyrians, and its king reduced to vassalage. A war with Teumman of Elam had resulted in the overthrow of the Elamite army; the head of Teumman was sent to Nineveh, and another king, Umman-igas, appointed by the Assyrians. The kings of Cilicia and the Tabal offered their daughters to the harem of Assur-bani-pal; embassies came from Ararat, and even Gyges of Lydia despatched envoys to "the great king" in the hope of obtaining help against the Cimmerians. Suddenly the mighty empire began to totter. The Lydian king, finding that Nineveh was helpless to assist him, turned instead to Egypt and furnished the mercenaries with whose help Psammetichus drove the Assyrians out of the country and suppressed his brother satraps. Egypt was thus lost to Assyria for ever (660 B.C.). In Babylonia, moreover, discontent was arising, and finally Samas-sum-yukin put himself at the head of the national party and declared war upon his brother. Elamite aid was readily forthcoming, especially when stimulated by bribes, and the Arab tribes joined in the revolt. The resources of the Assyrian empire were strained to their utmost. But thanks in some measure to the intestine troubles in Elam, the Babylonian army and its allies were defeated and driven into Babylon, Sippara, Borsippa and Cutha. One by one the cities fell, Babylon being finally starved into surrender (648 B.C.) after Samas-sum-yukin had burnt himself in his palace to avoid falling into the conqueror's hands. It was now the turn of the Arabs, some of whom had been in Babylon during the siege, while others had occupied themselves in plundering Edom, Moab and the Hauran. Northern Arabia was traversed by the Assyrian forces, the Nabataeans were almost exterminated, and the desert tribes terrorized into order. Elam was alone left to be dealt with, and the last resources of the empire were therefore expended in preventing it from ever being again a thorn in the Assyrian side.

But the effort had exhausted Assyria. Drained of men and resources it was no longer able to make head against the Cimmerian and Scythian hordes who now poured over western Asia. The Cimmerian Dugdammē (Lygdamis in Strabo i. 3, 16), whom Assur-bani-pal calls "a limb of Satan," after sacking Sardis, had been slain in Cilicia, but other Scythian invaders came to take his place. When Assur-bani-pal died in 626 (?) B.C. his empire was already in decay, and within a few years the end came. He was luxurious and indolent, entrusting the command of his armies to others whose successes he appropriated, cruel and superstitious, but a magnificent patron of art and literature. The great library of Nineveh was to a considerable extent his creation, and scribes were kept constantly employed in it copying the older tablets of Babylonia, though unfortunately their patron's tastes inclined rather to omens and astrology than to subjects of more modern interest. The library was contained in the palace that he built on the northern side of the mound of Kuyunjik and lined with sculptured slabs which display Assyrian art at its best. Whether Kandalanu (Kinēladanos), who became viceroy of Babylonia after the suppression of the revolt, was Assur-bani-pal under another name, or a different personage, is still doubtful (see SARDANAPALUS).

AUTHORITIES.—George Smith, *History of Assurbanipal* (1871); S. A. Smith, *Die Keilschrifttexte Asurbanipals* (1887–1889); P. Jensen in E. Schrader's *Keilinschriftliche Bibliothek*, ii. (1889); J. A. Knudtzon, *Assyrische Gebete an den Sonnengott* (1893); C. Lehmann, *Schamashschumukin* (1892). (A. H. S.)

[1] As essentially a *national* god, he is almost identical in character with the early Yahweh of Israel. See Sayce, Hibbert Lectures, *Religion of Ancient Babylonia*, p. 129.

ASSUS [mod. *Behram*], an ancient Greek city of the Troad, on the Adramyttian Gulf. The situation is one of the most magnificent in all the Greek lands. The natural cleavage of the trachyte into joint planes had already scarped out shelves which it was comparatively easy for human labour to shape; and so, high up this cone of trachyte, the Greek town of Assus was built, tier above tier, the summit of the crag being crowned with a Doric temple of Athena. The view from the summit is very beautiful and of great historical interest. In front is Lesbos, one of whose towns, Methymna, is said to have sent forth the founders of Assus, as early, perhaps, as 1000 or 900 B.C. The whole south coast-line of the Troad is seen, and in the south-east the ancient territory of Pergamum, from whose masters the possession of Assus passed to Rome by the bequest of Attalus III. (133 B.C.). The great heights of Ida rise in the east. Northward the Tuzla is seen winding through a rich valley. This valley was traversed by the road which St Paul must have followed when he came overland from Alexandria Troas to Assus, leaving his fellow-travellers to proceed by sea. The north-west gateway, to which this road led, is still flanked by two massive towers, of Hellenic work. On the shore below, the ancient mole can still be traced by large blocks under the clear water. Assus affords the only harbour on the 50 m. of coast between Cape Lectum and the east end of the Adramyttian Gulf; hence it must always have been the chief shipping-place for the exports of the southern Troad. The great natural strength of the site protected it against petty assailants; but, like other towns in that region, it has known many masters—Lydians, Persians, the kings of Pergamum, Romans and Ottoman Turks. From the Persian wars to about 350 B.C. Assus enjoyed at least partial independence. It was about 348–345 B.C. that Aristotle spent three years at Assus with Hermeas, an ex-slave who had succeeded his former master Eubulus as despot of Assus and Atarneus. Aristotle has left some verses from an invocation to Arete (Virtue), commemorating the worth of Hermeas, who had been seized by Persian treachery and put to death.

Under its Turkish name of Behram, Assus is still the commercial port of the southern Troad, being the place to which loads of valonia are conveyed by camels from all parts of the country. Explorations were conducted at Assus in 1881–1883 by Mr J. T. Clarke for the Archaeological Institute of America. The main object was to clear the Doric temple of Athena, built about 470 B.C. This temple is remarkable for a sculptured architrave which took the place of the ordinary frieze. The scenes are partly mythological (labours of Heracles), partly purely heraldic. Eighteen panels were transported to the Louvre in 1838; other fragments rewarded the Americans, and a scientific ground-plan was drawn. The well-preserved Hellenistic walls were also studied.

See J. T. Clarke, *Assos*, 2 vols., 1882 and 1898 (Papers of Arch. Inst. of America, i. ii.); and authorities under TROAD. (D. G. H.)

ASSYRIA. The two great empires, Assyria and Babylon, which grew up on the banks of the Tigris and Euphrates, can be separated as little historically as geographically. From the beginning their history is closely intertwined; and the power of the one is a measure of the weakness of the other. This interdependence of Assyrian and Babylonian history was recognized by ancient writers, and has been confirmed by modern discovery. But whereas Assyria takes the first place in the classical accounts to the exclusion of Babylonia, the decipherment of the inscriptions has proved that the converse was really the case, and that, with the exception of some seven or eight centuries, Assyria might be described as a province or dependency of Babylon. Not only was Babylonia the mother country, as the tenth chapter of Genesis explicitly states, but the religion and culture, the literature and the characters in which it was contained, the arts and the sciences of the Assyrians were derived from their southern neighbours. They were similar in race and language. (See BABYLONIA AND ASSYRIA.)

AST, GEORG ANTON FRIEDRICH (1778–1841), German philosopher and philologist, was born at Gotha. Educated there and at the university of Jena, he became privat-docent at Jena in 1802. In 1805 he became professor of classical literature in the university of Landshut, where he remained till 1826, when it was transferred to Munich. There he lived till his death on the 31st of October 1841. In recognition of his work he was made an aulic councillor and a member of the Bavarian Academy of Sciences. He is known principally for his work during the last twenty-five years of his life on the dialogues of Plato. His *Platon's Leben und Schriften* (1816) was the first of those critical inquiries into the life and works of Plato which originated in the *Introductions* of Schleiermacher and the historical scepticism of Niebuhr and Wolf. Distrusting tradition, he took a few of the finest dialogues as his standard, and from internal evidence denounced as spurious not only those which are generally admitted to be so (*Epinomis*, *Minos*, *Theages*, *Arastae*, *Clitophon*, *Hipparchus*, *Eryxias*, *Letters and Definitions*), but also the *Meno*, *Euthydemus*, *Charmides*, *Lysis*, *Laches*, *First and Second Alcibiades*, *Hippias Major and Minor*, *Ion*, *Euthyphro*, *Apology*, *Crito*, and even (against Aristotle's explicit assertion) *The Laws*. The genuine dialogues he divides into three series:—(1) the earliest, marked chiefly by the poetical and dramatic element, *i.e. Protagoras*, *Phaedrus*, *Gorgias*, *Phaedo*; (2) the second, marked by dialectic subtlety, *i.e. Theaetetus*, *Sophist*, *Statesman*, *Parmenides*, *Cratylus*; (3) the third group, combining both qualities harmoniously, *i.e.* the *Philebus*, *Symposium*, *Republic*, *Timaeus*, *Critias*. The work was followed by a complete edition of Plato's works (11 vols., 1819–1832) with a Latin translation and commentary. His last work was the *Lexicon Platonicum* (3 vols., 1834–1839), which is both valuable and comprehensive. In his works on aesthetics he combined the views of Schelling with those of Winckelmann, Lessing, Kant, Herder, Schiller and others. His histories of philosophy are marked more by critical scholarship than by originality of thought, though they are interesting as asserting the now familiar principle that the history of philosophy is not the history of opinions, but of reason as a whole; he was among the first to attempt to formulate a principle of the development of thought. Beside his works on Plato, he wrote, on aesthetics, *System der Kunstlehre* (1805) and *Grundriss der Aesthetik* (1807); on the history of philosophy, *Grundlinien der Philosophie* (1807, republished 1809, but soon forgotten), *Grundriss einer Geschichte der Philosophie* (1807 and 1825), and *Hauptmomente der Geschichte der Philosophie* (1829); in philology, *Grundlinien der Philologie* (1808), and *Grundlinien der Grammatik, Hermeneutik und Kritik* (1808).

ASTARA, a port of Russian Transcaucasia, government of Baku, on the Caspian, in 38° 27′ N. lat. and 48° 53′ E. long., on the river of the same name, which forms the frontier between Persia and Russia. Russian merchandize is landed there and forwarded to Azerbáiján and Tabriz via Ardebil.

ASTARABAD, a province of Persia bounded N. by the Caspian Sea and Russian Transcaspian, S. by the Elburz Mountains, W. by Mazandaran, and E. by Khorasan. The country, mountainous in its southern portion, possesses extensive forests, fertile valleys, producing rice, wheat and other grains in abundance, and rich pasturages. The soil, even with little culture, is exceedingly productive, owing to the abundance of water which irrigates and fertilizes it. But while the province in many parts presents a landscape of luxuriant beauty, it is a prey to the ravages of disease, principally malarial fevers due to the extensive swamps formed by waters stagnating in the forests, and to the frequent incursions of the Goklan and Yomut Turkomans, who have their camping-grounds in the northern part of the province, and until about 1890 plundered caravans sometimes at the very gates of Astarabad city, and carried people off into slavery and bondage. The province has a population of about 100,000 and pays a yearly revenue of about £30,000. The inhabitants, notwithstanding the unhealthiness of their climate, are a strong and athletic race, belying their yellow and sickly appearance. The province has the following bulúk (administrative divisions):—(1) Astarabad town; (2) Astarabad rustak (villages); (3) Sadan rustak; (4) Anazan; (5) Katúl; (6) Findarisk, with Kuhsar and Nodeh; (7) Shahkuh Sávar.

ASTARABAD, the capital of the province, is situated on the Astar, a small tributary of the Kara Su (Black river), which flows into the Caspian Sea 20 m. W. of the city, and about 18 m. S. of the Gurgan river, in 36° 51′ N. lat. and 54° 26′ E. long. It is surrounded by a mud wall about 30 ft. in height and about 3½ m. in circuit, but much of the enclosed space is occupied by gardens, mounds of refuse, and ruins. At one time of greater size, it was reduced by Nadir Shah within its present limits. Astarabad owes its origin to Yazid ibn Mohallab, who occupied the province early in the 8th century for Suleiman, the seventh of the Omayyad caliphs (715–717), and was destroyed by Timur (Tamerlane) in 1384. Jonas Hanway, the philanthropist (d. 1786), visited the place in 1744, and attempted to open a direct trade through it between Europe and central Asia. Owing to the noxious exhalations of the surrounding forests the town is so extremely unhealthy during the hot weather as to have acquired the title of the "Abode of the Plague." It has post and telegraph offices, and a population of about 10,000. Since 1890 the Turkomans who impeded trade by their perpetual raids have been kept more in check, and with the decrease of insecurity the commercial activity of Astarabad has increased considerably.

ASTARTE, a Semitic goddess whose name appears in the Bible as Ashtoreth.[1] She is everywhere the great female principle, answering to the Baal of the Canaanites and Phoenicians[2] and to the Dagon of the Philistines. She had temples at Sidon and at Tyre (whence her worship was transplanted to Carthage), and the Philistines probably venerated her at Ascalon (1 Sam. xxxi. 10). Solomon built a high-place for her at Jerusalem which lasted until the days of King Josiah (1 Kings xi. 5; 2 Kings xxiii. 13), and the extent of her cult among the Israelites is proved as much by the numerous biblical references as by the frequent representations of the deity turned up on Palestinian soil.[3] The Moabites formed a compound deity, Ashtar-Chemosh (see MOAB), and the absence of the feminine termination occurs similarly in the Babylonian and Assyrian prototype Ishtar. The old South Arabian phonetic equivalent 'Athtar is, however, a male deity. Another compound, properly of mixed sex, appears in the Aramaean Atargatis ('At[t]ar-'athe), worn down to Derketo, who is specifically associated with sacred pools and fish (Ascalon, Hierapolis-Mabog). (See ATARGATIS.)

The derivation of the name Ishtar is uncertain, and the original attributes of the goddess are consequently unknown. She assumes various local forms in the old Semitic world, and this has led to consequent fusion and identification with the deities of other nations. As the great nature-goddess, the attributes of fertility and reproduction are characteristically hers, as also the accompanying immorality which originally, perhaps, was often nothing more than primitive magic. As patroness of the hunt, later identification with Artemis was inevitable. Hence the consequent fusion with Aphrodite, Artemis, Diana, Juno and Venus, and the action and reaction of one upon the other in myth and legend. Her star was the planet Venus, and classical writers give her the epithet Caelestis and Urania. Whether Astarte was also a lunar goddess has been questioned. As the female counterpart of the Phoenician Baal (viewed as a sun-god), and on the testimony of late writers (Lucian, Herodian) that she was represented with horns, the place-name Ashteroth-Karnaim in Gilead ("Ashteroth of the horns") has been considered ample proof in favour of the theory. But it is probable that the horns were primarily ram's horns,[4] and that Astarte the moon-goddess is due to the influence of the Egyptian Isis and Hathor. Robertson Smith, too, argues that Astarte was originally a sheep-goddess, and points to the interesting use of "Astartes of the flocks" (Deut. vii. 13, see the comm.) to denote the offspring. To nomads, Astarte may well have been a sheep-goddess, but this, if her earliest, was not her only type, as is clear from the sacred fish of Atargatis, the doves of Ascalon (and of the Phoenician sanctuary of Eryx), and the gazelle or antelope of the goddess of love (associated also with the Arabian Athtar).

The literature is vast; see G. A. Barton, *Amer. Journ. of Sem. Lang.* vols. ix. x., and his *Semitic Origins*; Driver, Hastings' *Dict. Bible*, i. pp. 167-171; Zimmern, *Keilinschr. und das alte Test.*[3] pp. 420 sqq.; Lagrange, *Études d. Relig. Sem.* pp. 123-140; and the articles ADONIS, APHRODITE, ARTEMIS, BAAL.

(S. A. C.)

ASTELL, MARY (1668–1731), English author, was born at Newcastle-upon-Tyne. She was instructed by her uncle, a clergyman, in Latin and French, logic, mathematics and natural philosophy. In her twentieth year she went to London, where she continued her studies. She published, in 1697, a work entitled *A Serious Proposal to the Ladies, wherein a Method is offered for the Improvement of their Minds.* With the same end in view she elaborated a scheme for a ladies' college, which was favourably entertained by Queen Anne, and would have been carried out had not Bishop Burnet interfered. The most important of her other works was *The Christian Religion, as professed by a Daughter of the Church of England*, published in 1705.

ASTER (Gr. ἀστήρ, a star), the name of a genus of plants, given from the fact of the flowers having a radiated or star-like appearance (see below). The Greek word also provides many derivatives: *e.g. asterism* (Gr. ἀστερισμός), a constellation (*q.v.*); *asteroid* (Gr. ἀστερο-ειδής, star-like), an alternative name for planetoids or minor planets (see PLANET).

The genus of composite plants named aster (natural order *Compositae*) is found largely in North America, and scattered sparingly over Asia, Europe and South America. They are usually herbaceous perennials; their flowers arranged in numerous heads (*capitula*) recall those of the daisy, whence they are popularly known in England as Michaelmas daisies, since many are in bloom about that time. They are valuable plants in a garden, the various species flowering from late summer right on to November or December. The only British species is *Aster Tripolium*, found abundantly in saline marshes near the sea. One of the species, *Aster alpinus*, grows at a considerable height on the mountains of Europe. Some of them, such as *Aster spectabilis* of North America, are very showy. They are mostly easy to cultivate in ordinary garden soil, and are readily propagated by dividing the roots in early spring. The following are some of the better known forms:—*A. alpinus*, barely 1 ft. high, and *A. Amellus*, 1½ ft., with its var. *bessarabicus*, have broadish blunt leaves and large starry bluish flowers; *A. longifolius* var. *formosus*, 2 ft., bright rosy lilac; *A. acris*, 2 to 3 ft., with blue flowers in August; *A. ericoides*, 3 ft., with heath-like leaves and masses of small white flowers; *A. puniceus*, 4 to 6 ft., blue or rosy-lilac; *A. turbinellus*, 2 to 3 ft., mauve-coloured, are showy border plants; and *A. Novae-Angliae*, 5 to 6 ft., rosy-violet; *A. Novi-Belgii*, 3 to 6 ft., pale blue; *A. laevis*, 2 to 6 ft., blue-lilac; and *A. grandiflorus*, 3 ft., violet, are especially useful from their late-flowering habit.

The China aster (*Callistephus chinensis*) is also a member of the order *Compositae*. It is a hardy annual, a native of China, which by cultivation has yielded a great variety of forms. Some of the best for ornamental gardening are the chrysanthemum-flowered, the paeony-flowered, the crown or cockade, the comet, and the globe-quilled. Crown asters have a white centre, and dark crimson or purple circumference, and are very beautiful. The colours range from white and blush through pink and rose to crimson, and from lilac through blue to purple, in various shades. They should be sown early in March in pans, in a gentle heat, the young plants being quickly transferred to a cool pit, and there pricked out in rich soil as soon as large enough, and eventually planted out in the garden in May or June, in soil which has been well worked and copiously manured, where they grow from

[1] The vocalization suggests the Heb. *bōsheth*, "shame"; see BAAL.

[2] Add also the Hittites; for Sutekh, the Egyptian equivalent of the male partner, see W. M. Müller, *Mitt. d. vorderasiat. Gesell.* (1902), v. pp. 11, 38. Astarte was introduced also into Egypt and had her temple at Memphis. See also S. A. Cook, *Religion of Ancient Palestine, Index*, s.v.

[3] Such figurines are in a sense the prototypes of the Venus of Medici. On the influence of her cult upon that of the Virgin Mary, see Rösch, *Studien u. Krit.* (1888), pp. 265 sqq.

[4] A model of an Astarte with ram's horns was unearthed by R. A. S. Macalister at Gezer (*Pal. Explor. Fund, Quart. Statement*, 1903, p. 227 with figure facing).

8 to 18 in. high, and flower towards the end of summer. They also make handsome pot plants for the conservatory.

ASTERIA, or STAR-STONE (from Gr. ἀστήρ, star), a name applied to such ornamental stones as exhibit when cut *en cabochon* a luminous star. The typical asteria is the star-sapphire, generally a bluish-grey corundum, milky or opalescent, with a star of six rays. (See SAPPHIRE.) In red corundum the stellate reflexion is less common, and hence the star-ruby occasionally found with the star-sapphire in Ceylon is among the most valued of "fancy stones." When the radiation is shown by yellow corundum, the stone is called star-topaz. Cymophane, or chatoyant chrysoberyl, may also be asteriated. In all these cases the asterism is due to the reflexion of light from twin-lamellae or from fine tubular cavities or thin enclosures definitely arranged in the stone. The *astrion* of Pliny is believed to have been our moonstone, since it is described as a colourless stone from India having within it the appearance of a star shining with the light of the moon. All star-stones were formerly regarded with much superstition.

ASTERID, a group of starfish. They are the starfish proper, and have the typical genus *Asterias* (see STARFISH).

ASTERISK (from Gr. ἀστερίσκος, a little star), the sign* used in typography. The word is also used in its literal meaning in old writers, and as a description of an ornamental form (star-shaped) in one of the utensils in the Greek Church.

ASTERIUS, of Cappadocia, sophist and teacher of rhetoric in Galatia, was converted to Christianity about the year 300, and became the disciple of Lucian, the founder of the school of Antioch. During the persecution under Maximian (304) he relapsed into paganism, and thus, though received again into the church by Lucian and supported by the Eusebian party, never attained to ecclesiastical office. He is best known as an able defender of the semi-Arian position, and was styled by Athanasius the "advocate" of the Arians. His chief work was the *Syntagmation*, but he wrote many others, including commentaries on the Gospels, the Psalms, and Romans. He attended many synods, and we last hear of him at the synod of Antioch in 341.

ASTERIUS, bishop of Amasia, in Pontus, *c.* 400. He was partly contemporary with the emperor Julian (d. 363) and lived to a great age. His fame rests chiefly on his *Homilies*, which were much esteemed in the Eastern Church. Most of these have been lost, but twenty-one are given in full by Migne (*Patrol. Ser. Gr.* xl. 164-477), and there are fragments of others in Photius (*Cod.* 271). Asterius was a man of much culture, and his works are a valuable contribution to our knowledge of the history of preaching.

ASTHMA (Gr. ἆσθμα, gasping, whence ἀσθμαίνω, I gasp for breath), a disorder of respiration characterized by severe paroxysms of difficult breathing (*dyspnoea*) usually followed by a period of complete relief, with recurrence of the attacks at more or less frequent intervals. The term is often loosely employed in reference to states of embarrassed respiration, which are plainly due to permanent organic disease of the respiratory organs (see RESPIRATORY SYSTEM: *Pathology*).

The attacks occur quite suddenly, and in some patients at regular, in others at irregular intervals. They are characterized by extreme difficulty both in inspiration and expiration, but especially in the latter, the chest becoming distended and the diaphragm immobile. In the case of "pure" "idiopathic" or "nervous" asthma, there is no fever or other sign of inflammation. But where the asthma is secondary to disease of some organ of the body, the symptoms will depend largely on that organ and the disease present. Such secondary forms may be bronchitic, cardiac, renal, peptic or thymic.

The mode of onset differs very markedly in different cases. In some the attack begins quite suddenly and without warning, but in others various sensations well known to the patient announce that an attack is imminent. According to the late Dr Hyde Salter the commonest warning is that of an intense desire for sleep, so overpowering that though the patient knows his only chance of warding off the attack is to keep awake, he is yet utterly unable to fight against his drowsiness. Among other patients, however, a condition of unwonted mental excitement presages the attack. Again the secondary forms of the disease may be ushered in by flatulence, constipation and loss of appetite, and a symptom which often attends the onset, though it is not strictly premonitory, is a profuse diuresis, the urine being watery and nearly colourless, as in the condition of hysterical diuresis. In the majority of instances the attack begins during the night, sometimes abruptly but often by degrees. The patient may or may not be aware that his asthma is threatening. A few hours after midnight he is aroused from sleep by a sense of difficult breathing. In some cases this is a slowly increasing condition, not becoming acute for some hour or more. But in others the attack is so sudden, so severe, that the patient springs from his bed and makes his way at once to an open window, apparently struggling for breath. Most asthmatics have some favourite attitude which best enables them to use all the auxiliary muscles of respiration in their struggle for breath, and this attitude they immediately assume, and guard fixedly until the attack begins to subside. The picture is characteristic and a very painful one to watch. The face is pale, anxious, and it may be livid. The veins of the forehead stand out, the eyes bulge, and perspiration bedews the face. The head is fixed in position, and likewise the powerful muscles of the back to aid the attempt at respiration. The breath is whistling and wheezing, and if it becomes necessary for the patient to speak, the words are uttered with great difficulty: If the chest be watched it is seen to be almost motionless, and the respirations may become extraordinarily slowed. Inspiration is difficult as the chest is already over-distended, but expiration is an even far greater struggle. The attack may last any time from an hour to several days, and between the attacks the patient is usually quite at ease. But notwithstanding the intensely distressing character of the attacks, asthma is not one of the diseases that shorten life.

In the child, asthma is usually periodic in its recurrence, but as he ages it tends to become more erratic in both its manifestations and time of appearance. Also, though at first it may be strictly "pure" asthma, later in life it becomes attended by chronic bronchitis, which in its turn gives rise to emphysema.

As to the underlying cause of the disease, one has only to read the many utterly different theories put forward to account for it, to see how little is really known. But it has now been clearly shown that in the asthmatic state the respiratory centre is in an unstable and excitable condition, and that there is a morbid connexion between this and some part of the nasal apparatus. Dr Alexander Francis has shown, however, that the disease is not directly due to any mechanical obstruction of the nasal passages, and that the nose comparatively rarely supplies the immediate exciting cause of the asthmatic attack. Paroxysmal sneezing is another form in which asthma may show itself, and, curiously enough, this form occurs more frequently in women, asthma of the more recognized type in men. In infants and young children paroxysmal bronchitis is another form of the same disease. Dr James Goodhart notes the connexion between asthma and certain skin troubles, giving cases of the alternation of asthma and psoriasis, and also of asthma and eczema. The disease occurs in families with a well-marked neurotic inheritance, and twice as frequently in men as in women. The immediate cause of an attack may be anything or nothing. Dr Hyde Salter notes that 80% of cases in the young date from an attack of whooping cough, bronchitis or measles.

In the general treatment of asthma there are two methods of dealing with the patient, either that of hardening the individual, widening his range of accommodation, and thus making him less susceptible, or that of modifying and adapting the environment to the patient. These two methods correspond to the two methods of drug treatment, tonic or sedative. During the last few years the method of treatment first used by Dr Alexander Francis has come into prominence. His plan is to restore the stability of the respiratory centre, by cauterizing the septal mucous membrane, and combining with this general hygienic measures. In his own words the operation, which is entirely

painless and insignificant, is performed as follows:—"After painting one side of the septum nasi with a few drops of cocaine and resorcin, I draw a line with a galvano-cautery point from a spot opposite the middle turbinated body, forwards and slightly downwards for a distance of rather less than half an inch. In about one week's time I repeat the operation on the other side." In his monograph on the subject, he classifies a large number of cases treated in this manner, most of which resulted in complete relief, some in very great improvement, and a very few in slight or no relief.

ASTI (anc. *Hasta*), a town and episcopal see of Piedmont, Italy, in the province of Alessandria, situated on the Tanaro; it is 22 m. W. by rail from Alessandria. Pop. (1901) town, 19,787; commune, 41,047. Asti has still numerous medieval towers, a fine Gothic cathedral of the 14th century, the remains of a Christian basilica of the 6th century, and the octagonal baptistery of S. Pietro (11th century). It was the birthplace of the poet Vittorio Alfieri. In ancient times it manufactured pottery. It is now famous for its sparkling wine (*Asti spumante*), and is a considerable centre of trade.

ASTLEY, JACOB ASTLEY, BARON (1579–1652), royalist commander in the English Civil War, came of a Norfolk family. In 1598 he joined Counts Maurice and Henry of Orange in the Netherlands, where he served with distinction, and afterwards fought under the elector palatine Frederick V. and Gustavus Adolphus in the Thirty Years' War. He was evidently thought highly of by the states-general, for when he was absent, serving under the king of Denmark, his company in the Dutch army was kept open for him. Returning to England with a well-deserved reputation, he was in the employment of Charles I. in various military capacities. As "sergeant-major," or general of the infantry, he went north in 1639 to organize the defence against the expected Scottish invasion. Here his duties were as much diplomatic as military, as the discontent which ended in the Civil War was now coming to a head. In the ill-starred "Bishops' War," Astley did good service to the cause of the king, and he was involved in the so-called "Army Plot." At the outbreak of the Great Rebellion (1642) he at once joined Charles, and was made major-general of the foot. His characteristic battle-prayer at Edgehill has become famous: "O Lord, Thou knowest how busy I must be this day. If I forget Thee, do not forget me. March on, boys!" At Gloucester he commanded a division, and at the first battle of Newbury he led the infantry of the royal army. With Hopton, in 1644, he served at Arundel and Cheriton. At the second battle of Newbury he made a gallant and memorable defence of Shaw House. He was made a baron by the king, and at Naseby he once more commanded the main body of the foot. He afterwards served in the west, and with 1500 men fought stubbornly but vainly the last battle for the king at Stow-on-the-Wold (March 1646). His remark to his captors has become as famous as his words at Edgehill, "You have now done your work and may go play, unless you will fall out amongst yourselves." His scrupulous honour forbade him to take any part in the Second Civil War, as he had given his parole at Stow-on-the-Wold; but he had to undergo his share of the discomforts that were the lot of the vanquished royalists. He died in February 1651/2. The barony became extinct in 1668.

ASTLEY, SIR JOHN DUGDALE, Bart. (1828–1894), English soldier and sportsman, was a descendant of Lord Astley, and son of the 2nd baronet (cr. 1821). From 1848 to 1859 he was in the army, serving in the Crimean War and retiring as lieutenant-colonel. He married an heiress in 1858, and thenceforth devoted himself to horse-racing, pugilism and sport in general. He succeeded to the baronetcy in 1873, and from 1874 to 1880 was Conservative M.P. for North Lincolnshire. He was a popular figure on the turf, being familiarly known as "the Mate," and won and lost large sums of money. Just before his death, on the 10th of October 1894, he published some entertaining reminiscences, under the title of *Fifty Years of my Life*.

ASTON, ANTHONY (fl. 1712–1731), English actor and dramatist, began to be known on the London stage in the early years of the 18th century. He had tried the law and other professions, which he finally abandoned for the theatre. He had some success as a dramatic author, writing *Love in a Hurry*, performed in Dublin about 1709, and *Pastora, or the Coy Shepherdess*, an opera (1712). For many years he toured the English provinces with his wife and son, producing pieces which he himself wrote, or medleys from various plays fitted together with songs and dialogues of his own.

ASTON MANOR, a municipal and parliamentary borough of Warwickshire, England, adjoining Birmingham on the north-east. Pop. (1901) 77,326. There are extensive manufactures, including those of motors and cycles with their accessories, also paper-mills, breweries, &c., and the population is largely industrial. Aston Hall, erected by Sir Thomas Holte in 1618–1635, is an admirable architectural example of its period, built of red brick. It stands in a large park, the whole property being acquired by the corporation of Birmingham in 1864, when the mansion became a museum and art gallery. It contains the panelling of a room from the house of Edmund Hector, which formerly stood in Old Square, Birmingham, where Dr Samuel Johnson was a frequent visitor. Aston Lower Grounds, adjoining the park, contain an assembly hall, and the playing field of the Aston Villa Football Club, where the more important games are witnessed by many thousands of spectators. Aston Manor was incorporated in 1903. The parliamentary borough returns one member. The corporation consists of a mayor, 6 aldermen and 18 councillors. Area, 960 acres.

ASTOR, JOHN JACOB (1763–1848), American merchant, was born at the village of Walldorf, near Heidelberg, Germany, on the 17th of July 1763. Until he was sixteen he worked in the shop of his father, a butcher; he then joined an elder brother in London, and there for four years was employed in the piano and flute factory of an uncle, of the firm of Astor & Broadwood. In 1783 he emigrated to America, and settled in New York, whither one of his brothers had previously gone. On the voyage he became acquainted with a fur-trader, by whose advice he devoted himself to the same business, buying furs directly from the Indians, preparing them at first with his own hands for the market, and selling them in London and elsewhere at a great profit. He was also the agent in New York of the firm of Astor & Broadwood. By his energy, industry and sound judgment he gradually enlarged his operations, did business in all the fur markets of the world, and amassed an enormous fortune,—the largest up to that time made by any American. He devoted many years to carrying out a project for organizing the fur trade from the Great Lakes to the Pacific Ocean, and thence by way of the Hawaiian Islands to China and India. In 1811 he founded at the mouth of the Columbia river a settlement named after him Astoria, which was intended to serve as the central depot; but two years later the settlement was seized and occupied by the English. The incidents of this undertaking are the theme of Washington Irving's *Astoria*. A series of disasters frustrated the gigantic scheme. Astor made vast additions to his wealth by investments in real estate in New York City, and erected many buildings there, including the hotel known as the Astor House. The last twenty-five years of his life were spent in retirement in New York City, where he died on the 29th of March 1848, his fortune then being estimated at about $30,000,000. He made various charitable bequests by his will, and among them a gift of $50,000 to found an institution, opened as the "Astor House" in 1854, for the education of poor children and the relief of the aged and the destitute in his native village in Germany. His chief benefaction, however, was a bequest of $400,000 for the foundation and endowment of a public library in New York City, since known as the Astor library, and since 1895 part of the New York public library.

See Parton's *Life of John Jacob Astor* (New York, 1865).

His eldest son, WILLIAM BACKHOUSE ASTOR (1792–1875), inherited the greater part of his father's fortune, and chiefly by judicious investments in real estate greatly increased it. He was sometimes known as the "Landlord of New York." Under

his direction the building for the Astor library was erected, and to the library he gave about $550,000, including a bequest of $200,000. His son, JOHN JACOB ASTOR (1822–1890), was also well known as a capitalist and philanthropist, giving liberally to the Astor library.

The son of the last named, WILLIAM WALDORF ASTOR (1848–), served in the New York assembly in 1877, and in the state senate in 1880–81. He was United States minister to Italy from 1882 to 1885. He published two romances, *Valentine* (1885) and *Sforza* (1889). His wealth, arising from property in New York, where also he built the New Netherland hotel and the Waldorf hotel, was enormous. In 1890 he removed to England, and in 1899 was naturalized. In 1893 he became proprietor of the *Pall Mall Gazette*, and afterwards started the *Pall Mall Magazine*.

ASTORGA, EMANUELE D' (1681–1736), Italian musical composer, was born at Naples on the 11th of December 1681. No authentic account of Astorga's life can be successfully constructed from the obscure and confusing evidence that has been until now handed down, although historians have not failed to indulge many pleasant conjectures According to some of these, his father, a baron of Sicily, took an active part in the attempt to throw off the Spanish yoke, but was betrayed by his own soldiers and publicly executed. His wife and son were compelled to be spectators of his fate; and such was the effect upon them that his mother died on the spot, and Emanuele fell into a state of gloomy despondency, which threatened to deprive him of reason. By the kindness of the princess Ursini, the unfortunate young man was placed in a convent at Astorga, in Leon, where he completed a musical education which is said to have been begun in Palermo under Francesco Scarlatti. Here he recovered his health, and his admirable musical talents were cultivated under the best masters. On the details of this account no reliance can safely be placed, nor is there any certainty that in 1703 he entered the service of the duke of Parma. Equally untrustworthy is the story that the duke, suspecting an attachment between his niece Elizabeth Farnese and Astorga, dismissed the musician. The established facts concerning Astorga are indeed few enough. They are: that the opera *Dafne* was written and conducted by the composer in Barcelona in 1709; that he visited London, where he wrote his *Stabat Mater*, possibly for the society of "Antient Musick"; that it was performed in Oxford in 1713; that in 1712 he was in Vienna, and that he retired at an uncertain date to Bohemia, where he died on the 21st of August 1736, in a castle which had been given to him in the domains of Prince Lobkowitz, in Raudnitz. Astorga deserves remembrance for his dignified and pathetic *Stabat Mater*, and for his numerous chamber-cantatas for one or two voices. He was probably the last composer to carry on the traditions of this form of chamber-music as perfected by Alessandro Scarlatti.

ASTORGA, a city of N.W. Spain, in the province of Leon; situated near the right bank of the river Tuerto, and at the junction of the Salamanca-Corunna and Leon-Astorga railways. Pop. (1900) 5573. Astorga was the Roman Asturica Augusta, a provincial capital, and the meeting-place of four military roads. Though sacked by the Goths in the 5th century, and later by the Moors, it is still surrounded by massive walls of Roman origin. A ruined castle, near the city, recalls its strategic importance in the 8th century, when Asturias, Galicia and Leon were the headquarters of resistance to the Moors. Astorga has been the see of a bishop since the 3rd century, and was formerly known as the City of Priests, from the number of ecclesiastics resident within its walls. Its Gothic cathedral dates from the 15th century. The city confers the title of marquis on the Osorio family, the ruins of whose palace, sacked in 1810 by the French, are still an object of interest.

For the history, especially the ecclesiastical history, of Astorga, see the anonymous *Historia de la ciudad de Astorga* (Valladolid, 1840); with *Fundación de la . . . iglesia . . . de Astorga*, by P. A. Ezpeleta (Madrid, 1634); and *Fundación, nombre y armas de . . . Astorga*, by P. Junco (Pamplona, 1635).

ASTORIA, a city, port of entry, and the county-seat of Clatsop county, Oregon, U.S.A., on the Columbia river, 8 m. from its mouth. Pop. (1890) 6184; (1900) 8381, of whom 3779 were foreign-born (many being Finns,—a Finnish weekly was established here in 1905), and 601 were Chinese; (1910, census) 9599. It is served by the Astoria & Columbia River railroad (Northern Pacific System), and by several coastwise and foreign steamship lines (including that of the Oregon Railway & Navigation Co.). The river here is about 6 m. wide, and the city has a water-front of about 5 m. and a deep, spacious and placid harbour. By dredging and the construction of jetties the Federal government has since 1885 greatly improved the channel at the mouth of the river. The business portion of the city occupies the low ground of the river bottom; the residence portion is on the hillsides overlooking the harbour. Astoria is the port of entry for the Oregon Customs District, Oregon; in 1907 its imports were valued at $21,262, and its exports at $329,103. The city is especially important as a salmon fishing and packing centre (cod, halibut and smaller fish also being abundant); it has also an extensive lumber trade, important lumber manufactories, pressed brick and terra-cotta factories, and dairy interests. In 1905 the value of the factory product was $3,092,628 (of which $1,759,871 was the value of preserved and canned fish), being an increase of 41·8% in five years. Astoria is the oldest American settlement in the Columbia Valley. It was founded in 1811, as a depot for the fur trade, by John Jacob Astor, in whose honour it was named. It was seized by the British in 1813, but was restored in 1818. In 1821, while occupied by the North-West Fur Company, it was burned and practically abandoned, only a few settlers remaining. It was chartered as a city in 1876.

See Washington Irving's *Astoria; or Anecdotes of an Enterprise beyond the Rocky Mountains* (Philadelphia, 1836).

ASTRAEA, in Greek legend, the "star maiden," daughter of Zeus and Themis, or of Astraeus the Titan and Eos, in which case she is identified with Dikē. During the golden age she remained among men distributing blessings, but when the iron (or bronze) age came on, she was forced to withdraw, being the last of the goddesses to quit the earth. In the heavens she is amongst the signs of the zodiac as the constellation Virgo. She is usually represented with a pair of scales and a crown of stars.

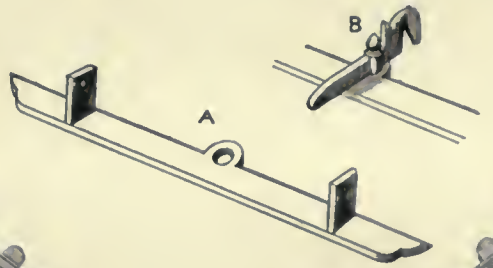
Ov. *Met.* i. 150; Juv. vi. 19; Aratus, *Phaenomena*, 96.

ASTRAGAL (from the Gr. ἀστράγαλος, the ankle-joint), an architectural term for a convex moulding. This term is generally applied to small mouldings, "torus" (*q.v.*) to large ones of the same form. The Lesbian astragal referred to by Vitruvius, bk. iv. ch. vi., was in all probability an astragal carved with a bead and reel enrichment.

ASTRAKHAN, a government of S.E. Russia, on the lower Volga, bounded N. by the governments of Samara and Saratov, W. by Saratov and the government of the Don Cossacks, S. by Stavropol and Terek, and E. by the Caspian Sea and the government of the Urals. Area, 91,327 sq. m., of which 6730 sq. m. belong to the delta of the Volga and its brackish lagoons, and 62,290 sq. m. are covered by the Kalmuck and Kirghiz Steppes. The surface is a low-lying plain, except that in the west the Ergeni Hills (500–575 ft.) form the water-parting between the Volga basin and that of the Don. The climate is very hot and dry, the average temperature for the year being 50° Fahr., for January 21°, and for July 78°, rainfall 7·3 in., but often there is no rain at all in the summer. Pop. (1897) 1,005,460, of whom 132,383 were urban. The Kalmucks (138,580 in 1897) and Kirghiz (260,000) are semi-nomads. In addition to them the population includes nearly 44,000 Tatars, 4270 Armenians, with Poles and Jews. Fishing off the mouth of the Volga gives occupation to 50,000 persons; the fish, chiefly herrings and sturgeon, together with the caviare prepared from the latter, are sold for the most part at Nizhniy-Novgorod. Over 300,000 tons of salt are extracted annually from the lakes, principally those of Baskunchak and Elton. Cattle-breeding is an important industry. Market-gardening (mustard, water-melons, fruit) is on the increase; but pure agriculture is relatively not much developed. The government is divided into five districts, the chief towns of which are Astrakhan, Enotayevsk (pop. 2810 in 1897), Krasnyi-yar (4680), Chernyi-yar (5140), and Tsarev

FRONT, showing the *Rete* or *Spider*, a network of star pointers. Beneath the *Rete*, in a hollow, are four thin brass discs, called Tables or Climates, engraved with projections of the sphere for different latitudes.

FIG. 1.—PERSIAN ASTROLABE (*c.*1712) INSCRIBED IN ARABIC.



BACK, showing graduations, parallelogram for measuring heights; and other tables, together with the *Rule* with sights (A) held by a moveable pin (B), known as the *Horse* or *Wedge*.

(8900). The Kalmucks and Kirghiz have their own local administrations, and so have the Astrakhan Cossacks (25,600).

ASTRAKHAN, a town of E. Russia, capital of the government of Astrakhan, on the left bank of the main channel of the Volga, 50 m. from the Caspian Sea, in 46° 21′ N. lat. and 48° 5′ E. long. Since the growth of the petroleum industry of Baku and the construction of the Transcaspian railway, Astrakhan has become an important commercial centre, exporting fish, caviare, sugar, metals, naphtha, cottons and woollens, and importing grain, cotton, fruit and timber, to the aggregate value of £8,250,000 with foreign countries and of £14,500,000 with the interior of Russia. The town gives its name to the "fur" called "astrakhan," the skin of the new-born Persian lamb, and so to an imitation in rough woollen cloth. There is some tanning, shipbuilding and brewing, and making of soap, tar and machinery. Astrakhan is the chief port on the Caspian Sea and the headquarters of the Russian Caspian fleet. The city consists of (1) the *kreml* or citadel (1550), crowning a hill, on which stand also the spacious brick cathedral containing the tombs of two Georgian princes, the archbishop's palace and the monastery of the Trinity; (2) the Byelogorod or White Town, containing the administrative offices and the bazaars; and (3) the suburbs, where most of the population resides. The buildings in the first two quarters are of stone, in the third of wood, irregularly arranged along unpaved, dirty streets. The city is the see of a Greek Catholic archbishop and of an Armenian archbishop, and contains a Lamaist monastery, as well as technical schools, an ichthyological museum, the Peter museum, with ethnographical, archaeological and natural history collections, a botanical garden, an ecclesiastical seminary, and good squares and public gardens, one of which is adorned with a statue (1884) of Alexander II. Vineyards surround the city. Astrakhan was anciently the capital of a Tatar state, and stood some 7 m. farther north. After this was destroyed by the Mongol prince Timur the Great in 1395, the existing city was built. The Tatars were expelled about 1554 by Ivan IV. of Russia. In 1569 the city was besieged by the Turks, but they were defeated with great slaughter by the Russians. In 1670 it was seized by the rebel Stenka Razin; early in the following century Peter the Great constructed here a shipbuilding yard and made Astrakhan the base for his hostilities against Persia, and later in the same century Catherine II. accorded the city important industrial privileges. In 1702, 1718 and 1767, it suffered severely from fires; in 1719 was plundered by the Persians; and in 1830 the cholera swept away a large number of its people. In the middle ages the city was known also as Jitarkhan and Ginterkhan. Pop. (1867) 47,839; (1900) 121,580. Eight miles above Astrakhan, on the right bank of the Volga, are the ruins of two ancient cities superimposed one upon the other. In the upper, which may represent the city of Balanjar (Balansar, Belenjer), have been found gold and silver coins struck by Mongol rulers, as well as ornaments in the same metals. The older and scantier underlying ruins are supposed to be those of the once large and prosperous city of Itil or Atel (Etel, Idl) of the Arab geographers, a residence of the khan of the Khazars, destroyed by the Russians in 969. (P. A. K.)

ASTROLABE (from Gr. ἄστρον, star, and λαβεῖν, to take), an instrument used not only for stellar, but for solar and lunar altitude-taking. The principle of the astrolabe is explained in fig. 2. There were two kinds,—spherical and planispheric.

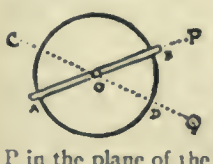


FIG. 2.—Principle of the Astrolabe. If a solid circle be fixed in any one position and a tube be pivoted on its centre so as to move; and if the line C D be drawn upon the circle pointing towards any object Q in the heavens which lies in the plane of the circle, by turning the tube A B towards any other object P in the plane of the circle, the angle B O D will be the angle subtended by the two objects P and Q at the eye.

The earliest forms were "armillae" and spherical. Gradually, from Eratosthenes to Tycho, Hipparchus playing the most important part among ancient astronomers, the complex astrolabe was evolved, large specimens being among the chief observatory instruments of the 15th, 16th and even 17th centuries; while small ones were in use among travellers and learned men, not only for astronomical, but for astrological and topographical purposes. Nearly every one of the modern instruments used for the observations of physical astronomy is a part of the perfected astrolabe. A collection of circles such as is the armillary sphere, if each circle were fitted with a view-tube, might be considered a complete astrolabe. Tycho's armillae were astrolabes. In fact the modern equatorial, and the altitude and azimuth circle are astrolabes in the strictest and oldest meaning of the term; and Tycho in one of his astrolabes came so near the modern equatorial that it may be taken as the first of the kind.

The two forms of the planispheric astrolabe most widely known and used in the 15th, 16th and even 17th centuries were: (1) the *portable astrolabe* shown in fig. 1 (Plate). This originated in the East, and was in early use in India, Persia and Arabia, and was introduced into Europe by the Arabs, who had perfected it—perhaps as early as A.D. 700. It combines the planisphere and armillae of Hipparchus and others, and the theodolite of Theon, and was usually of brass, varying in diameter from a couple of inches to a foot or more. It was used for taking the altitudes of sun, moon and stars; for calculating latitude; for determining the points of the compass, and time; for ascertaining heights of mountains, &c.; and for construction of horoscopes. The instrument was a marvel of convenience and ingenuity, and was called "the mathematical jewel." Nevertheless it passed out of use, because incapable of any great precision.

From *Exercises*, by T. Blundeville.

FIG. 3.—Mariner's Astrolabe, A.D. 1594. Made of brass, or of heavy wood: it varied in size from a few inches to 1 ft. in diameter.

(2) The *mariner's astrolabe*, fig. 3, was adapted from that of astronomers by Martin Behaim, *c.* 1480. This was the instrument used by Columbus. With the tables of the sun's declination then available, he could calculate his latitude by meridian altitudes of the sun taken with his astrolabe. The mariner's astrolabe was superseded by John Hadley's quadrant of 1731.

AUTHORITIES.—Chaucer, *Treatise on the Astrolabe* (Skeat's edition of Chaucer); J. J. Stöffler, *Elucidatio Fabrice ususque Astrolabii*, &c.; Thomas Blundeville, *His Exercises* (1594); F. Ritter, *Astrolabium*; W. H. Morley, *Description of Astrolabe of Shah Husain*; M. L. Huggins, "The Astrolabe" (*Astrophysical Journal*, 1894); *Penny Cyclopaedia*, article "Astrolabe;" R. Grant, *History of Physical Astronomy*. (M. L. H.)

ASTROLOGY, the ancient art or science of divining the fate and future of human beings from indications given by the positions of the stars (sun, moon and planets). The belief in a connexion between the heavenly bodies and the life of man has played an important part in human history. For long ages astronomy and astrology (which might be called astromancy, on the same principle as "chiromancy") were identified; and a distinction is made between "natural astrology," which predicts the motions of the heavenly bodies, eclipses, &c., and "judicial astrology," which studies the influence of the stars on human destiny. Isidore of Seville (d. 636) is one of the first to distinguish between astronomy and astrology; nor did astronomy begin to rid itself of astrology till the 16th century, when, with the system of Copernicus, the conviction that the earth itself is one of the heavenly bodies was finally established. The study of astromancy and the belief in it, as part of astronomy, is found in a developed form among the ancient Babylonians, and directly or indirectly through the Babylonians spread to other nations. It came to Greece about the middle of the 4th century B.C., and reached Rome before the opening of the Christian era. In India and China astronomy and astrology are largely reflections of Greek theories and speculations; and similarly with

the introduction of Greek culture into Egypt, both astronomy and astrology were actively cultivated in the region of the Nile during the Hellenistic and Roman periods. Astrology was further developed by the Arabs from the 7th to the 13th century, and in the Europe of the 14th and 15th centuries astrologers were dominating influences at court.

Even up to the present day men of intellectual eminence like Dr Richard Garnett have convinced themselves that astromancy has a foundation of truth, just as there are still believers in chiromancy or other forms of divination. Dr Garnett ("A. G. Trent") insisted indeed that it was a mistake to confuse astrology with fortune-telling, and maintained that it was a "physical science just as much as geology," depending like them on ascertained facts, and grossly misrepresented by being connected with magic. Dr Garnett himself looked upon the study of biography in relation to the casting of horoscopes as an empirical investigation, but it is difficult in practice to keep the distinction clear, to judge by present-day text-books such as those of Dr Wilde (*Primer of Astrology*, &c.). Dr Wilde insists on there being "nothing incongruous with the laws of nature in the theory that the sun, moon and stars influence men's physical bodies and conditions, seeing that man is made up of a physical part of the earth." There is an obvious tendency, however, for astromancy to be employed, like palmistry, as a means of imposing on the ignorant and credulous. How far the more serious claim is likely to be revived in connexion with the renewal of research into the "occult" sciences generally, it is still too early to speculate; and it has to be recognized that such a point of view is opposed to the generally established belief that astrology is either mere superstition or absolute imposture, and that its former vogue was due either to deception or to the tyranny of an unscientific environment. But if the progress of physical science has not prevented the rehabilitation of much of ancient alchemy by the later researches into chemical change, and if psychology now finds a place for explanations of spiritualism and witchcraft which involve the admission of the empirical facts under a new theory (as in the case of the divining-rod, &c.), it is at least conceivable that some new synthesis might once more justify part at all events of ancient and medieval astromancy, to the extent of admitting the empirical facts where provable, and substituting for the supposed influence of the stars as such, some deeper theory which would be consistent with an application to other forms of prophecy, and thus might reconcile the possibility of dipping into futurity with certain interrelations of the universe, different indeed from those assumed by astrological theory, but underlying and explaining it. If this is ever accomplished it will need the patient investigation of a number of empirical observations by competent students unbiassed by any *parti pris*—a difficult set of conditions to obtain; and even then no definite results may be achieved.

The history of astrology can now be traced back to ancient Babylonia, and indeed to the earliest phases of Babylonian history, *i.e.* to about 3000 B.C. In Babylonia as well as in Assyria as a direct offshoot of Babylonian culture (or as we might also term it "Euphratean" culture), astrology takes its place in the official cult as one of the two chief means at the disposal of the priests (who were called *bārē* or "inspectors") for ascertaining the will and intention of the gods, the other being through the inspection of the liver of the sacrificial animal (see OMEN). Just as this latter method of divination rested on a well-defined theory, to wit, that the liver was the seat of the soul of the animal and that the deity in accepting the sacrifice identified himself with the animal, whose "soul" was thus placed in complete accord with that of the god and therefore reflected the mind and will of the god, so astrology is based on a theory of divine government of the world, which in contrast to "liver" divination assumes at the start a more scientific or pseudo-scientific aspect. This theory must be taken into consideration as a factor in accounting for the persistent hold which even at the present day astrology still maintains on many minds. Starting with the indisputable fact that man's life and happiness are largely dependent upon phenomena in the heavens, that the fertility of the soil is dependent upon the sun shining in the heavens as well as upon the rains that come from heaven, that on the other hand the mischief and damage done by storms and inundations, to both of which the Euphratean Valley was almost regularly subject, were to be traced likewise to the heavens, the conclusion was drawn that all the great gods had their seats in the heavens. In that early age of culture known as the "nomadic" stage, which under normal conditions precedes the "agricultural" stage, the moon cult is even more prominent than sun worship, and with the moon and sun cults thus furnished by the "popular" faith it was a natural step for the priests, who correspond to the "scientists" of a later day, to perfect a theory of a complete accord between phenomena observed in the heavens and occurrences on earth.

If moon and sun, whose regular movements conveyed to the more intelligent minds the conception of the reign of law and order in the universe as against the more popular notion of chance and caprice, were divine powers, the same held good of the planets, whose movements, though more difficult to follow, yet in the course of time came to be at least partially understood. Of the planets five were recognized—Jupiter, Venus, Saturn, Mercury and Mars—to name them in the order in which they appear in the older cuneiform literature; in later texts Mercury and Saturn change places. These five planets were identified with the great gods of the pantheon as follows:—Jupiter with Marduk (*q.v.*), Venus with the goddess Ishtar (*q.v.*), Saturn with Ninib (*q.v.*), Mercury with Nebo (*q.v.*), and Mars with Nergal (*q.v.*). The movements of the sun, moon and five planets were regarded as representing the activity of the five gods in question, together with the moon-god Sin (*q.v.*) and the sun-god Shamash (*q.v.*), in preparing the occurrences on earth. If, therefore, one could correctly read and interpret the activity of these powers, one knew what the gods were aiming to bring about. The Babylonian priests accordingly applied themselves to the task of perfecting a system of interpretation of the phenomena to be observed in the heavens, and it was natural that the system was extended from the moon, sun and five planets to the more prominent and recognizable fixed stars. That system involved not merely the movements of the moon, sun and planets, but the observation of their relative position to one another and to all kinds of peculiarities noted at any point in the course of their movements: in the case of the moon, for instance, the exact appearance of the new crescent, its position in the heavens, the conditions at conjunction and opposition, the appearance of the horns, the halo frequently seen with the new moon, which was compared to a "cap," the ring round the full moon, which was called a "stall" (*i.e.* "enclosure"), and more of the like. To all these phenomena some significance was attached, and this significance was naturally intensified in the case of such a striking phenomenon as an eclipse of the moon. Applying the same method of careful observation to the sun and planets, and later to some of the constellations and to many of the fixed stars, it will be apparent that the body of observations noted must have grown in the course of time to large and indeed to enormous proportions, and correspondingly the interpretations assigned to the nearly endless variations in the phenomena thus observed. The interpretations themselves were based (as in the case of divination through the liver) chiefly on two factors:—(1) on the recollection or on written records of what in the past had taken place when the phenomenon or phenomena in question had been observed, and (2) association of ideas—involving sometimes merely a play upon words—in connexion with the phenomenon or phenomena observed. Thus if on a certain occasion the rise of the new moon in a cloudy sky was followed by victory over an enemy or by abundant rain, the sign in question was thus proved to be a favourable one and its recurrence would be regarded as a good omen, though the prognostication would not necessarily be limited to the one or the other of those occurrences, but might be extended to apply to other circumstances. On the other hand, the appearance of the new moon earlier than was expected was regarded as an unfavourable omen—prognosticating in one case defeat, in another death

among cattle, in a third bad crops—not necessarily because these events actually took place after such a phenomenon, but by an application of the general principle resting upon association of ideas whereby anything premature would suggest an unfavourable occurrence. A thin halo seen above the new moon was pictured as a cap, and the association between this and the symbol of royalty, which was a conical-shaped cap, led to interpreting the phenomenon as an indication that the ruler would have a successful reign. In this way a mass of traditional interpretation of all kinds of observed phenomena was gathered, and once gathered became a guide to the priests for all times.

Astrology in this its earliest stage is, however, marked by two characteristic limitations. In the first place, the movements and position of the heavenly bodies point to such occurrences as are of public import and affect the general welfare. The individual's interests are not in any way involved, and we must descend many centuries and pass beyond the confines of Babylonia and Assyria before we reach that phase which in mediæval and modern astrology is almost exclusively dwelt upon—genethliology or the individual horoscope. In Babylonia and Assyria the cult centred largely and indeed almost exclusively in the public welfare and the person of the king, because upon his well-being and favour with the gods the fortunes of the country were dependent in accordance with the ancient conception of kingship (see J. G. Frazer, *The Early History of Kingship*). To some extent, the individual came in for his share in the incantations and in the purification ritual through which one might hope to rid oneself of the power of the demons and of other evil spirits, but outside of this the important aim of the priests was to secure for the general benefit the favour of the gods, or, as a means of preparing oneself for what the future had in store, to ascertain in time whether that favour would be granted in any particular instance or would be continued in the future. Hence in "liver" divination, as in astrology, the interpretations of the signs noted all have reference to public affairs and events and not to the individual's needs or desires. In the second place, the astronomical knowledge presupposed and accompanying early Babylonian astrology is essentially of an empirical character. While in a general way the reign of law and order in the movements of the heavenly bodies was recognized, and indeed must have exercised an influence at an early period in leading to the rise of a methodical divination that was certainly of a much higher order than the examination of an animal's liver, yet the importance that was laid upon the endless variations in the form of the phenomena and the equally numerous apparent deviations from what were regarded as normal conditions, prevented for a long time the rise of any serious study of astronomy beyond what was needed for the purely practical purposes that the priests as "inspectors" of the heavens (as they were also the "inspectors" of the sacrificial livers) had in mind. True, we have, probably as early as the days of Khammurabi, *i.e. c.* 2000 B.C., the combinations of prominent groups of stars with outlines of pictures fantastically put together, but there is no evidence that prior to 700 B.C. more than a number of the constellations of our zodiac had become part of the current astronomy. The theory of the ecliptic as representing the course of the sun through the year, divided among twelve constellations with a measurement of 30° to each division, is also of Babylonian origin, as has now been definitely proved; but it does not appear to have been perfected until after the fall of the Babylonian empire in 539 B.C. Similarly, the other accomplishments of Babylonian astronomers, such as their system or rather systems of moon calculations and the drawing up of planetary tablets, belong to this late period, so that the golden age of Babylonian astronomy belongs not to the remote past, as was until recently supposed, but to the Seleucid period, *i.e.* after the advent of the Greeks in the Euphrates Valley. From certain expressions used in astrological texts that are earlier than the 7th century B.C. it would appear, indeed, that the beginnings at least of the calculation of sun and moon eclipses belong to the earlier period, but here, too, the chief work accomplished was after 400 B.C., and the defectiveness of early Babylonian astronomy may be gathered from the fact that as late as the 6th century B.C. an error of almost an entire month was made by the Babylonian astronomers in the attempt to determine through calculation the beginning of a certain year.

The researches of Bouché-Leclercq, Cumont and Boll have enabled us to fix with a considerable degree of definiteness the middle of the 4th century B.C. as the period when Babylonian astrology began its triumphal march to the west, invading the domain of Greek and Roman culture and destined to exercise a strong hold on all nations and groups—more particularly in Egypt—that came within the sphere of Greek and Roman influence. It is rather significant that this spread of astrology should have been concomitant with the intellectual impulse that led to the rise of a genuine scientific phase of astronomy in Babylonia itself, which must have weakened to some extent the hold that astrology had on the priests and the people. The advent of the Persians, bringing with them a conception of religion of a far higher order than Babylonian-Assyrian polytheism (see ZOROASTER), must also have acted as a disintegrating factor in leading to the decline of the old faith in the Euphrates Valley, and we thus have the interesting though not entirely exceptional phenomenon of a great civilization bequeathing as a legacy to posterity a superstition instead of a real achievement. "Chaldaean wisdom" became among Greeks and Romans the synonym of divination through the planets and stars, and it is not surprising that in the course of time to be known as a "Chaldaean" carried with it frequently the suspicion of charlatanry and of more or less wilful deception. The spread of astrology beyond Babylonia is thus concomitant with the rise of a truly scientific astronomy in Babylonia itself, which in turn is due to the intellectual impulse afforded by the contact with new forms of culture from both the East and the West.

In the hands of the Greeks and of the later Egyptians both astrology and astronomy were carried far beyond the limits attained by the Babylonians, and it is indeed a matter of surprise to observe the harmonious combination of the two fields—a harmony that seems to grow more complete with each age, and that is not broken until we reach the threshold of modern science in the 16th century. To the Greek astronomer Hipparchus belongs the credit of the discovery (*c.* 130 B.C.) of the theory of the precession of the equinoxes, for a knowledge of which among the Babylonians we find no definite proof; but such a signal advance in pure science did not prevent the Greeks from developing in a most elaborate manner the theory of the influence of the planets upon the fate of the individual. The endeavour to trace the horoscope of the individual from the position of the planets and stars at the time of birth (or, as was attempted by other astrologers, at the time of conception) represents the most significant contribution of the Greeks to astrology. The system was carried to such a degree of perfection that later ages made but few additions of an essential character to the genethliology or drawing up of the individual horoscope by the Greek astrologers. The system was taken up almost bodily by the Arab astronomers, it was embodied in the Kabbalistic lore of Jews and Christians, and through these and other channels came to be the substance of the astrology of the middle ages, forming, as already pointed out, under the designation of "judicial astrology," a pseudo-science which was placed on a perfect footing of equality with "natural astrology" or the more genuine science of the study of the motions and phenomena of the heavenly bodies.

Partly in further development of views unfolded in Babylonia, but chiefly under Greek influences, the scope of astrology was enlarged until it was brought into connexion with practically all of the known sciences, botany, chemistry, zoology, mineralogy, anatomy and medicine. Colours, metals, stones, plants, drugs and animal life of all kinds were associated with the planets and placed under their tutelage. In the system that passes under the name of Ptolemy, Saturn is associated with grey, Jupiter with white, Mars with red, Venus with yellow, while Mercury, occupying a peculiar place in Greek as it did in Babylonian astrology (where it was at one time designated as *the* planet *par excellence*), was supposed to vary its colour according to changing

circumstances. The sun was associated with gold, the moon with silver, Jupiter with electrum, Saturn with lead, Venus with copper, and so on, while the continued influence of astrological motives is to be seen in the association of quicksilver, upon its discovery at a comparatively late period, with Mercury, because of its changeable character as a solid and a liquid. In the same way stones were connected with both the planets and the months; plants, by diverse association of ideas, were connected with the planets, and animals likewise were placed under the guidance and protection of one or other of the heavenly bodies. By this curious process of combination the entire realm of the natural sciences was translated into the language of astrology with the single avowed purpose of seeing in all phenomena signs indicative of what the future had in store. The fate of the individual, as that feature of the future which had a supreme interest, led to the association of the planets with parts of the body. Here, too, we find various systems devised, in part representing the views of different schools, in part reflecting advancing conceptions regarding the functions of the organs in man and animals. In one system the seat of Mercury, representing divine intelligence as the source of all knowledge—a view that reverts to Babylonia where Nebo (corresponding to Mercury) was regarded as the divine power to whom all wisdom is due—was placed in the liver as the primeval seat of the soul (see OMEN), whereas in other systems this distinction was assigned to Jupiter or to Venus. Saturn, taking in Greek astrology the place at the head of the planets which among the Babylonians was accorded to Jupiter-Marduk, was given a place in the brain, which in later times was looked upon as the centre of soul-life; Venus, as the planet of the passion of love, was supposed to reign supreme over the genital organs, the belly and the lower limbs; Mars, as the violent planet, is associated with the bile, as well as with the blood and kidneys. Again, the right ear is associated with Saturn, the left ear with Mars, the right eye in the case of the male with the sun and the left eye with the moon, while in the case of the female it was just the reverse. From the planets the same association of ideas was applied to the constellations of the zodiac, which in later phases of astrology are placed on a par with the planets themselves, so far as their importance for the individual horoscope is concerned. The fate of the individual in this combination of planets with the zodiac was made dependent not merely upon the planet which happened to be rising at the time of birth or of conception, but also upon its local relationship to a special sign or to certain signs of the zodiac. The zodiac was regarded as the prototype of the human body, the different parts of which all had their corresponding section in the zodiac itself. The head was placed in the first sign of the zodiac—the Ram; and the feet in the last sign—the Fishes. Between these two extremes the other parts and organs of the body were distributed among the remaining signs of the zodiac, the neck being assigned to the Bull, the shoulders and arms to the Gemini (or twins), the breast to Cancer, the flanks to Leo, the bladder to Virgo, the buttocks to the Balance, the pubis to the Scorpion, the thighs to Sagittarius, the knees to Capricorn, and the limbs to Aquarius. Not content with this, we find the late Egyptian astrologers setting up a correspondence between the thirty-six *decani* recognized by them and the human body, which is thus divided into thirty-six parts; to each part a god was assigned as a controlling force. With human anatomy thus connected with the planets, with constellations, and with single stars, medicine became an integral part of astrology, or, as we might also put it, astrology became the handmaid of medicine. Diseases and distrubances of the ordinary functions of the organs were attributed to the influence of planets or explained as due to conditions observed in a constellation or in the position of a star; and an interesting survival of this bond between astrology and medicine is to be seen in the use up to the present time of the sign of Jupiter ♃, which still heads medicinal prescriptions, while, on the other hand, the influence of planetary lore appears in the assignment of the days of the week to the planets, beginning with Sunday, assigned to the sun, and ending with Saturday, the day of Saturn. Passing on into still later periods, Saturn's day was associated with the Jewish sabbath, Sunday with the Lord's Day, Tuesday with Tiw, the god of war, corresponding to Mars of the Romans and to the Nergal of the Babylonians. Wednesday was assigned to the planet Mercury, the equivalent of the Germanic god Woden; Thursday to Jupiter, the equivalent of Thor; and Friday to Friga, the goddess of love, who is represented by Venus among the Romans and among the Babylonians by Ishtar. Astrological considerations likewise already regulated in ancient Babylonia the distinction of lucky and unlucky days, which passing down to the Greeks and Romans (*dies fasti* and *nefasti*) found a striking expression in Hesiod's *Works and Days*. Among the Arabs similar associations of lucky and unlucky days directly connected with the influence of the planets prevailed through all times, Tuesday and Wednesday, for instance, being regarded as the days for blood-letting, because Tuesday was connected with Mars, the lord of war and blood, and Wednesday with Mercury, the planet of humours. Even in modern times travellers relate how, when an auspicious day has been proclaimed by the astrologers, the streets of Bagdad may be seen running with blood from the barbers' shops.

It is unnecessary here to give a detailed analysis of the methods of judicial astrology as an art, or directions for the casting of a horoscope, or "nativity," *i.e.* a map of the heavens at the hour of birth, showing, according to the Ephemeris, the position of the heavenly bodies, from which their influence may be deduced. Each of the twelve signs of the zodiac (*q.v.*) is credited with its own characteristics and influence, and is the controlling sign of its "house of life." The sign exactly rising at the moment of birth is called the ascendant. The benevolent or malignant influence of each planet, together with the sun and moon, is modified by the sign it inhabits at the nativity; thus Jupiter in one house may indicate riches, fame in another, beauty in another, and Saturn similarly poverty, obscurity or deformity. The calculation is affected by the "aspects," *i.e.* according as the planets are near or far as regards one another (in conjunction, in semi-sextile, semi-square, sextile, quintile, square, trine, sesqui-quadrate, bi-quintile, opposition or parallel acclination). Disastrous signs predominate over auspicious, and the various effects are combined in a very elaborate and complicated manner.

Judicial astrology, as a form of divination, is a concomitant of natural astrology, in its purer astronomical aspect, but mingled with what is now considered an unscientific and superstitious view of world-forces. In the *Janua aurea reserata quatuor linguarum* (1643) of J. A. Comenius we find the following definition:—"*Astronomus siderum meatus seu motus considerat: Astrologus eorundem efficaciam, influxum, et effectum.*" Kepler was more cautious in his opinion; he spoke of astronomy as the wise mother, and astrology as the foolish daughter, but he added that the existence of the daughter was necessary to the life of the mother. Tycho Brahe and Gassendi both began with astrology, and it was only after pursuing the false science, and finding it wanting, that Gassendi devoted himself to astronomy. In their numerous allusions to the subtle mercury, which the one makes when treating of a means of measuring time by the efflux of the metal, and the other in a treatise on the transit of the planet, we see traces of the school in which they served their first apprenticeship. Huygens, moreover, in his great posthumous work, *Cosmotheoros, seu de terris coelestibus*, shows himself a more exact observer of astrological symbols than Kircher himself in his *Iter exstaticum*. Huygens contends that between the inhabitants of different planets there need not be any greater difference than exists between men of different types on the earth. "There are on the earth," continues this rational interpreter of the astrologers and chiromancers, "men of cold temperament who would thrive in Saturn, which is the farthest planet from the sun, and there are other spirits warm and ardent enough to live in Venus."

Those were indeed strange times, according to modern ideas, when astrologers were dominant by the terror they inspired, and sometimes by the martydom they endured when their predictions were either too true or too false. Faith, to borrow their

own language, was banished to Virgo, and rarely shed her influence on men. Cardan (1501–1576), for instance, hated Luther, and so changed his birthday in order to give him an unfavourable horoscope. In Cardan's times, as in those of Augustus, it was a common practice for men to conceal the day and hour of their birth, till, like Augustus, they found a complaisant astrologer. But, as a general rule, medieval and Renaissance astrologers did not give themselves the trouble of reading the stars, but contented themselves with telling fortunes by faces. They practised chiromancy (see PALMISTRY), and relied on afterwards drawing a horoscope to suit. As physiognomists (see PHYSIOGNOMY) their talent was undoubted, and according to Vanini there was no need to mount to the house-top to cast a nativity. "Yes," he says, "I can read his face; by his hair and his forehead it is easy to guess that the sun at his birth was in the sign of Libra and near Venus. Nay, his complexion shows that Venus touches Libra. By the rules of astrology he could not lie."

A few salient facts may be added concerning the astrologers and their predictions, remarkable either for their fulfilment or for the ruin and confusion they brought upon their authors. We may begin with one taken from Bacon's *Essay of Prophecies*:—"When I was in France, I heard from one Dr Pena, that the queen mother, who was given to curious arts, caused the king her husband's nativitie to be calculated, under a false name; and the astrologer gave a judgment, that he should be killed in a duell; at which the queene laughed, thinking her husband to be above challenges and duels; but he was slaine, upon a course at tilt, the splinters of the staffe of Mongomery going in at his bever." A favourite topic of the astrologers of all countries has been the immediate end of the world. As early as 1186 the earth had escaped one threatened cataclysm of the astrologers. This did not prevent Stöffler from predicting a universal deluge for the year 1524—a year, as it turned out, distinguished for drought. His aspect of the heavens told him that in that year three planets would meet in the aqueous sign of Pisces. The prediction was believed far and wide, and President Aurial, at Toulouse, built himself a Noah's ark—a curious realization, in fact, of Chaucer's merry invention in the *Miller's Tale*.

Tycho Brahe was from his fifteenth year devoted to astrology, and adjoining his observatory at Uranienburg the astronomer-royal of Denmark had a laboratory built in order to study alchemy, and it was only a few years before his death that he finally abandoned astrology. We may here notice one very remarkable prediction of the master of Kepler. That he had carefully studied the comet of 1577 as an astronomer, we may gather from his adducing the very small parallax of this comet as disproving the assertion of the Aristotelians that a solid sphere enveloped the heavens. But besides this, we find him in his character of astrologer drawing a singular prediction from the appearance of this comet. It announced, he tells us, that in the north, in Finland, there should be born a prince who should lay waste Germany and vanish in 1632. Gustavus Adolphus, it is well known, was born in Finland, overran Germany, and died in 1632. The fulfilment of the details of this prophecy suggests that Tycho Brahe had some basis of reason for his prediction. Born in Denmark of a noble Swedish family, a politician, as were all his contemporaries of distinction, Tycho, though no conjuror, could foresee the advent of some great northern hero. Moreover, he was doubtless well acquainted with a very ancient tradition, that heroes generally came from the northern frontiers of their native land, where they are hardened and tempered by the threefold struggle they wage with soil, climate and barbarian neighbours.

Kepler explained the double movement of the earth by the rotation of the sun. At one time the sun presented its friendly side, which attracted one planet, sometimes its adverse side, which repelled it. He also peopled the planets with souls and genii. He was led to his three great laws by musical analogies, just as William Herschel afterwards passed from music to astronomy. Kepler, who in his youth made almanacs, and once prophesied a hard winter, which came to pass, could not help putting an astrological interpretation on the disappearance of the brilliant star of 1572, which Tycho had observed. Theodore Beza thought that this star, which in December 1573 equalled Jupiter in brilliancy, predicted the second coming of Christ. Astronomers were only then beginning to study variable and periodic stars, and disturbances in that part of the heavens, which had till then, on the authority of Aristotle, been regarded as incorruptible, combined with the troubles of the times, must have given a new stimulus to belief in the signs in heaven. Montaigne (*Essais*, lib. i. chap. x.) relates a singular episode in the history of astrology. Charles V. and Francis I., who both bid for the friendship of the infamous Aretino, surnamed the divine, both likewise engaged astrologers to fight their battles. In Italy those who prophesied the ruin of France were sure to be listened to. These prophecies affected the public funds much as telegrams do nowadays. "At Rome," Montaigne tells us, "a large sum of money was lost on the Change by this prognostication of our ruin." The marquis of Saluces, notwithstanding his gratitude to Francis I. for the many favours he had received, including his marquisate, of which the brother was despoiled for his benefit, was led in 1536 to betray his country, being scared by the glorious prophecies of the ultimate success of Charles V. which were then rife. The influence of the Medici made astrologers popular in France. Richelieu, on whose council was Jacques Gaffarel (1601–1681), the last of the Kabbalists, did not despise astrology as an engine of government. At the birth of Louis XIV. a certain Morin de Villefranche was placed behind a curtain to cast the nativity of the future autocrat. A generation back the astrologer would not have been hidden behind a curtain, but have taken precedence of the doctor. La Bruyère dares not pronounce against such beliefs, "for there are perplexing facts affirmed by grave men who were eye-witnesses." In England William Lilly and Robert Fludd were both dressed in a little brief authority. The latter gives us elaborate rules for the detection of a thief, and tells us that he has had personal experience of their efficacy. "If the lord of the sixth house is found in the second house, or in company with the lord of the second house, the thief is one of the family. If Mercury is in the sign of the Scorpion he will be bald, &c." Francis Bacon abuses the astrologers of his day no less than the alchemists, but he does so because he has visions of a reformed astrology and a reformed alchemy. Sir Thomas Browne, too, while he denies the capacity of the astrologers of his day, does not venture to dispute the reality of the science. The idea of the souls of men passing at death to the stars, the blessedness of their particular sphere being assigned them according to their deserts (the metempsychosis of J. Reynaud), may be regarded as a survival of religious astrology, which, even as late as Descartes's day, assigned to the angels the task of moving the planets and the stars. Joseph de Maistre believed in comets as messengers of divine justice, and in animated planets, and declared that divination by astrology is not an absolutely chimerical science. Lastly, we may mention a few distinguished men who ran counter to their age in denying stellar influences. Aristarchus of Samos, Martianus Capella (the precursor of Copernicus), Cicero, Favorinus, Sextus Empiricus, Juvenal, and in a later age Savonarola and Pico della Mirandola, and La Fontaine, a contemporary of the neutral La Bruyère, were all pronounced opponents of astrology.

In England Swift may fairly claim the credit of having given the death-blow to astrology by his famous squib, entitled *Prediction for the Year 1708, by Isaac Bickerstaff, Esq.* He begins, by professing profound belief in the art, and next points out the vagueness and the absurdities of the philomaths. He then, in the happiest vein of parody, proceeds to show them a more excellent way:—"My first prediction is but a trifle, yet I mention it to show how ignorant these sottish pretenders to astrology are in their own concerns: it refers to Partridge the almanac-maker. I have consulted the star of his nativity by my own rules, and find he will infallibly die upon the 29th of March next about eleven at night of a raging fever. Therefore I advise him to consider of it and settle his affairs in time."

Then followed a letter to a person of quality giving a full and particular account of the death of Partridge on the very day and nearly at the hour mentioned. In vain the wretched astrologer protested that he was alive, got a literary friend to write a pamphlet to prove it, and published his almanac for 1709. Swift, in his reply, abused him for his want of manners in giving a gentleman the lie, answered his arguments *seriatim*, and declared that the evidence of the publication of another almanac was wholly irrelevant, "for Gadbury, Poor Robin, Dove and Way do yearly publish their almanacs, though several of them have been dead since before the Revolution." Nevertheless a field is found even to this day for almanacs of a similar type, and for popular belief in them.

To astrological politics we owe the theory of heaven-sent rulers, instruments in the hands of Providence, and saviours of society. Napoleon, as well as Wallenstein, believed in his star. Many passages in the older English poets are unintelligible without some knowledge of astrology. Chaucer wrote a treatise on the astrolabe; Milton constantly refers to planetary influences; in Shakespeare's *King Lear*, Gloucester and Edmund represent respectively the old and the new faith. We still *contemplate* and *consider*; we still speak of men as *jovial*, *saturnine* or *mercurial*; we still talk of the *ascendancy* of genius, or a *disastrous* defeat. In French *heur*, *malheur*, *heureux*, *malheureux*, are all derived from the Latin *augurium*; the expression *né sous une mauvaise étoile*, born under an evil star, corresponds (with the change of *étoile* into *astre*) to the word *malôtru*, in Provençal *malastrue*; and *son étoile pâlit*, his star grows pale, belongs to the same class of illusions. The Latin *ex augurio* appears in the Italian *sciagura*, *sciagurato*, softened into *sciaura*, *sciaurato*, wretchedness, wretched. The influence of a particular planet has also left traces in various languages; but the French and English *jovial* and the English *saturnine* correspond rather to the gods who served as types in chiromancy than to the planets which bear the same names. In the case of the expressions *bien* or *mal luné*, well or ill mooned, *avoir un quartier de lune dans la tête*, to have the quarter of the moon in one's head, the German *mondsüchtig* and the English *moonstruck* or *lunatic*, the fundamental idea lies in the strange opinions formerly held about the moon.

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ASTRONOMY (from Gr. ἄστρον, a star, and νέμειν, to classify or arrange). The subject matter of astronomical science, considered in its widest range, comprehends all the matter of the universe which lies outside the limit of the earth's atmosphere. The seeming anomaly of classifying as a single branch of science all that we know in a field so wide, while subdividing our knowledge of things on our own planet into an indefinite number of separate sciences, finds its explanation in the impossibility of subjecting the matter of the heavens to that experimental scrutiny which yields such rich results when applied to matter which we can handle at will. Astronomy is of necessity a science of observation in the pursuit of which experiment can directly play no part. It is the most ancient of the sciences because, before the era of experiment, it was the branch of knowledge which could be most easily systematized, while the relations of its phenomena to day and night, times and seasons, made some knowledge of the subject a necessity of social life. In recent times it is among the more progressive of the sciences, because the new and improved methods of research now at command have found in its cultivation a field of practically unlimited extent, in which the lines of research may ultimately lead to a comprehension of the universe impossible of attainment before our time.

The field we have defined is divisible into at least two parts, that of Astronomy proper, or "Astrometry," which treats of the motions, mutual relations and dimensions of the heavenly bodies; and that of Astrophysics (*q.v.*), which treats of their physical constitution. While it is true that the instruments and methods of research in these two branches are quite different in their details, there is so much in common in the fundamental principles which underlie their application, that it is unprofitable to consider them as completely distinct sciences.

Speaking in the most comprehensive way, and making an exception of the ethereal medium (see AETHER), which, being capable of experimental study, is not included in the subject of astronomy, we may say that the great masses of matter which make up the universe are of two kinds:—(1) incandescent bodies, made visible to us by their own light; (2) dark bodies, revolving round them or round each other. These dark bodies are known to us in two ways: (*a*) by becoming visible through reflecting the light from incandescent bodies in their neighbourhood, (*b*) by their attraction upon such bodies.

The incandescent bodies are of two classes: stars and nebulae. Among the stars our sun is to be included, as it has no properties which distinguish it from the great mass of stars except our proximity to it. The stars are supposed to be generally spherical, like the sun, in form, and to have fairly well-defined boundaries; while the nebulae are generally irregular in outline and have no well-defined limits. It is, however, probable that the one class runs into the other by imperceptible gradations. In the relation of the universe to us there is yet another separation of its bodies into two classes, one comprising the solar system, the other the remainder of the universe. The former consists of the sun and the bodies which move round it. Considered as a part of the universe, our solar system is insignificant in extent, though, for obvious reasons, great in practical importance to us, and in the facility with which we may gain knowledge relating to it.

Referring to special articles, SOLAR SYSTEM, STAR, SUN, MOON, &c. for a description of the various parts of the universe, we confine ourselves, at present, to setting forth a few of the most general modern conceptions of the universe. As to extent, it may be said, in a general way, that while no definite limits can be set to the possible extent of the universe, or the distance of its farthest bodies, it seems probable, for reasons which will be given under STAR, that the system to which the stars that we see belong, is of finite extent.

As the incandescent bodies of the universe are visible by their own light, the problem of ascertaining their existence and position is mainly one of seeing, and our facilities for attacking it have constantly increased with the improvement of our optical appliances. But such is not the case with the dark bodies. Such a body can be made known to us only when in the neighbourhood of an incandescent body; and even then, unless its mass or its dimensions are considerable, it will evade all the scrutiny of our science. The question of the possible number and magnitude of such bodies is therefore one that does not admit of accurate investigation. We can do no more than

balance vague estimates of probability. What we do know is that these bodies vary widely in size. Those known to be revolving round certain of the stars are far larger in proportion to their central bodies than our planets are in respect to the sun; for were it otherwise we should never be able to detect their existence. At the other extreme we know that innumerable swarms of minute bodies, probably little more than particles, move round the sun in orbits of every degree of eccentricity, making themselves known to us only in the exceptional cases when they strike the earth's atmosphere. They then appear to us as "shooting stars" (see METEOR).

A general idea of the relation of the solar system to the universe may be gained by reflecting that the average distance between any two neighbouring stars is several thousand times the extent of the solar system. Between the orbit of Neptune and the nearest star known to us is an immense void in which no bodies are yet known to exist, except comets. But although these sometimes wander to distances considerably beyond the orbit of Neptune, it is probable that the extent of the void which separates our system from the nearest star is hundreds of times the distance of the farthest point to which a comet ever recedes.

We may conclude this brief characterization of astronomy with a statement and classification of the principal lines on which astronomical researches are now pursued. The most comprehensive problem before the investigator is that of the constitution of the universe. It is known that, while infinite diversity is found among the bodies of the universe, there are also common characteristics throughout its whole extent. In a certain sense we may say that the universe now presents itself to the thinking astronomer, not as a heterogeneous collection of bodies, but as a unified whole. The number of stars is so vast that statistical methods can be applied to many of the characters which they exhibit—their spectra, their apparent and absolute luminosity, and their arrangement in space. Thus has arisen in recent times what we may regard as a third branch of astronomical science, known as *Stellar Statistics*. The development of this branch has infused life and interest into what might a few years ago have been regarded as the most lifeless mass of figures possible, expressing merely the positions and motions of innumerable individual stars, as determined by generations of astronomical observers. The development of this new branch requires great additions to this mass, the product of perhaps centuries of work on the older lines of the science. To the statistician of the stars, catalogues of spectra, magnitude, position and proper motions are of the same importance that census tables are to the student of humanity. The measurement of the speed with which the individual stars are moving towards or from our system is a work of such magnitude that what has yet been done is scarcely more than a beginning. The discovery by improved optical means, and especially by photography, of new bodies of our system so small that they evaded all scrutiny in former times, is still going on, but does not at present promise any important generalization, unless we regard as such the conclusion that our solar system is a more complex organism than was formerly supposed.

One characteristic of astronomy which tends to make its progress slow and continuous arises out of the general fact that, except in the case of motions to or from us, which can be determined by a single observation with the spectroscope, the motion of a heavenly body can be determined only by comparing its position at two different epochs. The interval required between these two epochs depends upon the speed of the motion. In the case of the greater number of the fixed stars this is so slow that centuries may have to elapse before motion can be deduced. Even in the case of the planets, the variations in the form and position of the orbits are so slow that long periods of observation are required for their correct determination.

The process of development is also made slow and difficult by the great amount of labour involved in deriving the results of astronomical observations. When an astronomer has made an observation, it still has to be "reduced," and this commonly requires more labour than that involved in making it. But even this labour may be small compared with that of the theoretical astronomer, who, in the future, is to use the result as the raw material of his work. The computations required in such work are of extreme complexity, and the labour required is still further increased by the fact that cases are rather exceptional in which the results reached by one generation will not have to be revised and reconstructed by another; processes which may involve the repetition of the entire work. We may, in fact, regard the fabric of astronomical science as a building in the construction of which no stone can be added without a readjustment of some of the stones on which it has to rest. Thus it comes about that the observer, the computer, and the mathematician have in astronomical science a practically unlimited field for the exercise of their powers.

In treating so comprehensive a subject we may naturally distinguish between what we know of the universe and the methods and processes by which that knowledge is acquired. The former may be termed *general*, and the latter *practical*, astronomy. When we descend more minutely into details we find these two branches of the subject to be connected by certain principles, the application of which relates to both subjects. Considering as general or descriptive astronomy a description of the universe as we now understand it, the other branches of the subject generally recognized are as follows:—

Geometrical or *Spherical Astronomy*, by the principles of which the positions and the motions of the heavenly bodies are defined.

Theoretical Astronomy, which may be considered as an extension of geometrical astronomy and includes the determination of the positions and motions of the heavenly bodies by combining mathematical theory with observation. Modern theoretical astronomy, taken in the most limited sense, is based upon *Celestial Mechanics*, the science by which, using purely deductive mechanical methods, the laws of motion of the heavenly bodies are derived by deductive methods from their mutual gravitation towards each other.

Practical Astronomy, which comprises a description of the instruments used in astronomical observation, and of the principles and methods underlying their application.

Spherical or Geometrical Astronomy.

In astronomy, as in analytical geometry, the position of a point is defined by stating its distance and its direction from a point of reference taken as known. The numerical quantities by which the distance and direction, and therefore the position, are defined, are termed *co-ordinates* of the point. The latter are measured or defined with regard to a fixed system of lines and planes, which form the basis of the system.

The following are the fundamental concepts of such a system.

(*a*) An origin or point of reference. The points most generally taken for this purpose in astronomical practice are the following:—

(1) The position of a point of observation on the earth's surface. We conceive its position to be that occupied by an observer. The position of a heavenly body is then defined by its direction and distance from the supposed observer.

(2) The centre of the earth. This point, though it can never be occupied by an observer, is used because the positions of the heavenly bodies in relation to it are more readily computed than they can be from a point on the earth's surface.

(3) The centre of the sun.

(4) In addition to these three most usual points, we may, of course, take the centre of a planet or that of a star in order to define the position of bodies in their respective neighbourhoods.

Co-ordinates referred to a point of observation as the origin are termed "apparent," those referred to the centre of the earth are "geocentric," those referred to the centre of the sun, "heliocentric."

(*b*) The next concept of the system is a fundamental plane, regarded as fixed, passing through the origin. In connexion with it is an axis perpendicular to it, also passing through the origin. We may consider the axis and the plane as a single concept, the axis determining the plane, or the plane the axis. The fundamental concepts of this class most in use are:—

(1) When a point on the earth's surface is taken as the origin, the fundamental axis may be the direction of gravity at that point. This direction defines the vertical line. The fundamental plane which it determines is horizontal and is termed the plane of the horizon. Such a plane is realized in the surface of a liquid, a basin of quicksilver, for example.

(2) When the centre of the earth is taken as origin, the most natural fundamental axis is that of the earth's rotation. This axis cuts the earth's surface at the North and South Poles. The fundamental plane perpendicular to it is the plane of the equator. This plane intersects the earth's surface in the terrestrial equator. Co-ordinates referred to this system are termed equatorial. A system of equatorial co-ordinates may also be used when the origin is on the earth's surface. The fundamental axis, instead of being the earth's axis itself, is then a line parallel to it, and the fundamental plane is the plane passing through the point, and parallel to the plane of the equator.

(3) In the system of heliocentric co-ordinates, the plane in which the earth moves round the sun, which is the plane of the ecliptic, is taken as the fundamental one. The axis of the ecliptic is a line perpendicular to this plane.

(*c*) The third concept necessary to complete the system is a fixed line passing through the origin, and lying in the fundamental plane. This line defines an initial direction from which other directions are counted.

The geometrical concepts just defined are shown in fig. 1. Here O is the origin, whatever point it may be; OZ is the fundamental axis passing through it. In order to represent in the figure the position of the fundamental plane, we conceive a circle to be drawn round O, lying in that plane. This circle, projected in perspective as an ellipse, is shown in the figure. OX is the fixed initial line by which directions are to be defined.

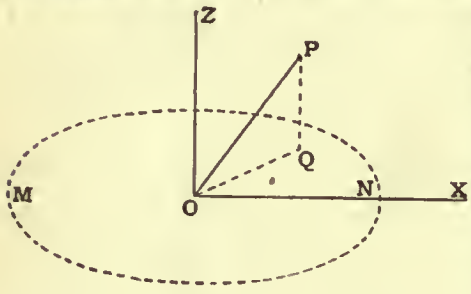

FIG. 1.

Now let P be any point in space, say the centre of a heavenly body. Conceive a perpendicular PQ to be dropped from this point on the fundamental plane, meeting the latter in the point Q; PQ will then be parallel to OZ. The co-ordinates of P will then be the following three quantities:—

(1) The length of the line OP, or the distance of the body from the origin, which distance is called the radius vector of the body.

(2) The angle XOQ which the projection of the radius vector upon the fundamental plane makes with the initial line OX. This angle is called the Longitude, Right Ascension or Azimuth of the body, in the various systems of co-ordinates. We may term it in a general way the longitudinal co-ordinate.

(3) The angle QOP, which the radius vector makes with the fundamental plane. This we may call the latitudinal co-ordinate. Instead of it is frequently used the complementary angle ZOP, known as the polar distance of the body. Since ZOQ is a right angle, it follows that the sum of the polar distance and the latitudinal co-ordinates is always 90°. Either may be used for astronomical purposes.

It is readily seen that the position of a heavenly body is completely defined when these co-ordinates are given.

One of the systems of co-ordinates is familiar to every one, and may be used as a general illustration of the method. It is our system of defining the position of a point on the earth's surface by its latitude and longitude. Regarding O (fig. 1) as the centre of the earth, and P as a point on the earth's surface, a city for example, it will be seen that OZ being the earth's axis, the circle MN will be the equator. The initial line OX then passes through the foot of the perpendicular dropped from Greenwich upon the plane of the equator, and meets the surface at N. The angle QOP is the latitude of the place and the angle NOQ its longitude. The longitudes and latitudes thus defined are geocentric, and the latitude is slightly different from that in ordinary use for geographic purposes. The difference arises from the oblateness of the earth, and need not be considered here.

The conception of the co-ordinates we have defined is facilitated by introducing that of the celestial sphere. This conception is embodied in our idea of the vault of heaven, or of the sky. Taking as origin the position of an observer, the direction of a heavenly body is defined by the point in which he sees it in the sky; that is to say, on the celestial sphere. Imagining, as we may well do, that the radius of this sphere is infinite—then every direction, whatever the origin, may be represented by a point on its surface. Take for example the vertical line which is embodied in the direction of the plumb line. This line, extended upwards, meets the celestial sphere in the zenith. The earth's axis, continued indefinitely upwards, meets the sphere in a point called the Celestial Pole. This point in our middle latitudes is between the zenith and the north horizon, near a certain star of the second magnitude familiarly known as the Pole Star. As the earth revolves from west to east the celestial sphere appears to us to revolve in the opposite direction, turning on the line joining the Celestial Poles as on a pivot.

As we conceive of the sky, it does not consist of an entire sphere but only as a hemisphere bounded by the horizon. But we have no difficulty in extending the conception below the horizon, so that the earth with everything upon it is in the centre of a complete sphere. The two parts of this sphere are the visible hemisphere, which is above the horizon, and the invisible, which is below it. Then the plumb line not only defines the zenith as already shown, but in a downward direction it defines the nadir, which is the point of the sphere directly below our feet. On the side of this sphere opposite to the North Celestial is the South Pole, invisible in the Northern Terrestrial Hemisphere but visible in the Southern one.

The relation of geocentric to apparent co-ordinates depends upon the latitude of the observer. The changes which the aspect of the heaven undergoes, as we travel North and South, are so well known that they need not be described in detail here; but a general statement of them will give a luminous idea of the geometrical co-ordinates we have described. Imagine an observer starting from the North Pole to travel towards the equator, carrying his zenith with him. When at the pole his zenith coincides with the celestial pole, and as the earth revolves on its axis, the heavenly bodies perform their apparent diurnal revolutions in horizontal circles round the zenith. As he travels South, his zenith moves along the celestial sphere, and the circles of diurnal rotation become oblique to the horizon. The obliquity continually increases until the observer reaches the equator. His zenith is then in the equator and the celestial poles are in the North and South horizon respectively. The circles in which the heavenly bodies appear to revolve are then vertical. Continuing his journey towards the south, the north celestial pole sinks below the horizon; the south celestial pole rises above it; or to speak more exactly, the zenith of the observer approaches that pole. The circles of diurnal revolution again become oblique. Finally, at the south pole the circles of diurnal revolution are again apparently horizontal, but are described in a direction apparently (but not really) the reverse of that near the north pole. The reader who will trace out these successive concepts and study the results of his changing positions will readily acquire the notions which it is our subject to define.

We have next to point out the relation of the co-ordinates we have described to the annual motion of the earth around the sun. In consequence of this motion the sun appears to us to describe annually a great circle, called the ecliptic, round the celestial sphere, among the stars, with a nearly uniform motion, of somewhat less than 1° in a day. Were the stars visible in the daytime in the immediate neighbourhood of the sun, this motion could be traced from day to day. The ecliptic intersects the celestial equator at two opposite points, the equinoxes, at an angle of 23° 27′. The vernal equinox is taken as the initial point on the sphere from which co-ordinates are measured in the equatorial and ecliptic systems. Referring to fig. 1, the initial line OX is defined as directed toward the vernal equinox, at which point it intersects the celestial sphere.

The following is an enumeration of the co-ordinates which we have described in the three systems:—

APPARENT SYSTEM.

Latitudinal Co-ordinate; Altitude or Zenith Distance.
Longitudinal ,, Azimuth.

EQUATORIAL SYSTEM.

Latitudinal Co-ordinate; Declination or Polar Distance.
Longitudinal ,, Right Ascension.

ECLIPTIC SYSTEM.

Latitudinal Co-ordinate; Latitude or Ecliptic Polar Distance.
Longitudinal ,, Longitude.

Relation of the Diurnal Motion to Spherical Co-ordinates.—The vertical line at any place being the fundamental axis of the apparent system of co-ordinates, this system rotates with the earth, and so seems to us as fixed. The other two systems, including the vernal equinox, are fixed on the celestial sphere, and so seem to us to perform a diurnal revolution from east towards west. Regarding the period of the revolution as 24 hours, the apparent motion goes on at the rate of 15° per hour. Here we have to make a distinction of fundamental importance between the diurnal motions of the sun and of the stars. Owing to the unceasing apparent motion of the sun toward the east, the interval between two passages of the same star over the meridian is nearly four minutes less than the interval between consecutive passages of the sun. The latter is the measure of the day as used in civil life. In astronomical practice is introduced a day, termed " sidereal," determined, not by the diurnal revolution of the sun, but of the stars. The year, which comprises 365·25 solar days, contains 366·25 sidereal days. The latter are divided into sidereal hours, minutes and seconds as the solar day is. The conception of a revolution through 360° in 24 hours is applicable to each case. The sun apparently moves at the rate of 15° in a solar hour; the stars at the rate of 15° in a sidereal hour. The latter motion leads to the use, in astronomical practice, of time instead of angle, as the unit in which the right ascensions are to be expressed. Considering the position of the vernal equinox, and also of a star on the celestial sphere, it will be seen that the interval between the transits of these two points across the meridian may be used to measure the right ascension of a star, since the latter amounts to

15° for every sidereal hour of this interval. For example, if the right ascension of a star is exactly 15°, it will pass the meridian one sidereal hour after the vernal equinox. For the relations thus arising, and their practical applications, see TIME, MEASUREMENT OF.

Theoretical Astronomy.

Theoretical Astronomy is that branch of the science which, making use of the results of astronomical observations as they are supplied by the practical astronomer, investigates the motions of the heavenly bodies. In its most important features it is an offshoot of celestial mechanics, between which and theoretical astronomy no sharp dividing line can be drawn. While it is true that the one is concerned altogether with general theories, it is also true that these theories require developments and modifications to apply them to the numberless problems of astronomy, which we may place in either class.

Among the problems of theoretical astronomy we may assign the first place to the determination of orbits (*q.v.*), which is auxiliary to the prediction of the apparent motions of a planet, satellite or star. The computations involved in the process, while simple in some cases, are extremely complex in others. The orbit of a newly-discovered planet or comet may be computed from three complete observations by well-known methods in a single day. From the resulting elements of the orbit the positions of the body from day to day may be computed and tabulated in an ephemeris for the use of observers. But when definitive results as to the orbits are required, it is necessary to compute the perturbations produced by such of the major planets as have affected the motions of the body. With this complicated process is associated that of combining numerous observations with a view of obtaining the best definitive result. Speaking in a general way, we may say that computations pertaining to the orbital revolutions of double stars, as well as the bodies of our solar system, are to a greater or less extent of the classes we have described. The principal modification is that, up to the present time, stellar astronomy has not advanced so far that a computation of the perturbations in each case of a system of stars is either necessary or possible, except in exceptional cases.

Celestial Mechanics.

Celestial Mechanics is, strictly speaking, that branch of applied mathematics which, by deductive processes, derives the laws of motion of the heavenly bodies from their gravitation towards each other, or from the mutual action of the parts which form them. The science had its origin in the demonstration by Sir Isaac Newton that Kepler's three laws of planetary motion, and the law of gravitation, in the case of two bodies, could be mutually derived from each other. A body can move round the sun in an elliptic orbit having the sun in its focus, and describing equal areas in equal times, only under the influence of a force directed towards the sun, and varying inversely as the square of the distance from it. Conversely, assuming this law of attraction, it can be shown that the planets will move according to Kepler's laws.

Thus celestial mechanics may be said to have begun with Newton's *Principia*. The development of the science by the successors of Newton, especially Laplace and Lagrange, may be classed among the most striking achievements of the human intellect. The precision with which the path of an eclipse is laid down years in advance cannot but imbue the minds of men with a high sense of the perfection reached by astronomical theories; and the discovery, by purely mathematical processes, of the changes which the orbits and motions of the planets are to undergo through future ages is more impressive the more fully one apprehends the nature of the problem. The purpose of the present article is to convey a general idea of the methods by which the results of celestial mechanics are reached, without entering into those technical details which can be followed only by a trained mathematician. It must be admitted that any intelligent comprehension of the subject requires at least a grasp of the fundamental conceptions of analytical geometry and the infinitesimal calculus, such as only one with some training in these subjects can be expected to have. This being assumed, the hope of the writer is that the exposition will afford the student an insight into the theory which may facilitate his orientation, and convey to the general reader with a certain amount of mathematical training a clear idea of the methods by which conclusions relating to it are drawn. The non-mathematical reader may possibly be able to gain some general idea, though vague, of the significance of the subject.

The fundamental hypothesis of the science assumes a system of bodies in motion, of which the sun and planets may be taken as examples, and of which each separate body is attracted toward all the others according to the law of Newton. The motion of each body is then expressed in the first place by Newton's three laws of motion (see MOTION, LAWS OF, and MECHANICS). The first step in the process shows in a striking way the perfection of the analytic method. The conception of force is, so to speak, eliminated from the conditions of the problem, which is reduced to one of pure kinematics. At the outset, the position of each body, considered as a material particle, is defined by reference to a system of co-ordinate axes, and not by any verbal description. Differential equations which express the changes of the co-ordinates are then constructed. The process of discovering the laws of motion of the particle then consists in the integration of these equations. Such equations can be formed for a system of any number of bodies, but the process of integration in a rigorous form is possible only to a limited extent or in special cases.

The problems to be treated are of two classes. In one, the bodies are regarded as material particles, no account being taken of their dimensions. The earth, for example, may be regarded as a particle attracted by another more massive particle, the sun. In the other class of problems, the relative motion of the different parts of the separate bodies is considered; for example, the rotation of the earth on its axis, and the consequences of the fact that those parts of a body which are nearer to another body are more strongly attracted by it. Beginning with the first branch of the subject, the fundamental ideas which it is our purpose to convey are embodied in the simple case of only two bodies, which we may call the sun and a planet. In this case the two bodies really revolve round their common centre of gravity; but a very slight modification of the equations of motion reduces them to the relative motion of the planet round the sun, regarding the moving centre of the latter as the origin of co-ordinates. The motion of this centre, which arises from the attraction of the planet on the sun, need not be considered.

In the actual problems of celestial mechanics three co-ordinates necessarily enter, leading to three differential equations and six equations of solution. But the general principles of the problem are completely exemplified with only two bodies, in which case the motion takes place in a fixed plane. By taking this plane, which is that of the orbit in which the planet performs its revolution, as the plane of xy, we have only two co-ordinates to consider. Let us use the following notation:

x, y, the co-ordinates of the planet relative to the sun as the origin.
M, m, the masses of the attracting bodies, sun and planet.
r, the distance apart of the two bodies, or the radius vector of m relative to M. This last quantity is analytically defined by the equation—

$$r^2 = x^2 + y^2.$$

t, the time, reckoned from any epoch we choose.

The differential equations which completely determine the changes in the co-ordinates x and y, or the motion of m relative to M, are:—

$$\frac{d^2x}{dt^2} = -\frac{(M+m)x}{r^3} \qquad (1)$$
$$\frac{d^2y}{dt^2} = -\frac{(M+m)y}{r^3}$$

These formulae are worthy of special attention. They are the expression in the language of mathematics of Newton's first two laws of motion. Their statement in this language may be regarded as perfect, because it completely and unambiguously expresses the naked phenomena of the motion. The equations do this without expressing any conception, such as that of force, not associated with the actual phenomena. Moreover, as a third advantage, these expressions are entirely free from those difficulties and ambiguities which are met with in every attempt to express the laws of motion in ordinary language. They afford yet another great advantage in that the derivation of the results requires only the analytic operations of the infinitesimal calculus.

The power and spirit of the analytic method will be appreciated by showing how it expresses the relations of motion as they were conceived geometrically by Newton and Kepler. It is quite evident that Kepler's laws do not in themselves enable us to determine the actual motion of the planets. We must have, in addition, in the case of each special planet, certain specific facts, viz. the axes and eccentricity of the ellipse, and the position of the plane in which it lies. Besides these, we must have given the position of the planet in the orbit at some specified moment. Having these data, the position of the planet at any other time may be geometrically constructed by Kepler's laws. The third law enables us to compute the time taken by the radius vector to sweep over the entire area of the orbit, which is identical with the time of revolution. The problem of constructing successive radii vectores, the angles of which are measured off from the radius vector of the body at the original given position, is then a geometric one, known as Kepler's problem.

In the analytic process these specific data, called elements of the

orbit, appear as arbitrary constants, introduced by the process of integration. In a case like the present one, where there are two differential equations of the second order, there will be four such constants. The result of the integration is that the co-ordinates x and y and their derivatives as to the time, which express the position, direction of motion and speed of the planet at any moment, are found as functions of the four constants and of the time. Putting

$$a,\ b,\ c,\ d,$$

for the constants, the general form of the solution will be

$$\begin{aligned} x &= f_1(a,b,c,d,t) \\ y &= f_2(a,b,c,d,t) \end{aligned} \qquad (2)$$

From these may be derived by differentiation as to t the velocities

$$\begin{aligned} \frac{dx}{dt} &= f'_1(a,b,c,d,t) = x' \\ \frac{dy}{dt} &= f'_2(a,b,c,d,t) = y' \end{aligned} \qquad (3)$$

The symbols x' and y' are used for brevity to mean the velocities expressed by the differential coefficients. The arbitrary constants, a, b, c and d, are the elements of the orbit, or any quantities from which these elements can be obtained. We note that, in the actual process of integration, no geometric construction need enter.

Let us next consider the problem in another form. Conceive that instead of the orbit of the planet, there is given a position P (fig. 2), through which the planet passed at an assigned moment, with a given velocity, and in a given direction, represented by the arrowhead. Logically these data completely determine the orbit in which the planet shall move, because there is only one such orbit passing through P, a planet moving in which would have the given speed. It follows that the elements of the orbit admit of determination when the co-ordinates of the planet at an assigned moment and their derivatives as to time are given.

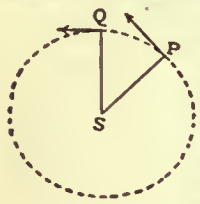

FIG. 2

Analytically the elements are determined from these data by solving the four equations just given, regarding a, b, c and d as unknown quantities, and x, y, x', y' and t as given quantities. The solution of these equations would lead to expressions of the form

$$\begin{aligned} a &= \phi_1(x,y,x',y',t) \\ b &= \phi_2(x,y,x',y',t) \\ &\&c. \qquad \&c. \end{aligned} \qquad (4)$$

one for each of the elements.

The general equations expressing the motion of a planet considered as a material particle round a centre of attraction lead to theorems the more interesting of which will now be enunciated.

(1) The motion of such a planet may take place not only in an ellipse but in any curve of the second order; an ellipse, hyperbola, or parabola, the latter being the bounding curve between the other two. A body moving in a parabola or hyperbola would recede indefinitely from its centre of motion and never return to it. The ellipse is therefore the only closed orbit.

(2) The motion takes place in accord with Kepler's laws, enunciated elsewhere.

(3) *Whewell's theorem*: if a point R be taken at a distance from the sun equal to the major axis of the orbit of a planet and, therefore, at double the mean distance of the planet, the speed of the latter at any point is equal to the speed which a body would acquire by falling from the point R to the actual position of the planet. The speed of the latter may, therefore, be expressed as a function of its radius vector at the moment and of the major axis of its orbit without introducing any other elements into the expression. Another corollary is that in the case of a body moving in a parabolic orbit the velocity at any moment is that which would be acquired by the body in falling from an infinite distance to the place it occupies at the moment.

(4) If a number of bodies are projected from any point in space with the same velocity, but in various directions, and subjected only to the attraction of the sun, they will all return to the point of projection at the same moment, although the orbits in which they move may be ever so different.

(5) At each distance from the sun there is a certain velocity which a body would have if it moved in a circular orbit at that distance. If projected with this velocity in any direction the point of projection will be at the end of the minor axis of the orbit, because this is the only point of an ellipse of which the distance from the focus is equal to the semi-major axis of the curve, and therefore the only point at which the distance of the body from the sun is equal to its mean distance.

(6) The relation between the periodic time of a planet and its mean distance, approximately expressed by Kepler's third law, follows very simply from the laws of centrifugal force. It is an elementary principle of mechanics that this force varies directly as the product of the distance of the moving body from the centre of motion into the square of its angular velocity. When bodies revolve at different distances around a centre, their velocities must be such that the centrifugal force of each shall be balanced by the attraction of the central mass, and therefore vary inversely as the square of the distance. If M is the central mass, n the angular velocity, and a the distance, the balance of the two forces is expressed by the equation

$$an^2 = M/a^2,$$

whence $a^3n^2 = M$, a constant.

The periodic time varying inversely as n, this equation expresses Kepler's third law. This reasoning tacitly supposes the orbit to be a circle of radius a, and the mass of the planet to be negligible. The rigorous relation is expressed by a slight modification of the law. Putting M and m for the respective masses of the sun and planet, a for the semi-major axis of the orbit, and n for the mean angular motion in unit of time, the relation then is

$$a^3n^2 = M+m.$$

What is noteworthy in this theorem is that this relation depends only on the sum of the masses. It follows, therefore, that were any portion of the mass of the sun taken from it, and added to the planet, the relation would be unchanged. Kepler's third law therefore expresses the fact that the mass of the sun is the same for all the planets, and deviates from the truth only to the extent that the masses of the latter differ from each other by quantities which are only a small fraction of the mass of the sun.

Problem of Three Bodies.—As soon as the general law of gravitation was fully apprehended, it became evident that, owing to the attraction of each planet upon all the others, the actual motion of the planets must deviate from their motion in an ellipse according to Kepler's laws. In the *Principia* Newton made several investigations to determine the effects of these actions; but the geometrical method which he employed could lead only to rude approximations. When the subject was taken up by the continental mathematicians, using the analytical method, the question naturally arose whether the motions of three bodies under their mutual attraction could not be determined with a degree of rigour approximating to that with which Newton had solved the problem of two bodies. Thus arose the celebrated "problem of three bodies." Investigation soon showed that certain integrals expressing relations between the motions not only of three but of any number of bodies could be found. These were:—

First, the law of the conservation of the centre of gravity. This expresses the general fact that whatever be the number of the bodies which act upon each other, their motions are so related that the centre of gravity of the entire system moves in a straight line with a constant velocity. This is expressed in three equations, one for each of the three rectangular co-ordinates.

Secondly, the law of conservation of areas. This is an extension of Kepler's second law. Taking as the radius vector of each body the line from the body to the common centre of gravity of all, the sum of the products formed by multiplying each area described, by the mass of the body, remains a constant. In the language of theoretical mechanics, the moment of momentum of the entire system is a constant quantity. This law is also expressed in three equations, one for each of the three planes on which the areas are projected.

Thirdly, the entire *vis viva* of the system or, as it is now called, the energy, which is obtained by multiplying the mass of each body into half the square of its velocity, is equal to the sum of the quotients formed by dividing the product of every pair of the masses, taken two and two, by their distance apart, with the addition of a constant depending on the original conditions of the system. In the language of algebra putting m_1, m_2, m_3, &c. for the masses of the bodies, $r_{1.2}$ $r_{1.3}$ $r_{2.3}$, &c. for their mutual distances apart; v_1, v_2, v_3, &c., for the velocities with which they are moving at any moment; these quantities will continually satisfy the equation

$$\tfrac{1}{2}(m_1v_1^2+m_2v_2^2+\ldots) = \frac{m_1m_2}{r_{1.2}}+\frac{m_1m_3}{r_{1.3}}+\frac{m_2m_3}{r_{2.3}}+\ldots+\text{a constant}.$$

The theorems of motion just cited are expressed by seven integrals, or equations expressing a law that certain functions of the variables and of the time remain constant. It is remarkable that although the seven integrals were found almost from the beginning of the investigation, no others have since been added; and indeed it has recently been shown that no others exist that can be expressed in an algebraic form. In the case of three bodies these do not suffice completely to define the motion. In this case, the problem can be attacked only by methods of approximation, devised so as to meet the special conditions of each case. The special conditions which obtain in the solar system are such as to make the necessary approximation theoretically possible however complex the process may be. These conditions are:—(1) The smallness of the masses of the planets in comparison with that of the sun, in consequence of which the orbit of each planet deviates but slightly from an ellipse during any one revolution; (2) the fact that the orbits of the planets are nearly circular, and the planes of their orbits but slightly inclined to each other. The result of these conditions is that all the quantities required admit of development in series proceeding according to the powers of the eccentricities and inclinations of the orbits, and the ratio of the masses of the several planets to the mass of the sun.

Perturbations of the Planets.—Kepler's laws do not completely express the motion of a planet around a central body, except when no force but the mutual attraction of the two bodies comes into play. When one or more other bodies form a part of the system, their action produces deviations from the elliptic motion, which are called *perturbations*. The problem of determining the perturbations of the

heavenly bodies is perhaps the most complicated with which the mathematical astronomer has to grapple; and the forms under which it has to be studied are so numerous that they cannot be easily arranged under any one head. But there is one conception of perturbations of such generality and elegance that it forms the common base of all those methods of determining these deviations which have high scientific interest. This conception is embodied in the method of "variation of elements," originally due to J. L. Lagrange. The simplest method of presenting it starts with the second view of the elliptic motion already set forth.

We have shown that, when the position of a planet and the direction and speed of its motion at a certain instant are given, the elements of the orbit can be determined. We have supposed this to be done at a certain point P of the orbit, the direction and speed being expressed by the variables x, y, x' and y'. Now, consider the values of these same variables expressing the position of the planet at a second point Q, and the speed with which it passes that point. With this position and speed the elements of the orbit can again be determined. Since the orbit is unchanged so long as no disturbing force acts, it follows that the elements determined by means of the two sets of values of the variables are in this case the same. In a word, although the position and speed of the planet and the direction of its motion are constantly changing, the values of the elements determined from these variables remain constant. This fact is fully expressed by the equations (4) where we have constants on one side of the equation equal to functions of the variables on the other. Functions of the variables possessing this property of remaining constant are termed *integrals*.

Now let the planet be subjected to any force additional to that of the sun's attraction,—say to the attraction of another planet. To fix the ideas let us suppose that the additional attraction is only an impulse received at the moment of passing the point P. The first effect will evidently be to change either the velocity or the direction in which the planet is moving at the moment, or both. If, with the changed velocity we again compute the elements they will be different from the former elements. But, if the impulse is not repeated, these new elements will again remain invariable. If repeated, the second impulse will again change the elements, and so on indefinitely. It follows that, if we go on computing the elements a, b, c, d from the actual values of x, y, x' and y', at each moment when the planet is subject to the attraction of another body, they will no longer be invariable, but will slowly vary from day to day and year to year. These ever varying elements represent an ever varying elliptic orbit,—not an orbit which the planet actually describes through its whole course, but an ideal one in which it is moving at each instant, and which continually adjusts itself to the actual motion of the planet at the instant. This is called the *osculating* orbit.

The essential principle of Lagrange's elegant method consists in determining the variations of this osculating ellipse, the co-ordinates and velocities of the planet being ignored in the determination. This may be done because, since the elements and co-ordinates completely determine each other, we may concentrate our attention on either, ignoring the other. The reason for taking the elements as the variables is that they vary very slowly, a property which facilitates their determination, since the variations may be treated as small quantities, of which the squares and products may be neglected in a first solution. In a second solution the squares and products may be taken account of, and so on as far as necessary.

If the problem is viewed from a synthetic point of view, the stages of its solution are as follows. We first conceive of the planets as moving in invariable elliptic orbits, and thus obtain approximate expressions for their positions at any moment. With these expressions we express their mutual action, or their pull upon each other at any and every moment. This pull determines the variations of the ideal elements. Knowing these variations it becomes possible to represent by integration the value of the elements as algebraic expressions containing the time, and the elements with which we started. But the variations thus determined will not be rigorously exact, because the pull from which they arise has been determined on the supposition that the planets are moving in unvarying orbits, whereas the actual pull depends on the actual position of the planets. Another approximation is, therefore, to be made, when necessary, by correcting the expression of the pull through taking account of the variations of the elements already determined, which will give a yet nearer approximation to the truth. In theory these successive approximations may be carried as far as we please, but in practice the labour of executing each approximation is so great that we are obliged to stop when the solution is so near the truth that the outstanding error is less than that of the best observations. Even this degree of precision may be impracticable in the more complex cases.

The results which are required to compare with observations are not merely the elements, but the co-ordinates. When the varying elements are known these are computed by the equations (2) because, from the nature of the algebraic relations, the slowly varying elements are continuously determined by the equations (4), which express the same relations between the elements and the variables as do the equations (2) and (3). This method is, therefore, in form at least, completely rigorous. There are some cases in which it may be applied unchanged. But commonly it proves to be extremely long and cumbrous, and modifications have to be resorted to. Of these modifications the most valuable is one conceived by P. A. Hansen. A certain mean elliptic orbit, as near as possible to the actual varying orbit of the planet, is taken. In this orbit a certain fictitious planet is supposed to move according to the law of elliptic motion. Comparing the longitudes of the actual and the fictitious planet the former will sometimes be ahead of the latter and sometimes behind it. But in every case, if at a certain time t, the actual planet has a certain longitude, it is certain that at a very short interval dt before or after t, the fictitious planet will have this same longitude. What Hansen's method does is to determine a correction dt such that, being applied to the actual time t, the longitude of the fictitious planet computed for the time $t+dt$, will give the longitude of the true planet at the time t. By a number of ingenious devices Hansen developed methods by which dt could be determined. The computations are, as a general rule, simpler, and the algebraic expressions less complex, than when the computations of the longitude itself are calculated. Although the longitude of the fictitious planet at the fictitious time is then equal to that of the true planet at the true time, their radii vectores will not be strictly equal. Hansen, therefore, shows how the radius vector is corrected so as to give that of the true planet.

In all that precedes we have considered only two variables as determining the position of the planet, the latter being supposed to move in a plane. Although this is true when there are any number of bodies moving in the same plane, the fact is that the planets move in slightly different planes. Hence the position of the plane of the orbit of each planet is continually changing in consequence of their mutual action. The problem of determining the changes is, however, simpler than others in perturbations. The method is again that of the variation of elements. The position and velocity being given in all three co-ordinates, a certain osculating plane is determined for each instant in which the planet is moving at that instant. This plane remains invariable so long as no third body acts; when it does act the position of the plane changes very slowly, continually rotating round the radius vector of the planet as an instantaneous axis of rotation.

Secular and Periodic Variations.—When, following the preceding method, the variations of the elements are expressed in terms of the time, they are found to be of two classes, *periodic* and *secular*. The first depend on the mean longitudes of the planets, and always tend back to their original values when the planets return to their original positions in their orbits. The others are, at least through long periods of time, continually progressive.

A luminous idea of the nature of these two classes of variation may be gained by conceiving of the motion of a ship, floating on an ocean affected by a long ground swell. In consequence of the swell, the ship is continually pitching in a somewhat irregular way, the oscillations up and down being sometimes great and sometimes small. An observer on board of her would notice no motion except this. But, suppose the tide to be rising. Then, by continued observation, extended over an hour or more, it will be found that, in the general average, the ship is gradually rising, so that two different kinds of motion are superimposed on each other. The effect of the rising tide is in the nature of a secular variation, while the pitching is periodic.

But the analogy does not end here. If the progressive rise of the ship be watched for six hours or more, it will be found gradually to cease and reverse its direction. That is to say, making abstraction of the pitching, the ship is slowly rising and falling in a total period of nearly twelve hours, while superimposed upon this slow motion is a more rapid motion due to the waves. It is thus with the motions of the planets going through their revolutions. Each orbit continually changes its form and position, sometimes in one direction and sometimes in another. But when these changes are averaged through years and centuries it is found that the average orbit has a secular variation which, for a number of centuries, may appear as a very slow progressive change in one direction only. But when this change is more fully investigated, it is found to be really periodic, so that after thousands, tens of thousands, or hundreds of thousands of years, its direction will be reversed and so on continually, like the rising and falling tide. The orbits thus present themselves to us in the words of a distinguished writer as "Great clocks of eternity which beat ages as ours beat seconds."

The periodic variations can be represented algebraically as the resultant of a series of harmonic motions in the following way: Let L be an angle which is increasing uniformly with the time, and let n be its rate of increase. We put L_0 for its value at the moment from which the time is reckoned. The general expression for the angle will then be

$$L = nt + L_0.$$

Such an angle continually goes through the round of 360° in a definite period. For example, if the daily motion is 5°, and we take the day as the unit of time, the round will be completed in 72 days, and the angle will continually go through the value which it had 72 days before. Let us now consider an equation of the form

$$U = a \sin (nt + L_0).$$

The value of U will continually oscillate between the extreme values $+a$ and $-a$, going through a series of changes in the same

period in which the angle $nt+L_0$ goes through a revolution. In this case the variation will be simply periodic.

The value of any element of the planet's motion will generally be represented by the sum of an infinite series of such periodic quantities, having different periods. For example

$$U=a \sin (nt+L_0)+b \sin (mt+L_1)+c \sin (kt+L_2) \text{ \&c.}$$

In this case the motion of U, while still periodic, is seemingly irregular, being much like that of a pitching ship, which has no one unvarying period.

In the problems of celestial mechanics the angles within the parentheses are represented by sums or differences of multiples of the mean longitudes of the planets as they move round their orbits. If l be the mean longitude of the planet whose motion we are considering, and l' that of the attracting planet affecting it, the periodic inequalities of the elements as well as of the co-ordinates of the attracted planet, may be represented by an infinite series of terms like the following:—

$$a \sin (l'-l)+b \sin (2l'-l)+c \sin (l'-2l)+\text{\&c.}$$

Here the coefficients of l and l' may separately take all integral values, though as a general rule the coefficients a, b, c, &c. diminish rapidly when these coefficients become large, so that only small values have to be considered.

The most interesting kind of periodic inequalities are those known as "terms of long period." A general idea both of their nature and of their cause will be gained by taking as a special case one celebrated in the history of the subject—the great inequality between Jupiter and Saturn. We begin by showing what the actual fact is in the case of these two planets. Let fig. 3 represent the two orbits, the sun being at C. We know that the period of Jupiter is nearly twelve years, and that of Saturn a little less than thirty years. It will be seen that these numbers are nearly in the ratio of 2 to 5. It follows that the motions of the mean longitudes are nearly in the same proportion reversed. The annual motion of Jupiter is nearly 30°, that of Saturn a little more than 12°. Let us now consider the effect of this relation upon the configurations and relations of the two planets. Let the line CJ represent the common direction of the two planets from the sun when they are in conjunction, and let us follow the motions until they again come into conjunction. This will occur along a line CR_1, making an angle of nearly 240° with CJ. At this point Saturn will have moved 240° and Jupiter an entire revolution+240°, making 600°. These two motions, it will be seen, are in the proportion 5 : 2. The next conjunction will take place along CS_1, and the third after the initial one will again take place near the original position JQ, Jupiter having made five revolutions and Saturn two.

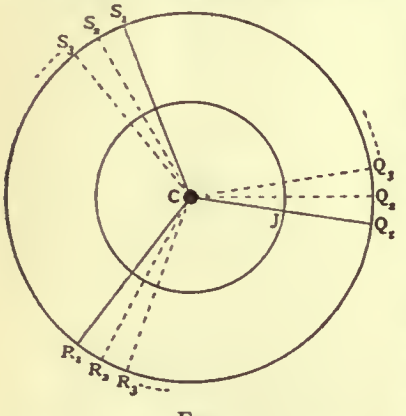

FIG. 3.

The result of these repetitions is that, during a number of revolutions, the special mutual actions of the two planets at these three points of their orbits repeat themselves, while the actions corresponding to the three intermediate arcs are wanting. Thus it happens that if the mutual actions are balanced through a period of a few revolutions only there is a small residuum of forces corresponding to the three regions in question, which repeats itself in the same way, and which, if it continued indefinitely, would entirely change the forms of the two orbits. But the actual mean motions deviate slightly from the ratio 2 : 5, and we have next to show how this deviation results in an ultimate balancing of the forces. The annual mean motions, with the corresponding combinations, are as follows:—

Jupiter:— n	$=30°\cdot349043$
Saturn:— n'	$=12\cdot221133$
$2n$	$=60\cdot69809$
$5n'$	$=61\cdot10567$
$5n'-2n$	$=0\cdot40758$

If we make a more accurate computation of the conjunctions from these data, we shall find that, in the general mean, the consecutive conjunctions take place when each planet has moved through an entire number of revolutions+242·7°. It follows that the third conjunction instead of occurring exactly along the line CQ_1 occurs along CQ_2, making an angle of nearly 8° with CQ_1. The successive conjunctions following will be along CR_2, CS_2, CQ_3, &c., the law of progression being obvious.

The balancing of the series of forces will not be complete until the respective triplets of conjunctions have filled up the entire space between them. This will occur when the angle whose annual motion is $5n'-2n$ has gone through 360°. From the preceding value of $5n'-2n$ we see that this will require a little more than 883 years. The result of the continued action of the two planets upon each other is that during half of this period the motion of one planet is constantly retarded and of the other constantly accelerated, while during the other half the effects are reversed. There is thus in the case of each planet an oscillation of the mean longitude which increases it and then diminishes it to its original value at the end of the period of 883 years.

The longitudes, latitudes and radii vectores of a planet, being algebraically expressed as the sum of an infinite periodic series of the kind we have been describing, it follows that the problem of finding their co-ordinates at any moment is solved by computing these expressions. This is facilitated by the construction of tables by means of which the co-ordinates can be computed at any time. Such tables are used in the offices of the national Ephemerides to construct ephemerides of the several planets, showing their exact positions in the sky from day to day.

We pass now to the second branch of celestial mechanics viz. that in which the planets are no longer considered as particles, but as rotating bodies of which the dimensions are to be taken into account. Such a body, in free space, not acted on by any force except the attraction of its several parts, will go on rotating for ever in an invariable direction. But, in consequence of the centrifugal force generated by the rotation, it assumes a spheroidal form, the equatorial regions bulging out. Such a form we all know to be that of the earth and of the planets rotating on their axes. Let us study the effect of this deviation from the spherical form upon the attraction exercised by a distant body.

We begin with the special case of the earth as acted upon by the sun and moon. Let fig. 4 represent a section of the earth through its axis AB, ECQ being a diameter of the equator. Let the dotted lines show the direction of the distant attracting body. The point E, being more distant than C, will be attracted with less force, while Q will be attracted with a greater force than will the centre C. Were the force equal on every point of the earth it would have no influence on its rotation, but would simply draw its whole mass toward the attracting body. It is therefore only the *difference* of the forces on different parts of the earth that affects the rotation.

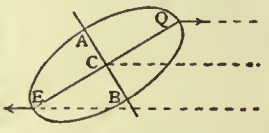

FIG. 4.

Let us, therefore, divide the attracting forces at each point into two parts, one the average force, which we may call F, and which for our purpose may be regarded as equal to the force acting at C; the others the residual forces which we must superimpose upon the average force F in order that the combination may be equal to the actual force. It is clear that at Q this residual force as represented by the arrow will be in the same direction as the actual force. But at E, since the actual force is less than F, the residual force must tend to diminish F, and must, therefore, act toward the right, as shown by the arrow. These residual forces tend to make the whole earth turn round the centre C in a clockwise direction. If nothing modified this tendency the result would be to bring the points E and Q into the dotted lines of the attraction. In other words the equator would be drawn into coincidence with the ecliptic. Here, however, the same action comes into play, which keeps a rotating top from falling over. (See GYROSCOPE and MECHANICS.) For the same reason as in the case of the gyroscope the actual motion of the earth's axis is at right angles to the line joining the earth and the attracting centre, and without going into the details of the mathematical processes involved, we may say that the ultimate mean effect will be to cause the pole P of the earth to move at right angles to the circle joining it to the pole of the ecliptic. Were the position of the latter invariable, the celestial pole would move round it in a circle. Actually the curve in which it moves is nearly a circle; but the distance varies slightly owing to the minute secular variation in the position of the ecliptic, caused by the action of the planets. This motion of the celestial pole results in a corresponding revolution of the equinox around the celestial sphere. The rate of motion is slightly variable from century to century owing to the secular motion of the plane of the ecliptic. Its period, with the present rate of motion, would be about 26,000 years, but the actual period is slightly indeterminate from the cause just mentioned.

The residual force just described is not limited to the case of an ellipsoidal body. It will be seen that the reasoning applies to the case of any one body or system of bodies, the dimensions of which are not regarded as infinitely small compared with the distance of the attracting body. In all such cases the residual forces virtually tend to draw those portions of the body nearest the attracting centre toward the latter, and those opposite the attracting centre away from it. Thus we have a tide-producing force tending to deform the body, the action of which is of the same nature as the force producing precession. It is of interest to note that, very approximately, this deforming force varies inversely as the cube of the distance of the attracting body.

The action of the sun upon the satellites of the several planets and the effects of this action are of the same general nature. For the same reason that the residual forces virtually act in opposite directions upon the nearer and more distant portions of a planet

they will virtually act in the case of a satellite. When the latter is between its primary and the sun, the attraction of the latter tends to draw the satellite away from the primary. When the satellite is in the opposite direction from the sun, the same action tends to draw the primary away from the satellite. In both cases, relative to the primary, the action is the same. When the satellite is in quadrature the convergence of the lines of attraction toward the centre of the sun tends to bring the two bodies together. When the orbit of the satellite is inclined to that of the primary planet round the sun, the action brings about a change in the plane of the orbit represented by a rotation round an axis perpendicular to the plane of the orbit of the primary. If we conceive a pole to each of these orbits, determined by the points in which lines perpendicular to their planes intersect the celestial sphere, the pole of the satellite orbit will revolve around the pole of the planetary orbit precisely as the pole of the earth does around the pole of the ecliptic, the inclination of the two orbits remaining unchanged.

If a planet rotates on its axis so rapidly as to have a considerable ellipticity, and if it has satellites revolving very near the plane of the equator, the combined actions of the sun and of the equatorial protuberances may be such that the whole system will rotate almost as if the planes of revolution of the satellites were solidly fixed to the plane of the equator. This is the case with the seven inner satellites of Saturn. The orbits of these bodies have a large inclination, nearly 27°, to the plane of the planet's orbit. The action of the sun alone would completely throw them out of these planes as each satellite orbit would rotate independently; but the effect of the mutual action is to keep all of the planes in close coincidence with the plane of the planet's equator.

Literature.—The modern methods of celestial mechanics may be considered to begin with Joseph Louis Lagrange, whose theory of the variation of elements is developed in his *Mécanique analytique*. The practical methods of computing perturbations of the planets and satellites were first exhaustively developed by Pierre Simon Laplace in his *Mécanique céleste*. The only attempt since the publication of this great work to develop the various theories involved on a uniform plan and mould them into a consistent whole is that of de Pontécoulant in *Théorie analytique du système du monde* (1829–46, Paris). An approximation to such an attempt is that of F. F. Tisserand in his *Traité de mécanique céleste* (4 vols., Paris). This work contains a clear and excellent résumé of the methods which have been devised by the leading investigators from the time of Lagrange until the present, and thus forms the most encyclopaedic treatise to which the student can refer.

Works less comprehensive than this are necessarily confined to the elements of the subject, to the development of fundamental principles and general methods, or to details of special branches. An elementary treatise on the subject is F. R. Moulton's *Introduction to Celestial Mechanics* (London, 1902). Other works with the same general object are H. A. Resal, *Mécanique céleste*; and O. F. Dziobek, *Theorie der Planetenbewegungen*. The most complete and systematic development of the general principles of the subject, from the point of view of the modern mathematician, is found in J. H. Poincaré, *Les Méthodes nouvelles de la mécanique céleste* (3 vols., Paris, 1899, 1892, 1893). Of another work of Poincaré, *Leçons de mécanique céleste*, the first volume appeared in 1905.

Practical Astronomy.

Practical Astronomy, taken in its widest sense, treats of the instruments by which our knowledge of the heavenly bodies is acquired, the principles underlying their use, and the methods by which these principles are practically applied. Our knowledge of these bodies is of necessity derived through the medium of the light which they emit; and it is the development and applications of the laws of light which have made possible the additions to our stock of such knowledge since the middle of the 19th century.

At the base of every system of astronomical observation is the law that, in the voids of space, a ray of light moves in a right line. The fundamental problem of practical astronomy is that of determining by measurement the co-ordinates of the heavenly bodies as already defined. Of the three co-ordinates, the radius vector does not admit of direct measurement, and must be inferred by a combination of indirect measurements and physical theories. The other two co-ordinates, which define the direction of a body, admit of direct measurement on principles applied in the construction and use of astronomical instruments.

In the first system of co-ordinates already described the fundamental axis is the vertical line or direction of gravity at the point of observation. This is not the direction of gravity proper, or of the earth's attraction, but the resultant of this attraction combined with the centrifugal force due to the earth's rotation on its axis. The most obvious method of realizing this direction is by the plumb-line. In our time, however, this appliance is replaced by either of two others, which admit of much more precise application. These are the basin of mercury and the spirit-level. The surface of a liquid at rest is necessarily perpendicular to the direction of gravity, and therefore horizontal. Considered as a curved surface, concentric with the earth, a tangent plane to such a surface is the plane of the horizon. The problem of measuring from an axis perpendicular to this plane is solved on the principle that the incident and reflected rays of light make equal angles with the perpendicular to a reflecting surface. It follows that if PO (fig. 5) is the direction of a ray, either from a heavenly body or from a terrestrial point, impinging at O upon the surface of quicksilver, and reflected in the direction OR, the vertical line is the bisector OZ, of the angle POR. If the point P is so adjusted over the quicksilver that the ray is reflected back

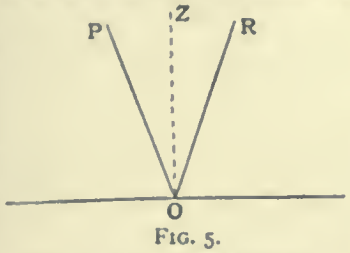

Fig. 5.

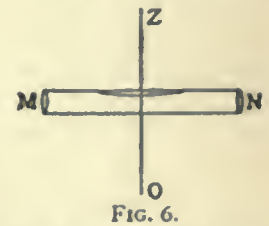

Fig. 6.

on its own path, P and R lying on the same line above O, then we know that the line PO is truly vertical. The zenith-distance of an object is the angle which the ray of light from it makes with the vertical direction thus defined.

To show the principle involved in the spirit-level let MN (fig. 6) be the tube of such a level, fixed to an axis OZ on which it may revolve. If this axis is so adjusted that in the course of a revolution around it the bubble of the level undergoes no change of position, we know that the axis is truly vertical. Any slight deviation from verticality is shown by the motion of the bubble during the revolution, which can be measured and allowed for. The level may not be actually attached to an axis, a revolution of 180° being effected round an imaginary vertical axis by turning the level end for end. The motion of the bubble then measures double the inclination of this imaginary axis, or the deviation of a cylinder on which the level may rest from horizontality.

The problem of determining the zenith distance of a celestial object now reduces itself to that of measuring the angle between the direction of the object and the direction of the vertical line realized in one of these ways. This measurement is effected by a combination of two instruments, the telescope and the graduated circle. Let OF (fig. 7) be a section of the telescope, MN being its

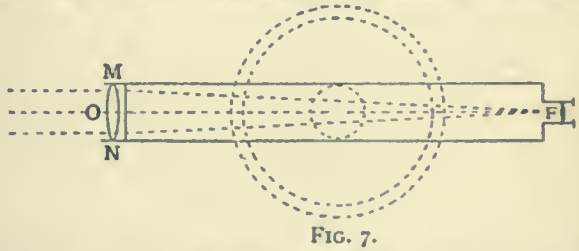

Fig. 7.

object glass. Let the parallel dotted lines represent rays of light emanating from the object to be observed, which, for our purpose, we regard as infinitely distant, a star for example. These rays come to a focus at a point F lying in the focal plane of the telescope. In this plane are a pair of cross threads or spider lines which, as the observer looks into the telescope, are seen as AB and CD (fig. 8). If the telescope is so pointed that the image of the star is seen in coincidence with the cross threads, as represented in fig. 8, then we know that the star is exactly in the line of sight of the telescope, defined as the line joining the centre of the object glass, and the point of intersection of the cross threads. If the telescope is moved around so that the images of two distant points are successively brought into coincidence with the cross threads, we know that the angle between the directions of these points is equal to that through which the telescope has been turned. This angle is measured by means of a graduated circle, rigidly attached to the tube of the telescope in a plane parallel to the line of sight. When the telescope is turned in this plane, the angular motion of the line of sight is equal to that through which the circle has turned.

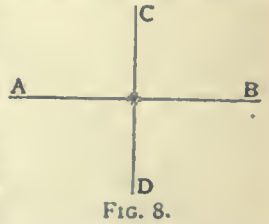

Fig. 8.

Stripped of all unnecessary adjuncts, and reduced to a geometric form, the ideal method by which the zenith distance of a heavenly body is determined by the combination which we have described is as follows:—Let OP (fig. 9) be the direction of a celestial body at which a telescope, supplied with a graduating circle, is pointed. Let OZ be an axis, as nearly vertical as it can easily be set, round which

the entire instrument may revolve through 180°. After the image of the body is brought into coincidence with the cross threads, the instrument is turned through 180° on the axis, which results in the line of sight of the telescope pointing in a certain direction OQ, determined by the condition QOZ=ZOP. The telescope is then a second time pointed at the object by being moved through the angle QOP. Either of the angles QOZ and ZOP is then one half that through which the telescope has been turned, which may be measured by a graduated circle, and which is the zenith distance of the object measured from the direction of the axis OZ. This axis may not be exactly vertical. Its deviation from the vertical line is determined by the motion of the bubble of a spirit-level rigidly attached either to the axis, or to the telescope. Applying this deviation to the measured arc, the true zenith distance of the body is found.

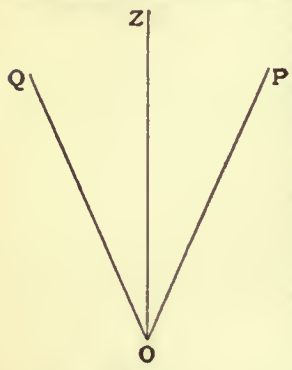

FIG. 9.

When the basin of quicksilver is used, the telescope, either before or after being directed toward P, is pointed directly downwards, so that the observer mounting above it looks through it into the reflecting surface. He then adjusts the instrument so that the cross threads coincide with their images reflected from the surface of the quicksilver. The angular motion of the telescope in passing from this position to that when the celestial object is in the line of sight is the distance (ND) of the body from the nadir. Subtracting 90° from (ND) gives the altitude; and subtracting (ND) from 180° gives the zenith distance.

In the measurement of equatorial co-ordinates, the polar distance is determined in an analogous way. We determine the apparent position of an object near the pole on the celestial sphere at any moment, and again at another moment, twelve hours later, when, by the diurnal motion, it has made half a revolution. The angle through the celestial pole, between these two positions, is double the polar distance. The pole is the point midway between them. This being ascertained by one or more stars near it, may be used to determine by direct measurements the polar distances of other bodies.

The preceding methods apply mainly to the latitudinal co-ordinate. To measure the difference between the longitudinal co-ordinates of two objects by means of a graduated circle the instruments must turn on an axis parallel to the principal axis of the system of co-ordinates, and the plane of the graduated circle must be at right angles to that axis, and, therefore, parallel to the principal co-ordinate plane. The telescope, in order that it may be pointed in any direction, must admit of two motions, one round the principal axis, and the other round an axis at right angles to it. By these two motions the instrument may be pointed first at one of the objects and then at the other. The motion of the graduated circle in passing from one pointing to the other is the measure of the difference between the longitudinal co-ordinates of the two objects.

In the equatorial system this co-ordinate (the right ascension) is measured in a different way, by making the rotating earth perform the function of a graduated circle. The unceasing diurnal motion of the image of any heavenly body relative to the cross threads of a telescope makes a direct accurate measure of any co-ordinate except the declination almost impossible. Before the position of a star can be noted, it has passed away from the cross threads. This troublesome result is utilized and made a means of measurement. Right ascensions are now determined, not by measuring the angle between one star and another, but, by noting the time between the transits of successive stars over the meridian. The difference between these times, when reduced to an angle, is the difference of the right ascensions of the stars. The principle is the same as that by which the distance between two stations may be determined by the time required for a train moving at a uniform known speed to pass from one station to the other. The uniform speed of the diurnal motion is 15° per hour. We have already mentioned that in astronomical practice right ascensions are expressed in time, so that no multiplication by 15 is necessary.

Measures made on the various systems which we have described give the apparent direction of a celestial object as seen by the observer. But this is not the true direction, because the ray of light from the object undergoes refraction in passing through the atmosphere. It is therefore necessary to correct the observation for this effect. This is one of the most troublesome problems in astronomy because, owing to the ever varying density of the atmosphere, arising from differences of temperature, and owing to the impossibility of determining the temperature with entire precision at any other point than that occupied by the observer, the amount of refraction must always be more or less uncertain. The complexity of the problem will be seen by reflecting that the temperature of the air inside the telescope is not without its effect. This temperature may be and commonly is somewhat different from that of the observing room, which, again, is commonly higher than the temperature of the air outside. The uncertainty thus arising in the amount of the refraction is least near the zenith, but increases more and more as the horizon is approached.

The result of astronomical observations which is ordinarily wanted is not the direction of an object from the observer, but from the centre of the earth. Thus a reduction for parallax is required. Having effected this reduction, and computed the correction to be applied to the observation in order to eliminate all known errors to which the instrument is liable, the work of the practical astronomer is completed.

The instruments used in astronomical research are described under their several names. The following are those most used in astrometry:—

The equatorial telescope (*q.v.*) is an instrument which can be directed to any point in the sky, and which derives its appellation from its being mounted on an axis parallel to that of the earth. By revolving on this axis it follows a star in its diurnal motion, so that the star is kept in the field of view notwithstanding that motion.

Next in extent of use are the transit instrument and the meridian circle, which are commonly united in a single instrument, the transit circle (*q.v.*), known also as the meridian circle. This instrument moves only in the plane of the meridian on a horizontal east and west axis, and is used to determine the right ascensions and declinations of stars. These two instruments or combinations are a necessary part of the outfit of every important observatory. An adjunct of prime importance, which is necessary to their use, is an accurate clock, beating seconds.

Use of Photography.—Before the development of photography, there was no possible way of making observations upon the heavenly bodies except by the eye. Since the middle of the 19th century the system of photographing the heavenly bodies has been introduced, step by step, so that it bids fair to supersede eye observations in many of the determinations of astronomy. (See PHOTOGRAPHY: *Celestial.*)

The field of practical astronomy includes an extension which may be regarded as making astronomical science in a certain sense universal. The science is concerned with the heavenly bodies. The earth on which we live is, to all intents and purposes, one of these bodies, and, so far as its relations to the heavens are concerned, must be included in astronomy. The processes of measuring great portions of the earth, and of determining geographical positions, require both astronomical observations proper, and determinations made with instruments similar to those of astronomy. Hence geodesy may be regarded as a branch of practical astronomy. (S. N.)

History of Astronomy.

Origin of the science.

A practical acquaintance with the elements of astronomy is indispensable to the conduct of human life. Hence it is most widely diffused among uncivilized peoples, whose existence depends upon immediate and unvarying submission to the dictates of external nature. Having no clocks, they regard instead the face of the sky; the stars serve them for almanacs; they hunt and fish, they sow and reap in correspondence with the recurrent order of celestial appearances. But these, to the untutored imagination, present a mystical, as well as a mechanical aspect; and barbaric familiarity with the heavens developed at an early age, through the promptings of superstition, into a fixed system of observation. In China, Egypt and Babylonia, strength and continuity were lent to this native tendency by the influence of a centralized authority; considerable proficiency was attained in the arts of observation; and from millennial stores of accumulated data, empirical rules were deduced by which the scope of prediction was widened and its accuracy enhanced. But no genuine science of astronomy was founded until the Greeks sublimed experience into theory.

Chinese astronomy.

Already, in the third millennium B.C., equinoxes and solstices were determined in China by means of culminating stars. This is known from the orders promulgated by the emperor Yao about 2300 B.C., as recorded in the *Shu Chung*, a collection of documents antique in the time of Confucius (550–478 B.C.). And Yao was merely the renovator of a system long previously established. The *Shu Chung* further relates the tragic fate of the official astronomers, Hsi and Ho, put to death for neglecting to perform the rites customary during an eclipse of the sun, identified by Professor S. E. Russell[1] with a partial obscuration visible in northern China 2136 B.C. The date cannot be far wrong, and it is by far the earliest assignable to an event of the kind. There is, however, no certainty that the Chinese were then capable of predicting

[1] *The Observatory*, Nos. 231-234, 1895.

eclipses. They were, on the other hand, probably acquainted, a couple of millenniums before Meton gave it his name, with the nineteen-year cycle, by which solar and lunar years were harmonized;[1] they immemorially made observations in the meridian; regulated time by water-clocks, and used measuring instruments of the nature of armillary spheres and quadrants. In or near 1100 B.C., Chou Kung, an able mathematician, determined with surprising accuracy the obliquity of the ecliptic; but his attempts to estimate the sun's distance failed hopelessly as being grounded on belief in the flatness of the earth. From of old, in China, circles were divided into 365¼ parts, so that the sun described daily one Chinese degree; and the equator began to be employed as a line of reference, concurrently with the ecliptic, probably in the second century B.C. Both circles, too, were marked by star-groups more or less clearly designated and defined. Cometary records of a vague kind go back in China to 2296 B.C.; they are intelligible and trustworthy from 611 B.C. onward. Two instruments constructed at the time of Kublai Khan's accession in 1280 were still extant at Peking in 1881. They were provided with large graduated circles adapted for measurements of declination and right ascension, and prove the Chinese to have anticipated by at least three centuries some of Tycho Brahe's most important inventions.[2] The native astronomy was finally superseded in the 17th century by the scientific teachings of Jesuit missionaries from Europe.

Astrolatry was, in Egypt, the prelude to astronomy. The stars were observed that they might be duly worshipped. The importance of their heliacal risings, or first visible appearances at dawn, for the purposes both of practical life and of ritual observance, caused them to be systematically noted; the length of the year was accurately fixed in connexion with the annually recurring Nile-flood; while the curiously precise orientation of the Pyramids affords a lasting demonstration of the high degree of technical skill in watching the heavens attained in the third millennium B.C. The constellational system in vogue among the Egyptians appears to have been essentially of native origin; but they contributed little or nothing to the genuine progress of astronomy.

Egyptian astronomy.

With the Babylonians the case was different, although their science lacked the vital principle of growth imparted to it by their successors. From them the Greeks derived their first notions of astronomy. They copied the Babylonian asterisms, appropriated Babylonian knowledge of the planets and their courses, and learned to predict eclipses by means of the "Saros." This is a cycle of 18 years 11 days, or 223 lunations, discovered at an unknown epoch in Chaldaea, at the end of which the moon very nearly returns to her original position with regard as well to the sun as to her own nodes and perigee. There is no getting back to the beginning of astronomy by the shores of the Euphrates. Records dating from the reign of Sargon of Akkad (3800 B.C.) imply that even then the varying aspects of the sky had been long under expert observation. Thus early, there is reason to suppose, the star-groups with which we are now familiar began to be formed. They took shape most likely, not through one stroke of invention, but incidentally, as legends developed and astrological persuasions became defined.[3] The zodiacal series in particular seem to have been reformed and reconstructed at wide intervals of time (see ZODIAC). Virgo, for example, is referred by P. Jensen, on the ground of its harvesting associations, to the fourth millennium B.C., while Aries (according to F. K. Ginzel) was interpolated at a comparatively recent time. In the main, however, the constellations transmitted to the West from Babylonia by Aratus and Eudoxus must have been arranged very much in their present order about 2800 B.C. E. W. Maunder's argument to this effect is unanswerable.[4] For the space of the southern sky left blank of stellar emblazonments was necessarily centred on the pole; and since the pole shifts among the stars through the effects of precession by a known annual amount, the ascertainment of any former place for it virtually fixes the epoch. It may then be taken as certain that the heavens described by Aratus in 270 B.C. represented approximately observations made some 2500 years earlier in or near north latitude 40°.

Babylonian astronomy.

In the course of ages, Babylonian astronomy, purified from the astrological taint, adapted itself to meet the most refined needs of civil life. The decipherment and interpretation by the learned Jesuits, Fathers Epping and Strassmeier, of a number of clay tablets preserved in the British Museum, have supplied detailed knowledge of the methods practised in Mesopotamia in the 2nd century B.C.[5] They show no trace of Greek influence, and were doubtless the improved outcome of an unbroken tradition. How protracted it had been, can be in a measure estimated from the length of the revolutionary cycles found for the planets. The Babylonian computers were not only aware that Venus returns in almost exactly eight years to a given starting-point in the sky, but they had established similar periodic relations in 46, 59, 79 and 83 years severally for Mercury, Saturn, Mars and Jupiter. They were accordingly able to fix in advance the approximate positions of these objects with reference to ecliptical stars which served as fiducial points for their determination. In the Ephemerides published year by year, the times of new moon were given, together with the calculated intervals to the first visibility of the crescent, from which the beginning of each month was reckoned; the dates and circumstances of solar and lunar eclipses were predicted; and due information was supplied as to the forthcoming heliacal risings and settings, conjunctions and oppositions of the planets. The Babylonians knew of the inequality in the daily motion of the sun, but misplaced by 10° the perigee of his orbit. Their sidereal year was 4½[m] too long,[6] and they kept the ecliptic stationary among the stars, making no allowance for the shifting of the equinoxes. The striking discovery, on the other hand, has been made by the Rev. F. X. Kugler[7] that the various periods underlying their lunar predictions were identical with those heretofore believed to have been independently arrived at by Hipparchus, who accordingly must be held to have borrowed from Chaldaea the lengths of the synodic, sidereal, anomalistic and draconitic months.

Greek astronomy. Thales.

A steady flow of knowledge from East to West began in the 7th century B.C. A Babylonian sage named Berossus founded a school about 640 B.C. in the island of Cos, and perhaps counted Thales of Miletus (*c.* 639–548) among his pupils. The famous "eclipse of Thales" in 585 B.C. has not, it is true, been authenticated by modern research[8]; yet the story told by Herodotus appears to intimate that a knowledge of the Saros, and of the forecasting facilities connected with it, was possessed by the Ionian sage. Pythagoras of Samos (fl. 540–510 B.C.) learned on his travels in Egypt and the East to identify the morning and evening stars, to recognize the obliquity of the ecliptic, and to regard the earth as a sphere freely poised in space. The tenet of its axial movement was held by many of his followers—in an obscure form by Philolaus of Crotona after the middle of the 5th century B.C., and more explicitly by Ecphantus and Hicetas of Syracuse (4th century B.C.), and by Heraclides of Pontus. Heraclides, who became a disciple of Plato in 360 B.C., taught in addition that the sun, while circulating round the earth, was the centre of revolution to Venus and Mercury.[9] A genuine heliocentric system, developed by Aristarchus of Samos (fl. 280–264 B.C.), was described by Archimedes in his *Arenarius*, only to be set aside

Pythagoras.

Heraclides.

[1] *Observations of Comets*, translated from the Chinese *Annals* by John Williams, F.S.A. (1871).

[2] J. L. E. Dreyer, *Proc. Roy. Irish Acad.* vol. iii. No. 7 (December 1881).

[3] F. K. Ginzel, "Die astronomischen Kenntnisse der Babylonier," C. F. Lehmann, *Beiträge zur alten Geschichte*, Heft i. p. 6 (1901).

[4] *Knowledge and Scientific News*, vol. i. pp. 2, 228.

[5] *Astronomisches aus Babylon* (Freiburg im Breisgau, 1889).

[6] Ginzel, *loc. cit.* Heft ii. p. 204.

[7] *Die babylonische Mondrechnung*, p. 50 (1900).

[8] S. Newcomb, *Astr. Nach.* No. 3682; P. H. Cowell, *Month. Notices Roy. Astr. Soc.* lxv. 867.

[9] G. V. Schiaparelli, *I Precursori del Copernico*, pp. 23–28, Pubbl. del R. Osservatorio di Brera, No. iii. (1873).

with disapproval. The long-lived conception of a series of crystal spheres, acting as the vehicles of the heavenly bodies, and attuned to divine harmonies, seems to have originated with Pythagoras himself.

The first mathematical theory of celestial appearances was devised by Eudoxus of Cnidus (408–355 B.C.).[1] The problem he attempted to solve was so to combine uniform circular movements as to produce the resultant effects actually observed. The sun and moon and the five planets were, with this end in view, accommodated each with a set of variously revolving spheres, to the total number of 27. The Eudoxian or "homocentric" system, after it had been further elaborated by Callippus and Aristotle, was modified by Apollonius of Perga (fl. 250–220 B.C.) into the hypothesis of deferents and epicycles, which held the field for 1800 years as the characteristic embodiment of Greek ideas in astronomy. Eudoxus further wrote two works descriptive of the heavens, the *Enoptron* and *Phaenomena*, which, substantially preserved in the *Phaenomena* of Aratus (fl. 270 B.C.), provided all the leading features of modern stellar nomenclature.

Eudoxus.

Greek astronomy culminated in the school of Alexandria. It was, soon after its foundation, illustrated by the labours of Aristyllus and Timocharis (*c.* 320–260 B.C.), who constructed the first catalogue giving star-positions as measured from a reference-point in the sky. This fundamental advance rendered inevitable the detection of precessional effects. Aristarchus of Samos observed at Alexandria 280–264 B.C. His treatise on the magnitudes and distances of the sun and moon, edited by John Wallis in 1688, describes a theoretically valid method for determining the relative distances of the sun and moon by measuring the angle between their centres when half the lunar disk is illuminated; but the time of dichotomy being widely indeterminate, no useful result was thus obtainable. Aristarchus in fact concluded the sun to be not more than twenty times, while it is really four hundred times farther off than our satellite. His general conception of the universe was comprehensive beyond that of any of his predecessors.

School of Alexandria.

Aristarchus.

Eratosthenes (276–196 B.C.), a native of Cyrene, was summoned from Athens to Alexandria by Ptolemy Euergetes to take charge of the royal library. He invented, or improved armillary spheres, the chief implements of ancient astrometry, determined the obliquity of the ecliptic at 23° 51′ (a value 5′ too great), and introduced an effective mode of arc-measurement. Knowing Alexandria and Syene to be situated 5000 stadia apart on the same meridian, he found the sun to be 7° 12′ south of the zenith at the northern extremity of this arc when it was vertically overhead at the southern extremity, and he hence inferred a value of 252,000 stadia for the entire circumference of the globe. This is a very close approximation to the truth, if the length of the unit employed has been correctly assigned.[2]

Eratosthenes.

Among the astronomers of antiquity, two great men stand out with unchallenged pre-eminence. Hipparchus and Ptolemy entertained the same large organic designs; they worked on similar methods; and, as the outcome, their performances fitted so accurately together that between them they re-made celestial science. Hipparchus fixed the chief data of astronomy—the lengths of the tropical and sidereal years, of the various months, and of the synodic periods of the five planets; determined the obliquity of the ecliptic and of the moon's path, the place of the sun's apogee, the eccentricity of his orbit, and the moon's horizontal parallax; all with approximate accuracy. His loans from Chaldaean experts appear, indeed, to have been numerous; but were doubtless independently verified. His supreme merit, however, consisted in the establishment of astronomy on a sound geometrical basis. His acquaintance with trigonometry, a branch of science initiated by him, together with his invention of the planisphere, enabled him to solve a number of elementary problems; and he was thus led to bestow especial attention upon the position of the equinox, as being the common point of origin for measures both in right ascension and longitude. Its steady retrogression among the stars became manifest to him in 130 B.C., on comparing his own observations with those made by Timocharis a century and a half earlier; and he estimated at not less than 36″ (the true value being 50″) the annual amount of "precession."

Hipparchus.

The choice made by Hipparchus of the geocentric theory of the universe decided the future of Greek astronomy. He further elaborated it by the introduction of "eccentrics," which accounted for the changes in orbital velocity of the sun and moon by a displacement of the earth, to a corresponding extent, from the centre of the circles they were assumed to describe. This gave the elliptic inequality known as the "equation of the centre," and no other was at that time obvious. He attempted no detailed discussion of planetary theory; but his catalogue of 1080 stars, divided into six classes of brightness, or "magnitudes," is one of the finest monuments of antique astronomy. It is substantially embodied in Ptolemy's *Almagest* (see PTOLEMY).

An interval of 250 years elapsed before the constructive labours of Hipparchus obtained completion at Alexandria. His observations were largely, and somewhat arbitrarily, employed by Ptolemy. Professor Newcomb, who has compiled an instructive table of the equinoxes severally observed by Hipparchus and Ptolemy, with their errors deduced from Leverrier's solar tables, finds palpable evidence that the discrepancies between the two series were artificially reconciled on the basis of a year 6^m too long, adopted by Ptolemy on trust from his predecessor. He nevertheless holds the process to have been one that implied no fraudulent intention.

Ptolemy.

The Ptolemaic system was, in a geometrical sense, defensible; it harmonized fairly well with appearances, and physical reasonings had not then been extended to the heavens. To the ignorant it was recommended by its conformity to crude common sense; to the learned, by the wealth of ingenuity expended in bringing it to perfection. The *Almagest* was the consummation of Greek astronomy. Ptolemy had no successor; he found only commentators, among the more noteworthy of whom were Theon of Alexandria (fl. A.D. 400) and his daughter Hypatia (370–415). With the capture of Alexandria by Omar in 641, the last glimmer of its scientific light became extinct, to be rekindled, a century and a half later, on the banks of the Tigris. The first Arabic translation of the *Almagest* was made by order of Harun al-Rashid about the year 800; others followed, and the Caliph al-Mamun built in 829 a grand observatory at Bagdad. Here Albumazar (805–885) watched the skies and cast horoscopes; here Tobit ben Korra (836–901) developed his long unquestioned, yet misleading theory of the "trepidation" of the equinoxes; Abd-ar-rahman al-Sūfi 903–986) revised at first hand the catalogue of Ptolemy;[3] and Abulwefa (939–998), like al-Sūfi, a native of Persia, made continuous planetary observations, but did not (as alleged by L. Sédillot) anticipate Tycho Brahe's discovery of the moon's variation. Ibn Junis (*c.* 950–1008), although the scene of his activity was in Egypt, falls into line with the astronomers of Bagdad. He compiled the Hakimite Tables of the planets, and observed at Cairo, in 977 and 978, two solar eclipses which, as being the first recorded with scientific accuracy,[4] were made available in fixing the amount of lunar acceleration. Nasir ud-din (1201–1274) drew up the Ilkhanic Tables, and determined the constant of precession at 51″. He directed an observatory established by Hulagü Khan (d. 1265) at Maraga in Persia, and equipped with a mural quadrant of 12 ft. radius, besides altitude and azimuth instruments. Ulugh Beg (1394–1449), a grandson of Tamerlane, was the illustrious personification of Tatar

Arab astronomers.

[1] G. V. Schiaparelli, *I Precursori del Copernico*, pp. 23–28, Pubbl. del R. Osservatorio di Brera, No. ix.

[2] Marie, *Hist. des sciences*, t. i. p. 79; P. Tannery, *Hist. de l'astronomie ancienne*, ch. v. p. 115.

[3] Published by H. C. Schjellerup in a French translation (St Petersburg, 1874).

[4] Newcomb, *Researches on the Motion of the Moon*, Washington Observations for 1875, Appendix ii. p. 20.

astronomy. He founded about 1420 a splendid observatory at Samarkand, in which he re-determined nearly all Ptolemy's stars, while the Tables published by him held the primacy for two centuries.[1]

Arab astronomy, transported by the Moors to Spain, flourished temporarily at Cordova and Toledo. From the latter city the Toletan Tables, drawn up by Arzachel in 1080, took their name; and there also the Alfonsine Tables, published in 1252, were prepared under the authority of Alphonso X. of Castile. Their appearance signalized the dawn of European science, and was nearly coincident with that of the *Sphaera Mundi*, a text-book of spherical astronomy, written by a Yorkshireman, John Holywood, known as Sacro Bosco (d. 1256). It had an immense vogue, perpetuated by the printing-press in fifty-nine editions. In Germany, during the 15th century, a brilliant attempt was made to patch up the flaws in Ptolemaic doctrine. George Purbach (1423–1461) introduced into Europe the method of determining time by altitudes employed by Ibn Junis. He lectured with applause at Vienna from 1450; was joined there in 1452 by Regiomontanus (*q.v.*); and was on the point of starting for Rome to inspect a manuscript of the *Almagest* when he died suddenly at the age of thirty-eight. His teachings bore fruit in the work of Regiomontanus, and of Bernhard Walther of Nuremberg (1430–1504), who fitted up an observatory with clocks driven by weights, and developed many improvements in practical astronomy.

Moorish astronomy. *European astronomy.* *Purbach.* *Walther.*

Meantime, a radical reform was being prepared in Italy. Under the searchlights of the new learning, the dictatorship of Ptolemy appeared no more inevitable than that of Aristotle; advanced thinkers like Domenico Maria Novara (1454–1504) promulgated *sub rosa* what were called Pythagorean opinions; and they were eagerly and fully appropriated by Nicolaus Copernicus during his student-years (1496–1505) at Bologna and Padua. He laid the groundwork of his heliocentric theory between 1506 and 1512, and brought it to completion in *De Revolutionibus Orbium Coelestium* (1543). The colossal task of remaking astronomy on an inverted design was, in this treatise, virtually accomplished. Its reasonings were solidly founded on the principle of the relativity of motion. A continuous shifting of the standpoint was in large measure substituted for the displacements of the objects viewed, which thus acquired a regularity and consistency heretofore lacking to them. In the new system, the sphere of the fixed stars no longer revolved diurnally, the earth rotating instead on an axis directed towards the celestial pole. The sun too remained stationary, while the planets, including our own globe, circulated round him. By this means, the planetary "retrogradations" were explained as simple perspective effects due to the combination of the earth's revolutions with those of her sister orbs. The retention, however, by Copernicus of the antique postulate of uniform circular motion impaired the perfection of his plan, since it involved a partial survival of the epicyclical machinery. Nor was it feasible, on this showing, to place the sun at the true centre of any of the planetary orbits; so that his ruling position in the midst of them was illusory. The reformed scheme was then by no means perfect. Its simplicity was only comparative; many outstanding anomalies compromised its harmonious working. Moreover, the absence of sensible parallaxes in the stellar heavens seemed inconsistent with its validity; and a mobile earth outraged deep-rooted prepossessions. Under these disadvantageous circumstances, it is scarcely surprising that the heliocentric theory, while admired as a daring speculation, won its way slowly to acceptance as a truth.

Copernicus.

The *Tabulae Prutenicae*, calculated on Copernican principles by Erasmus Reinhold (1511–1553), appeared in 1551. Although they represented celestial movements far better than the Alfonsine Tables, large discrepancies were still apparent, and the desirability of testing the novel hypothesis upon which they were based by more refined observations prompted a reform of methods, undertaken almost simultaneously by the landgrave William IV. of Hesse-Cassel (1532–1592), and by Tycho Brahe. The landgrave built at Cassel in 1561 the first observatory with a revolving dome, and worked for some years at a star-catalogue finally left incomplete. Christoph Rothmann and Joost Bürgi (1552–1632) became his assistants in 1577 and 1579 respectively; and through the skill of Bürgi, time-determinations were made available for measuring right ascensions. At Cassel, too, the altitude and azimuth instrument is believed to have made its first appearance in Europe.[2]

Observatory of Cassel.

Tycho's labours were both more strenuous and more effective. He perfected the art of pre-telescopic observation. His instruments were on a scale and of a type unknown since the days of Nasir ud-din. At Augsburg, in 1569, he ordered the construction of a 19-ft. quadrant, and of a celestial globe 5 ft. in diameter; he substituted equatorial for zodiacal armillae, thus definitively establishing the system of measurements in right ascension and declination; and improved the graduation of circular arcs by adopting the method of "transversals." By these means, employed with consummate skill, he attained an unprecedented degree of accuracy, and as an incidental though valuable result, demonstrated the unreality of the supposed trepidation of the equinoxes.

Tycho Brahe.

No more congruous arrangement could have been devised than the inheritance by Johann Kepler of the wealth of materials amassed by Tycho Brahe. The younger man's genius supplied what was wanting to his predecessor. Tycho's endowments were of the practical order; yet he had never designed his observations to be an end in themselves. He thought of them as means towards the end of ascertaining the true form of the universe. His range of ideas was, however, restricted; and the attempt embodied in his ground-plan of the solar system to revive the ephemeral theory of Heraclides failed to influence the development of thought. Kepler, on the contrary, was endowed with unlimited powers of speculation, but had no mechanical faculty. He found in Tycho's ample legacy of first-class data precisely what enabled him to try, by the touchstone of fact, the successive hypotheses that he imagined; and his untiring patience in comparing and calculating the observations at his disposal was rewarded by a series of unique discoveries. He long adhered to the traditional belief that all celestial revolutions must be performed equably in circles; but a laborious computation of seven recorded oppositions of Mars at last persuaded him that the planet travelled in an ellipse, one focus of which was occupied by the sun. Pursuing the inquiry, he found that its velocity was uniform with respect to no single point within the orbit, but that the areas described, in equal times, by a line drawn from the sun to the planet were strictly equal. These two principles he extended, by direct proof, to the motion of the earth; and, by analogy, to that of the other planets. They were published in 1609 in *De Motibus Stellae Martis*. The announcement of the third of "Kepler's Laws" was made ten years later, in *De Harmonice Mundi*. It states that the squares of the periods of circulation round the sun of the several planets are in the same ratio as the cubes of their mean distances. This numerical proportion, as being a necessary consequence of the law of gravitation, must prevail in every system under its sway. It does in fact prevail among the satellite-families of our acquaintance, and presumably in stellar combinations as well. Kepler's ineradicable belief in the existence of some such congruity was derived from the Pythagorean idea of an underlying harmony in nature; but his arduous efforts for its realization took a devious and fantastic course which seemed to give little promise of their surprising ultimate success. The outcome of his discoveries was, not only to perfect the geometrical plan of the solar system, but to enhance very materially the predicting power of astronomy. The Rudolphine Tables (Ulm, 1627), computed by him from elliptic elements, retained authority for a century, and have in principle never been superseded. He was deterred from research into the

Kepler.

[1] F. Baily, *Memoirs Roy. Astr. Society*, vol. xiii. p. 19.

[2] J. L. E. Dreyer, *Life of Tycho Brahe*, p. 321.

orbital relations of comets by his conviction of their perishable nature. He supposed their tails to result from the action of solar rays, which, in traversing their mass, bore off with them some of their subtler particles to form trains directed away from the sun. And through the process of waste thus set on foot, they finally dissolved into the aether, and expired "like spinning insects." (*De Cometis; Opera*, ed. Frisch, t. vii. p. 110.) This remarkable anticipation of the modern theory of light-pressure was suggested to him by his observations of the great comets of 1618.

The formal astronomy of the ancients left Kepler unsatisfied. He aimed at finding out the cause as well as the mode of the planetary revolutions; and his demonstration that the planes in which they are described all pass through the sun was an important preliminary to a physical explanation of them. But his efforts to supply such an explanation were rendered futile by his imperfect apprehension of what motion is in itself. He had, it is true, a distinct conception of a force analogous to that of gravity, by which cognate bodies tended towards union. Misled, however, into identifying it with magnetism, he imagined circulation in the solar system to be maintained through the material compulsion of fibrous emanations from the sun, carried round by his axial rotation. Ignorance regarding the inertia of matter drove him to this expedient. The persistence of movement seemed to him to imply the persistence of a moving power. He did not recognize that motion and rest are equally natural, in the sense of requiring force for their alteration. Yet his rationale of the tides in *De Motibus Stellae* is not only memorable as an astonishing forecast of the principle of reciprocal attraction in the proportion of mass, but for its bold extension to the earth of the lunar sphere of influence.

Galileo Galilei, Kepler's most eminent contemporary, took a foremost part in dissipating the obscurity that still hung over the very foundations of mechanical science. He had, indeed, precursors and co-operators. Michel Varo of Geneva wrote correctly in 1584 on the composition of forces; Simon Stevin of Bruges (1548–1620) independently demonstrated the principle; and G. B. Benedetti expounded in his *Speculationum Liber* (Turin, 1585) perfectly clear ideas as to the nature of accelerated motion, some years in advance of Galileo's dramatic experiments at Pisa. Yet they were never assimilated by Kepler; while, on the other hand, the laws of planetary circulation he had enounced were strangely ignored by Galileo. The two lines of inquiry remained for some time apart. Had they at once been made to coalesce, the true nature of the force controlling celestial movements should have been quickly recognized. As it was, the importance of Kepler's generalizations was not fully appreciated until Sir Isaac Newton made them the corner-stone of his new cosmic edifice.

Galileo's contributions to astronomy were of a different quality from Kepler's. They were easily intelligible to the general public; in a sense, they were obvious, since they could be verified by every possessor of one of the Dutch perspective-instruments, just then in course of wide and rapid distribution. And similar results to his were in fact independently obtained in various parts of Europe by Christopher Scheiner at Ingolstadt, by Johann Fabricius at Osteel in Friesland, and by Thomas Harriot at Syon House, Isleworth. Galileo was nevertheless by far the ablest and most versatile of these early telescopic observers. His gifts of exposition were on a par with his gifts of discernment. What he saw, he rendered conspicuous to the world. His sagacity was indeed sometimes at fault. He maintained with full conviction to the end of his life a grossly erroneous hypothesis of the tides, early adopted from Andrea Caesalpino; the "triplicate" appearance of Saturn always remained an enigma to him; and in regarding comets as atmospheric emanations he lagged far behind Tycho Brahe. Yet he unquestionably ranks as the true founder of descriptive astronomy; while his splendid presentment of the laws of projectiles in his dialogue of the "New Sciences" (Leiden, 1638) lent potent aid to the solid establishment of celestial mechanics.

Galileo.

The accumulation of facts does not in itself constitute science. Empirical knowledge scarcely deserves the name. *Vere scire est per causas scire.* Francis Bacon's prescient dream, however, of a living astronomy by which the physical laws governing terrestrial relations should be extended to the highest heavens, had long to wait for realization. Kepler divined its possibility; but his thoughts, derailed (so to speak) by the false analogy of magnetism, brought him no farther than to the rough draft of the scheme of vortices expounded in detail by René Descartes in his *Principia Philosophiae* (1644). And this was a *cul-de-sac*. The only practicable road struck aside from it. The true foundations of a mechanical theory of the heavens were laid by Kepler's discoveries, and by Galileo's dynamical demonstrations; its construction was facilitated by the development of mathematical methods. The invention of logarithms, the rise of analytical geometry, and the evolution of B. Cavalieri's "indivisibles" into the infinitesimal calculus, all accomplished during the 17th century, immeasurably widened the scope of exact astronomy. Gradually, too, the nature of the problem awaiting solution came to be apprehended. Jeremiah Horrocks had some intuition, previously to 1639, that the motion of the moon was controlled by the earth's gravity, and disturbed by the action of the sun. Ismael Bouillaud (1605–1694) stated in 1645 the fact of planetary circulation under the sway of a sun-force decreasing as the inverse square of the distance; and the inevitableness of this same "duplicate ratio" was separately perceived by Robert Hooke, Edmund Halley and Sir Christopher Wren before Newton's discovery had yet been made public. He was the only man of his generation who both recognized the law, and had power to demonstrate its validity. And this was only a beginning. His complete achievement had a twofold aspect. It consisted, first, in the identification, by strict numerical comparisons, of terrestrial gravity with the mutual attraction of the heavenly bodies; secondly, in the following out of its mechanical consequences throughout the solar system. Gravitation was thus shown to be the sole influence governing the movements of planets and satellites; the figure of the rotating earth was successfully explained by its action on the minuter particles of matter; tides and the precession of the equinoxes proved amenable to reasonings based on the same principle; and it satisfactorily accounted as well for some of the chief lunar and planetary inequalities. Newton's investigations, however, were very far from being exhaustive. Colossal though his powers were, they had limits; and his work could not but remain unterminated, since it was by its nature interminable. Nor was it possible to provide it with what could properly be called a sequel. The synthetic method employed by him was too unwieldy for common use. Yet no other was just then at hand. Mathematical analysis needed half a century of cultivation before it was fully available for the arduous tasks reserved for it. They were accordingly taken up anew by a band of continental inquirers, primarily by three men of untiring energy and vivid genius, Leonhard Euler, Alexis Clairault, and Jean le Rond d'Alembert. The first of the outstanding gravitational problems with which they grappled was the unaccountably rapid advance of the lunar perigee. But the apparent anomaly disappeared under Euler's powerful treatment in 1749, and his result was shortly afterwards still further assured by Clairault. The subject of planetary perturbations was next attacked. Euler devised in 1753 a new method, that of the "variation of parameters," for their investigation, and applied it to unravel some of the earth's irregularities in a memoir crowned by the French Academy in 1756; while in 1757, Clairault estimated the masses of the moon and Venus by their respective disturbing effects upon terrestrial movements. But the most striking incident in the history of the verification of Newton's law was the return of Halley's comet to perihelion, on the 12th of March 1759, in approximate accordance with Clairault's calculation of the delays due to the action of Jupiter and Saturn. Visual proof

Gravitational astronomy.

Bacon.

Descartes.

Newton.

Euler. Clairault. D'Alembert.

was thus, it might be said, afforded of the harmonious working of a single principle to the uttermost boundaries of the sun's dominion.

These successes paved the way for the higher triumphs of Joseph Louis Lagrange and of Pierre Simon Laplace. The subject of the lunar librations was treated by Lagrange with great originality in an essay crowned by the Paris Academy of Sciences in 1764; and he filled up the lacunae in his theory of them in a memoir communicated to the Berlin Academy in 1780. He again won the prize of the Paris Academy in 1766 with an analytical discussion of the movements of Jupiter's satellites (*Miscellanea*, Turin Acad. t. iv.); and in the same year expanded Euler's adumbrated method of the variation of parameters into a highly effective engine of perturbational research. It was especially adapted to the tracing out of "secular inequalities," or those depending upon changes in the orbital elements of the bodies affected by them, and hence progressing indefinitely with time; and by its means, accordingly, the mechanical stability of the solar system was splendidly demonstrated through the successive efforts of Lagrange and Laplace. The proper share of each in bringing about this memorable result is not easy to apportion, since they freely imparted and profited by one another's advances and improvements; it need only be said that the fundamental proposition of the invariability of the planetary major axes laid down with restrictions by Laplace in 1773, was finally established by Lagrange in 1776; while Laplace in 1784 proved the subsistence of such a relation between the eccentricities of the planetary orbits on the one hand, and their inclinations on the other, that an increase of either element could, in any single case, proceed only to a very small extent. The system was thus shown, apart from unknown agencies of subversion, to be constructed for indefinite permanence. The prize of the Berlin Academy was, in 1780, adjudged to Lagrange for a treatise on the perturbations of comets; and he contributed to the Berlin Memoirs, 1781–1784, a set of five elaborate papers, embodying and unifying his perfected methods and their results.

Lagrange.

The crowning trophies of gravitational astronomy in the 18th century were Laplace's explanations of the "great inequality" of Jupiter and Saturn in 1784, and of the "secular acceleration" of the moon in 1787. Both irregularities had been noted, a century earlier, by Edmund Halley; both had, since that time, vainly exercised the ingenuity of the ablest mathematicians; both now almost simultaneously yielded their secret to the same fortunate inquirer. Johann Heinrich Lambert pointed out in 1773 that the motion of Saturn, from being retarded, had become accelerated. A periodic character was thus indicated for the disturbance; and Laplace assigned its true cause in the near approach to commensurability in the periods of the two planets, the cycle of disturbance completing itself in about 900 (more accurately 929½) years. The lunar acceleration, too, obtains ultimate compensation, though only after a vastly protracted term of years. The discovery, just one hundred years after the publication of Newton's *Principia*, of its dependence upon the slowly varying eccentricity of the earth's orbit signalized the removal of the last conspicuous obstacle to admitting the unqualified validity of the law of gravitation. Laplace's calculations, it is true, were inexact. An error, corrected by J. C. Adams in 1853, nearly doubled the value of the acceleration deducible from them; and served to conceal a discrepancy with observation which has since given occasion to much profound research (see MOON).

Laplace.

The *Mécanique céleste*, in which Laplace welded into a whole the items of knowledge accumulated by the labours of a century, has been termed the "Almagest of the 18th century" (Fourier). But imposing and complete though the monument appeared, it did not long hold possession of the field. Further developments ensued. The "method of least squares," by which the most probable result can be educed from a body of observational data, was published by Adrien Marie Legendre in 1806, by Carl Friedrich Gauss in his *Theoria Motus* (1809), which described also a mode of calculating the orbit of a planet from three complete observations, afterwards turned to important account for the recapture of Ceres, the first discovered asteroid (see PLANETS, MINOR). Researches into rotational movement were facilitated by S. D. Poisson's application to them in 1809 of Lagrange's theory of the variation of constants; Philippe de Pontécoulant successfully used in 1829, for the prediction of the impending return of Halley's comet, a system of "mechanical quadratures" published by Lagrange in the Berlin Memoirs for 1778; and in his *Théorie analytique du système du monde* (1846) he modified and refined general theories of the lunar and planetary revolutions. P. A. Hansen in 1829 (*Astr. Nach.* Nos. 166-168, 179) left the beaten track by choosing time as the sole variable, the orbital elements remaining constant. A. L. Cauchy published in 1842–1845 a method similarly conceived, though otherwise developed; and the scope of analysis in determining the movements of the heavenly bodies has since been perseveringly widened by the labours of Urbain J. J. Leverrier, J. C. Adams, S. Newcomb, G. W. Hill, E. W. Brown, H. Gyldén, Charles Delaunay, F. Tisserand, H. Poincaré and others too numerous to mention. Nor were these abstract investigations unaccompanied by concrete results. Sir George Airy detected in 1831 an inequality, periodic in 240 years, between Venus and the earth. Leverrier undertook in 1839, and concluded in 1876, the formidable task of revising all the planetary theories and constructing from them improved tables. Not less comprehensive has been the work carried out by Professor Newcomb of raising to a higher grade of perfection, and reducing to a uniform standard, all the theories and constants of the solar system. His inquiries afford the assurance of a nearly exact conformity among its members to strict gravitational law, only the moon and Mercury showing some slight, but so far unexplained, anomalies of movement. The discovery of Neptune in 1846 by Adams and Leverrier marked the first solution of the "inverse problem" of perturbations. That is to say, ascertained or ascertainable effects were made the starting-point instead of the goal of research.

Observational astronomy, meanwhile, was advancing to some extent independently. The descriptive branch found its principle of development in the growing powers of the telescope, and had little to do with mathematical theory; which, on the contrary, was closely allied, by relations of mutual helpfulness, with practical astronomy, or "astrometry." Meanwhile, the elementary requirement of making visual acquaintance with the stellar heavens was met, as regards the unknown southern skies, when Johann Bayer published at Nuremberg in 1603 a celestial atlas depicting twelve new constellations formed from the rude observations of navigators across the line. In the same work, the current mode of star-nomenclature by the letters of the Greek alphabet made its appearance. On the 7th of November 1631 Pierre Gassendi watched at Paris the passage of Mercury across the sun. This was the first planetary transit observed. The next was that of Venus on the 24th of November (O.S.) 1639, of which Jeremiah Horrocks and William Crabtree were the sole spectators. The improvement of telescopes was prosecuted by Christiaan Huygens from 1655, and promptly led to his discoveries of the sixth Saturnian moon, of the true shape of the Saturnian appendages, and of the multiple character of the "trapezium" of stars in the Orion nebula. William Gascoigne's invention of the filar micrometer and of the adaptation of telescopes to graduated instruments remained submerged for a quarter of a century in consequence of his untimely death at Marston Moor (1644). The latter combination had also been ineffectually proposed in 1634 by Jean Baptiste Morin (1583–1656); and both devices were recontrived at Paris about 1667, the micrometer by Adrien Auzout (d. 1691), telescopic sights (so-called) by Jean Picard (1620–1682), who simultaneously introduced the astronomical use of pendulum-clocks, constructed by Huygens eleven years previously. These improvements were ignored or rejected by Johann Hevelius of Danzig, the author of the last important star-catalogue based solely upon naked-eye determinations.

Descriptive and practical astronomy.

Bayer.

Gassendi.

Horrocks.

Huygens.

Gascoigne.

Hevelius.

He, nevertheless, used telescopes to good purpose in his studies of lunar topography, and his designations for the chief mountain-chains and "seas" of the moon have never been superseded. He, moreover, threw out the suggestion (in his *Cometographia*, 1668) that comets move round the sun in orbits of a parabolic form.

The establishment, in 1671 and 1676 respectively, of the French and English national observatories at once typified and stimulated progress. The Paris institution, it is true, lacked unity of direction. No authoritative chief was assigned to it until 1771. G. D. Cassini, his son and his grandson were only *primi inter pares*. Claude Perrault's stately edifice was equally accessible to all the more eminent members of the Academy of Sciences; and researches were, more or less independently, carried on there by (among others) Philippe de la Hire (1640–1718), G. F. Maraldi (1665–1729), and his nephew, J. D. Maraldi, Jean Picard, Huygens, Olaus Römer and Nicolas de Lacaille. Some of the best instruments then extant were mounted at the Paris observatory. G. D. Cassini brought from Rome a 17-ft. telescope by G. Campani, with which he discovered in 1671 Iapetus, the ninth in distance of Saturn's family of satellites; Rhea was detected in 1672 with a glass by the same maker of 34-ft. focus; the duplicity of the ring showed in 1675; and, in 1684, two additional satellites were disclosed by a Campani telescope of 100 ft. Cassini, moreover, set up an altazimuth in 1678, and employed from about 1682 a "parallactic machine," provided with clockwork to enable it to follow the diurnal motion. Both inventions have been ascribed to Olaus Römer, who used but did not claim them, and must have become familiar with their principles during the nine years (1672–1681) spent by him at the Paris observatory. Römer, on the other hand, deserves full credit for originating the transit-circle and the prime vertical instrument; and he earned undying fame by his discovery of the finite velocity of light, made at Paris in 1675 by comparing his observations of the eclipses of Jupiter's satellites at the conjunctions and oppositions of the planet.

The Paris observatory.

G. D. Cassini.

Römer.

The organization of the Greenwich observatory differed widely from that adopted at Paris. There a fundamental scheme of practical amelioration was initiated by John Flamsteed, the first astronomer royal, and has never since been lost sight of. Its purpose is the attainment of so complete a power of prediction that the places of the sun, moon and planets may be assigned without noticeable error for an indefinite future time. Sidereal inquiries, as such, made no part of the original programme in which the stars figured merely as points of reference. But these points are not stationary. They have an apparent precessional movement, the exact amount of which can be arrived at only by prolonged and toilsome enquiries. They have besides "proper motions," detected in 1718 by E. Halley in a few cases, and since found to prevail universally. Further, James Bradley discovered in 1728 the annual shifting of the stars due to the aberration of light (see ABERRATION), and in 1748, the complicating effects upon precession of the "nutation" of the earth's axis. Hence, the preparation of a catalogue recording the "mean" positions of a number of stars for a given epoch involves considerable preliminary labour; nor do those positions long continue to satisfy observation. They need, after a time, to be corrected, not only systematically for precession, but also empirically for proper motion. Before the stars can safely be employed as route-marks in the sky, their movements must accordingly be tabulated, and research into the method of such movements inevitably follows. We perceive then that the fundamental problems of sidereal science are closely linked up with the elementary and indispensable procedures of celestial measurement.

Flamsteed.

The history of the Greenwich observatory is one of strenuous efforts for refinement, stimulated by the growing stringency of theoretical necessities. Improved practice, again, reacted upon theory by bringing to notice residual errors, demanding the correction of formulae, or intimating neglected disturbances. Each increase of mechanical skill claims a corresponding gain in the subtlety of analysis; and vice versa. And this kind of interaction has gone on ever since Flamsteed reluctantly furnished the "places of the moon," which enabled Newton to lay the foundations of lunar theory.

Edmund Halley, the second astronomer royal, devoted most of his official attention to the moon. But his plan of attack was not happily chosen; he carried it out with deficient instrumental means; and his administration (1720–1742) remained comparatively barren. That of his successor, though shorter, was vastly more productive. James Bradley chose the most appropriate tasks, and executed them supremely well, with the indispensable aid of John Bird (1709–1776), who constructed for him an 8-ft. quadrant of unsurpassed quality. Bradley's store of observations has accordingly proved invaluable. Those of 3222 stars, reduced by F. W. Bessel in 1818, and again with masterly insight by Dr A. Auwers in 1882, form the true basis of exact astronomy, and of our knowledge of proper motions. Those relating to the moon and planets, corrected by Sir George Airy, 1840–1846, form part of the standard materials for discussing theories of movement in the solar system. The fourth astronomer royal, Nathaniel Bliss, provided in two years a sequel of some value to Bradley's performance. Nevil Maskelyne, who succeeded him in 1764, set on foot, in 1767, the publication of the *Nautical Almanac*, and about the same time had an achromatic telescope fitted to the Greenwich mural quadrant. The invention, perfected by John Dollond in 1757, was long debarred from becoming effective by difficulties in the manufacture of glass, aggravated in England by a heavy excise duty levied until 1845. More immediately efficacious was the innovation made by John Pond (astronomer royal, 1811–1836) of substituting entire circles for quadrants. He further introduced, in 1821, the method of duplicate observations by direct vision and by reflection, and by these means obtained results of very high precision. During Sir George Airy's long term of office (1836–1881) exact astronomy and the traditional purposes of the royal observatory were promoted with increased vigour, while the scope of research was at the same time memorably widened. Magnetic, meteorological, and spectroscopic departments were added to the establishment; electricity was employed, through the medium of the chronograph, for the registration of transits; and photography was resorted to for the daily automatic record of the sun's condition.

Halley.

Bradley.

Bliss.

Maskelyne.

Pond.

Airy.

Meanwhile, advances were being made in various parts of the continent of Europe. Peter Wargentin (1717–1783), secretary to the Swedish Academy of Sciences, made a special study of the Jovian system. James Bradley had described to the Royal Society on the 2nd of July 1719 the curious cyclical relations of the three inner satellites; and their period of 437 days was independently discovered by Wargentin, who based upon it in 1746 a set of tables, superseded only by those of J. B. J. Delambre in 1792. Among the fruits of the strenuous career of Nicolas Louis de Lacaille were tables of the sun, in which terms depending upon planetary perturbations were, for the first time, introduced (1758); an extended acquaintance with the southern heavens; and a determination of the moon's parallax from observations made at opposite extremities of an arc of the meridian 85° in length. Tobias Mayer of Göttingen (1723–1762) originated the mode of adjusting transit-instruments still in vogue; drew up a catalogue of nearly a thousand zodiacal stars (published posthumously in 1775); and deduced the proper motions of eighty stars from a comparison of their places as given by Olaus Römer in 1706 with those obtained by himself in 1756. He executed besides a chart and forty drawings of the moon (published at Göttingen in 1881), and calculated lunar tables from a skilful development of Euler's theory, for which a reward of £3000 was in 1765 paid to his widow by the British government. They were published by the Board of Longitude, together with his solar tables, in 1770. The material interests of navigation were in these works primarily regarded;

Wargentin.

Lacaille.

Tobias Mayer.

but the imaginative side of knowledge had also potent representatives during the latter half of the 18th century. In France, especially, the versatile activity of J. J. Lalande popularized the acquisitions of astronomy, and enforced its demands; and he had a German counterpart in J. E. Bode. *Lalande.*

Between the time of Aristarchus and the opposition of Mars in 1672, no serious attempt was made to solve the problem of the sun's distance. In that year, however, Jean Richer at Cayenne and G. D. Cassini at Paris made combined observations of the planet, which yielded a parallax for the sun of 9·5″, corresponding to a mean radius for the terrestrial orbit of 87,000,000 m. This result, though widely inaccurate, came much nearer to the truth than any previously obtained; and it instructively illustrated the feasibility of concerted astronomical operations at distant parts of the earth. The way was thus prepared for availing to the full of the opportunities for a celestial survey offered by the transits of Venus in 1761 and 1769. They had been signalized by E. Halley in 1716; they were later insisted upon by Lalande; an enthusiasm for co-operation was evoked, and the globe, from Siberia to Otaheite, was studded with observing parties. The outcome, nevertheless, disappointed expectation. The instants of contact between the limbs of the sun and planet defied precise determination. Optical complications fatally impeded sharpness of vision, and the phenomena took place in a debateable borderland of uncertainty. J. F. Encke, it is true, derived from them in 1822–1824 what seemed an authentic parallax of 8·57″, implying a distance of 95,370,000 m.; but the confidence it inspired was finally overthrown in 1854 by P. A. Hansen's announcement of its incompatibility with lunar theory. An appeal then lay to the 19th century pair of transits in 1874 and 1882; but no peremptory decision ensued; observations were marred by the same optical evils as before. Their upshot, however, had lost its essential importance; for a fresh series of investigations based on a variety of principles had already been started. Leverrier, in 1858, calculated a value of 8·95″ for the solar parallax (equivalent to a distance of 91,000,000 m.) from the "parallactic inequality" of the moon; Professor Newcomb, using other forms of the gravitational method, derived in 1895 a parallax of 8·76″. Again, since the constant of aberration defines the ratio between the velocity of light and the earth's orbital speed, the span of the terrestrial circuit, in other words, the distance of the sun, is immediately deducible from known values of the first two quantities. The rate of light-transmission was accordingly made the subject of an elaborate set of experiments by Professor Newcomb in 1880–1882; and the result, taken in connexion with the aberration-constant as determined at Pulkowa, yielded a solar parallax of 8·79″, or a distance (in round numbers) of 93,000,000 m. But the direct or geometrical mode of attack has still the preference over any of the indirect plans. Sir David Gill derived a highly satisfactory value of 8·78″ for the long-sought constant from the opposition of Mars in 1877, and from combined heliometer observations at five observatories in 1888–1889 of the minor planets Iris, Victoria and Sappho, the apparently definitive value of 8·80″ (equivalent distance, 92,874,000 m.). But an unlooked-for fresh opportunity was afforded by the discovery in 1898 of the singularly circumstanced minor planet Eros, which occasionally approaches the earth more nearly than any other heavenly body except the moon. The opposition of November 1900, though only moderately favourable, could not be neglected; an international photographic campaign was organized at Paris with the aid of 58 observatories; and the voluminous collected data imply, so far as they have been discussed, a parallax for the sun a little greater than 8·8″. (See also PARALLAX.) *Distance of the sun.*

The first specimen of a reflecting telescope was constructed by Isaac Newton in 1668. It was of what is still called "Newtonian" design, and had a speculum 2 in. in diameter. Through the skill of John Hadley (1682–1743) and James Short of Edinburgh (1710–1768) the instrument unfolded, in the ensuing century, some of its capabilities, which the labours of William Herschel enormously enhanced. Between 1774 and 1789 he built scores of specula of continually augmented size, up to a diameter of 4 ft., the optical excellence of which approved itself by a crowd of discoveries. Uranus (*q.v.*) was recognized by its disk on the 13th of March 1781; two of its satellites, Oberon and Titania, disclosed themselves on the 11th of January 1787; while with the giant 48-in. mirror, used on the "front-view" plan, Mimas and Enceladus, the innermost Saturnian moons, were brought to view on the 28th of August and the 17th of September 1789. These were incidental trophies; Herschel's main object was the exploration of the sidereal heavens. The task, though novel and formidable, was executed with almost incredible success. Charles Messier (1730–1817) had catalogued in 1781 103 nebulae; Herschel discovered 2500, laid down the lines of their classification, divined the laws of their distribution, and assigned their place in a scheme of development. The proof supplied by him in 1802 that coupled stars mutually circulate threw open a boundless field of research; and he originated experimental inquiries into the construction of the heavens by systematically collecting and sifting stellar statistics. He, moreover, definitively established, in 1783, the fact and general direction of the sun's movement in space, and thus introduced an element of order into the maze of stellar proper motions. Sir John Herschel continued in the northern, and extended to the southern hemisphere, his father's work. The third earl of Rosse mounted, at Parsonstown in 1845, a speculum 6 ft. in diameter, which afforded the first indications of the spiral structure shown in recent photographs to be the most prevalent characteristic of nebulae. Down to near the close of the 19th century, both the use and the improvement of reflectors were left mainly in British hands; but the gift of the "Crossley" instrument in 1895, to the Lick observatory, and its splendid subsequent performances in nebular photography, brought similar tools of research into extensive use among American astronomers; and they are now, for many of the various purposes of astrophysics, strongly preferred to refractors. *Reflecting telescopes.* *William Herschel.* *Sir John Herschel.* *Lord Rosse.*

Acquaintance with the asteroidal family began as the 19th century opened. On the 1st of January 1801 Giuseppe Piazzi (1746–1826) discovered Ceres, at Palermo, while engaged in collecting materials for his star-catalogues. A prolonged succession of similar events followed. But in the mode of detecting these swarming bodies, a typical change was made on the 22nd of December 1891, when Dr Max Wolf of Heidelberg photographically captured No. 323. Repetitions of the feat are now counted by the score. *Giuseppe Piazzi.* *Max Wolf.*

Practical astronomy was only secondarily concerned with the addition of Neptune, on the 23rd of September 1846, to the company of known planets; but William Lassell's discovery of its satellite, on the 10th of October following, was a consequence of the perfect figure and high polish of his 2-ft. speculum. With the same instrument, he further detected, on the 19th of September 1848, Hyperion, the seventh of Saturn's attendants, and, on the 24th of October 1851, Ariel and Umbriel, the interior moons of Uranus. Simultaneously with Lassell, on the opposite shore of the Atlantic, W. C. Bond identified Hyperion; and he perceived, on the 15th of November 1850, Saturn's dusky ring, independently observed, a fortnight later, by W. R. Dawes, at Wateringbury in Kent. With the Washington 26-in. refractor, on the 11th of August 1877, Professor Asaph Hall descried the moons of Mars, Deimos and Phobos; and a minute light-speck, noticed by Professor E. E. Barnard in the close neighbourhood of Jupiter on the 9th of September 1892, proved representative of a small inner satellite, invisible with less perfect and powerful instruments than the Lick 36-in. achromatic. The Jovian system has been reinforced by three remote and extremely faint members, two photographed by Professor C. D. Perrine with the Crossley reflector in 1904–1905, and the third at Greenwich in *Lassell.* *Bond.* *Hall.* *Barnard.* *Perrine.*

1908; and a pair of Saturnian moons, designated Phoebe and Themis, were tracked out by Professor W. H. Pickering, in 1898 and 1905 respectively, amid the thicket of stars imprinted on negatives taken at Arequipa with the Bruce 24-in. doublet lens. This raises to 26 the number of discovered satellites in the solar system.

W. H. Pickering.

Cometary science has ramified in unexpected ways during the last hundred years. The establishment of a class of "short-period" comets by the computations of J. F. Encke in 1819, and of Wilhelm von Biela in 1826, led to the theory of their "capture" by the great planets, for which a solid mathematical basis was provided by H. Newton, F. Tisserand and O. Callandreau. An argument for the aboriginal connexion of comets with the solar system, founded by R. C. Carrington in 1860 upon their participation in its translatory movement, was more fully developed by L. Fabry in 1893; and the close orbital relationships of cometary groups, accentuated by the pursuit of each other along nearly the same track by the comets of 1843, 1880 and 1882, singularly illustrated the probable vicissitudes of their careers. The most remarkable event, however, in the recent history of cometary astronomy was its assimilation to that of meteors, which took unquestionable cosmical rank as a consequence of the Leonid tempest of November 1833. The affinity of the two classes of objects became known in 1866 through G. V. Schiaparelli's announcement that the orbit of the bright comet of 1862 agreed strictly with the elliptic ring formed by the circulating Perseid meteors; and three other cases of close coincidence were soon afterwards brought to light. Tebbutt's comet in 1881 was the first to be satisfactorily photographed. The study of such objects is now carried on mainly through the agency of the sensitive plate. The photographic registration of meteor-trails, too, has been lately attempted with partial success. The full realization of the method will doubtless provide adequate data for the detailed investigation of meteoric paths.

Comets.

Meteors.

The progress of science during the 19th century had no more distinctive feature than the rapid growth of sidereal astronomy (see STAR). Its scope, wide as the universe, can be compassed no otherwise than by statistical means; and the collection of materials for this purpose involves most arduous preliminary labour. The multitudinous enrolment of stars was the first requisite. Only one "catalogue of precision"—Nevil Maskelyne's of 36 fundamental stars—was available in 1800. J. J. Lalande, however, published in 1801, in his *Histoire céleste*, the approximate places of 47,390 from a reobservation of which the great Paris catalogue (1887–1892) has been compiled. A valuable catalogue of about 7600 stars was issued by Giuseppe Piazzi in 1814; Stephen Groombridge determined 4239 at Blackheath in 1806–1816; while through the joint and successive work of F. W. Bessel and W. A. Argelander, exact acquaintance was made with 90,000, a more general acquaintance with the 324,000 stars recorded in the *Bonn Durchmusterung* (1859–1862). The southern hemisphere was subsequently reviewed on a similar duplicate plan by E. Schönfeld (1828–1891) at Bonn, by B. A. Gould and J. M. Thome at Córdoba. Moreover, the imposing catalogue set on foot in 1865 at thirteen observatories by the German astronomical society has recently been completed; and adjuncts to it have, from time to time, been provided in the publications of the royal observatories at Greenwich and the Cape of Good Hope, and of national, imperial and private establishments in the United States and on the continent of Europe. But in the execution of these protracted undertakings, the human eye has been, to a large and increasing extent, superseded by the camera. Photographic star-charting was begun by Sir David Gill in 1885, and the third and concluding volume of the *Cape Photographic Durchmusterung* appeared in 1900. It gives the co-ordinates of above 450,000 stars, measured by Professor J. C. Kapteyn at Groningen on plates taken by C. Ray Woods at the Cape observatory. And this comprehensive work was merely preparatory to the International Catalogue and Chart, the production of which was initiated by the resolutions of the Paris Photographic Congress of 1887. Eighteen observatories scattered north and south of the equator divided the sky among them; and the outcome of their combined operations aimed at the production of a catalogue of at least 2,000,000 strictly determined stars, together with a colossal map in 22,000 sheets, showing stars to the fourteenth magnitude, in numbers difficult to estimate. (See PHOTOGRAPHY, CELESTIAL.)

Sidereal astronomy.

Star catalogues.

The arrangement of the stars in space can be usefully discussed only in connexion with their apparent light-power, or "magnitude." Photometric catalogues, accordingly, form an indispensable part of stellar statistics; and their construction has been zealously prosecuted. The *Harvard Photometry* of 4260 lucid stars was issued by Professor E. C. Pickering in 1884, the *Uranometria Nova Oxoniensis*, giving the relative lustre of 2784 stars, by C. Pritchard in 1885. The instrument used at Harvard was a "meridian photometer," constructed on the principle of polarization; while the "method of extinctions," by means of a wedge of neutral-tinted glass, served for the Oxford determinations. At Potsdam, some 17,000 stars have been measured by C. H. G. Müller and P. F. F. Kempf with a polarizing photometer; but by far the most comprehensive work of the kind is the Harvard *Photometric Durchmusterung* (1901–1903), embracing all stars to 7·5 magnitude, and extended to the southern pole by measurements executed at Arequipa. The embarrassing subject of photographic photometry has also been attacked by Professor Pickering. The need is urgent of fixing a scale, and defining standards of actinic brightness; but it has not yet been successfully met.

Photometric catalogues.

The investigation of double stars was carried on from 1819 to 1850 with singular persistence and ability at Dorpat and Pulkowa by F. G. W. Struve, and by his son and successor, O. W. Struve. The high excellence of the data collected by them was a combined result of their skill, and of the vast improvement in refracting telescopes due to the genius of Joseph Fraunhofer (1787–1826). Among the inheritors of his renown were Alvan Clark and Alvan G. Clark of Cambridgeport, Massachusetts; and the superb definition of their great achromatics rendered practicable the division of what might have been deemed impossibly close star-pairs. These facilities were remarkably illustrated by Professor S. W. Burnham's record of discovery, which roused fresh enthusiasm for this line of inquiry by compelling recognition of the extraordinary profusion throughout the heavens of compound objects. Discoveries with the spectroscope have ratified and extended this conclusion.

Double stars.

Only spurious star-parallaxes had claimed the attention of astronomers until F. W. Bessel announced, in December 1838, the perspective yearly shifting of 61 Cygni in an ellipse with a mean radius of about one-third of a second. Thomas Henderson (1798–1844) had indeed measured the larger displacements of α Centauri at the Cape in 1832–1833, but delayed until 1839 to publish his result. Out of several hundred stars since then examined, seventy or eighty have yielded fairly accurate, though very small parallaxes. But this amount of knowledge, however valuable in itself, is utterly inadequate to the needs of sidereal research; and various attempts have accordingly been made, chiefly by Professors J. C. Kapteyn and Simon Newcomb, to estimate, through the analysis of their proper motions, the "mean parallax" of stars assorted by magnitude. And the data thus arrived at are reassuringly self-consistent. A wide photographic survey, by which parallaxes might be secured wholesale, has further been recommended by Kapteyn; but is unlikely to be undertaken in the immediate future.

Stellar parallax.

The exhaustive ascertainment of stellar parallaxes, combined with the visible facts of stellar distribution, would enable us to build a perfect plan of the universe in three dimensions. Its perfection would, nevertheless, be undermined by the mobility of all its constituent parts. Their configuration at a given instant supplies no information as to their configuration hereafter unless the mode and laws of their movements have been determined. Hence, one of the leading

Proper motions.

inducements to the construction of exact and comprehensive catalogues has been to elicit, by comparisons of those for widely separated epochs, the proper motions of the stars enumerated in them. Little was known on the subject at the beginning of the 19th century. William Herschel founded his determination in 1783 of the sun's route in space upon the movements of thirteen stars; and he took into account those of only six in his second solution of the problem in 1805. But in 1837 Argelander employed 390 proper motions as materials for the treatment of the same subject; and L. Struve had at his disposal, in 1887, no less than 2800. From the re-observation of Lalande's stars, after the lapse of not far from a century, J. Bossert was enabled to deduce 2675 proper motions, published at Paris in four successive memoirs, 1887–1902; and the sum-total of those ascertained probably now exceeds 6000. Yet this number, although it represents a portentous expenditure of labour, is insignificant compared with the multitude of the stellar throng; nor had any general tendency been discerned to regulate what seemed casual flittings until Professor Kapteyn, in 1904, adverted to the prevalence among all the brighter stars of opposite stream-flows towards two "vertices" situated in the Milky Way (see STAR). The assured general fact as regards the direction of stellar movements was that they included a common parallactic element due to the sun's translation. And it is by the consideration of this partial accordance in motion that the advance through space of the solar system has been ascertained.

The apex of the sun's way was fixed by Professor Newcomb in 1898 at a point about 4° S. of the brilliant star Vega; but was shifted nearly 7° to the S.W. by J. C. Kapteyn's inquiry in 1901; so that the range of uncertainty as to its position continues unsatisfactorily wide. The speed with which our system progresses is, on the other hand, fairly well known. It cannot differ much from 12½ m. a second, the rate assigned to it by Professor W. W. Campbell in 1902. He employed in his discussion the radial velocities of 280 stars, spectroscopically determined; and the upshot signally exemplified the community of interests between the rising science of astrophysics and the ancient science of astrometry. Their characteristic purposes are, nevertheless, entirely different. The positions of the heavenly bodies in space, and the changes of those positions with time, constitute the primary subject of investigation by the elder school; while the new astronomy concerns itself chiefly with the individual peculiarities of suns and planets, with their chemistry, physical habitudes and modes of luminosity. Its distinctive method is spectrum analysis, the invention and development of which in the 19th century have fundamentally altered the purpose and prospects of celestial inquiries.

Astro-physics.

Spectrum analysis.

A beam of sunlight admitted into a darkened room through a narrow aperture, and there dispersed into a vario-tinted band by the interposition of a prism, is not absolutely continuous. Dr W. H. Wollaston made the experiment in 1802, and perceived the spaces of colour to be interrupted by seven obscure gaps, which took the shape of lines owing to his use of rectangular slit. He thus caught a preliminary glimpse of the "Fraunhofer lines," so called because Joseph Fraunhofer brought them into prominent notice by the diligence and insight of his labours upon them in 1814–1815. He mapped 324, chose out nine, which he designated by the letters of the alphabet, to be standards of measurement for the rest, and ascertained the coincidence in position between the double yellow ray derived from the flame of burning sodium and the pair of dark lines named by him "D" in the solar spectrum. There ensued forty-five years of groping for a law which should clear up the enigma of the solar reversals. Partial anticipations abounded. The vital heart of the matter was barely missed by W. A. Miller in 1845, by L. Foucault in 1849, by A. J. Ångström in 1853, by Balfour Stewart in 1858; while Sir George Stokes held the solution of the problem in the hollow of his hand from 1852 onward. But it was the synthetic genius of Gustav Kirchhoff which first gave unity to the scattered phenomena, and finally reconciled what was elicited in the laboratory with what was observed in the sun. On the 15th of December 1859 he communicated to the Berlin Academy of Sciences the principle which bears his name. Its purport is that glowing vapours similarly circumstanced absorb the identical radiations which they emit. That is to say, they stop out just those sections of white light transmitted through them which form their own special luminous badges. Moreover, if the white light come from a source at a higher temperature than theirs, the sections, or lines, absorbed by them show dark against a continuous background. And this is precisely the case with the sun. Kirchhoff's principle, accordingly, not only afforded a simple explanation of the Fraunhofer lines, but availed to found a far-reaching science of celestial chemistry. Thousands of the dark lines in the solar spectrum agree absolutely in wave-length with the bright rays artificially obtained from known substances, and appertaining to them individually. These substances must then exist near the sun. They are in fact suspended in a state of vapour between our eyes and the photosphere, the dazzling prismatic radiance of which they, to a minute extent, intercept, thus writing their signatures on the coloured scroll of dispersed sunshine. By persistent research, powerfully aided by the photographic camera and by the concave gratings invented by H. A. Rowland (1848–1901) in 1882, about forty terrestrial elements have been identified in the sun. Among them, iron, sodium, magnesium, calcium and hydrogen are conspicuous; but it would be rash to assert that any of the seventy forms of matter provisionally enumerated in text-books are wholly absent from his composition.

Wollaston.

Fraun-hofer.

Kirchhoff.

Chemistry of the sun.

Solar physics has profited enormously by the abolition of glare during total eclipses. That of the 8th of July 1842 was the first to be efficiently observed; and the luminous appendages to the sun disclosed by it were such as to excite startled attention. Their investigation has since been diligently prosecuted. The corona was photographed at Königsberg during the totality of the 28th of July 1851; similar records of the red prominences, successively obtained by Father Angelo Secchi and Warren de la Rue, as the shadow-track crossed Spain on the 18th of July 1860, finally demonstrated their solar status. The Indian eclipse of the 18th of August 1868 supplied knowledge of their spectrum, found to include the yellow ray of an exotic gas named by Sir Norman Lockyer "helium." It further suggested, to Lockyer and P. Janssen separately, the spectroscopic method of observing these objects in daylight. Under cover of an eclipse visible in North America on the 7th of August 1869, the bright green line of the corona was discerned; and Professor C. A. Young caught the "flash spectrum" of the reversing layer, at the moment of second contact, at Xerez de la Frontera in Spain, on the 22nd of December 1870. This significant but evanescent phenomenon, which represents the direct emissions of a low-lying solar envelope, was photographed by William Shackleton on the occasion of an eclipse in Novaya Zemlya on the 9th of August 1896; and it has since been abundantly registered by exposures made during the obscurations of 1898, 1900, 1901 and 1905. A singular and unlooked-for result of eclipse-work has been to include the corona within the scope of solar periodicity. Heinrich Schwabe established, in 1851, the cyclical variation, in eleven years, of spot-frequency; terrestrial magnetic disturbances manifestly obeyed the same law; and the peculiar winged aspect of the corona disclosed by the eclipse of the 29th of July 1878, at an epoch of minimum sun-spots, intimated to A. C. Ranyard a theory of coronal types, changing concurrently with the fluctuations of spot-activity. This was amply verified at subsequent eclipses.

Solar eclipses.

The photography of prominences was, after some preliminary trials by C. A. Young and others, fully realized in 1891 by Professor George E. Hale at Chicago, and independently by Henri Deslandres at Paris. The pictures were taken, in both cases, with only one quality of light, the violet ray of calcium, the remaining superfluous beams being eliminated by the agency of a double slit. The

Prominence photography.

last-named expedient had been described by Janssen in 1867. Hale devised on the same principle the "spectroheliograph," an instrument by which the sun's disk can be photographed in calcium-light by imparting a rapid movement to its image relatively to the sensitive plate; and the method has proved in many ways fruitful.

Stellar spectroscopy.

The likeness of the sun to the stars has been shown by the spectroscope to be profound and inherent. Yet the general agreement of solar and stellar chemistry does not exclude important diversities of detail. Fraunhofer was the pioneer in this branch. He observed, in 1823, dark lines in stellar spectra which Kirchhoff's discovery supplied the means of interpreting. The task, attempted by G. B. Donati in 1860, was effectively taken in hand, two years later, by Angelo Secchi, William Huggins and Lewis M. Rutherfurd. There ensued a general classification of the stars by Secchi into four leading types, distinguished by diversities of spectral pattern; and the recognition by Huggins of a considerable number of terrestrial elements as present in stellar atmospheres. Nebular chemistry was initiated by the same investigator when, on the 29th of August 1864, he observed the bright-line spectrum of a planetary nebula in Draco. About seventy analogous objects, including that in the Sword of Orion, were found by him to give light of the same quality; and thus after seventy-three years, verification was brought to William Herschel's hypothesis of a "shining fluid" diffused through space, the possible raw material of stars. In 1874, Dr H. C. Vogel published a modification of Secchi's scheme of stellar diversities, and gave it organic meaning by connecting spectral differences with advance in "age." And in 1895, he set apart, as in the earliest stage of growth, a new class of "helium stars," supposed to develop successively into Sirian, solar, Antarian, or alternatively into carbon stars.

Spectra of comets.

On the 5th of August 1864, G. B. Donati analysed the light of a small comet into three bright bands. Sir William Huggins repeated the experiment on Winnecke's comet in 1868, obtained the same bands, and traced them to their origin from glowing carbon-vapour. A photograph of the spectrum of Tebbutt's comet, taken by him on the 24th of June 1881, showed radiations of shorter wave-lengths but identical source, and in addition, a percentage of reflected solar light marked as such by the presence of some well-known Fraunhofer lines. Further experience has generalized these earlier results. The rule that comets yield carbon-spectra has scarcely any exceptions. The usual bands were, however, temporarily effaced in the two brilliant apparitions of 1882 by vivid rays of sodium and iron, emitted during the excitement of perihelion-passage.

Progress in spectrography.

The adoption, by Sir William Huggins in 1876, of gelatine or dry plates in celestial photography was a change of decisive import. For it made long exposures possible; and only with long exposures could autographic impressions be secured of such faint objects as nebulae, telescopic comets, and the immense majority of stars, or of the dim ranges of stellar and nebular spectra. The first conspicuous triumph of the new "spectrographic" art thus established was the record by Huggins in 1879 of the dispersed light of several "white" or Sirian stars, in which the chief traits of absorption were the rhythmical series of hydrogen-lines, then memorably discovered. Again by Sir William Huggins, the spectrum of the Orion nebula was photographed on the 7th of March 1882; and the method has gradually become nearly exclusive in the study of nebular emanations. The "Draper Catalogue" of 10,351 stellar spectra was published by Professor E. C. Pickering in 1890. The materials for it were rapidly accumulated by the use of an objective prism, that is, of a prism placed in front of, instead of behind the object-lens, by which means the spectra of all the stars in the field, to the number often of many score, imprinted themselves simultaneously on the sensitive plate. The progress of this survey was marked by a number of important discoveries of "new" and variable stars and of spectroscopic binaries, mainly through the acumen of Mrs Williamina Paton Fleming of Harvard College in scrutinizing the negatives forming the data for the great catalogue.

Doppler's principle.

The principle that the refrangibility of light is altered by end-on motion was enunciated by Christian Doppler of Prague in 1842. The pitch of a steam-whistle quite obviously rises and falls as the engine to which it is attached approaches and recedes from a stationary auditor; and light-pulses are modified like sound-waves by velocity in the line of sight. They are crowded together and therefore rendered shorter and more frequent by the advance of their source, but drawn apart and lengthened by its recession. These effects vary with the rate of motion, which they consequently serve to measure; and they are produced indifferently by movements of the spectator or of the light-source. But Doppler's idea that they might be detected by colour-change was entirely illusory. It would apply only if the spectrum had no infra-red and ultra-violet extensions. These, however, since they share the general lengthening or shortening of wave-length through motion, are thereby shifted, to a certain definite extent, into visibility, and so produce accurate chromatic compensation. Integrated light, accordingly, tells nothing about velocity; but analysed light does, when it includes bright or dark rays the normal positions of which are known. The distinction was pointed out by Hippolyte Fizeau in 1848. By comparison with their analogues in the laboratory it can be determined whether, in which direction, and how much, lines of recognized origin are displaced in the spectra of the heavenly bodies. This subtle mode of research was made available by Sir William Huggins in 1868. He employed it, with an outcome of striking promise, to measure the radial speed of some of the brighter stars. In the following year, Sir Norman Lockyer was enabled to prove, by its means, the extraordinary vehemence of chromospheric disturbances, the bright prominence-rays in his spectroscope betraying, through their opposite shiftings, movements and counter-movements up to 120 m. a second; while its validity and refinement were, in 1871, vouched for by H. C. Vogel's observations on the 9th of June 1871, of differences due to the sun's rotation in the refrangibility of Fraunhofer lines derived respectively from the east and west limbs. Stellar line-of-sight work, however, made no satisfactory progress until, in 1888, Vogel changed the *venue* from the eye to the camera. A high degree of precision in measurement thus became attainable, and has since been fully attained. Not only the grosser facts concerning radial velocity, but variations in it so small as a mile, or less, per second, have been recorded and interpreted in terms of deep meaning. For the investigation of the general scheme of sidereal structure, the multiplication of results of the kind is indispensable. But as yet, the recessional or approaching movements of only a few hundred stars have been registered; and this store of information is scanty indeed compared with the needs of research. How the stars really move in space, and how the sun travels among them, can be ascertained only with the aid of materials collected by the spectrograph, which has now fortunately been brought to comply with the arduous conditions of exactitude requisite for collaboration with the transit instrument and its allies, the clock and chronograph. And here, to their great mutual advantage, the old and the new astronomies meet and join forces.

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ASTROPALIA (classical *Astypalaea*), an island, with good harbours, in the south part of the Aegean, situated in 36·5° N. and immediately west of 26·5° E. It was colonized by Megara, and its constitution and buildings are known from numerous inscriptions. The Roman emperors recognized it as a free state, and in the middle ages it was called *Stampalia*, and belonged to the noble Venetian family of Quirini. It was taken by the Turks in the 16th century, and is now noted for its sponges. The customs and dress of the people, who speak a patois of romaic origin, are interesting.

ASTROPHYSICS, the branch of astronomical science which treats of the physical constitution of the heavenly bodies. So long as these bodies could be known to men only as points or disks of light in the sky, no such science was possible. Even later, when the telescope was the only instrument of research, knowledge on this subject was confined to the appearances presented by the planets, supplemented by more or less probable inferences as to the nature of their surfaces. When, in the third quarter of the 19th century, spectrum analysis was applied to the light coming to us from the heavenly bodies, a new era in astronomical science was opened up of such importance that the body of knowledge revealed by this method has sometimes been termed the "new astronomy." The development of the method has been greatly assisted by photography, while the application of photometric measurements has been a powerful auxiliary in the work. It has thus come about that astrophysics owes its recent development, and its recognition as a distinct branch of astronomical science, to the combination of the processes involved in the three arts of spectroscopy, photography and photometry. The most general conclusions reached by this combination may be summed up as follows:—

1. The heavenly bodies are composed of like matter with that which we find to make up our globe. The sun and stars are found to contain the more important elements with which chemistry has made us acquainted. Iron, calcium and hydrogen may be especially mentioned as three familiar chemical elements which enter largely into the constitution of all the matter of the heavens. It would be going too far to say that all the elements known to us exist in the sun or the stars; nor is the question whether the rarer ones can or cannot be found there of prime importance. The general fact of identity in the main constituents is the one of most fundamental importance. It would be going too far in the other direction to claim that all the elements which compose the heavenly bodies are found on the earth. There are many lines in the spectra of the stars, as well as of the nebulae, which are not certainly identified with those belonging to any elements known to our chemistry. The recent discoveries growing out of the investigation of newly discovered forms of radiation lead to the conclusion that the question of the forms of matter in the stars has far wider range than the simple question whether any given element is or is not found outside our earth. The question is rather that of the infinity of forms that matter may assume, including that most attenuated form found in the nebulae, which seem to be composed of matter more refined than even the atoms supposed to make up the matter around us.

2. The second conclusion is that, as a general rule, the incandescent heavenly bodies are not masses of solid or liquid matter as formerly assumed, but mainly masses either of gas, or of substances gaseous in their nature, so compressed by the gravitation of their superincumbent parts toward a common centre that their properties combine those of the three forms of matter known to us. We have strong reason to believe that even the sun, though much denser than the general average of the stars, may possibly be characterized as gaseous rather than solid. Probabilities also seem to favour the view that this may, to a certain extent, be true of the four great planets of our system. The case of bodies like our earth and Mars, which are solid either superficially or throughout, is probably confined to the smaller bodies of the universe.

3. A third characteristic which seems to belong to the great bodies of the universe is the very high temperature of their interior. With a modification to be mentioned presently, we may regard them as intensely hot bodies, probably at a temperature higher than any we can produce by artificial means, of which the superficial portions have cooled off by radiation into space. A modification in this proposition which may hereafter be accepted involves an extension of our ideas of temperature, and leads us to regard the interior heat of the heavenly bodies as due to a form of molecular activity similar to that of which radium affords so remarkable an instance. This modification certainly avoids many difficulties connected with the question of the interior heat of the earth, sun, Jupiter and probably all the larger heavenly bodies.

A limit is placed on our knowledge of astrophysics which, up to the present time, we have found no means of overstepping. This is imposed upon us by the fact that it is only when matter is in a gaseous form that the spectroscope can give us certain knowledge as to its physical condition. So long as bodies are in the solid state the light which they emit, though different in different substances, has no characteristic so precisely marked that detailed conclusions can be drawn as to the nature of the substance emitting it. Even in a liquid form, the spectrum of any kind of matter is less characteristic than that of gas. Moreover, a gaseous body of uniform temperature, and so dense as to be non-transparent, does not radiate the characteristic spectrum of the gas of which it is composed. Precise conclusions are possible only when a gaseous body is transparent through and through, so that the gas emits its characteristic rays—or when the rays from an incandescent body of any kind pass through a gaseous envelope at a temperature lower than that of the body itself. In this case the revelations of the spectroscope relate only to the constitution of the gaseous envelope, and not to the body below the envelope, from which the light emanates. The outcome of this drawback is that our knowledge of the chemical constitution of the stars and planets is still confined to their atmospheres, and that conclusions as to the constitution of the interior masses which form them must be drawn by other methods than the spectroscopic one.

When the spectroscope was first applied in astronomy, it was hoped that the light reflected from living matter might be found to possess some property different from that found in light reflected from non-living matter, and that we might thus detect the presence of life on the surface of a planet by a study of its spectrum; but no hope of this kind has so far been realized.

We have, in this brief view of the subject, referred mainly to the results of spectrum analysis. Growing out of, but beyond this method is the beginning of a great branch of research which may ultimately explain many heretofore enigmatical phenomena of nature. The discovery of radio-activity may, by explaining the interior heat of the great bodies of the universe, solve a difficulty which since the middle of the 19th century has been discussed by physicists and geologists—that of reconciling the long duration which geologists claim for the crust of the earth with the period during which physicists have deemed it possible that the sun should have radiated heat. Evidence is also accumulating to show that the sun and stars are radio-active bodies, and that emanations proceeding from the sun, and reaching the earth, have important relations to the phenomena of Terrestrial Magnetism and the Aurora.

The subject of Astrophysics does not admit of so definite a subdivision as that of Astrometry. The conclusions which researches relating to it have so far reached are treated in the articles Star; Sun; Comet; Nebula; Aurora Polaris, &c. (S. N.)

ASTRUC, JEAN (1684–1766), French physician and Biblical critic, was born on the 19th of March 1684 at Sauve, in Languedoc.

He graduated in medicine at Montpellier in 1703, and in 1710 he was appointed to the chair of anatomy at Toulouse, which he retained till 1717, when he became professor of medicine at Montpellier. Subsequently he was appointed successively superintendent of the mineral waters of Languedoc (1721), first physician to the king of Poland (1729), and regius professor of medicine at Paris (1731). He died on the 5th of May 1766 at Paris. Of his numerous works, that on which his fame principally rests is the treatise entitled *De Morbis Venereis libri sex*, 1736. In addition to other medical works he published anonymously *Conjectures sur les mêmoires originaux dont il paraît que Moyse s'est servi pour composer le livre de la Genèse*, (1753), in which he pointed out that two main sources can be traced in the book of Genesis; and two dissertations on the immateriality and immortality of the soul, 1755.

See Hauck, *Realencyk. f. prot. Theol.*, 1897, vol. ii. pp. 162-170.

ASTURA, formerly an island, now a peninsula, on the coast of Latium, Italy, 7 m. S.E. of Antium, at the S.E. extremity of the Bay of Antium. The name also belongs to the river which flowed into the sea immediately to the S.E., at the mouth of which there was, according to Strabo, an anchorage. The medieval castle of the Frangipani, in which Conradin of Swabia vainly sought refuge after the battle of Tagliacozza in 1268, is built upon the foundations of a very large villa, of *opus reticulatum* with later additions in brickwork, and with a small harbour attached to it on the south-east. Remains of buildings also exist behind the sand dunes, which possibly mark the line of the channel which separated the island from the mainland, and these may have belonged to the post-station on the Via Severiana. As far as can be seen at present, there are remains of only one villa on the island itself;[1] but along the coast a mile to the north-west a line of villas begins, which continues as far as Antium. To the south-east, on the other hand, remains are almost entirely absent, and this portion of the coast seems to have been as sparsely populated in Roman times as it is now. The island seems to have existed as such in the time of Pope Honorius III. Astura was the site of a favourite villa of Cicero, whither he retired on the death of his daughter Tullia in 45 B.C. It appears to have been unhealthy even in Roman times; according to Suetonius, both Augustus and Tiberius contracted here the illnesses which proved fatal to them.

See T. Ashby, in *Mélanges de l'École Française de Rome* (1905), p. 207. (T. As.)

ASTURIAS, an ancient province and principality of northern Spain, bounded on the N. by the Bay of Biscay, E. by Old Castile, S. by Leon and W. by Galicia. Pop. (1900) 627,069; area, 4205 sq. m. By the division of Spain in 1833, the province took the name of Oviedo, though not to the exclusion, in ordinary usage, of the older designation. A full description of its modern condition is therefore given under the heading Oviedo; the present article being confined to an account of its physical features, its history, and the resultant character of its inhabitants. Asturias consists of a portion of the northern slope of the Cantabrian Mountains, and is covered in all directions with offshoots from the main chain, by which it is almost completely shut in on the south. The higher summits, which often reach a height of 7000–8000 ft., are usually covered with snow until July or August, and the whole region is one of the wildest and most picturesque parts of Spain. Until the first railway was opened, in the middle of the 19th century, few of the passes across the mountains were practicable for carriages, and most of them are difficult even for horses. A narrow strip of level moorland, covered with furze and rich in deposits of peat, coal and amber, stretches inland, from the edge of the sheer cliffs which line the coast, to the foot of the mountains. The province is watered by numerous streams and rivers, which have hollowed out deep valleys; but owing to the narrowness of the level tract, their courses are short, rapid and subject to floods. The most important is the Nalon or Pravia, which receives the waters of the Caudal, the Trubia and the Narcea, and has a course of 62 m.; after it rank the Navia and the Sella. The estuaries of these rivers are rarely navigable, and along the entire littoral, a distance of 130 m., the only important harbours are at Gijón and Avilés.

A country so rugged, and so isolated by land and sea, naturally served as the last refuge of the older races of Spain when hard pressed by successive invaders. Before the Roman conquest, the Iberian tribe of Astures had been able to maintain itself independent of the Carthaginians, and to extend its territory as far south as the Douro. It was famous for its wealth in horses and gold. About 25 B.C., the Romans subjugated the district south of the Cantabrians, to which they gave the name of Augustana. Their capital was Asturica Augusta, the modern Astorga, in Leon. The warlike mountaineers of the northern districts, known as Transmontana, never altogether abandoned their hostility to the Romans, whose rule was ended by the Visigothic conquest, late in the 5th century. In 713, two years after the defeat and death of Roderick, the last Visigothic king, all Spain, except Galicia and Asturias, fell into the hands of the Moors. One of the surviving Christian leaders, Pelayo the Goth, took refuge with three hundred followers in the celebrated cave of Covadonga, or Cobadonga, near Cangas de Onís, and from this hiding-place undertook the Christian reconquest of Spain. The Asturians chose him as their king in 718, and although Galicia was lost in 734, the Moors proved unable to penetrate into the remoter fastnesses held by the levies of Pelayo. After his death in 737, the Asturians continued to offer the same heroic resistance, and ultimately enabled the people of Galicia, Leon and Castile to recover their liberty. The title of prince of Asturias, conferred on the heir-apparent to the crown of Spain, dates from 1388, when it was first bestowed on a Castilian prince. The title of count of Covadonga is assumed by the kings of Spain. In modern times Asturias formed a captaincy-general, divided into Asturias d'Oviedo, which corresponds with the limits of the ancient principality, and Asturias de Santillana, which now constitutes the western half of Santander.

Owing to their almost entire immunity from any alien domination except that of the Romans and Goths, the Asturians may perhaps be regarded as the purest representatives of the Iberian race; while their dialect (*linguaje bable*) is sometimes held to be closely akin to the parent speech from which modern Castilian is derived. It is free from Moorish idioms, and, like Galician and Portuguese, it often retains the original Latin *f* which Castilian changes into *h*. In physique, the Asturians are like the Galicians, a people of hardy mountaineers and fishermen, finely built, but rarely handsome, and with none of the grace of the Castilian or Andalusian. Unlike the Galicians, however, they are remarkable for their keen spirit of independence, which has been fostered by centuries of isolation. Despite the harsh land-laws and grinding taxation which prevent them, with all their industry and thrift, from securing the freehold of the patch of ground cultivated by each peasant family, the Asturians regard themselves as the aristocracy of Spain. This pride in their land, race and history they preserve even when, as often happens, they emigrate to other parts of the country or to South America, and earn their living as servants, water-carriers, or, in the case of the women, as nurses. They make admirable soldiers and sailors, but lack the enterprise and commercial aptitude of the Basques and Catalans; while they are differentiated from the inhabitants of central and southern Spain by their superior industry, and perhaps their lower standard of culture. It is, on the whole, true that by the exclusion of the Moors they lost their opportunity of playing any conspicuous part in the literary and artistic development of Spain. One class of the Asturians deserving special mention is that of the nomad cattle-drovers known as Baqueros or Vaqueros, who tend their herds on the mountains of Leitariegos in summer, and along the coast in winter; forming a separate caste, with distinctive customs, and rarely or never intermarrying with their neighbours.

For the modern condition of the principality (including climate, fauna and flora), see S. Canals, *Asturias: informacion sobre su presente estado* (Madrid, 1900); and G. Casal, *Memorias de historia*

[1] Servius, in speaking of it as *oppidum*, must be referring to the post-station.

natural y médica de Asturias (Oviedo, 1900). For the history and antiquities, there is much that is valuable in *Asturias monumental, epigráfica y diplomática*, &c., by C. M. Vigil (Madrid, 1887)—folio, with maps and illustrations. See also F. de Aramburu y Zuloaga, *Monografía de Asturias* (Oviedo, 1899).

ASTYAGES, the last king of the Median empire. In the inscriptions of Nabonidus the name is written Ishtuvegu (cylinder from Abu Habba V R 64, col. 1, 32; Annals, published by Pinches, *Tr. Soc. Bibl. Arch.* vii. col. 2, 2). According to Herodotus, he was the son of Cyaxares and reigned thirty-five years (584–550 B.C.); his wife was Aryenis, the daughter of Alyattes of Lydia (Herod. i. 74). About his reign we know little, as the narrative of Herodotus, which makes Cyrus the grandson of Astyages by his daughter Mandane, is merely a legend; the figure of Harpagus, who as general of the Median army betrays the king to Cyrus, alone seems to contain an historical element, as Harpagus and his family afterwards obtained a high position in the Persian empire. From the inscriptions of Nabonidus we learn that Cyrus, king of Anshan (Susiana), began war against him in 553 B.C.; in 550, when Astyages marched against Cyrus, his troops rebelled, and he was taken prisoner. Then Cyrus occupied and plundered Ecbatana. The captive king was treated fairly by Cyrus (Herod. i. 130), and according to Ctesias (*Pers.* 5, cf. Justin i. 6) made satrap of Hyrcania, where he was afterwards slain by Oebares against the will of Cyrus, who gave him a splendid funeral. Alexander Polyhistor and Abydenus in their excerpts from Berossus, which Eusebius (*Chron.* i. pp. 29 and 37) and Syncellus (p. 396) have preserved, give the name Astyages to the Median king who reigned in the time of the fall of Nineveh (606 B.C.), and became father-in-law of Nebuchadrezzar. This is evidently a mistake; the name ought to be Cyaxares (in the fragments of the Jewish history of Alexander Polyhistor, in Euseb. *Praep. Ev.* ix. 39, the name is converted into Astibaras, who, according to the unhistorical list of Ctesias, was the father of Astyages), and there is no reason to invent an earlier king Astyages I., as some modern authors have done. The Armenian historians render the name Astyages by Ashdahak, *i.e.* Azhi Dahaka (Zohak), the mythical king of the Iranian epics, who has nothing whatever to do with the historical king of the Medes. (Ed. M.)

ASTYLAR (from Gr. ἀ-, privative, and στῦλος, a column), an architectural term given to a class of design in which neither columns nor pilasters are used for decorative purposes; thus the Ricardi and Strozzi palaces in Florence are astylar in their design, in contradistinction to Palladio's palaces at Vicenza, which are columnar.

ASUNCIÓN (Nuestra Señora de la Asunción), a city and port of Paraguay, and capital of the republic, on the left bank of the Paraguay river in 25° 16′ 04″ S., 57° 42′ 40″ W., and 970 m. above Buenos Aires. Pop. (est. in 1900) 52,000. The port is connected with Buenos Aires and Montevideo by regular lines of river steamers, which are its only means of trade communication with the outer world, and with the inland town of Villa Rica (95 m.) by a railway worked by an English company. The city faces upon a curve in the river bank forming what is called the Bay of Asunción, and is built on a low sandy plain, rising to pretty hillsides overlooking the bay and the low, wooded country of the Chaco on the opposite shore. The general elevation is only 253 ft. above sea-level. Asunción is laid out on a regular plan, the credit for which is largely due to Dictator Francia; the principal streets are paved and lighted by gas and electricity; and telephone and street-car services are maintained. The climate is hot but healthful, the mean annual temperature being about 72° F. The city is the seat of a bishopric dating from 1547, and contains a large number of religious edifices. It has a national college and public library, but no great progress in education has been made. The most prominent edifice in the city is the palace begun by the younger Lopez, which is now occupied by a bank. There are some business edifices and residences of considerable architectural merit, but the greater part are small and inconspicuous, a majority of the residences being thatched, mud-walled cabins. Considerable progress was made during the last two decades of the 19th century, however, notwithstanding misgovernment and the extreme poverty of the people. Asunción was founded by Ayolas in 1535, and is the oldest permanent Spanish settlement on the La Plata. It was for a long time the seat of Spanish rule in this region, and later the scene of a bitter struggle between the church authorities and Jesuits. Soon after the declaration of independence in 1811, the city fell under the despotic rule of Dr Francia, and then under that of the elder and younger Lopez, through which its development was greatly impeded. It was captured and plundered by the Brazilians in 1869, and has been the theatre of several revolutionary outbreaks since then, one of which (1905) resulted in a blockade of several months' duration. (A. J. L.)

ASVINS, in Hindu mythology, twin deities of light. After Indra, Agni and Soma, they are the most prominent divinities in the Rig-Veda, and have more than fifty entire hymns addressed to them. Their exact attributes are obscure. They appear to be the spirits of dawn, the earliest bringers of light in the morning sky; they hasten on in the clouds before Dawn and prepare the way for her. In some hymns they are called sons of the sun; in others, children of the sky; in others, offspring of the ocean. They are youngest of the gods, bright lords of lustre, honey-hued. They are inseparable. The sole purpose of one hymn is to compare them with different twin objects, such as eyes, hands, feet and wings. They have a common wife, Surya. They are physicians, protectors of the weak and old, especially of elderly unmarried women. They are the friends of lovers, and bless marriages and make them fruitful.

See A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897).

ASYLUM (from Gr. ἀ-, privative, and σύλη, right of seizure), a place of refuge. In ancient Greece, an asylum was an "inviolable" refuge for persons fleeing from pursuit and in search of protection. In a general sense, all Greek temples and altars were inviolable, that is, it was a religious crime to remove by force any person or thing once under the protection of a deity. But it was only in the case of a small number of temples that this protecting right of a deity was recognized with common consent. Such were the sanctuaries of Zeus Lycaeus in Arcadia, of Poseidon in the island of Calauria, and of Apollo at Delos; they were, however, numerous in Asia Minor. They guaranteed absolute security to the suppliant within their limits. The right of sanctuary, originally possessed by all temples, appears to have become limited to a few in consequence of abuses of it. Asylums in this sense were peculiar to the Greeks. The asylum of Romulus (Livy i. 8), which was probably the altar of Veiovis, cannot be considered as such. Under Roman dominion, the rights of existing Greek sanctuaries were at first confirmed, but their number was considerably reduced by Tiberius. Under the Empire, the statues of the emperors and the eagles of the legions were made refuges against acts of violence. Generally speaking, the classes of persons who claimed the rights of asylum were slaves who had been maltreated by their masters, soldiers defeated and pursued by the enemy, and criminals who feared a trial or who had escaped before sentence was passed. (See treatises *De Asylis Graecis*, by Förster, 1847; Jaenisch, 1868; Barth, 1888.)

With the establishment of Christianity, the custom of asylum or sanctuary (*q.v.*) became attached to the church or churchyard. In modern times the word asylum has come to mean an institution providing shelter or refuge for any class of afflicted or destitute persons, such as the blind, deaf and dumb, &c., but more particularly the insane. (See Insanity.)

ASYLUM, RIGHT OF (Fr. *droit d'asile*; Ger. *Asylrecht*), in international law, the right which a state possesses, by virtue of the principle that every independent state is sole master within its boundaries, of allowing fugitives from another country to enter or sojourn upon its territory. Extradition (*q.v.*) treaties are undertakings between states curtailing the exercise of the right of asylum in respect of refugees from justice, but the conditions therein laid down invariably show that nations regard the maintenance of this right of asylum as intimately connected with their right of independent action, however weak as states they may be, on their own soil. The neutral right to grant asylum to belligerent forces is now governed by articles 57, 58

and 59 of the regulations annexed to the Hague Convention of the 29th of July 1899, relating to the Laws and Customs of War on Land. (See WAR.) (T. BA.)

ATACAMA, a province of northern Chile, bounded N. and S. respectively by the provinces of Antofagasta and Coquimbo, and extending from the Pacific coast E. to the Argentine boundary line. It has an area of 30,729 sq. m., lying in great part within the Atacama desert region (see below), and a population (1902) of 71,446. The silver and copper mines of the province are numerous, some of them ranking among the most productive known, but the majority are worked with limited capital and on a small scale. The silver ore was first discovered in 1832 by a shepherd at a place which bears his name, Juan Godoi. The nitrate and borax deposits are extensive and productive, and common salt is a natural product of large areas in the elevated desert regions of the Andes. The exports include copper and silver and their ores, nitrate of soda, borax, guano and other minerals in small quantities. The capital, Copiapó (est. pop. 8991 in 1902), is situated on a small river of the same name 37 m. from the coast and 51 m. south-east by rail from Caldera, the principal port of this great mining district. Before 1842, when guano began to attract notice as an exportable product, Atacama was considered as Bolivian territory, and Coquimbo the extreme northern province of Chile. In that year Chile decided to explore the desert coast, and in 1843 that part of the desert extending north to the 26th parallel was organized into the province of Atacama.

ATACAMA, DESERT OF, an arid, barren and saline region of western South America, covering the greater part of the Chilean provinces of Atacama and Antofagasta, the Argentine territory of Los Andes, and the south-western corner of the Bolivian department of Potosí. The higher elevations are known as the Puna de Atacama, which is practically a continuation southward of the great *puna* region of Peru and Bolivia. It is a broken, mountainous region, volcanic in places, saline in others, and ranges from 7000 to 13,500 ft. in general elevation. Its culminating ridges are marked by an irregular line of peaks and extinct volcanoes extending north by east from about 28° S. into southern Bolivia. On the eastern side, occasional rainfalls occur and streams from the snow-clads peaks produce some slight displays of fertility, but the general aspect of the plateaus, which are dry and cold in winter and in summer are swept by rain-storms and covered by occasional tufts of coarse grass, is barren and forbidding. They are also broken by great saline lagoons and dry salt basins. This region forms the Argentine territory of Los Andes and is habitable in places. On the western slope the land descends gradually to the Pacific, being broken into great basins, or terraces, by mountainous ridges in its higher elevations, widening out into gently-sloping sandy plains below, famous for their nitrate deposits, and terminating on the coast with sharply-sloping bluffs, having an elevation of 800 to 1500 ft., and looking from the sea like a range of flat-topped hills. This desolate region, which is rainless and absolutely barren, and was considered worthless for three and a half centuries, is now a treasure-house of mineral wealth, abounding in copper, silver, lead, nickel, cobalt, iron, nitrates and borax. It is occupied by many mining settlements, and includes some of the most productive copper and silver mines of the world.

See L. Darapsky, "Zur Geographie der Puna de Atacama," *Zeits. Ges. Erdk. zu Berlin*, 1899; G. E. Church, "South America: an Outline of its Physical Geography," *Geographical Journal*, 1901; John Ball, *Notes of a Naturalist in South America* (London, 1887); F. O'Driscoll, "A Journey to the North of the Argentine Republic," *Geographical Journal*, 1904. (A. J. L.)

ATACAMITE, a mineral found originally in the desert of Atacama, and named by D. de Gallizen in 1801. It is a cupric oxychloride, having the formula $CuCl_2.3Cu(OH)_2$, and crystallizing in the orthorhombic system. Its hardness is about 3 and its specific gravity 3·7, while its colour presents various shades of green, usually dark. Atacamite is a comparatively rare mineral, formed in some cases by the action of sea-water on various copper-ores, and occurring also as a volcanic product on Vesuvian lavas. Some of the finest crystals have been yielded by the copper-mines of South Australia, especially at Wallaroo. It occurs also, with malachite, at Bembe, near Ambriz, in West Africa. From one of its localities in Chile, Los Remolinos, it was termed Remolinite by Brooke and Miller. Atacamite, in a pulverulent state, was formerly used as a pounce under the name of "Peruvian green sand," and was known in Chile as arsenillo. (F. W. R.*)

ATAHUALLPA (*atahu*, Lat. *virtus*, and *allpa*, sweet), "the last of the Incas" (or Yncas) of Peru, was the son of the ruler Huayna Capac, by Pacha, the daughter of the conquered sovereign of Quito. His brother Huascar succeeded Huayna Capac in 1527; for, as Atahuallpa was not descended on both sides from the line of Incas, Peruvian law considered him illegitimate. He obtained, however, the kingdom of Quito. A jealous feeling soon sprang up between him and Huascar, who insisted that Quito should be held as a dependent province of his empire. A civil war broke out between the brothers, and, about the time when the Spanish conqueror Pizarro was beginning to move inland from the town of San Miguel, Huascar had been defeated and thrown into prison, and Atahuallpa had become Inca. Pizarro set out in September 1532, and made for Caxamarca, where the Inca was. Messengers passed frequently between them, and the Spaniards on their march were hospitably received by the inhabitants. On the 15th of November, Pizarro entered Caxamarca, and sent his brother and Ferdinando de Soto to request an interview with the Inca. On the evening of the next day, Atahuallpa entered the great square of Caxamarca, accompanied by some five or six thousand men, who were either unarmed or armed only with short clubs and slings concealed under their dresses. Pizarro's artillery and soldiers were planted in readiness in the streets opening off the square. The interview was carried on by the priest Vicente de Valverde, who addressed the Inca through an interpreter. He stated briefly and dogmatically the principal points of the Christian faith and the Roman Catholic policy, and concluded by calling upon Atahuallpa to become a Christian, obey the commands of the pope, give up the administration of his kingdom, and pay tribute to Charles V., to whom had been granted the conquest of these lands. To this extraordinary harangue, which from its own nature and the faults of the interpreter must have been completely unintelligible, the Inca at first returned a very temperate answer. He pointed out what seemed to him certain difficulties in the Christian religion, and declined to accept as monarch of his dominions this Charles, of whom he knew nothing. He then took a bible from the priest's hands, and, after looking at it, threw it violently from him, and began a more impassioned speech, in which he exposed the designs of the Spaniards, and upbraided them with the cruelties they had perpetrated. The priest retired, and Pizarro at once gave the signal for attack. The Spaniards rushed out suddenly, and the Peruvians, astonished and defenceless, were cut down in hundreds. Pizarro himself seized the Inca, and in endeavouring to preserve him alive, received, accidentally, on his hand the only wound inflicted that day on a Spaniard. Atahuallpa, thus treacherously captured, offered an enormous sum of money as a ransom, and fulfilled his engagement; but Pizarro still detained him, until the Spaniards should have arrived in sufficient numbers to secure the country. While in captivity, Atahuallpa gave secret orders for the assassination of his brother Huascar, and also endeavoured to raise an army to expel the invaders. His plans were betrayed, and Pizarro at once brought him to trial. He was condemned to death, and, as being an idolator, to death by fire. Atahuallpa, however, professed himself a Christian, received baptism, and his sentence was then altered into death by strangulation (August 29, 1533). His body was afterwards burned, and the ashes conveyed to Quito. (See also PERU: *History*.)

ATALANTA, in Greek legend, the name of two Greek heroines. (1) The Arcadian Atalanta was the daughter of Iasius or Iasion and Clymene. At her birth, she had been exposed on a hill, her father having expected a son. At first she was suckled by a she-bear, and then saved by huntsmen, among whom she grew

up to be skilled with the bow, swift, and fond of the chase, like the virgin goddess Artemis. At the Calydonian boar-hunt her arrows were the first to hit the monster, for which its head and hide were given her by Meleager. At the funeral games of Pelias, she wrestled with Peleus, and won. For a long time she remained true to Artemis and rejected all suitors, but Meilanion at last gained her love by his persistent devotion. She was the mother of Parthenopaeus, one of the Seven against Thebes (Apollodorus iii. 9; Hyginus, *Fab.* 99). (2) The Boeotian Atalanta was the daughter of Schoeneus. She was famed for her running, and would only consent to marry a suitor who could outstrip her in a race, the consequence of failure being death. Hippomenes, before starting, had obtained from Aphrodite three golden apples, which he dropped at intervals, and Atalanta, stopping to pick them up, fell behind. Both were happy at the result; but forgetting to thank the goddess for the apples, they were led by her to a religious crime, and were transformed into lions by the goddess Cybele (Ovid, *Metam.* x. 560; Hyginus, *Fab.* 185). The characteristics of these two heroines (frequently confounded) point to their being secondary forms of the Arcadian Artemis.

ATARGATIS, a Syrian deity, known to the Greeks by a shortened form of the name, Derketo (Strabo xvi. c. 785; Pliny, *Nat. Hist.* v. 23. 81), and as Dea Syria, or in one word Deasura (Lucian, *de Dea Syria*). She is generally described as the "fish-goddess." The name is a compound of two divine names; the first part is a form of the Himyaritic '*Athtar*, the equivalent of the Old Testament *Ashtoreth*, the Phoenician *Astarte* (*q.v.*), with the feminine ending omitted (Assyr. *Ishtar*); the second is a Palmyrene name '*Athe* (*i.e. tempus opportunum*), which occurs as part of many compounds. As a consequence of the first half of the name, Atargatis has frequently, though wrongly, been identified with Astarte. The two deities were, no doubt, of common origin, but their cults are historically distinct. In 2 Macc. xii. 26 we find reference to an Atargateion or Atergateion (temple of Atargatis) at Carnion in Gilead (cf. 1 Macc. v. 43), but the home of the goddess was unquestionably not Palestine, but Syria proper, expecially at Hierapolis (*q.v.*), where she had a great temple. From Syria her worship extended to Greece, Italy and the furthest west. Lucian and Apuleius give descriptions of the beggar-priests who went round the great cities with an image of the goddess on an ass and collected money. The wide extension of the cult is attributable largely to Syrian merchants; thus we find traces of it in the great seaport towns; at Delos especially numerous inscriptions have been found bearing witness to its importance. Again we find the cult in Sicily, introduced, no doubt, by slaves and mercenary troops, who carried it even to the farthest northern limits of the Roman empire. In many cases, however, Atargatis and Astarte are fused to such an extent as to be indistinguishable. This fusion is exemplified by the Carnion temple, which is probably identical with the famous temple of Astarte at Ashtaroth-Karnaim.

Atargatis appears generally as the wife of Hadad (Baal). They are the protecting deities of the community. Atargatis, in the capacity of πολιοῦχος, wears a mural crown, is the ancestor of the royal house, the founder of social and religious life, the goddess of generation and fertility (hence the prevalence of phallic emblems), and the inventor of useful appliances. Not unnaturally she is identified with the Greek Aphrodite. By the conjunction of these many functions, she becomes ultimately a great Nature-Goddess, analogous to Cybele and Rhea (see GREAT MOTHER OF THE GODS); in one aspect she typifies the function of water in producing life; in another, the universal mother-earth (Macrobius, *Saturn*, i. 23); in a third (influenced, no doubt, by Chaldaean astrology), the power of destiny. The legends are numerous and of an astrological character, intended to account for the Syrian dove-worship and abstinence from fish (see the story in Athenaeus viii. 37, where Atargatis is derived from ἄτερ Γάτιδος, "without Gatis,"—a queen who is said to have forbidden the eating of fish). Thus Diodorus Siculus, using Ctesias, tells how she fell in love with a youth who was worshipping at the shrine of Aphrodite, and by him became the mother of Semiramis, the Assyrian queen, and how in shame she flung herself into a pool at Ascalon or Hierapolis and was changed into a fish (W. Robertson Smith in *Eng. Hist. Rev.* ii., 1887). In another story she was hatched from an egg found by some fish in the Euphrates and by them thrust on the bank where it was hatched by a dove; out of gratitude she persuaded Jupiter to transfer the fish to the Zodiac (cf. Ovid, *Fast.* ii. 459-474, *Metam.* v. 331).

See articles *s.v.* in Herzog-Hauck, *Realencyk.* (1897), by W. Baudissin; and Pauly-Wissowa, *Realencyc.*; Fr. Baethgen, *Beiträge zur Semit. Religiongesch.* (1888); R. Pietschmann, *Gesch. der Phönizier* (1889).

ATAULPHUS (the Latinized form of the Gothic Ataulf, "Father-wolf," from *atta*, father, and *vulfs*, wolf; mod. Germ. Adolf, Latinized as Adolphus, the form used by Gibbon for the subject of this article), king of the Goths (d. 415). On the death of Alaric (*q.v.*) his followers acclaimed his brother-in-law Ataulphus as king. In 412 he quitted Italy and led his army across the Alps into Gaul. Here he fought against some of the usurpers who threatened the throne of Honorius; he made some sort of compact with that emperor and, in 414, he married his sister Placidia, who had been since the siege of Rome a captive in the camp of the Goths. The ex-emperor Attalus danced at the marriage festival, which was celebrated with great pomp at Narbonne. In 415 Ataulphus crossed the Pyrenees into Spain and died at Barcelona, being assassinated by a groom. The most important fact in his history is his confession, recorded by Orosius, that he saw the inability of his countrymen to rear a civilized or abiding kingdom, and that consequently his aim should be to build on Roman foundations and blend the two nations into one.

ATAVISM (from Lat. *atavus*, a great-great-great-grandfather or ancestor), the term given in biology to the reproduction in a living person or animal of the characteristics of an ancestor more remote than its parents (see HEREDITY). Loosely used, it connotes a reversion to an earlier type. Individuals reproduce unexpectedly the traits of earlier ancestors, and ethnologists and criminologists frequently explain by "atavism" the occurrence of degenerate species of man; but the whole subject is complicated by other possible explanations of such phenomena, included in the scientific study of normal "variation."

ATBARA (*Bahr-el-Aswad*, or Black River), the most northern affluent of the river Nile, N.E. Africa. It rises in Abyssinia to the N.W. of Lake Tsana, unites its waters with a number of other rivers which also rise in the Abyssinian highlands, and flows north-west 800 m. till its junction at Ed Damer with the Nile (*q.v.*). The battle of the Atbara, fought near Nakheila, a place on the north bank of the river about 30 m. above Ed Damer, on the 8th of April 1898, between the khalifa's forces under Mahmud and Sir Herbert (afterwards Lord) Kitchener's Anglo-Egyptian army, resulted in the complete defeat of the Mahdists and the capture of their leader, and paved the way for the decisive battle of Omdurman on the 2nd of September following (see EGYPT: *Military Operations*).

ATCHISON, a city and the county-seat of Atchison county, Kansas, U.S.A., on the west bank of the Missouri river, which is navigable at this point but is utilized comparatively little for commerce. Pop. (1890) 13,963; (1900) 15,722, of whom 2508 were of negro descent and 1308 were foreign-born; (1910) 16,429. Atchison is served by the Atchison, Topeka & Santa Fé, the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, and the Missouri Pacific railways. The city is the seat of Midland College (Lutheran, 1887), St Benedict's College (Roman Catholic, 1858) for boys, Mt. Scholastica Academy (Roman Catholic) for girls, and Western Theological Seminary (Evangelical-Lutheran, 1893); a state soldiers' orphans' home is also located here. Atchison's situation and transportation facilities make it an important supply-centre, its trade in grains and live-stock being particularly large; it has large railway machine shops, and its principal manufactures are flour, furniture, lumber, hardware and drugs. The value of the city's factory

products increased from $2,093,469 in 1900 to $4,052,274 in 1905, or 93·6%. Atchison was founded in 1854 by pro-slavery partisans, and was named in honour of their leader, David Rice Atchison, a United States senator. The city was quickly surpassed by Leavenworth in commercial importance, and during the Kansas struggle was never of great political importance. Its first city charter was granted in 1858. The Atchison *Globe* (established 1878) is one of the best-known of western papers.

ATE, in Greek mythology, the personification of criminal folly, the daughter of Zeus and Eris (Strife). She misled even Zeus to take a hasty oath, whereby Heracles became subject to Eurystheus. Zeus thereupon cast her by the hair out of Olympus, whither she did not return, but remained on earth, working evil and mischief (*Iliad*, xix. 91). She is followed by the Litae (Prayers), the old and crippled daughters of Zeus, who are able to repair the evil done by her (*Iliad*, ix. 502). In later times Ate is regarded as the avenger of sin (Sophocles, *Antigone*, 614, 625).

See J. Girard, *Le Sentiment religieux en Grèce* (1869); J. F. Scherer, *De Graecorum Ates Notione atque Indole* (1858); E. Berch, *Bedeutung der Ate bei Aeschylos* (1876); C. Lehrs, *Populäre Aufsätze aus dem Alterthum* (1875); L. Schmidt, *Die Ethik der alten Griechen* (1882).

ATELLA, an ancient Oscan town of Campania, 9 m. N. of Naples and 9 m. S. of Capua, on the road between the two. It was a member of the Campanian confederation, and shared the fortunes of Capua, but remained faithful to Hannibal for a longer time; the great part of the inhabitants, when they could no longer resist the Romans, were transferred by him to Thurii, and the town was reoccupied in 211 by the Romans, who settled the exiled inhabitants of Nuceria there. The fate of Atella at the end of the war, when the latter were able to return to their own city, is unknown. Cicero was in friendly relations with it, and exerted influence that it might retain its property in Gaul, so that it is obvious that it had then recovered municipal rights. The town is mainly famous as the cradle of early Roman comedy, the *Fabulae Atellanae* (see below). Some remains of the town still exist, including a tower of the city wall in brick.

See J. Beloch, *Campanien* (2nd ed., Breslau, 1890), p. 379.

ATELLANAE FABULAE ("Atellan fables"), the name of a sort of popular comedy amongst the ancient Romans. The name is derived from Atella, an Oscan town in Campania; for this reason, and from their being also called *Osci ludi*, it has been supposed that they were of Oscan origin and introduced at Rome after Campania had been deprived of its independence. It seems highly improbable that they were performed in the Oscan language. Mommsen, however, rejects their Oscan origin altogether; he regards them as purely Latin, the scene merely being laid at Atella to avoid causing offence by placing it at Rome or one of the Latin cities. These plays, or rather sketches, contained humorous descriptions of country as contrasted with town life, and found their subjects amongst the lower classes of the people. The subjects alone were decided upon before the performance began; the dialogue was improvised as it proceeded. The Atellanae contained certain stock characters, like the Italian harlequinades: Maccus (the fool), Bucco (fat-chaps), Pappus (daddy), Dossennus (sharper); monsters and bogeys like Manducus, Pytho, Lamia also made their appearance. The performers were the sons of Roman citizens, who did not lose their rights as citizens, and were allowed to serve in the army: professional actors were excluded. The simple prose dialogues were probably varied by songs in the rude Saturnian metre: the language was that of the common people, accompanied by lively gesticulation and movements. They were characterized by coarseness and obscenity. In the time of Sulla a literary form was given to the Atellanae by Pomponius of Bononia and Novius, who made them regular written comedies. Living persons seem to have been attacked, and even the doings of the gods and heroes of mythology burlesqued. From this time the Atellanae were used as after-pieces and performed by professional actors. In 46 B.C. they were ousted by the mimes, but regained popularity during the reign of Tiberius (chiefly owing to a certain Mummius), until they were definitely superseded by and merged in the mimes. They held their ground in the small towns and villages of Italy during the last days of the empire; they probably lingered on into the middle ages, and were the origin of the Italian *Commedie dell' arte*.

The scanty fragments of Pomponius and Novius are collected in Ribbeck's *Comicorum Romanorum Reliquiae*; see also Munk, *De Fabulis Atellanis* (1840); and art. LATIN LITERATURE.

ATESTE (mod. *Este, q.v.*), an ancient town of Venetia, at the southern foot of the Euganean hills, 43 ft. above sea-level; 22 m. S.W. of Patavium (Padua). The site was occupied in very early times, as the discoveries since 1882 show. Large cemeteries have been excavated, which show three different periods from the 8th century B.C. down to the Roman domination. In the first period (Italic) cremation burials closely approximating to the Villanova type are found; in the second[1] (Venetian) the tombs are constructed of blocks of stone, and *situlae* (bronze buckets), sometimes decorated with elaborate designs, are frequently used to contain the cinerary urns; in the third (Gallic), which begins during the 4th century B.C., though cremation continues, the tombs are much poorer, the ossuaries being of badly baked rough clay, and show traces of Gallic influence, and characteristics of the La-Tène civilization. The many important objects found in these excavations are preserved in the local museum. See G. Ghirardini in *Notizie degli Scavi*; *Monumenti dei Lincei*, ii. (1893) 161 seq., vii. (1897) 5 seq., x. (1901) 5 seq.; *Atti del Congresso Internazionale di Scienze Storiche* (Rome, 1904), v. 279 seq. Inscriptions show that the national language asserted its existence even after Ateste came into the hands of the Romans. When this occurred is not known; boundary stones of 135 B.C. exist, which divide the territory of Ateste from that of Patavium and of Vicetia, showing that the former extended from the middle of the Euganean hills to the Atesis (mod. *Adige*, from which Ateste no doubt took its name, and on which it once stood). After the battle of Actium, Augustus settled veterans from various of his legions in this territory, Ateste being thenceforth spoken of as a colony. It appears to have furnished many recruits, especially for the *cohortes urbanae*. It appears but little in history, though its importance is vouched for by numerous inscriptions, the majority of which belong to the early Empire. (T. As.)

ATH, or AATH, an ancient town of the province of Hainaut, Belgium, situated on the left bank of the Dender. Pop. (1890) 9868; (1904) 11,201. Formerly it was fortified, but after the change in the defensive system of Belgium in 1858 the fortress was dismantled and its ramparts superseded by boulevards. Owing to a fire caused by lightning its fine church of St Julien, dating from the 14th century, which had escaped serious injury during many wars, was destroyed in 1817 (since rebuilt). This left the Tour Burbant as its sole relic of the middle ages. This tower formed part of the *donjon* of the fortress erected by Baldwin IV., count of Hainaut, about the year 1150. Near Ath is the fine castle of Beloeil, the ancient seat of the princely family of Ligne. Ath is famous for its gild of archers, whose butts are erected on the plain of the Esplanade in the centre of the town. The town militia has the privilege of being armed with bows and crossbows. Ath is also well known in Hainaut for its annual fête called *le jour de ducasse—ducasse* being the Walloon word for kermesse (fête). On this occasion a procession escorting figures of two giants, Goliath, called locally Goyasse, and Samson, forms the chief feature of the celebration. The emperor Joseph II. stopped it for its "idolatrous" character, but this act was one of the causes of the Brabant revolution of 1789. The procession, revived in 1790, was again stopped by the French republicans five years later, but was revived under the Empire, and has flourished ever since.

ATHABASCA (*Athapescow*), or ELK, a river and lake of the province of Alberta, Canada. The river rises in the Rocky Mountains near the Yellowhead Pass in 52° 10′ N. and 117° 10′ W., and flows north-east as far as Athabasca Landing, and thence north into Lake Athabasca. It is 740 m. long and has a number of important tributaries, including the McLeod, Pembina, Lesser

[1] This is by some authorities divided into two.

Slave, which drains the lake of that name, and Clearwater. Athabasca lake is 195 m. long, west to east, from 20 to 32 m. wide, has an area of 3085 sq. m., and is 690 ft. above the sea. It discharges its waters northward by Slave river and the Mackenzie system to the Arctic Ocean. On its north shore the country is high and rocky; on the south, sandy and barren. Shallow-draught steamers navigate the lake and river, and Lesser Slave lake and river, with one interruption—at Grand Rapids near the mouth of the Clearwater river.

ATHALARIC (516–534), king of the Ostrogoths, grandson of Theodoric, became king of the Ostrogoths in Italy on his grandfather's death (526). As he was only ten years old, the regency was assumed by his mother Amalasuntha (*q.v.*). The murmurs of the Gothic nobles procured for their young sovereign too early emancipation from the schoolroom. He drank heavily, and indulged in vicious excesses which ruined his constitution. He died on the 2nd of October 534.

ATHALIAH, in the Bible, the daughter of Ahab, and wife of Jehoram, king of Judah. After the death of Ahaziah, her son, she usurped the throne and reigned for six years. She is said to have massacred all the members of the royal house of Judah (2 Kings xi. 1-3), but a similar atrocity is also ascribed to Jehu (2 Kings x. 12-14); with both notices contrast 2 Chron. xxi. 17. The sole survivor Joash was concealed in the temple by his aunt, Jehosheba, wife of the priest Jehoida (2 Chron. xxii. 11). These organized a revolution in favour of Joash, and caused Athaliah and her adherents to be put to death (2 Kings xi.; 2 Chron. xxii. 10-12, xxiii., xxiv. 7).

The story of Athaliah forms the subject of one of Racine's best tragedies. It has been musically treated by Handel and Mendelssohn.

ATHAMAS, in Greek mythology, king of the Minyae in Boeotian Orchomenus, son of Aeolus, king of Thessaly, or of Minyas. His first wife was Nephele, the cloud-goddess, by whom he had two children, Phrixus and Helle (see ARGONAUTS). Athamas and his second wife Ino were said to have incurred the wrath of Hera, because Ino had brought up Dionysus, the son of her sister Semele, as a girl, to save his life. Athamas went mad, and slew one of his sons, Learchus; Ino, to escape the pursuit of her frenzied husband, threw herself into the sea with her other son Melicertes. Both were afterwards worshipped as marine divinities, Ino as Leucothea, Melicertes as Palaemon (*Odyssey* v. 333). Athamas, with the guilt of his son's murder upon him, was obliged to flee from Boeotia. He was ordered by the oracle to settle in a place where he should receive hospitality from wild beasts. This he found at Phthiotis in Thessaly, where he surprised some wolves eating sheep; on his approach they fled, leaving him the bones. Athamas, regarding this as the fulfilment of the oracle, settled there and married a third wife, Themisto. The spot was afterwards called the Athamanian plain (Apollodorus i. 9; Hyginus, *Fab.* 1-5; Ovid, *Metam.* iv. 416, *Fasti*, vi. 485; Valerius Flaccus i. 277).

According to a local legend, Athamas was king of Halos in Phthiotis from the first (Schol. on Apoll. Rhodius ii. 513). After his attempt on the life of Phrixus, which was supposed to have succeeded, the Phthiots were ordered to sacrifice him to Zeus Laphystius, in order to appease the anger of the gods. As he was on the point of being put to death, Cytissorus, a son of Phrixus, suddenly arrived from Aea with the news that Phrixus was still alive. Athamas's life was thus saved, but the wrath of the gods was unappeased, and pursued the family. It was ordained that the eldest born of the race should not enter the council-chamber; if he did so, he was liable to be seized and sacrificed if detected (Herodotus vii. 197). The legend of Athamas is probably founded on a very old custom amongst the Minyae—the sacrifice of the first-born of the race of Athamas to Zeus Laphystius. The story formed the subject of lost tragedies by Aeschylus, Sophocles, Euripides and other Greek and Latin dramatists.

ATHANAGILD (d. 547) became king of the Visigoths (in Spain) in 534, having invoked the aid of the emperor Justinian for his revolt against his predecessor Agila. Athanagild, when himself king, vainly tried to oust his late allies from the footing which they had gained in Spain, nor were the Greeks finally expelled from Spain till seventy years later. Athanagild himself is chiefly remembered for the tragic fortunes of his daughters Brunechildis and Gavleswintha, who married two Frankish brother kings, Sigebert and Chilperic. Athanagild died ("peacefully," as the annalist remarks) in 547.

ATHANARIC (d. 381), a ruler of the Visigoths from about 366 to 380. He bore the title not of king but of judge, a title which may be compared with that of ealdorman among the Anglo-Saxon invaders of Britain. Athanaric waged, from 367 to 369, an unsuccessful war with the emperor Valens, and the peace by which the war was ended was ratified by the Roman and Gothic rulers meeting on a barge in mid-stream of the Danube. Athanaric was a harsh and obstinate heathen, and his short reign was chiefly famous for his brutal persecution of his Christian fellow-countrymen. In 376 he was utterly defeated by the Huns, who a few years before had burst into Europe. The bulk of the Visigothic people sought refuge within the Empire in the region now known as Bulgaria, but Athanaric seems to have fled into Transylvania. Being attacked there by two Ostrogothic chiefs he also, in 381, sought the protection of the Roman emperor. Theodosius I. received him courteously, and he was profoundly impressed by the glories of Constantinople, but on the fifteenth day after his arrival he died, and was honoured by the emperor with a magnificent funeral.

ATHANASIUS (293–373), bishop of Alexandria and saint, one of the most illustrious defenders of the Christian faith, was born probably at Alexandria. Of his family and of his early education nothing can be said to be known. According to the legend, the boy is said to have once baptized some of his playmates and thereupon to have been taken into his house by Bishop Alexander, who recognized the validity of this proceeding. It is certain that Athanasius was young when he took orders, and that he must soon have entered into close relations with his bishop, whom, after the outbreak of the Arian controversy, he accompanied as archdeacon to the council of Nicaea. In the sessions and discussions of the council he could take no part; but in unofficial conferences he took sides vigorously, according to his own evidence, against the Arians, and was certainly not without influence. He had already, before the opening of the Council, defined his personal attitude towards the dogmatic problem in two essays, *Against the Gentiles* and *On the Incarnation*, without, however, any special relation to the Arian controversy.

The essay *On the Incarnation* is the *locus classicus* for the presentation of the teaching of the ancient church on the subject of salvation. In this the great idea that God himself had entered into humanity becomes dominant. The doom of death under which mankind had sighed since Adam's fall could only then be averted, when the immortal Word of God (Λόγος) assumed a mortal body, and, by yielding this to death for the sake of all, abrogated once for all the law of death, of which the power had been spent on the body of the Lord. Thus was rendered possible the leading back of mankind to God, of which the sure pledge lies in the grace of the resurrection of Christ. Athanasius would hear of no questioning of this religious mystery. In the catch-word *Homousios*, which had been added to the creed at Nicaea, he too recognized the best formula for the expression of the mystery, although in his own writings he made but sparing use of it. He was in fact less concerned with the formula than with the content. Arians and Semi-Arians seemed to him to be pagans, who worship the creature, instead of the God who created all things, since they teach two gods, one having no beginning, the other having a beginning in Time and therefore of the same nature as the heathen gods, since, like them, he is a creature. Athanasius has no terms for the definition of the Persons in the one "Divine" (τὸ θεῖον), which are in their substance one; and yet he is certain that this "Divine" is not a mere abstraction, but something truly personal: "They are One,". so he wrote later in his *Discourses against the Arians*, "not as though the unity were torn into two parts, which outside the unity would be nothing, nor as though the unity bore two names, so that one and the same is at one time Father and then

his own Son, as the heretic Sabellius imagined. But they are two, for the Father is Father, and the Son is not the same, but, again, the Son is Son, and not the Father himself. But their Nature (φύσις) is one, for the Begotten is not dissimilar (ἀνόμοιος) to the Begetter, but his image, and everything that is the Father's is also the Son's."

Five months after the return from the council of Nicaea Bishop Alexander died; and on the 8th of February 326 Athanasius, at the age of thirty-three, became his successor. The first years of his episcopate were tranquil; then the storms in which the remainder of his life was passed began to gather round him. The council had by no means composed the divisions in the Church which the Arian controversy had provoked. Arius himself still lived, and his friend Eusebius of Nicomedia rapidly regained influence over the emperor Constantine. The result was a demand made by the emperor that Arius should be readmitted to communion. Athanasius stood firm, but many accusers soon rose up against one who was known to be under the frown of the imperial displeasure. He was charged with cruelty, even with sorcery and murder. It was reported that a bishop of the Meletian party (see MELETIUS) in the Thebaid, of the name of Arsenius, had been unlawfully put to death by him. He was easily able to clear himself of these charges ; but the hatred of his enemies was not relaxed, and in the summer of 335 he was peremptorily ordered to appear at Tyre, where a council had been summoned to sit in judgment upon his conduct. There appeared plainly a predetermination to condemn him, and he fled from Tyre to Constantinople to appeal to the emperor himself. Refused at first a hearing, his perseverance was at length rewarded by the emperor's assent to his reasonable request that his accusers should be brought face to face with him in the imperial presence. Accordingly the leaders of the council, the most conspicuous of whom were Eusebius of Nicomedia and his namesake of Caesarea, were summoned to Constantinople. Here they did not attempt to repeat their old charges, but found a more effective weapon to their hands in a new charge of a political kind—that Athanasius had threatened to stop the Alexandrian corn-ships bound for Constantinople. It is very difficult to understand how far there was truth in the persistent accusations made against the prince-bishop of Alexandria. Probably there was in the very greatness of his character and the extent of his popular influence a certain species of dominance which lent a colour of truth to some of the things said against him. On the present occasion his accusers succeeded at once in arousing the imperial jealousy. Without obtaining a hearing, he was banished at the end of 335 to Trèves in Gaul. This was the first banishment of Athanasius, which lasted about one year and a half. It was brought to a close by the death of Constantine, and the accession as emperor of the West of Constantine II., who, in June 337, allowed Athanasius to return to Alexandria.

He reached his see on the 23rd of November 337, and, as he himself has told us, " the people ran in crowds to see his face; the churches were full of rejoicing; thanksgivings were everywhere offered up ; the ministers and clergy thought the day the happiest in their lives." But this period of happiness was destined to be short-lived. His position as bishop of Alexandria placed him, not under his patron Constantine, but under Constantius, another son of the elder Constantine, who had succeeded to the throne of the East. He in his turn fell, as his father had done in later years, under the influence of Eusebius of Nicomedia, who in the latter half of 339 was transferred to the see of Constantinople, the new seat of the imperial court. A second expulsion of Athanasius was accordingly resolved upon. The old accusations against him were revived, and he was further charged with having set at naught the decision of a council. On the 18th of March 339 the exarch of Egypt suddenly confronted Athanasius with an imperial edict, by which he was deposed and a Cappadocian named Gregory was nominated bishop in his place. On the following day, after tumultuous scenes, Athanasius fled, and four days later Gregory was installed by the aid of the soldiery. On the first opportunity, Athanasius went to Rome, to " lay his case before the church." A synod assembled at Rome in the autumn of 340, and the great council—probably that which met at Sardica in 342 or 343, where the Orientals refused to meet the representatives of the Western church—declared him guiltless. This decision, however, had no immediate effect in favour of Athanasius. Constantius continued for some time implacable, and the bold action of the Western bishops only incited the Arian party in Alexandria to fresh severities. But the death of the intruder Gregory, on the 26th of June 345, opened up a way of reconciliation. Constantius decided to yield to the importunity of his brother Constans, who had succeeded Constantine II. in the West; and the result was the restoration of Athanasius for the second time, on the 21st of October 346. Again he returned to Alexandria amid the enthusiastic demonstrations of the populace, which is described by Gregory of Nazianzus, in his panegyric on Athanasius, as streaming forth like " another Nile " to meet him afar off as he approached the city.

The six years of his residence in the West had given Athanasius the opportunity of displaying a momentous activity. He made long journeys in Italy, in Gaul, and as far as Belgium. Everywhere he laboured for the Nicene faith, and the impression made by his personality was so great that to hold fast the orthodox faith and to defend Athanasius were for many people one and the same thing. This was shown when, after the death of the emperor Constans, Constantius became sole ruler of East and West. With the help of counsellors more subtle than discerning, the emperor, with the object of uniting the various parties in the Church at any cost, sought for the most colourless possible formula of belief, which he hoped to persuade all the bishops to accept. As his efforts remained for years fruitless, he used force. " My will is your guiding-line," he exclaimed in the summer of 355 to the bishops who had assembled at Milan in response to his orders. A series of his most defiant opponents had to go into banishment, Liberius of Rome, Hilarius of Poitiers and Hosius of Corduba, the last-named once the confidant of Constantine and the actual originator of the *Homousios*, and now nearly a hundred years old. At length came the turn of Athanasius, now almost the sole upholder of the banner of the Nicene creed in the East. Several attempts to expel him failed owing to the attitude of the populace. On the night of the 8th-9th of February 356, however, when the bishop was holding the Vigils, soldiers and police broke into the church of Theonas. Athanasius himself has described the scene for us : " I was seated upon my chair, the deacon was about to read the psalm, the people to answer, ' For his mercy endureth for ever.' The solemn act was interrupted; a panic arose." The bishop, who was at first unwilling to save himself, until he knew that his faithful followers were in safety, succeeded in escaping, leaving the town and finding a hiding-place in the country. The solitudes of Upper Egypt, where numerous monasteries and hermitages had been planted, seem at this time to have been his chief shelter. In this case, benefit was repayed by benefit, for Athanasius during his episcopate had been a zealous promoter of asceticism and monachism. With Anthony the hermit and Pachomius the founder of monasteries, he had maintained personal relations, and the former he had commemorated in his *Life of Anthony*. During his exile his time was occupied in writing on behalf of his cause, and to this period belong some of his most important works, above all the great *Orations* or *Discourses against the Arians*, which furnish the best exposition of his theological principles.

During his absence the see of Alexandria was left without a pastor. It is true that George of Cappadocia had taken his place; but he could only maintain himself for a short while (February 357–October 358). The great majority of the population remained faithful to the exile. At length, in November 361, the way was opened to him for his return to his see by the death of Constantius. Julian, who succeeded to the imperial throne, professed himself indifferent to the contentions of the Church, and gave permission to the bishops exiled in the late reign to return home. Among others, Athanasius availed himself of this permission, and in February 362 once more seated himself upon

his throne, amid the rejoicings of the people. He had begun his episcopal labours with renewed ardour, and assembled his bishops in Alexandria to decide various important questions, when an imperial mandate again—for the fourth time—drove him from his place of power. The faithful gathered around him weeping. "Be of good heart," he said, "it is but a cloud: it will pass." His forecast proved true; for within a few months Julian had closed his brief career of pagan revival. As early as September 363, Athanasius was able to travel to Jovian, the new emperor, who had sent him a letter praising his Christian fidelity and encouraging him to resume his work. He returned to Alexandria on the 20th of February 364. With the emperor he continued to maintain friendly relations; but the period of repose was short. In the spring of 365, after the accession of Valens to the throne, troubles again arose. Athanasius was once more compelled to seek safety from his persecutors in concealment (October 365), which lasted, however, only for four months. In February 366 he resumed his episcopal labours, in which he henceforth remained undisturbed. On the 2nd of May 373, having consecrated one of his presbyters as his successor, he died quietly in his own house.

Athanasius was a man of action, but he also knew how to use his pen for the furtherance of his cause. He left a large number of writings, which cannot of course be compared with those of an Origen, a Basil, or a Gregory of Nyssa. Athanasius was no systematic theologian. All his treatises are occasional pieces, born of controversy and intended for controversial ends. The interest in abstract exposition of clearly formulated theological ideas is everywhere subordinate to the polemical purpose. But all these writings are instinct with a living personal faith, and serve for the defence of the cause; for it was not about words that he was contending. Even those who do not sympathize with the cause which Athanasius steadfastly defended cannot but admire his magnanimous and heroic character. If he was imperious in temper and inflexible in his conception of the Christian faith, he possessed a great heart and a great intellect, inspired with an enthusiastic devotion to Christ. As a theologian, his main distinction was his zealous advocacy of the essential divinity of Christ. Christianity in its Arian conception would have evaporated in a new polytheism. To have set a dam against this process with the whole force of a mighty personality constitutes the importance of Athanasius in the world's history. It is with good reason that the Church honours him as the "Great," and as the "Father of Orthodoxy."

The best edition of the works of Athanasius is the so-called Maurine edition of Bernard de Montfaucon in 3 vols. (Paris, 1698); this was enlarged in the 3rd edition by Giustiniani (4 vols., Padua, 1777), and is printed in this form in Migne's *Patrologia*, vols. xxv.-xxviii. An English translation of selections, with excellent introductions to the several writings, was published by Archibald Robertson in the *Library of the Nicene and Post-Nicene Fathers*, second series, vol. 4 (Oxford and New York, 1892). There is no biography satisfactory from the modern point of view. Studies preliminary to such a biography began to be published by E. Schwartz in his essays, "Zur Geschichte des Athanasius" (in the *Nachrichten der königlichen Gesellschaft der Wissenschaften zu Göttingen*, 1904, &c.). The life of Athanasius, however, is so completely intertwined with the history of his time that it is permissible to refer, for a knowledge of him, to the general descriptions which will be found at the close of the article ARIUS. Of the older literature, Tillemont's *Mémoires pour servir à l'histoire ecclésiastique des six premiers siècles*, vols. vi. and viii., are still a mine of material for the historian. Of the newer literature the following deserve to be read:—Johann Adam Möhler, *Athanasius der Grosse und die Kirche seiner Zeit*, 2 vols. (2nd ed., Mainz, 1844); and Fr. Boehringer, "Arius und Athanasius," *Die Kirche Christi und ihre Zeugen*, vol. i. part 2 (2nd ed., Stuttgart, 1874). (G. K.)

ATHAPASCAN, a widely distributed linguistic stock of North American Indians, the chief tribes included being the Chippewyan, Navajo, Apache, Jicarilla, Lipan, Hupa and Wailaki. The Athapascan family is geographically divided into Northern, Pacific and Southern. The Northern division (Tinneh or Déné) is about Alaska, and the Yukon and Mackenzie rivers,—the eponymous "Athabasca" tribe living round Lake Athabasca, in the province of Alberta in Canada. The Pacific division covers a strip of territory, some 400 m. in length, from Oregon southwards into California. The Southern division includes Arizona and New Mexico, parts of Utah, Colorado, Kansas and Texas, and the northern part of Mexico. The typical tribes are those of the Northern division.

See *Handbook of American Indians* (Washington, 1907).

ATHARVA VEDA, the fourth book of the Vedas, the ancient scriptures of the Brahman religion. Like the other Vedas it is divided into Samhita, Brahmanas and Upanishads, representing the spiritual element and its magical and nationalistic development. The mantras or sayings composing the Samhita of the Atharva Veda differ from those of the other Vedas by being in the form of spells rather than prayers or hymns, and seem to indicate a stage of religion lower than that of the Rig Veda.

ATHEISM (from Gr. ἀ-, privative, and θεός, God), literally a system of belief which denies the existence of God. The term as generally used, however, is highly ambiguous. Its meaning varies (*a*) according to the various definitions of deity, and especially (*b*) according as it is (i.) deliberately adopted by a thinker as a description of his own theological standpoint, or (ii.) applied by one set of thinkers to their opponents. As to (*a*), it is obvious that atheism from the standpoint of the Christian is a very different conception as compared with atheism as understood by a Deist, a Positivist, a follower of Euhemerus or Herbert Spencer, or a Buddhist. But the ambiguities arising from the points of view described in (*b*) are much more difficult both intellectually and in their practical social issues. Thus history shows how readily the term has been used in the most haphazard manner to describe even the most trivial divergence of opinion concerning points of dogma. In other words, "atheism" has been used generally by the orthodox adherents of one religion, or even of a single sect, for all beliefs which are different or even differently expressed. It is in fact in these cases, like "heterodoxy," a term of purely negative significance, and its intellectual value is of the slightest. The distinction between the terms "religion" and "magic" is, in a similar way, often due merely to rivalry between the adherents of two or more mutually exclusive religions brought together in the same community. When the psalmist declares that "the fool hath said in his heart, there is no God," he probably does not refer to theoretical denial, but to a practical disbelief in God's government of human affairs, shown in disobedience to moral laws. Socrates was charged with "not believing in the gods the city believes in." The cry of the heathen populace in the Roman empire against the Christians was "Away with the atheists! To the lions with the Christians!" The ground for the charge was probably the lack of idolatry in all Christian worship. Spinoza, for whom God alone existed, was persecuted as an atheist. A common designation of Knox was "the atheist," although it was to him "matter of satisfaction that our most holy religion is founded on faith, not on reason."

In its most scientific and serious usage the term is applied to that state of mind which does not find deity (*i.e.* either one or many gods) in or above the physical universe. Thus it has been applied to certain primitive savages, who have been thought (*e.g.* by Lord Avebury in his *Prehistoric Times*) to have no religious belief; it is, however, the better opinion that there are no peoples who are entirely destitute of some rudimentary religious belief. In the second place, and most usually, it is applied to a purely intellectual, metaphysical disbelief in the existence of any god, or of anything supernatural. In this connexion it is usual to distinguish three types of atheism:—the *dogmatic*, which denies the existence of God positively; the *sceptical*, which distrusts the capacity of the human mind to discover the existence of God; and the *critical*, which doubts the validity of the theistic argument, the proofs for the existence of God. That the first type of atheism exists, in spite of the denials of those who favour the second or the third, may be proved by the utterances of men like Feuerbach, Flourens or Bradlaugh. "There is no God," says Feuerbach, "it is clear as the sun and as evident as the day that there is no God, and still more that there can be none." With greater passion

Flourens declares "Our enemy is God. Hatred of God is the beginning of wisdom. If mankind would make true progress, it must be on the basis of atheism." Bradlaugh maintained against Holyoake that he would fight until men respected the name "atheist." The answer to dogmatic atheism, that it implies infinite knowledge, has been well stated in John Foster's *Essays*, and restated by Chalmers in his *Natural Theology*, and its force is recognized in Holyoake's careful qualification of the sense in which secularism accepts atheism, "always explaining the term atheist to mean 'not seeing God' visually or inferentially, never suffering it to be taken for anti-theism, that is, hating God, denying God—as *hating* implies personal knowledge as the ground of dislike, and *denying* implies infinite knowledge as the ground of disproof." But dogmatic atheism is rare compared with the sceptical type, which is identical with agnosticism (*q.v.*) in so far as it denies the capacity of the mind of man to form any conception of God, but is different from it in so far as the agnostic merely holds his judgment in suspense, though, in practice, agnosticism is apt to result in an attitude towards religion which is hardly distinguishable from a passive and unaggressive atheism. The third or critical type may be illustrated by *A Candid Examination of Theism* by "Physicus" (G. J. Romanes), in which the writer endeavours to establish the weakness of the proofs for the existence of God, and to substitute for theism Spencer's physical explanation of the universe, and yet admits how unsatisfying to himself the new position is. "When at times I think, as think at times I must, of the appalling contrast between the hallowed glory of that creed which once was mine, and the lonely mystery of existence as now I find it—at such times I shall ever feel it impossible to avoid the sharpest pang of which my nature is susceptible."

Atheism has to meet the protest of the heart as well as the argument of the mind of mankind. It must be judged not only by theoretical but by practical arguments, in its relations either to the individual or to a society. Voltaire himself, speaking as a practical man rather than as a metaphysician, declared that if there were no God it would be necessary to invent one; and if the analysis is only carried far enough it will be found that those who deny the existence of God (in a conventional sense) are all the time setting up something in the nature of deity by way of an ideal of their own, while fighting over the meaning of a word or its conventional misapplication.

ATHELM (d. 923), English churchman, is said to have been a monk of Glastonbury before his elevation in 909 to the see of Wells, of which he was the first occupant. In 914 he became archbishop of Canterbury.

ATHELNEY, a slight eminence of small extent in the low level tract about the junction of the rivers Tone and Parrett in Somersetshire, England. It was formerly isolated by marshes and accessible only by boat or artificial causeway, and under these conditions it gained its historical fame as the retreat of King Alfred in 878–879 when he was unable to withstand the incursions of the Danes. After regaining his throne he founded a monastery here in gratitude for the retreat afforded him by the island; no traces of it exist above ground, but remains have been excavated. There was also found here, in 1693, the celebrated Alfred jewel, bearing his name, and preserved in the Ashmolean Museum at Oxford. An inscribed pillar commemorating the king was set up in 1801. The name of Athelney signifies the Isle of Princes (A.S. *Æthelingaea*). Athelney is a railway station on a branch of the Great Western line.

ATHENA (the Attic form of the Homeric Athene, also called Athenaia, Pallas Athene, Pallas), one of the most important goddesses in Greek mythology. With Zeus and Apollo, she forms a triad which represents the embodiment of all divine power. No satisfactory derivation of the name Athena has been given[1]; Pallas, at first an epithet, but after Pindar used by itself, may possibly be connected with παλλακή ("maiden"). Athena has been variously described as the pure aether, the storm-cloud, the dawn, the twilight; but there is little evidence that she was regarded as representing any of the physical powers of nature, and it is better to endeavour to form an idea of her character and attributes from a consideration of her cult-epithets and ritual. According to the legend, her father Zeus swallowed his wife Metis ("counsel"), when pregnant with Athena, since he had been warned that his children by her might prove stronger than himself and dethrone him. Hephaestus (or Prometheus) subsequently split open his head with a hatchet, and Athena sprang forth fully armed, uttering a loud shout of victory (Hesiod, *Theogony*, 886; Pindar, *Olympia*, vii. 35). In Crete she was said to have issued from a cloud burst asunder by Zeus. According to Roscher, the manner of her birth represents the storm-cloud split by lightning; Farnell (*Cults of the Greek States*, i. p. 285) sees in it an indication that, as the daughter of Metis, Athena was already invested with a mental and moral character, and explains the swallowing of Metis (for which compare the story of Cronus and his children) by the desire to attribute an extraordinary birth to one in whom masculine traits predominated. In another account (as Τριτογένεια) she is the daughter of the river Triton, to which various localities were assigned, and wherever there was a river (or lake) of that name, the inhabitants claimed that she was born there. It is probable that the name originated in Boeotia (C. O. Müller, *Geschichten hellenischer Stämme*, i. pp. 351-357; but see Macan on Herodotus, iv. 180), whence it was conveyed by colonists to Cyrene and thence to Libya, where there was a river Triton. Here some local divinity, a daughter of Poseidon, connected with the water and also of a warlike character, was identified by the colonists with their own Athena. In any case, it is fairly certain that Tritogeneia means "water-born," although an old interpretation derived it from τριτώ, a supposed Boeotian word meaning "head," which further points to the name having originated in Boeotia. Roscher suggests that the localization of her birthplace in the extreme west points to the western sea, the home of cloud and storm.

In Homer Athena already appears as the goddess of counsel, of war, of female arts and industries, and the protectress of Greek cities, this last aspect of her character being the most important and pronounced. Hence she is called πολιάς, πολιοῦχος, in many Greek states, and is frequently associated with Ζεὺς πολιεύς. The most celebrated festival of the city-goddess was the Panathenaea at Athens and other places. Other titles of kindred meaning are ἀρχηγέτις ("founder") and παναχαΐς, the protectress of the Achaean league. At Athens she presided over the phratries or clans, and was known as ἀπατουρία and φρατρία, and sacrifice was offered to her at the festival Apaturia. The title μήτηρ, given her by the inhabitants of Elis, whose women, according to the legend, she had blessed with abundance of children, seems at variance with the generally-recognized conception of her as παρθένος; but μήτηρ may bear the same meaning as κουροτρόφος, the fosterer of the young, in harmony with her aspect as protectress of civic and family life. At Alalcomenae, near the Tritonian lake in Boeotia, she was ἀλαλκομενηΐς ("defender"). Her temple, which was pillaged by Sulla, contained an ivory image, which was said to have fallen from heaven. The inhabitants claimed that the goddess was born there and brought up by a local hero Alalcomeneus. Her images, called Palladia, which guarded the heights (cf. her epithets ἀκρία, κραναία), represented her with shield uplifted, brandishing her spear to keep off the foe. The cult of Athena Itonia, whose earliest seat appears to have been amongst the Thessalians, who used her name as a battle-cry, made its way to Coronea in Boeotia, where her sanctuary was the seat of the Pamboeotian confederacy. The meaning of Itonia is obscure: Dümmler connects it with ἰτεῶνες, the "willow-beds" on the banks of the river Coralios (the river

[1] O. Gruppe (*Griechische Mythologie*, ii. p. 1194) thinks that it probably means "without mother's milk," either in an active or in a passive sense—"not giving suck," or "unsuckled," in her character as the virgin goddess, or as springing from the head of Zeus. In support of this view he refers to Hesychius (θήνιον· γάλα) and a passage in Athenagoras (*Legatio pro Christianis*, 17), where it is stated that Athena was sometimes called Ἀθηλᾶ or Ἀθήλη. For Pallas, he prefers the old etymology from πάλλω (to "shake"), rather in the sense of "earth-shaker" than "lance-brandisher."

of the maiden, *i.e.* Athena); Jebb (on Bacchylides, *fr.* xi. 2) suggests a derivation from ἴναι, the goddess of the "onset." At Thebes she was worshipped as Athena Onka or Onga, of equally uncertain derivation (possibly from ὄγκος, "a height"). Peculiar to Arcadia is the title Athena Alea, probably = "warder off of evil," although others explain it as = "warmth," and see in it an allusion to her physical nature as one of the powers of light. Farnell (*Cults*, p. 275) points out that at the same time she is certainly looked upon as in some way connected with the health-divinities, since in her temple she is grouped with Asclepius and Hygieia (see HYGIEIA).

She already appears as the goddess of counsel (πολίβουλος) in the *Iliad* and in Hesiod. The Attic bouleutae took the oath by Athena Boulaia; at Sparta she was ἀγοραία, presiding over the popular assemblies in the market-place; in Arcadia μηχανῖτις, the discoverer of devices. The epithet προνοία ("forethought") is due, according to Farnell, to a confusion with πρόναια, referring to a statue of the goddess standing "before a shrine," and arose later (probably spreading from Delphi), some time after the Persian wars, in which she repelled a Persian attack on the temples "by divine forethought"; another legend attributes the name to her skill in assisting Leto at the birth of Apollo and Artemis. With this aspect of her character may be compared the Hesiodic legend, according to which she was the daughter of Metis. Her connexion with the trial of Orestes, the introduction of a milder form of punishment for justifiable homicide, and the institution of the court τὸ ἐπὶ Παλλαδίῳ, show the important part played by her in the development of legal ideas.

The protectress of cities was naturally also a goddess of war. As such she appears in Homer and Hesiod and in post-Homeric legend as the slayer of the Gorgon and taking part in the battle of the giants. On numerous monuments she is represented as ἀρεία, "the warlike," νικηφόρος, "bringer of victory," holding an image of Nike (*q.v.*) in her outstretched hand (for other similar epithets see Roscher's *Lexikon*). She was also the goddess of the arts of war in general; στοιχεία, she who draws up the ranks for battle, ζωστηρία, she who girds herself for the fray. Martial music (cp. Ἀθήνη σάλπιγξ, "trumpet") and the Pyrrhic dance, in which she herself is said to have taken part to commemorate the victory over the giants, and the building of war-ships were attributed to her. She instructed certain of her favourites in gymnastics and athletics, as a useful training for war. The epithets ἵππία, χαλινῖτις, δαμάσιππος, usually referred to her as goddess of war-horses, may perhaps be reminiscences of an older religion in which the horse was sacred to her. As a war-goddess, she is the embodiment of prudent and intelligent tactics, entirely different from Ares, the personification of brute force and rashness, who is fitly represented as suffering defeat at her hands. She is the patroness and protectress of those heroes who are distinguished for their prudence and caution, and in the Trojan War she sides with the more civilized Greeks.

The goddess of war develops into the goddess of peace and the pursuits connected with it. She is prominent as the promoter of agriculture in Attic legend. The Athenian hero Erechtheus (Erichthonius), originally an earth-god, is her foster-son, with whom she was honoured in the Erechtheum on the Acropolis. Her oldest priestesses, the dew-sisters—Aglauros, Herse, Pandrosos—signify the fertilization of the earth by the dew, and were probably at one time identified with Athena, as surnames of whom both Aglauros and Pandrosos are found. The story of the voluntary sacrifice of the Attic maiden Aglauros on behalf of her country in time of war (commemorated by the ephebi taking the oath of loyalty to their country in her temple), and of the leap of the three sisters over the Acropolis rock (see ERECHTHEUS), probably points to an old human sacrifice. Athena also gave the Athenians the olive-tree, which was supposed to have sprung from the bare soil of the Acropolis, when smitten by her spear, close to the horse (or spring of water) produced by the trident of Poseidon, to which he appealed in support of his claim to the lordship of Athens. She is also connected with Poseidon in the legend of Erechtheus, not as being in any way akin to the former in nature or character, but as indicating the contest between an old and a new religion. This god, whose worship was introduced into Athens at a later date by the Ionian immigrants, was identified with Erechtheus-Erichthonius (for whose birth Athena was in a certain sense responsible), and thus was brought into connexion with the goddess, in order to effect a reconciliation of the two cults. Athena was said to have invented the plough, and to have taught men to tame horses and yoke oxen. Various arts were attributed to her—shipbuilding, the goldsmith's craft, fulling, shoemaking and other branches of industry. As early as Homer she takes especial interest in the occupations of women; she makes Hera's robe and her own peplus, and spinning and weaving are often called "the works of Athena." The custom of offering a beautifully woven peplus at the Panathenaic festival is connected with her character as Ergane the goddess of industry.[1] As patroness of the arts, she is associated with Hephaestus (one of her titles is Ἡφαιστία) and Prometheus, and in Boeotia she was regarded as the inventress of the flute. According to Pindar, she imitated on the flute the dismal wail of the two surviving Gorgons after the death of Medusa. The legend that Athena, observing in the water the distortion of her features caused by playing that instrument, flung it away, probably indicates that the Boeotians whom the Athenians regarded with contempt, used the flute in their worship of the Boeotian Athena. The story of the slaying of Medusa by Athena, in which there is no certain evidence that she played a direct part, explained by Roscher as the scattering of the storm-cloud, probably arose from the fact that she is represented as wearing the Gorgon's head as a badge.

As in the case of Aphrodite and Apollo, Roscher in his *Lexikon* deduces all the characteristics of Athena from a single conception—that of the goddess of the storm or the thunder-cloud (for a discussion of such attempts see Farnell, *Cults*, i. pp. 3, 263). There seems little reason for regarding her as a nature-goddess at all, but rather as the presiding divinity of states and cities, of the arts and industries—in short, as the goddess of the whole intellectual side of human life.

Except at Athens, little is known of the ceremonies or festivals which attended her worship. There we have the following. (1) The ceremony of the *Three Sacred Ploughs*, by which the signal for seed-time was given, apparently dating from a period when agriculture was one of the chief occupations of her worshippers. (2) The *Procharisteria* at the end of winter, at which thanks were offered for the germination of the seed. (3) The *Scirophoria*, with a procession from the Acropolis to the village of Skiron, in the height of summer, the priests who were to entreat her to keep off the summer heat walking under the shade of parasols (σκίρον) held over them; others, however, connect the name with σκῖρος ("gypsum"), perhaps used for smearing the image of the goddess. (4) The *Oschophoria*, at the vintage season, with races among boys, and a procession, with songs in praise of Dionysus and Ariadne. (5) The *Chalkeia* (feast of smiths), at which the birth of Erechtheus and the invention of the plough were celebrated. (6) The *Plynteria* and *Callynteria*, at which her ancient image and peplus in the Erechtheum and the temple itself were cleaned, with a procession in which bunches of figs (frequently used in lustrations) were carried. (7) The *Arrhephoria* or Errephoria (perhaps = *Ersephoria*, "dew-bearing"), at which four girls, between seven and eleven years of age, selected from noble families, carried certain unknown sacred objects to and from the temple of Aphrodite "in the gardens" (see J. E. Harrison, *Classical Review*, April 1889). (8) The *Panathenaea*, at which the new robes for the image of the goddess were carried through the city, spread like a sail on a mast. The reliefs of the frieze of the cella of the Parthenon enable us to form an idea of the procession. Athletic games, open to all who traced their nationality to Athens, were part of this festival. Mention should also be made of the Argive

[1] According to J. E. Harrison in *Classical Review* (June 1894), Athena Ergane is the goddess of the fruits of the field and the procreation of children.

ceremony, at which the *xoanon* (ancient wooden statue) of Athena was washed in the river Inachus, a symbol of her purification after the Gigantomachia.

The usual attributes of Athena were the helmet, the aegis, the round shield with the head of Medusa in the centre, the lance, an olive branch, the owl, the cock and the snake. Of these the aegis, usually explained as a storm-cloud, is probably intended as a battle-charm, like the Gorgon's head on the shield and the faces on the shields of Chinese soldiers; the owl probably represents the form under which she was worshipped in primitive times, and subsequently became her favourite bird (the epithet γλαυκῶπις, meaning "keen-eyed" in Homer, may have originally signified "owl-faced"); the snake, a common companion of the earth deities, probably refers to her connexion with Erechtheus-Erichthonius.

As to artistic representations of the goddess, we have first the rude figure which seems to be a copy of the Palladium; secondly, the still rude, but otherwise more interesting, figures of her, as *e.g.* when accompanying heroes, on the early painted vases; and thirdly, the type of her as produced by Pheidias, from which little variation appears to have been made. Of his numerous statues of her, the three most celebrated were set up on the Acropolis. (1) Athena *Parthenos*, in the Parthenon. It was in ivory and gold, and 30 ft. high. She was represented standing, in a long tunic; on her head was a helmet, ornamented with sphinxes and griffins; on her breast was the aegis, fringed with serpents and the Gorgon's head in centre. In her right hand was a Nike or winged victory, while her left held a spear, which rested on a shield on which were represented the battles of the Amazons with the giants. (2) A colossal statue said to have been formed from the spoils taken at Marathon, the so-called Athena *Promachos*. (3) Athena *Lemnia*, so called because it had been dedicated by the Athenian cleruchies in Lemnos. In this she was represented without arms, as a brilliant type of virgin beauty. The two last statues were of bronze. From the time of Pheidias calm earnestness, self-conscious might, and clearness of intellect were the main characteristics of the goddess. The eyes, slightly cast down, betoken an attitude of thoughtfulness; the forehead is clear and open; the mouth indicates firmness and resolution. The whole suggests a masculine rather than a feminine form.

From Greece the worship of Athena extended to Magna Graecia, where a number of temples were erected to her in various places. In Italy proper she was identified with Minerva (*q.v.*).

See articles in Pauly-Wissowa's *Realencyclopädie*; W. H. Roscher's *Lexikon der Mythologie*; Daremberg and Saglio's *Dictionnaire des antiquités* (*s.v.* "Minerva"); L. Preller, *Griechische Mythologie*; W. H. Roscher, "Die Grundbedeutung der Athene," in *Nektar und Ambrosia* (1883); F. A. Voigt, "Beiträge zur Mythologie des Ares und Athena," in *Leipziger Studien*, iv. (1881); L. R. Farnell, *The Cults of the Greek States*, i. (1896); J. E. Harrison, *Prolegomena to the Study of Greek Religion* (1903), for the festivals especially; O. Gruppe, *Griechische Mythologie*, ii. (1907). In the article GREEK ART, fig. 21 represents Athena in the act of striking a prostrate giant; fig. 38 a statuette of Athena Parthenos, a replica of the work of Pheidias. (J. H. F.)

ATHENAEUM, a name originally applied in ancient Greece (Ἀθήναιον) to buildings dedicated to Athena, and specially used as the designation of a temple in Athens, where poets and men of learning were accustomed to meet and read their productions. The academy for the promotion of learning which the emperor Hadrian built (about A.D. 135) at Rome, near the Forum, was also called the Athenaeum. Poets and orators still met and discussed there, but regular courses of instruction were given by a staff of professors in rhetoric, jurisprudence, grammar and philosophy. The institution, later called Schola Romana, continued in high repute till the 5th century. Similar academies were also founded in the provinces and at Constantinople by the emperor Theodosius II. In modern times the name has been applied to various academies, as those of Lyons and Marseilles, and the Dutch high schools; and it has become a very general designation for literary clubs. It is also familiar as the title of several literary periodicals, notably of the London literary weekly founded in 1828.

ATHENAEUS, of Naucratis in Egypt, Greek rhetorician and grammarian, flourished about the end of the 2nd and the beginning of the 3rd century A.D. Suidas only tells us that he lived "in the times of Marcus"; but the contempt with which he speaks of Commodus (died 192) shows that he survived that emperor. Athenaeus himself states that he was the author of a treatise on the *thratta*—a kind of fish mentioned by Archippus and other comic poets—and of a history of the Syrian kings, both of which works are lost. We still possess the *Deipnosophistae*, which may mean dinner-table philosophers or authorities on banquets, in fifteen books. The first two books, and parts of the third, eleventh and fifteenth, are only extant in epitome, but otherwise we seem to possess the work entire. It is an immense store-house of miscellaneous information, chiefly on matters connected with the table, but also containing remarks on music, songs, dances, games, courtesans. It is full of quotations from writers whose works have not come down to us; nearly 800 writers and 2500 separate writings are referred to by Athenaeus; and he boasts of having read 800 plays of the Middle Comedy alone. The plan of the *Deipnosophistae* is exceedingly cumbrous, and is badly carried out. It professes to be an account given by the author to his friend Timocrates of a banquet held at the house of Laurentius (or Larentius), a scholar and wealthy patron of art. It is thus a dialogue within a dialogue, after the manner of Plato, but a conversation of sufficient length to occupy several days (though represented as taking place in one) could not be conveyed in a style similar to the short conversations of Socrates. Among the twenty-nine guests are Galen and Ulpian, but they are all probably fictitious personages, and the majority take no part in the conversation. If Ulpian is identical with the famous jurist, the *Deipnosophistae* must have been written after his death (228); but the jurist was murdered by the praetorian guards, whereas Ulpian in Athenaeus dies a natural death. The conversation ranges from the dishes before the guests to literary matters of every description, including points of grammar and criticism; and they are expected to bring with them extracts from the poets, which are read aloud and discussed at table. The whole is but a clumsy apparatus for displaying the varied and extensive reading of the author. As a work of art it can take but a low rank, but as a repertory of fragments and morsels of information it is invaluable.

Editio princeps, Aldine, 1524; Casaubon, 1597–1600; Schweighäuser, 1801–1807; Dindorf, 1827; Meineke, 1859–1867; Kaibel, 1887–1890; English translation by Yonge in Bohn's *Classical Library*.

ATHENAGORAS, a Christian apologist of the 2nd century A.D., was, according to an emendator of the Paris Codex 451 of the 11th century, a native of Athens. The only sources of information regarding him are a short notice by Philip of Side, in Pamphylia (*c.* A.D. 420), and the inscription on his principal work. Philip—or rather the compiler who made excerpts from him—says that he was at the head of an Alexandrian school (the catechetical), that he lived in the time of Hadrian and Antoninus, to whom he addressed his *Apology*, and that Clement of Alexandria was his pupil; but these statements are more than doubtful. The inscription on the work describes it as the "Embassy of Athenagoras, the Athenian, a philosopher and a Christian concerning the Christians, to the Emperors Marcus Aurelius Antoninus and Lucius Aurelius Commodus, &c." This statement has given rise to considerable discussion, but from it and internal evidence the date of the *Apology* (Πρεσβεία περὶ Χριστιανῶν) may be fixed at about A.D. 177. Athenagoras is also the author of a discourse on the resurrection of the body, which is not authenticated otherwise than by the titles on the various manuscripts. In the *Apology*, after contrasting the judicial treatment of Christians with that of other accused persons, he refutes the accusations brought against the Christians of atheism, eating human flesh and licentiousness, and in doing so takes occasion to make a vigorous and skilful attack on pagan polytheism and mythology. The discourse on the resurrection answers objections to the doctrine, and attempts to prove its truth from considerations of God's purpose in the creation of man, His justice and the nature of man himself. Athenagoras is a powerful and clear writer, who strives to comprehend his opponents' views and is

acquainted with the classical writers. He used the *Apology* of Justin, but hardly the works of Aristides or Tatian. His theology is strongly tinged with Platonism, and this may account for his falling into desuetude. His discussion of the Trinity has some points of speculative interest, but it is not sufficiently worked out; he regards the Son as the Reason or Wisdom of the Father, and the Spirit as a divine effluence. On some other points, as the nature of matter, the immortality of the soul and the principle of sin, his views are interesting.

EDITIONS.—J. C. Th. Eg. de Otto, *Corpus Apol. Christ. Saec.* II. vol. vii. (Jena, 1857); E. Schwartz in *Texte und Untersuchungen*, iv. 2 (Leipzig, 1891).

TRANSLATIONS.—Humphreys (London, 1714); B. P. Pratten (*Ante-Nic. Fathers*, Edinburgh, 1867).

LITERATURE.—A. Harnack, *Gesch. der altchr. Litt.* pp. 526-558, and similar works by O. Bardenhewer and A. Ehrhard; Herzog-Hauck, *Realencyk.*; G. Krüger, *Early Chr. Lit.* p. 130 (where additional literature is cited). In 1559 and 1612 appeared in French a work on *True and Perfect Love*, purporting to be a translation from the Greek of Athenagoras; it is a palpable forgery.

ATHENODORUS, the name of two Stoic philosophers of the 1st century B.C., who have frequently been confounded.

1. ATHENODORUS CANANITES (*c.* 74 B.C.–A.D. 7), so called from his birthplace Canana near Tarsus (not Cana in Cilicia nor Canna in Lycaonia), was the son of one Sandon, whose name indicates Tarsian descent, not Jewish as many have held. He was a personal friend of Strabo, from whom we derive our knowledge of his life. He taught the young Octavian (afterwards Augustus) at Apollonia, and was a pupil of Posidonius at Rhodes. Subsequently he appears to have travelled in the East (Petra and Egypt) and to have made himself famous by lecturing in the great cities of the Mediterranean. Writing in 50 B.C., Cicero speaks of him with the highest respect (cf. *Ep. ad. Att.*, xvi. 11. 4, 14. 4), a fact which enables us to fix the date of his birth as not later than about 74. His influence over Augustus was strong and lasting. He followed him to Rome in 44, and is said to have criticized him with the utmost candour, bidding him repeat the letters of the alphabet before acting on an angry impulse. In later years he was allowed by Augustus to return to Tarsus in order to remodel the constitution of the city after the degenerate democracy which had misgoverned it under Boethus. He succeeded (*c.* 15–10 B.C.) in setting up a timocratic oligarchy in the imperial interest (see TARSUS). Sir W. M. Ramsay is inclined to attribute to the influence of Athenodorus the striking resemblances which can be established between Seneca and Paul, the latter of whom must certainly have been acquainted with his teachings. According to Eusebius and Strabo he was a learned scientist for his day, and some attribute to him a history of Tarsus. He helped Cicero in the composition of the *De Officiis*. His works are not certainly known, and none are extant. (See Sir W. M. Ramsay in the *Expositor*, September 1906, pp. 268 ff.)

2. ATHENODORUS CORDYLION, also of Tarsus, was keeper of the library at Pergamum, and was an old man in 47 B.C. In his enthusiasm for Stoicism he used to cut out from Stoic writings passages which seemed to him unsatisfactory. He also settled in Rome, where he died in the house of the younger Cato.

Among others of the name may be mentioned (3) ATHENODORUS OF TEOS, who played the cithara at the wedding of Alexander the Great and Statira at Susa (324 B.C.); (4) a Greek physician of the 1st century A.D., who wrote on epidemic diseases; and two sculptors, of whom (5) one executed the statues of Apollo and Zeus which the Spartans dedicated at Delphi after Aegospotami; and (6) the other was a son of Alexander of Rhodes, whom he helped in the Laocoon group.

ATHENRY, a market town of county Galway, Ireland, 14 m. inland (E.) from Galway on the Midland Great Western main line. Pop. (1901) 853. Its name is derived from *Ath-na-riogh*, the ford of kings; and it grew to importance after the Anglo-Norman invasion as the first town of the Burgs and Berminghams. The walls were erected in 1211 and the castle in 1238, and the remains of both are noteworthy. A Dominican monastery was founded with great magnificence by Myler de Bermingham in 1241, and was repaired by the Board of Works in 1893. Of the Franciscan monastery of 1464 little is left. The town returned two members to the Irish parliament from the time of Richard II. to the Union; but it never recovered from the wars of the Tudor period, culminating in a successful siege by Red Hugh O'Donnell in 1596.

ATHENS [Ἀθῆναι, *Athenae*, modern colloquial Greek Ἀθήνα], the capital of the kingdom of Greece, situated in 23° 44′ E. and 37° 58′ N., towards the southern end of the central and principal plain of Attica. The various theories with regard to the origin of the name are all somewhat unconvincing; it is conceivable that, with the other homonymous Greek towns, such as Athenae Diades in Euboea, Ἀθῆναι may be connected etymologically with ἄνθος, a flower (cf. *Firenze*, Florence); the patron goddess, Athena, was probably called after the place of her cult.

I. TOPOGRAPHY AND ANTIQUITIES

The Attic plain, τὸ πεδίον, slopes gently towards the coast of the Saronic Gulf on the south-west; on the east it is overlooked by Mount Hymettus (3369 ft.); on the north-east by Pentelicus or Brilessus (3635 ft.) from which, in ancient and modern times, an immense quantity of the finest marble has been quarried; on the north-west by Parnes (4636 ft.), a continuation of the Boeotian Cithaeron, and on the west by Aegaleus (1532 ft.), which descends abruptly to the bay of Salamis. In the centre of the plain extends from north-east to south-west a series of low heights, now known as Turcovuni, culminating towards the south in the sharply pointed Lycabettus (1112 ft.), now called Hagios Georgios from the monastery which crowns its summit. Lycabettus, the most prominent feature in the Athenian landscape, directly overhung the ancient city, but was not included in its walls; its peculiar shape rendered it unsuitable for fortification. The Turcovuni ridge, probably the ancient Anchesmus, separates the valley of the Cephisus on the north-west from that of its confluent, the Ilissus, which skirted the ancient city on the south-west. The Cephisus, rising in Pentelicus, enters the sea at New Phalerum; in summer it dwindles to an insignificant stream, while the Ilissus, descending from Hymettus, is totally dry, probably owing to the destruction of the ancient forests on both mountains, and the consequent denudation of the soil. Separated from Lycabettus by a depression to the south-west, through which flows a brook, now a covered drain (probably to be identified with the Eridanus), stands the remarkable oblong rocky mass of the Acropolis (512 ft.), rising precipitously on all sides except the western; its summit was partially levelled in prehistoric times, and the flat area was subsequently enlarged by further cutting and by means of retaining walls. Close to the Acropolis on the west is the lower rocky eminence of the Areopagus, Ἄρειος πάγος (377 ft.), the seat of the famous council; the name (see also AREOPAGUS) has been connected with Ares, whose temple stood on the northern side of the hill, but is more probably derived from the Ἀραί or Eumenides, whose sanctuary was formed by a cleft in its north-eastern declivity. Farther west of the Acropolis are three elevations; to the north-west the so-called "Hill of the Nymphs" (341 ft.), on which the modern Observatory stands; to the west the Pnyx, the meeting-place of the Athenian democracy (351 ft.), and to the south-west the loftier Museum Hill (482 ft.), still crowned with the remains of the monument of Philópappus. A cavity, a little to the west of the Observatory Hill, is generally supposed to be the ancient Barathron or place of execution. To the south-east of the Acropolis, beyond the narrow valley of the Ilissus, is the hill Ardettus (436 ft.). The distance from the Acropolis to the nearest point of the sea coast at Phalerum is a little over 3 m.

Influence of the geographical position.

The natural situation of Athens was such as to favour the growth of a powerful community. For the first requisites of a primitive settlement—food supply and defence—it afforded every advantage. The Attic plain, notwithstanding the lightness of the soil, furnished an adequate supply of cereals; olive and fig groves and vineyards were cultivated from the earliest times in the valley of the Cephisus, and pasturage for sheep and goats was abundant. The surrounding rampart of mountains was broken towards the

north-east by an open tract stretching between Hymettus and Pentelicus towards Marathon, and was traversed by the passes of Decelea, Phylé and Daphné on the north and north-west, but the distance between these natural passages and the city was sufficient to obviate the danger of surprise by an invading land force. On the other hand Athens, like Corinth, Megara and Argos, was sufficiently far from the sea to enjoy security against the sudden descent of a hostile fleet. At the same time the relative proximity of three natural harbours, Peiraeus, Zea and Munychia, favoured the development of maritime commerce and of the sea power which formed the basis of Athenian hegemony. The climate is temperate, but liable to sudden changes; the mean temperature is 63°·1 F., the maximum (in July) 99°·01, the minimum (in January) 31°·55. The summer heat is moderated by the sea-breeze or by cool northerly winds from the mountains (especially in July and August). The clear, bracing air, according to ancient writers, fostered the intellectual and aesthetic character of the people and endowed them with mental and physical energy. For the architectural embellishment of the city the finest building material was procurable without difficulty and in abundance; Pentelicus forms a mass of white, transparent, blue-veined marble; another variety, somewhat similar in appearance, but generally of a bluer hue, was obtained from Hymettus. For ordinary purposes grey limestone was furnished by Lycabettus and the adjoining hills; limestone from the promontory of Acté (the co-called "poros" stone), and conglomerate, were also largely employed. For the ceramic art admirable material was at hand in the district north-west of the Acropolis. For sculpture and various architectural purposes white, fine-grained marble was brought from Paros and Naxos. The main drawback to the situation of the city lay in the insufficiency of its water-supply, which was supplemented by an aqueduct constructed in the time of the Peisistratids and by later water-courses dating from the Roman period. A great number of wells were also sunk and rain-water was stored in cisterns.

For the purposes of scientific topography observation of the natural features and outlines is followed by exact investigation of the architectural structures or remnants, a process demanding high technical competence, acute judgment and practical experience, as well as wide and accurate scholarship. The building material and the manner of its employment furnish evidence no less important than the character of the masonry, the design and the modes of ornamentation. The testimony afforded by inscriptions is often of decisive importance, especially that of commemorative or votive tablets or of boundary-stones found *in situ*; the value of this evidence is, on the other hand, sometimes neutralized owing to the former removal of building material already used and its incorporation in later structures. Thus sepulchral inscriptions have been found on the Acropolis, though no burials took place there in ancient times. In the next place comes the evidence derived from the whole range of ancient literature and specially from descriptions of the city or its different localities. The earliest known description of Athens was that of Diodorus, ὁ περιηγητής, who lived in the second half of the 4th century B.C. Among his successors were Polemon of Ilium (beginning of 2nd century B.C.), whose great κοσμικὴ περιήγησις gave a minute account of the votive offerings on the Acropolis and the tombs on the Sacred Way; and Heliodorus (second half of the 2nd century) who wrote fifteen volumes on the monuments of Athens. Of these and other works of the earliest topographers only some fragments remain. In the period between A.D. 143 and 159 Pausanias visited Athens at a time when the monuments of the great age were still in their perfection and the principal embellishments of the Roman period had already been completed. The first thirty chapters of his invaluable *Description of Greece* (περιήγησις τῆς Ἑλλάδος) are devoted to Athens, its ports and environs. Pausanias makes no claim to exhaustiveness; he selected what was best worth noticing (τὰ ἀξιολογώτατα). His account, drawn up from notes taken in the main from personal observation, possesses an especial importance for topographical research, owing to his method of describing each object in the order in which he saw it during the course of his walks. His accuracy, which has been called in question by some scholars, has been remarkably vindicated by recent excavations at Athens and elsewhere. The list of ancient topographers closes with Pausanias. The literature of succeeding centuries furnishes only isolated references; the more important are found in the scholia on Aristophanes, the lexicons of Hesychius, Photius and others, and the *Etymologicum Magnum*. The notices of Athens during the earlier middle ages are scanty in the extreme. In 1395 Niccolo da Martoni, a pilgrim from the Holy Land, visited Athens and wrote a description of a portion of the city. Of the work of Cyriac of Ancona, written about 1450, only some fragments remain, which are well supplemented by the contemporaneous description of the capable observer known as the "Anonymus of Milan." Two treatises in Greek by unknown writers belong to the same period. The Dutchman Joannes Meursius (1579–1639) wrote three disquisitions on Athenian topography. The conquest by Venice in 1687 led to the publication of several works in that city, including the descriptions of De la Rue and Fanelli and the maps of Coronelli and others. The systematic study of Athenian topography was begun in the 17th century by French residents at Athens, the consuls Giraud and Chataignier and the Capuchin monks. The visit of the French physician Jacques Spon and the Englishman, Sir George Wheler or Wheeler (1650–1723), fortunately took place before the catastrophe of the Parthenon in 1687; Spon's *Voyage d'Italie, de Dalmatie, de Grèce et du Levant*, which contained the first scientific description of the ruins of Athens, appeared in 1678; Wheler's *Journey into Greece*, in 1682. A period of British activity in research followed in the 18th century. The monumental work of James Stuart and Nicholas Revett, who spent three years at Athens (1751–1754), marked an epoch in the progress of Athenian topography and is still indispensable to its study, owing to the demolition of ancient buildings which began about the middle of the 18th century. To this period also belong the labours of Richard Pococke and Richard Dalton, Richard Chandler, E. D. Clarke and Edward Dodwell. The great work of W. M. Leake (*Topography of Athens and the Demi*, 2nd ed., 1841) brought the descriptive literature to an end and inaugurated the period of modern scientific research, in which German archaeologists have played a distinguished part.

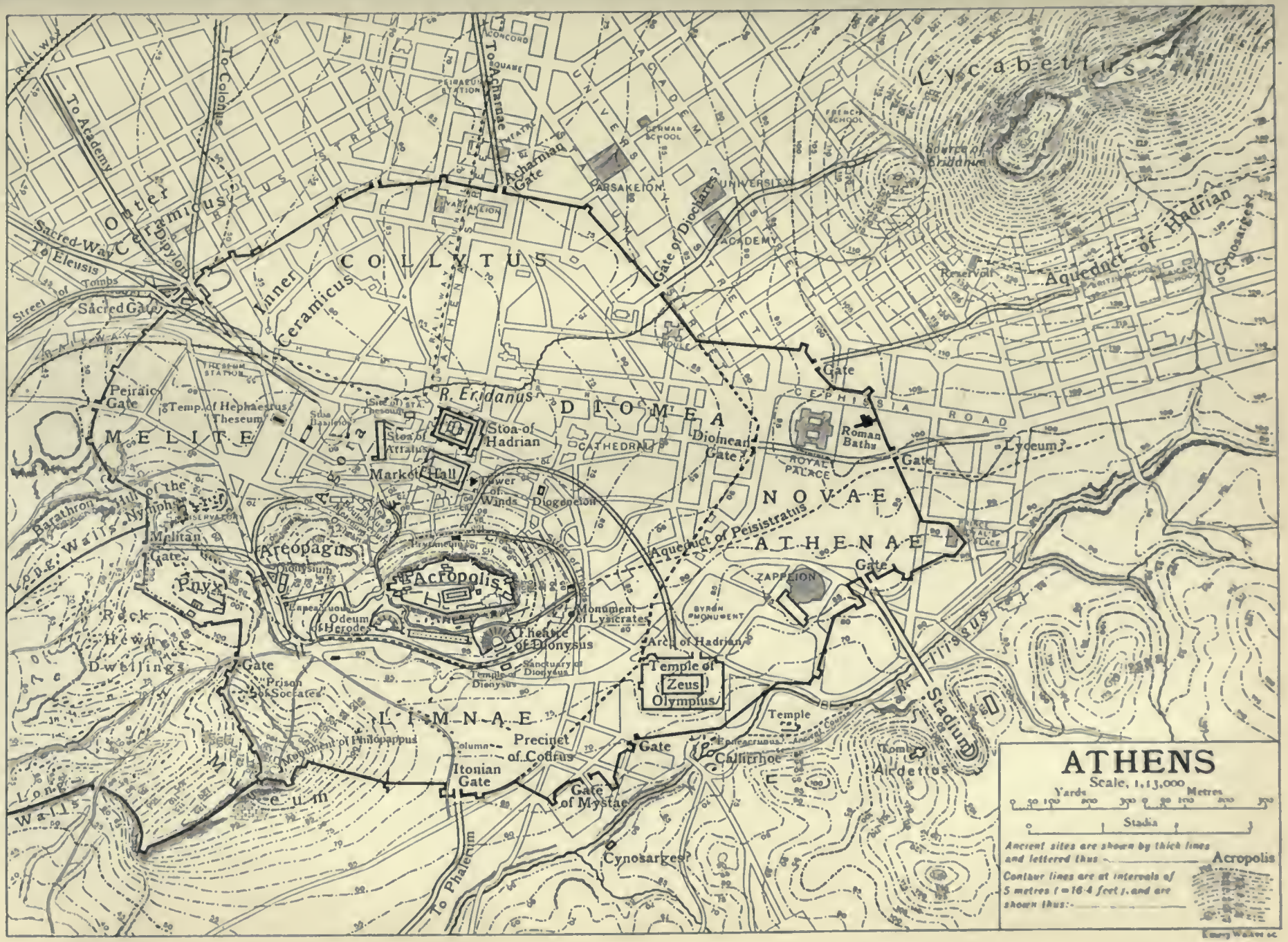
Sources for Athenian topography.

Recent investigation has thrown a new and unexpected light on the art, the monuments and the topography of the ancient city. Numerous and costly excavations have been carried out by the Greek government and by native and foreign scientific societies, while accidental discoveries have been frequently made during the building of the modern town. The museums, enriched by a constant inflow of works of art and inscriptions, have been carefully and scientifically arranged, and afford opportunities for systematic study denied to scholars of the past generation. Improved means of communication have enabled many acute observers to apply the test of scrutiny on the spot to theories and conclusions mainly based on literary evidence; five foreign schools of archaeology, directed by eminent scholars, lend valuable aid to students of all nationalities, and lectures are frequently delivered in the museums and on the more interesting and important sites. The native archaeologists of the present day hold a recognized position in the scientific world; the patriotic sentiment of former times, which prompted their zeal but occasionally warped their judgment, has been merged in devotion to science for its own sake, and the supervision of excavations, as well as the control of the art-collections, is now in highly competent hands. Athens has thus become a centre of learning, a meeting-place for scholars and a basis for research in every part of the Greek world. The attention of many students has naturally been concentrated on the ancient city, the birthplace of European art and literature, and a great development of investigation and discussion in the special domain of Athenian archaeology has given birth to a voluminous literature. Many theories hitherto universally accepted have been called in question or proved to be unsound: the views of Leake, for instance, have been challenged on various points, though many of his conclusions have been justified and confirmed. The supreme importance of a study of Greek antiquities on the spot, long understood by scholars in Europe and in America, has gradually come to be recognized in England, where a close attention to ancient texts, not always adequately supplemented by a course of local study and observation, formerly fostered a peculiarly conservative attitude in regard to the problems of Greek archaeology. Since the foundation of the German Institute in 1874, Athenian topography has to a large extent become a speciality of German scholars, among whom Wilhelm Dörpfeld occupies a pre-eminent position owing to his great architectural attainments and unrivalled local knowledge. Many of his bold and novel theories have provoked strenuous opposition, while others have met with general acceptance, except among scholars of the more conservative type.

Recent research.

Prehistoric Athens.—Numerous traces of the "Mycenaean" epoch have recently been brought to light in Athens and its neighbourhood. Among the monuments of this age discovered in the surrounding districts are the rock-hewn tombs of Spata, accidentally revealed by a landslip in 1877, and the domed sepulchre at Menidi, near the ancient Acharnae, excavated by Lolling in 1879. Other "Mycenaean" landmarks have been laid bare at Eleusis, Thoricus, Halae and Aphidna. These structures, however, are of comparatively minor importance in point of dimensions and decoration; they were apparently designed as places of sepulture for local chieftains, whose domains were afterwards incorporated in the Athenian realm by the συνοικισμός (synoecism) attributed

The early citadel.


ATHENS
Scale, 1:13,000
Yards
Metres
Stadia
Ancient sites are shown by thick lines and lettered thus
Acropolis
Contour lines are at intervals of 5 metres (=16·4 feet), and are shown thus:
Lycabettus
Source of Eridanus
Aqueduct of Hadrian
Cynosarges?
Reservoir
Gate of Diochares?
Acharnian Gate
To Acharnae
To Colonus
To Academy
Outer Ceramicus
Dipylon
Sacred Way
To Eleusis
Street of Tombs
Sacred Gate
Inner Ceramicus
COLLYTUS
Peiraic Gate
Temp. of Hephaestus?
Theseum
MELITE
R. Eridanus
Stoa of Hadrian
Stoa of Attalus
Market Hall
Tower of Winds
Diogeneion
DIOMEA
Diomean Gate?
Roman Baths
Gate
Lyceum?
NOVAE ATHENAE
Aqueduct of Peisistratus
Barathron
Hill of the Nymphs
Long Walls
Melitan Gate
Areopagus
Dionysium
Pnyx
Acropolis
Odeum of Herodes
Theatre of Dionysus
Monument of Lysicrates
Arch of Hadrian
Temple of Zeus Olympius
Temple
Callirrhoe
Stadium
Ardettus
Rock Hewn Dwellings
Gate
Prison of Socrates
LIMNAE
Monument of Philopappus
Precinct of Codrus
Itonian Gate
Gate of Mystae
Cynosarges?
To Phalerum
Long Walls
Museum
Ilissus
Emery Walker sc.

to Theseus. The situation of the Acropolis, dominating the surrounding plain and possessing easy communication with the sea, favoured the formation of a relatively powerful state—inferior, however, to Tiryns and Mycenae; the myths of Cecrops, Erechtheus and Theseus bear witness to the might of the princes who ruled in the Athenian citadel, and here we may naturally expect to find traces of massive fortifications resembling in some degree those of the great Argolid cities. Such in fact have been brought to light by the modern excavations on the Acropolis (1885–1889). Remains of primitive polygonal walls which undoubtedly surrounded the entire area have been found at various points a little within the circuit of the existing parapet. The best-preserved portions are at the eastern extremity, at the northern side near the ancient "royal" exit, and at the south-western angle. The course of the walls can be traced with a few interruptions along the southern side. On the northern side are the foundations of a primitive tower and other remains, apparently of dwelling-houses, one of which may have been the πυκινὸς δόμος Ἐρεχθῆος mentioned by Homer (*Od.* vii. 81). Among the foundations were discovered fragments of "Mycenaean" pottery. The various approaches to the citadel on the northern side—the rock-cut flight of steps north-east of the Erechtheum (*q.v.*), the stairs leading to the well Clepsydra, and the intermediate passage supposed to have furnished access to the Persians—are all to be attributed to the primitive epoch. Two pieces of polygonal wall, one beneath the bastion of Nike Apteros, the other in a direct line between the Roman gateway and the door of the Propylaea, are all that remain of the primitive defences of the main entrance.

The Pelasgicum.

These early fortifications of the Acropolis, ascribed to the primitive non-hellenic Pelasgi, must be distinguished from the Pelasgicum or Pelargicum, which was in all probability an encircling wall, built round the base of the citadel and furnished with nine gates from which it derived the name of Enneapylon. Such a wall would be required to protect the clusters of dwellings around the Acropolis as well as the springs issuing from the rock, while the gates opening in various directions would give access to the surrounding pastures and gardens. This view, which is that of E. Curtius, alone harmonizes with the statement of Herodotus (vi. 137) that the wall was "around" (περί) the Acropolis, and that of Thucydides (ii. 17) that it was "beneath" (ὑπό) the fortress. Thus it would appear that the citadel had an outer and an inner line of defence in prehistoric times. The space enclosed by the outer wall was left unoccupied after the Persian wars in deference to an oracular response apparently dictated by military considerations, the maintenance of an open zone being desirable for the defence of the citadel. A portion of the outer wall has been recognized in a piece of primitive masonry discovered near the Odeum of Herodes Atticus; other traces will probably come to light when the northern and eastern slopes of the Acropolis have been completely explored. Leake, whom Frazer follows, assumed the Pelasgicum to be a fortified space at the western end of the Acropolis; this view necessitates the assumption that the nine gates were built one within the other, but early antiquity furnishes no instance of such a construction; Dörpfeld believes it to have extended from the grotto of Pan to the sacred precinct of Asclepius. The well-known passage of Lucian (*Piscator*, 47) cannot be regarded as decisive for any of the theories advanced, as any portion of the old *enceinte* dismantled by the Persians may have retained the name in later times. The Pelasgic wall enclosed the spring Clepsydra, beneath the north-western corner of the Acropolis, which furnished a water-supply to the defenders of the fortress. The spring, to which a staircase leads down, was once more included in a bastion during the War of Independence by the Greek chief Odysseus.

The Pnyx.

To the "Pelasgic" era may perhaps be referred (with Curtius and Milchhöfer) the immense double terrace on the north-eastern slope of the Pnyx (395 ft. by 212), the upper portion of which is cut out of the rock, while the lower is enclosed by a semicircular wall of massive masonry; the theory of these scholars, however, that the whole precinct was a sanctuary of the Pelasgian Zeus cannot be regarded as proved, nor is it easy to abandon the generally received view that this was the scene of the popular assemblies of later times, notwithstanding the apparent unsuitability of the ground and the insufficiency of room for a large multitude. These difficulties are met by the assumption that the semicircular masonry formed the base of a retaining-wall which rose to a considerable height, supporting a theatre-like structure capable of seating many thousand persons. The masonry may be attributed to the 5th century; the chiselling of the immense blocks is not "Cyclopean." Projecting from the upper platform at the centre of the chord of the semicircular area is a cube of rock, 11 ft. square and 5 ft. high, approached on either side by a flight of steps leading to the top; this block, which Curtius supposes to have been the primitive altar of Zeus Ὕψιστος, may be safely identified with the orators' bema, ὁ λίθος ἐν τῇ Πυκνί (Aristoph. *Pax*, 680). Plutarch's statement that the Thirty Tyrants removed the bema so as to face the land instead of the sea is probably due to a misunderstanding. Other cubes of rock, apparently altars, exist in the neighbourhood. There can be little doubt that the Pnyx was the seat of an ancient cult; the meetings of the Ecclesia were of a religious character and were preceded by a sacrifice to Zeus Ἀγοραῖος; nor is it conceivable that, but for its sacred associations, a site would have been chosen so unsuitable for the purposes of a popular assembly as to need the addition of a costly artificial auditorium.

Rock-dwellings and tombs.

The Pnyx, the Hill of the Nymphs and the Museum Hill are covered with vestiges of early settlements which extend to a considerable distance towards the south-east in the direction of Phalerum. They consist of chambers of various sizes, some of which were evidently human habitations, together with cisterns, channels, seats, steps, terraces and quadrangular tombs, all cut in the rock. This neighbourhood was held by Curtius to have been the site of the primeval rock city, κραναὰ πόλις (Aristoph. *Ach.* 75), anterior to the occupation of the Acropolis and afterwards abandoned for the later settlement. It seems inconceivable, however, that any other site should have been preferred by the primitive settlers to the Acropolis, which offered the greatest advantages for defence; the Pnyx, owing to its proximity to the centres of civic life, can never have been deserted, and that portion which lay within the city walls must have been fully occupied when Athens was crowded during the Peloponnesian War. Some of the rock chambers originally intended for tombs were afterwards converted, perhaps under pressure of necessity, into habitations, as in the case of the so-called "Prison of Socrates," which consists of three chambers horizontally excavated and a small round apartment of the "beehive" type. The remains on the Pnyx and its neighbourhood cannot all be assigned to one epoch, the prehistoric age. The dwellings do not correspond in size or details with the undoubtedly prehistoric abodes on the Acropolis. In view of the ancient law which forbade burial within the city, the tombs within the circuit of the city walls must either be earlier than the time of Themistocles or several centuries later; in the similar rock-tombs on the neighbouring slopes of the Acropolis and Areopagus both Mycenaean and Dipylon pottery have been found. But the numerous vertically excavated tombs outside the walls are of late date and belong for the most part to the Roman period.

The Areopagus.

The Areopagus is now a bare rock possessing few architectural traces. The legend of its occupation by the Amazons (Aeschylus, *Eum.* 681 seq.) may be taken as indicating its military importance for an attack on the Acropolis; the Persians used it as a *point d'appui* for their assault.
The seat of the old oligarchical council and court for homicide was probably on its eastern height. Here were the altar of Athena Areia and two stones; the λίθος Ὕβρεως, on which the accuser, and the λίθος Ἀναιδείας, on which the accused, took their stand. Beneath, at the north-eastern corner, is the cleft which formed the sanctuary of the Σεμναί, or Erinyes. There is no reason for disturbing the associations connected with this

spot as the scene of St Paul's address to the Athenians (E. Gardner, *Anc. Athens*, p. 505).

Hellenic Period.—While modern research has added considerably to our knowledge of prehistoric Athens, a still greater light has been thrown on the architecture and topography of the city in the earlier historic or "archaic" era, the subsequent age of Athenian greatness, and the period of decadence which set in with the Macedonian conquest; the first extends from the dawn of history to 480–479 B.C., when the city was destroyed by the Persians; the second, or classical, age closes in 322 B.C., when Athens lost its political independence after the Lamian War; the third, or Hellenistic, in 146 B.C., when the state fell under Roman protection. We must here group these important epochs together, as distinguished from the later period of Roman rule, and confine ourselves to a brief notice of their principal monuments and a record of the discoveries by which they have been illustrated in recent years.

The city in the "archaic" era.

The earliest settlement on the Acropolis was doubtless soon increased by groups of dwellings at its base, inhabited by the dependents of the princes who ruled in the stronghold. These habitations would naturally in the first instance lie in close proximity to the western approach; after the building of the Pelasgicum they seem to have extended beyond its walls towards the south and south-west—towards the sea and the waters of the Ilissus. The district thus occupied sloped towards the sun and was sheltered by the Acropolis from the prevailing northerly winds. The Thesean synoecism led to the introduction of new cults and the foundation of new shrines partly on the Acropolis, partly in the inhabited district at its base both within and without the wall of the Pelasgicum. Some of the shrines in this region are mentioned by Thucydides in a passage which is of capital importance for the topography of the city at this period (ii. 15). By degrees the inhabited area began to comprise the open ground to the north-west, the nearer portion of the later Ceramicus, or "potters' field" (afterwards divided by the walls of Themistocles into the Inner and Outer Ceramicus), and eventually extended to the north and east of the citadel, which, by the beginning of the 5th century B.C., had become the centre of a circular or wheel-shaped city, πόλιος τροχοειδέος ἄκρα κάρηνα (Oracle *apud* Herod. vii. 140). To this enlarged city was applied, probably about the second half of the 6th century, the special designation τὸ ἄστυ, which afterwards distinguished Athens from its port, the Peiraeus; the Acropolis was already ἡ πόλις (Thucyd. ii. 15). The city is supposed to have been surrounded by a wall before the time of Solon, the existence of which may be deduced from Thucydides' account of the assassination of Hipparchus (vi. 57), but no certain traces of such a wall have been discovered; the materials may have been removed to build the walls of Themistocles.

The Agora.

The centre of commercial and civic life of the older group of communities, as of the greater city of the classical age, was the Agora or market. Here were the various public buildings, which, when the power of the princes on the citadel was transferred to the archons, formed the offices of the administrative magistracy. The site of the primitive Agora (ἀρχαία ἀγορά) was probably in the hollow between the Acropolis and the Pnyx, which formed a convenient meeting-place for the dwellers on the north and south sides of the fortress as well as for its inhabitants. In the time of the Peisistratids the Agora was enlarged so as to extend over the Inner Ceramicus on the north-west, apparently reaching the northern declivities of the Areopagus and the Acropolis on the south. After the Persian Wars the northern portion was used for commercial, the southern for political and ceremonial purposes. In the southern were the Orchestra, where the Dionysiac dances took place, and the famous statues of Harmodius and Aristogeiton by Antenor which were carried away by Xerxes; also the Metroum, or temple of the Mother of the Gods, the Bouleuterium, or council-chamber of the Five Hundred, the Prytaneum, the hearth of the combined communities, where the guests of the state dined, the temple of the Dioscuri, and the Tholus, or Skias, a circular stone-domed building in which the Prytaneis were maintained at the public expense; in the northern were the Leocorium, where Hipparchus was slain, the στοὰ βασιλική, the famous στοὰ ποικίλη, where Zeno taught, and other structures. The Agora was commonly described as the "Ceramicus," and Pausanias gives it this name; of the numerous buildings which he saw here scarcely a trace remains; their position, for the most part, is largely conjectural, and the exact boundaries of the Agora itself are uncertain. What are perhaps the remains of the στοὰ βασιλική, in which the Archon Basileus held his court and the Areopagus Council sat in later times, were brought to light in the winter of 1897–1898, when excavations were carried out on the eastern slope of the "Theseum" hill. Here was found a rectangular structure resembling a temple, but with a side door to the north; it possessed a portico of six columns. The north slope of the Areopagus, where a number of early tombs were found, was also explored, and the limits of the Agora on the south and north-west were approximately ascertained. A portion of the main road leading from the Dipylon to the Agora was discovered.

The Enneacrunus.

In 1892 Dörpfeld began a series of excavations in the district between the Acropolis and the Pnyx with the object of determining the situation of the buildings described by Pausanias as existing in the neighbourhood of the Agora, and more especially the position of the Enneacrunus fountain. The Enneacrunus has hitherto been generally identified with the spring Callirrhoe in the bed of the Ilissus, a little to the south-east of the Olympieum; it is apparently, though not explicitly, placed by Thucydides (ii. 15) in proximity to that building, as well as the temple of Dionysus ἐν λίμναις and other shrines, the temples of Zeus Olympius and of Ge and the Pythium, which he mentions as situated mainly to the south of the Acropolis. On the other hand, Pausanias (i. 14. 1), who never deviates without reason from the topographical order of his narrative, mentions the Enneacrunus in the midst of his description of certain buildings which were undoubtedly in the region of the Agora, and unless he is guilty of an unaccountable digression the Enneacrunus which he saw must have lain west of the Acropolis. It is now generally agreed that the Agora of classical times covered the low ground between the hill of the "Theseum," the Areopagus and the Pnyx; and Pausanias, in the course of his description, appears to have reached its southern end. The excavations revealed a main road of surprisingly narrow dimensions winding up from the Agora to the Acropolis. A little to the south-west of the point where the road turns towards the Propylaea was found a large rock-cut cistern or reservoir which Dörpfeld identifies with the Enneacrunus. The reservoir is supplied by a conduit of 6th-century tiles connected with an early stone aqueduct, the course of which is traceable beneath the Dionysiac theatre and the royal garden in the direction of the Upper Ilissus. These elaborate waterworks were, according to Dörpfeld, constructed by the Peisistratids in order to increase the supply from the ancient spring Callirrhoe; the fountain was furnished with nine jets and henceforth known as Enneacrunus. This identification has been hotly contested by many scholars, and the question must still be regarded as undecided. An interesting confirmation of Dörpfeld's view is furnished by the map of Guillet and Coronelli, published in 1672, in which the Enneacrunus is depicted as a well with a stream of running water in the neighbourhood of the Pnyx. The fact that spring water is not now found in this locality is by no means fatal to the theory; recent engineering investigations have shown that much of the surface water of the Attic plain has sunk to a lower level. In front of the reservoir is a small open space towards which several roads converge; close by is a triangular enclosure of polygonal masonry, in which were found various relics relating to the worship of Dionysus, a very ancient wine-press (ληνός) and the remains of a small temple. Built over this early precinct, which Dörpfeld identifies with the Dionysium ἐν λίμναις, or Lenaeum, is a basilica-shaped building of the Roman period, apparently sacred to Bacchus; in this was found an inscription containing the rules

of the society of the Iobacchi. There is an obvious difficulty in assuming that λίμναι, in the sense of "marshes," existed in this confined area, but stagnant pools may still be seen here in winter. Dörpfeld's identification of the Dionysium, ἐν λίμναις cannot be regarded as proved; his view that another Pythium and another Olympieum existed in this neighbourhood is still less probable; but the inconclusiveness of these theories does not necessarily invalidate his identification of the Enneacrunus, with regard to the position of which the language of Thucydides is far from clear. Another enclosure, a little to the south, is proved by an inscription to have been a sanctuary of the hitherto unknown hero Amynos, with whose cult those of Asclepius and the hero Dexion were here associated; under the name Dexion, the poet Sophocles is said to have been worshipped after his death. The whole district adjoining the Areopagus was found to have been thickly built over; the small, mean dwelling-houses intersected by narrow, crooked lanes convey a vivid idea of the contrast between the modest private residences and the great public structures of the ancient city.

The age of the Peisistratids (560–511 B.C.) marked an era in the history of Athenian topography. The greatest of their foundations, the temple of Olympian Zeus, will be referred to later. Among the monuments of their rule, in addition to the enlarged Agora and the Enneacrunus, were the Academy and perhaps the Lyceum. The original name of the Academy may have been Hecademia, from Hecademus, an early proprietor (but see ACADEMY, GREEK). The famous seat of the Platonic philosophy was a gymnasium enlarged as a public park by Cimon; it lay about a mile to the north-west of the Dipylon Gate, with which it was connected by a street bordered with tombs. The Lyceum, where Aristotle taught, was originally a sanctuary of Apollo Lyceius. Like the Academy, it was an enclosure with a gymnasium and garden; it lay to the east of the city beyond the Diocharean Gate.

The Academy and Lyceum.

Little was known of the buildings on the Acropolis in the pre-Persian period before the great excavations of 1885–1888, which rank among the most surprising achievements of modern research. The results of these operations, which were conducted by the Archaeological Society under the direction of Kavvadias and Kawerau, must be summarized with the utmost brevity. The great deposits of sculpture and pottery now unearthed, representing all that escaped from the ravages of the Persians and the burning of the ancient shrines, afford a startling revelation of the development of Greek art in the 7th and 6th centuries. Numbers of statues—among them a series of draped and richly-coloured female figures—masterpieces of painted pottery, only equalled by the Attic vases found in Magna Grecia and Etruria, and numerous bronzes, were among the treasures of art now brought to light. All belong to the "archaic" epoch; only a few remains of the greater age were found, including some fragments of sculptures from the Parthenon and Erechtheum. We are principally concerned, however, with the results which add to our knowledge of the topography and architecture of the Acropolis. The entire area of the summit was now thoroughly explored, the excavations being carried down to the surface of the rock, which on the southern side was found to slope outwards to a depth of about 45 ft. In the lower strata were discovered the remnants of Cyclopean or prehistoric architecture already mentioned. Of later date, perhaps, are the limestone polygonal retaining walls on the west front, which extended on either side of the early entrance. Of these a portion may probably be attributed to the Peisistratids, in whose time the Acropolis once more became the stronghold of a despotism. Its fortifications, though not increased, were apparently strengthened by the Tyrants. To its embellishment they probably contributed the older ornamental entrance, facing south-west, the precursor of the greater structure of Mnesicles (see PROPYLAEA) and the colonnade of the "Hecatompedon," or earlier temple of Athena, at this time the only large sacred edifice on the citadel. The name was subsequently applied to the cella, or eastern chamber, of the Parthenon, which is exactly 100 ft. long, and also became a popular designation of the temple itself.

The Acropolis before the Persian wars.

The ancient Hecatompedon may in all probability be identified with an early temple, also 100 ft. long, the foundations of which were pointed out in 1885 by Dörpfeld on the ground immediately adjoining the south side of the Erechtheum. On this spot was apparently the primitive sanctuary of Athena, the rich temple (πίων νηός) of Homer (*Il.* ii. 549), in which the cult of the goddess was associated with that of Erechtheus; the Homeric temple is identified by Furtwängler with the "compact house of Erechtheus" (*Od.* vii. 81), which, he holds, was not a royal palace, but a place of worship, and traces of it may perhaps be recognized in the fragments of prehistoric masonry enclosed by the existing foundations. The foundations seem to belong to the 7th century, except those of the colonnade, which was possibly added by Peisistratus. According to Dörpfeld, this was the "old temple" of Athena Polias, frequently mentioned in literature and inscriptions, in which was housed the most holy image (ξόανον) of the goddess which fell from heaven; it was burnt, but not completely destroyed, during the Persian War, and some of its external decorations were afterwards built into the north wall of the Acropolis; it was subsequently restored, he thinks, with or without its colonnade—in the former case a portion of the peristyle must have been removed when the Erechtheum was built so as to make room for the porch of the maidens; the building was set on fire in 406 B.C. (Xen. *Hell.* i. 6. 1), and the conflagration is identical with that mentioned by Demosthenes (*In Timocr.* xxiv. 155); its "opisthodomos" served as the Athenian treasury in the 5th and 4th centuries; the temple is the ἀρχαῖος νεὼς τῆς Πολιάδος mentioned by Strabo (ix. 16), and it was still standing in the time of Pausanias, who applies to it the same name (i. 27. 3). The conclusion that the foundations are those of an old temple burnt by the Persians has been generally accepted, but other portions of Dörpfeld's theory—more especially his assumption that the temple was restored after the Persian War—have provoked much controversy. Thus J. G. Frazer maintains the hitherto current theory that the earlier temple of Athena and Erechtheus was on the site of the Erechtheum; that the Erechtheum inherited the name ἀρχαῖος νεώς from its predecessor, and that the "opisthodomos" in which the treasures were kept was the west chamber of the Parthenon; Furtwängler and Milchhöfer hold the strange view that the "opisthodomos" was a separate building at the east end of the Acropolis, while Penrose thinks the building discovered by Dörpfeld was possibly the Cecropeum. E. Curtius and J. W. White, on the other hand, accept Dörpfeld's identification, but believe that only the western portion of the temple or opisthodomos was rebuilt after the Persian War. Admitting the identification, we may perhaps conclude that the temple was repaired in order to provide a temporary home for the venerated image and other sacred objects; no traces of a restoration exist, but the walls probably remained standing after the Persian conflagration. The removal of the ancient temple was undoubtedly intended when the Erechtheum was built, but superstition and popular feeling may have prevented its demolition and the removal of the ξόανον to the new edifice. The temple consisted of an eastern cella with pronaos; behind this was the opisthodomos, divided into three chambers—possibly treasuries—with a portico at the western end. The peristyle, if we compare the measurements of the stylobate with those of the drums built into the wall of the Acropolis, may be concluded to have consisted of six Doric columns at the ends and twelve at the sides. In one of the pediments was a gigantomachy, of which some fragments have been recovered.

The old temple of Athena.

In 1896 excavations with the object of exploring the whole northern and eastern slopes of the Acropolis were begun by Kavvadias. The pathway between the citadel and the Areopagus was found to be so narrow that it is certain the Panathenaic procession cannot have taken this route to the Acropolis. On the north-west rock the caves known as the grottoes of Pan and Apollo were cleared out; these consist of a slight high-arched indentation

The grottoes of Pan and Apollo.

immediately to the east of the Clepsydra and a double and somewhat deeper cavern a little farther to the east. In the first mentioned are a number of niches in which πίνακες (votive tablets) were placed: some of these, inscribed with dedications to Apollo, have been discovered. The whole locality was the seat of the ancient cult of this deity, afterwards styled "Hypacraeus," with which was associated the legend of Creüsa and the birth of Ion. The worship of Pan was introduced after the Persian wars, in consequence of an apparition seen by Pheidippides, the Athenian courier, in the mountains of Arcadia. Another cave more to the west was revealed by the demolition of the bastion of Odysseus. To the east a much deeper and hitherto unknown cavern has been revealed, which Kavvadias identifies with the grotto of Pan. Close to it are a series of steps hewn in the rock which connect with those discovered in 1886 within the Acropolis wall. Farther east is an underground passage leading eastward to a cave supposed to be the sanctuary of Aglaurus where the ephebi took the oath; with this passage is connected a secret staircase leading up through a cleft in the rock to the precinct of the Errephori on the Acropolis. It is conceivable that the priestesses employed this exit when descending on their mysterious errand.

The classical period: the walls of Themistocles.

In the fifty years between the Persian and the Peloponnesian wars architecture and plastic art attained their highest perfection in Athens. The almost complete destruction of the buildings on the Acropolis and in the lower city, among them many temples and shrines which religious sentiment might otherwise have preserved, facilitated the realization of the magnificent architectural designs of Themistocles, Cimon and Pericles, while the rapid growth of the Athenian empire provided the state with the necessary means for the execution of these sumptuous projects. Of the great monuments of this epoch few traces remain except on the Acropolis. After the departure of the Persians the first necessity was the reconstruction of the defences of the city and the citadel. The walls of the city, now built under the direction of Themistocles, embraced a larger area than the previous circuit, with which they seem to have coincided at the Dipylon Gate on the north-west where the Sacred Way to Eleusis was joined by the principal carriage route to the Peiraeus and the roads to the Academy and Colonus. The other more important gates were the Peiraic and Melitan on the west; the Itonian on the south leading to Phalerum, the Diomean and Diocharean on the east, and the Acharnian on the north. The wall, which was strengthened with numerous towers, enclosed the quarters of Collytus on the north, Melite on the west, Limnae on the south-west and south, and Diomea on the east. The scanty traces which remain have not been systematically excavated except in the neighbourhood of the Dipylon; the discovery of sepulchral tablets built into the masonry illustrates the statement of Thucydides with regard to the employment of such material in the hasty construction of the walls. The circuit has been practically ascertained in its general lines, though not in details; it is given by Thucydides (ii. 13. 7) as 43 stades (about 5½ m.) exclusive of the portion between the points of junction with the long walls extending to the Peiraeus, but the whole circumference cannot have exceeded 37 stades. Possibly Thucydides, who in the passage referred to is dealing with the question of defence, included a portion of the contiguous long walls in his measurement; this explanation derives probability from his underestimate of the length of the long walls.

The "Long Walls."

The design of connecting Athens with the Peiraeus by long parallel walls is ascribed by Plutarch to Themistocles. The "Long Walls" (τὰ μακρὰ τείχη, τὰ σκέλη) consisted of (1) the "North Wall" (τὸ βόρειον τεῖχος), (2) the "Middle" or "South Wall" (τὸ διὰ μέσου τεῖχος, Plato, *Gorg.* 555 E; τὸ νότιον τεῖχος); and (3) the "Phaleric Wall" (τὸ Φαληρικὸν τεῖχος). The north and Phaleric walls were perhaps founded by Cimon, and were completed about 457 B.C. in the early administration of Pericles; the middle wall was built about 445 B.C. The lines of the north and middle walls have been ascertained from the remnants still existing in the 18th century and the scantier traces now visible. The north wall, leaving the city circuit at a point near the modern Observatory, ran from north-east to south-west near the present road to the Peiraeus, until it reached the Peiraeus walls a little to the east of their northernmost bend. The middle wall, beginning south of the Pnyx near the Melitan Gate, gradually approached the northern wall and, following a parallel course at an interval of 550 ft., diverged to the east near the modern New Phalerum and joined the Peiraeus walls on the height of Munychia where they turn inland from the sea. The course of the Phaleric wall has been much disputed. The widely-received view of Curtius that it ran to Cape Kolias (now Old Phalerum) on the east of the Phaleric bay is not accepted by recent topographers. The exigencies of the defensive system planned by Themistocles could only have been satisfied by a juncture of the Phaleric wall with that of the Peiraeus. The existence of any third wall was denied by Leake, according to whose theory the southern parallel wall would be identical with the Phaleric. The language of Thucydides, however, seems decisive with regard to the existence of three walls. The Phaleric wall, branching from the city circuit at some point farther east than the middle or south wall, may have followed the ridge of the Sikelia heights, where some traces of fortifications remain, and then traversed the Phalerum plain till it reached the Peiraeus defences at a point a little to the north-west of their junction with the middle wall. The Phaleric wall, proving indefensible, was abandoned towards the close of the Peloponnesian war; with the other two walls it was completely destroyed after the surrender of the city, and was not rebuilt when they were restored by Conon in 393 B.C. The parallel walls fell into decay, during the Hellenistic period, and according to Strabo (ix. 396) were once more demolished by Sulla.

The Peiraeus.

The great advantages which the Peiraic promontory with its three natural harbours offered for purposes of defence and commerce were first recognized by Themistocles, in whose archonship (493 B.C.) the fortifications of the Peiraeus were begun. Before his time the Athenians used as a port the roadstead of Phalerum at the north-eastern corner of Phalerum bay partly sheltered by Cape Kolias. As soon as the building of the city walls had been completed, Themistocles resumed the construction of the Peiraeus defences, which protected the larger harbour of Cantharus on the west and the smaller ports of Zea and Munychia (respectively south-west and south-east of the Munychia heights), terminating in moles at their entrances and enclosing the entire promontory on the land and sea sides except a portion of the south-west shore of the peninsula of Acte. The walls, built of finely compacted blocks, were about 10 ft. in thickness and upwards of 60 ft. in height, and were strengthened by towers. The town was laid out at great expense in straight, broad streets, intersecting each other at right angles, by the architect Hippodamus of Miletus in the time of Pericles. In the centre was the Agora of Hippodamus; on the western margin of the Cantharus harbour extended the emporium, or Digma, the centre of commercial activity, flanked by a series of porticoes; at its northern end, near the entrance to the inner harbour, was another Agora, on the site of the modern market-place, and near it the μακρὰ στοά, the corn depot of the state. This inner and shallower harbour, perhaps the κωφὸς λιμήν, was afterwards excluded from the town precinct by the walls of Conon, which traversing its opening on an embankment (τὸ διὰ μέσου χῶμα) ran round the outer shore of the western promontory of Eëtionea, previously enclosed, with some space to the north-west, by the wider circuit of Themistocles. In the harbours of Zea and Munychia traces may be seen of the remarkable series of galley-slips in which the Athenian fleet was built and repaired. The galley-slips around Zea were roofed by a row of gables supported by stone columns, each gable sheltering two triremes. Among the other noteworthy buildings of the Peiraeus were the arsenal (σκευοθήκη) of Philo and the temples of Zeus Soter, the patron god of the sailors, of the Cnidian Artemis, built by Cimon, and of Artemis Munychia,

situated near the fort on the Munychia height; traces of a temple of Asclepius, of two theatres and of a hippodrome remain. The fine marble lion of the classical period which stood at the mouth of the Cantharus harbour gave the Peiraeus its medieval and modern names of Porto Leone and Porto Draco; it was carried away to Venice by Morosini.

The Dipylon and Ceramicus.

In 1870 the Greek Archaeological Society undertook a series of excavations in the Outer Ceramicus, which had already been partially explored by various scholars. The operations, which were carried on at intervals till 1890, resulted in the discovery of the Dipylon Gate, the principal entrance of ancient Athens. The Dipylon consists of an outer and an inner gate separated by an oblong courtyard and flanked on either side by towers; the gates were themselves double, being each composed of two apertures intended for the incoming and outgoing traffic. An opening in the city wall a little to the south-west, supposed to have been the Sacred Gate (ἱερὰ πύλη), was in all probability an outlet for the waters of the Eridanus. This stream, which has hitherto been regarded as the eastern branch of the Ilissus rising at Kaesariane, has been identified by Dörpfeld with a brook descending from the south slope of Lycabettus and conducted in an artificial channel to the north-western end of the city, where it made its exit through the walls, eventually joining the Ilissus. The channel was open in Greek times, but was afterwards covered by Roman arches; it appears to have served as the main drain of the city. Between this outlet and the Dipylon were found a boundary-stone, inscribed ὅρος Κεραμεικοῦ, which remains in its place, and the foundations of a large rectangular building, possibly the Pompeium, which may have been a robing-room for the processions which passed this way. On either side of the Dipylon the walls of Themistocles, faced on the outside by a later wall, have been traced for a considerable distance. The excavation of the outlying cemetery revealed the unique "Street of the Tombs" and brought to light a great number of sepulchral monuments, many of which remain *in situ*. Especially noteworthy are the *stelae* (reliefs) representing scenes of leave-taking, which, though often of simple workmanship, are characterized by a touching dignity and restraint of feeling. In this neighbourhood were found a great number of tombs containing vases of all periods, which furnish a marvellous record of the development of Attic ceramic art. A considerable portion of the district remains unexplored.

The Acropolis of the classical period: its fortifications and area.

The Acropolis had been dismantled as a fortress after the expulsion of Hippias; its defenders against the Persians found it necessary to erect a wooden barricade at its entrance. The fortifications were again demolished by the Persians, after whose departure the existing north wall was erected in the time of Themistocles; many columns, metopes and other fragments from the buildings destroyed by the Persians were built into it, possibly owing to haste, as in the case of the city walls, but more probably with the design of commemorating the great historic catastrophe, as the wall was visible from the Agora. The fine walls of the south and east sides were built by Cimon after the victory of the Eurymedon, 468 B.C.; they extend considerably beyond the old Pelasgic circuit, the intervening space being filled up with earth and the débris of the ruined buildings so as to increase the level space of the summit. On the northern side Cimon completed the wall of Themistocles at both ends and added to its height; the ground behind was levelled up on this side also, the platform of the Acropolis thus receiving its present shape and dimensions. The staircase leading down to the sanctuary of Aglaurus was enclosed in masonry. At the south-western corner, on the right of the approach to the old entrance, a bastion of early masonry was encased in a rectangular projection which formed a base for the temple of Nike. The great engineering works of Cimon provided a suitable area for the magnificent structures of the age of Pericles.

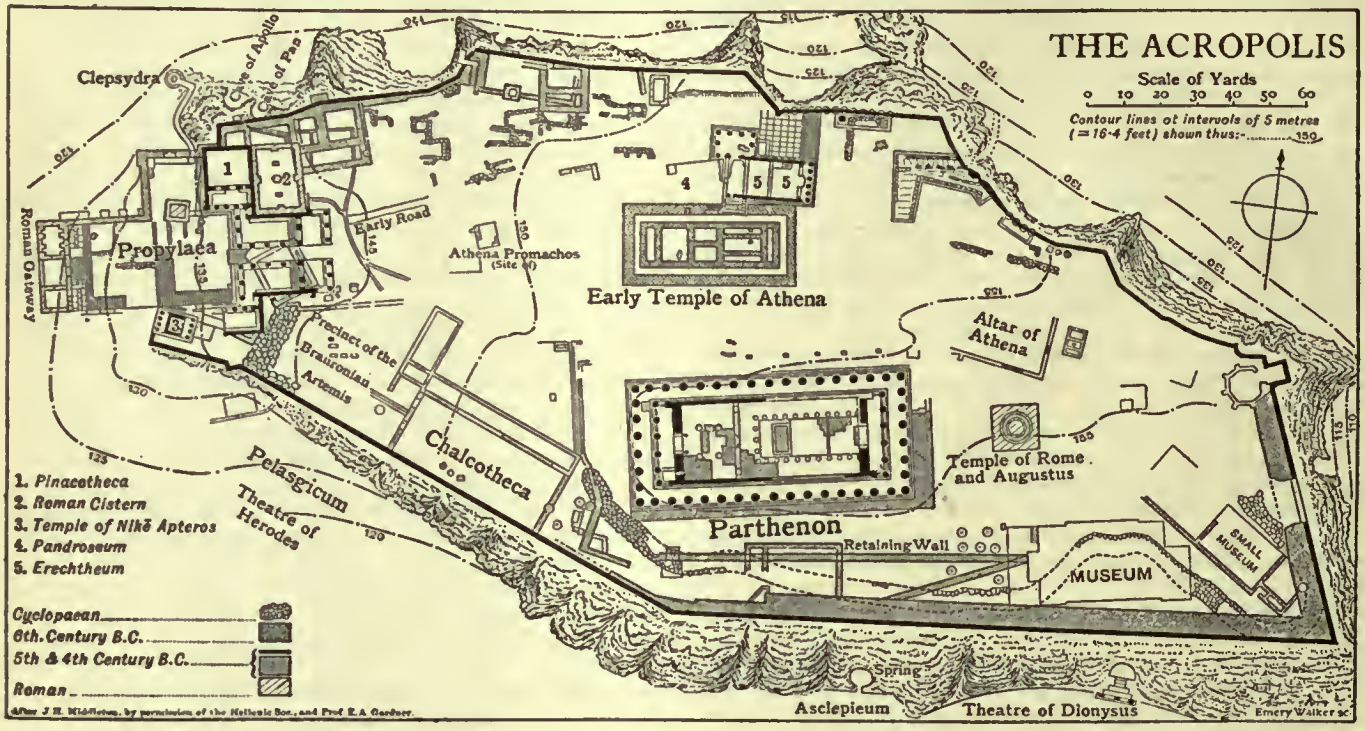
The greater monuments of the classical epoch on the Acropolis are described in separate articles (see PARTHENON, ERECHTHEUM, PROPYLAEA). Next in interest to these noble structures is the beautiful little temple of Athena Nike, wrongly designated Nike Apteros (Wingless Victory), standing on the bastion already mentioned; it was begun after 450 B.C. and was probably finished after the outbreak of the Peloponnesian War. The temple, which is entirely of Pentelic marble, is amphiprostyle tetrastyle, with fluted Ionic columns, resting on a stylobate of three steps; its length is 27 ft., its breadth 18½ ft., and its total height, from the apex of the pediment to the bottom of the steps, 23 ft. The frieze, running round the entire building, represents on its eastern side a number of deities, on its northern and southern sides Greeks fighting with Persians, and on its western side Greeks fighting with Greeks. Before the east front was the altar of Athena Nike. The irregularly shaped precinct around the temple was enclosed by a balustrade about 3 ft. 2 in. in height, decorated on the outside with beautiful reliefs representing a number of winged Victories engaged in the worship of Athena. The elaborate treatment of the drapery enveloping these female figures suggests an approach to the mannerism of later times; this and other indications point to the probability that the balustrade was added in the latter years of the Peloponnesian War. The temple was still standing in 1676; some eight years later it was demolished by the Turks, and its stones built into a bastion; on the removal of the bastion in 1835 the temple was successfully reconstructed by Ross with the employment of little new material. At either corner of the Propylaea entrance were equestrian statues dedicated by the Athenian knights; the bases with inscriptions have lately been recovered. From the inner exit of the Propylaea a passage led towards the east along the north side of the Parthenon; almost directly facing the entrance was the colossal bronze statue of Athena (afterwards called Athena Promachos) by Pheidias, probably set up by Cimon in commemoration of the Persian defeat. The statue, which was 30 ft. high, represented the goddess as fully armed; the gleam of her helmet and spear could be seen by the mariners approaching from Cape Sunium (Pausanias i. 28). On both sides of the passage were numerous statues, among them that of Athena Hygeia, set up by Pericles to commemorate the recovery of a favourite slave who was injured during the building of the Parthenon, a colossal bronze image of the wooden horse of Troy, and Myron's group of Marsyas with Athena throwing away her flute. Another statue by Myron, the famous Perseus, stood near the precinct of Artemis Brauronia. In this sacred enclosure, which lay between the south-eastern corner of the Propylaea and the wall of Cimon, no traces of a temple have been found. Adjoining it to the east are the remains of a large rectangular building, which was apparently fronted by a colonnade; this has been identified with the Χαλκοθήκη, a storehouse of bronze implements and arms, which was formerly supposed to lie against the north wall near the Propylaea. Beyond the Parthenon, a little to the north-east, was the great altar of Athena, and near it the statue and altar of Zeus Polieus. With regard to the buildings on the east end of the Acropolis, where the present museums stand, no certainty exists; among the many statues here were those of Xanthippus, the father of Pericles, and of Anacreon. Immediately west of the Erechtheum is the Pandroseum or temenos of Pandrosos, the daughter of Cecrops, the excavation of which has revealed no traces of the temple (ναός) seen here by Pausanias (i. 27). The site of this precinct, in which the sacred olive tree of Athena grew, has been almost certainly fixed by an inscription found in the bastion of Odysseus. At its north-western extremity is a platform of levelled rock which may have supported the altar of Zeus Hypsistus. Farther west, along the north wall of the Acropolis, is the space probably occupied by the abode and playground of the Errephori. Between this precinct and the Propylaea were a number of statues, among them the celebrated heifer of Myron, and perhaps his Erechtheus; the Lemnian Athena of Pheidias, and his effigy of his friend Pericles.

The monuments on the Acropolis.

The reconstruction of the city after its demolition by the Persians was not carried out on the lines of a definite plan like that of the Peiraeus. The houses were hastily repaired, and the

narrow, crooked streets remained; the influence of Themistocles, who aimed at transferring the capital to the Peiraeus, was probably directed against any costly scheme of restoration, except on the Acropolis. The period of Cimon's administration, however, especially the interval between his victory on the Eurymedon and his ostracism (468–461 B.C.), was marked by great architectural activity in the lower city as well as on the citadel. To his time may be referred many of the buildings around the Agora (probably rebuilt on the former sites) and elsewhere, and the passage, or δρόμος, from the Agora to the Dipylon flanked by long porticos. The Theseum or temple of Theseus, which lay to the east of the Agora near the Acropolis, was built by Cimon: here he deposited the bones of the national hero which he brought from Scyros about 470 B.C. The only building in the city which can with certainty be assigned to the administration of Pericles is the Odeum, beneath the southern declivity of the Acropolis, a structure mainly of wood, said to have been built in imitation of the tent of Xerxes: it was used for musical contests and the

The city in the classical period.



rehearsal of plays. Of the various temples in which statues by Pheidias, Alcamenes and other great sculptors are known to have been placed, no traces have yet been discovered; excavation has not been possible in a large portion of the lower city, which has always been inhabited. The only extant structures of the classical period are the Hephaesteum, the Dionysiac theatre, and the choragic monument of Lysicrates. The remains of a small Ionic temple which were standing by the Ilissus in the time of Stuart have disappeared.

The Hephaesteum, the so-called Theseum, is situated on a slight eminence, probably the Colonus Agoraeus, to the west of the Agora. The best preserved Greek temple in the world, it possesses no record of its origin; the style of its sculptures and architecture leads to the conclusion that it was built about the same time as the Parthenon; it seems to have been finished by 421 B.C. It has been known as the Theseum since the middle ages, apparently because some of its sculptures represent the exploits of Theseus, but the Theseum was an earlier sanctuary on the east of the Agora (see above). The building has been supposed by Curtius, Wachsmuth and others to be the Heracleum in Melite, but its identification with the temple of Hephaestus and Athena seen in this neighbourhood by Pausanias (i. 14. 6),

The Hephaesteum or Theseum.

though not established, may be regarded as practically certain, notwithstanding the difficulty presented by the subjects of the sculptures, which bear no relation to Hephaestus. The temple is a Doric peripteral hexastyle *in antis*, with 13 columns at the sides; its length is 104 ft., its breadth 45½ ft., its height, to the top of the pediment, 33 ft. The sculptures of the pediments have been completely lost, but their design has been ingeniously reconstructed by Sauer. The frieze of the entablature contains sculptures only in the metopes of the east front and in those of the sides immediately adjoining it; the frontal metopes represent the labours of Heracles, the lateral the exploits of Theseus. As in the Parthenon, there is a sculptured zophoros above the exterior of the cella walls; this, however, extends over the east and west fronts only and the east ends of the sides; the eastern zophoros represents a battle-scene with seated deities on either hand, the western a centauromachia. The temple is entirely of Pentelic marble, except the foundations and lowest step of the stylobate, which are of Peiraic stone, and the zophoros of the cella, which is in Parian marble. The preservation of the temple is due to its conversion into a church in the middle ages.

The Dionysiac theatre, situated beneath the south side of the Acropolis, was partly hollowed out from its declivity. The representation of plays was perhaps transferred to this spot from the early Orchestra in the Agora at the beginning of the 5th century B.C.; it afterwards superseded the Pnyx as the meeting-place of the Ecclesia. The site, which had been accurately determined by Leake, was explored by Strack in 1862, and the researches subsequently undertaken by the Greek Archaeological Society were concluded in 1879. It was not, however, till 1886 that traces of the original circular Greek orchestra were pointed out by Dörpfeld. The arrangements of the stage and orchestra as we now see them belong to Roman times; the *cavea* or auditorium dates from the administration of the orator Lycurgus (337–323 B.C.), and nothing is left of the theatre in which the plays of Sophocles were acted save a few small remnants of polygonal masonry. These, however, are sufficient to mark out the circuit of the ancient orchestra, on which the subsequently built proscenia encroached. The oldest stage-building was erected in the time of Lycurgus; it consisted of a rectangular hall with square projections (παρασκήνια) on either side; in

The Dionysiac theatre and Asclepieum.

front of this was built in late Greek or early Roman times a stage with a row of columns which intruded upon the orchestra space; a later and larger stage, dating from the time of Nero, advanced still farther into the orchestra, and this was finally faced (probably in the 3rd century A.D.) by the "bema" of Phaedrus, a platform-wall decorated with earlier reliefs, the slabs of which were cut down to suit their new position. The remains of two temples of Dionysus have been found adjoining the stoa of the theatre, and an altar of the same god adorned with masks and festoons; the smaller and earlier temple probably dates from the 6th century B.C., the larger from the end of the 5th or the beginning of the 4th century.

Immediately west of the theatre of Dionysus is the sacred precinct of Asclepius, which was excavated by the Archaeological Society in 1876–1878. Here were discovered the foundations of the celebrated Asclepieum, together with several inscriptions and a great number of votive reliefs offered by grateful invalids and valetudinarians to the god of healing. Many of the reliefs belong to the best period of Greek art. A Doric colonnade with a double row of columns was found to have extended along the base of the Acropolis for a distance of 54 yds.; behind it in a chamber hewn in the rock is the sacred well mentioned by Pausanias. The colonnade was a place of resort for the patients; a large building close beneath the rock was probably the abode of the priests.

The choragic monument of Lysicrates.

The beautiful choragic monument of Lysicrates, dedicated in the archonship of Euaenetus (335–334 B.C.), is the only survivor of a number of such structures which stood in the "Street of the Tripods" to the east of the Dionysiac theatre, bearing the tripods given to the successful choragi at the Dionysiac festival. It owes its preservation to its former inclusion in a Capuchin convent. The monument consists of a small circular temple of Pentelic marble, 21½ ft. in height and 9 ft. in diameter, with six engaged Corinthian columns and a sculptured frieze, standing on a rectangular base of Peiraic stone. The delicately carved convex roof, composed of a single block, was surmounted by the tripod. The spirited reliefs of the frieze represent the punishment of the Tyrrhenian pirates by Dionysus and their transformation into dolphins. Another choragic monument was that of Thrasyllus, which faced a cave in the Acropolis rock above the Dionysiac theatre. A portion of another, that of Nicias, was used to make the late Roman gate of the Acropolis. In one of these monuments was the famous Satyr of Praxiteles.

The Cynosarges.

The Cynosarges, from earliest times a sanctuary of Heracles, later a celebrated gymnasium and the school of Antisthenes the Cynic, has hitherto been generally supposed to have occupied the site of the Monastery of the Asomati on the eastern slope of Lycabettus; its situation, however, has been fixed by Dörpfeld at a point a little to the south of the Olympieum, on the left bank of the Ilissus. Here a series of excavations, carried out by the British School in 1896–1897 under the direction of Cecil Smith, revealed the foundations of an extensive Greek building, the outlines of which correspond with those of a gymnasium; it possessed a large bath or cistern, and was flanked on two sides by water-courses. An Ionic capital found here possibly belonged to the palaestra. The identification, however, cannot be regarded as certain in the absence of inscriptions.

The Hellenistic period: the Stoa of Attalus.

With the loss of political liberty the age of creative genius in Athenian architecture came to a close. The era of decadence, of honorary statues and fulsome inscriptions, began. The embellishments which the city received during the Hellenistic and Roman periods were no longer the artistic expression of the religious and political life of a great commonwealth; they were the tribute paid to the intellectual renown of Athens by foreign potentates or dilettanti, who desired to add their names to the list of its illustrious citizens and patrons. Among the first of these benefactions was the great gymnasium of Ptolemy, built in the neighbourhood of the Agora about 250 B.C. Successive princes of the dynasty of Pergamum interested themselves in the adornment of the city: Attalus I. set up a number of bronze statues on the Acropolis; Eumenes II. built the long portico west of the Dionysiac theatre, which was excavated and identified in 1877; Attalus II. erected the magnificent Stoa near the Agora, the remains of which were completely laid bare in 1898–1902 and have been identified by an inscription. The Stoa consisted of a series of 21 chambers, probably shops, faced by a double colonnade, the outer columns being of the Doric order, the inner unfluted, with lotus-leaf capitals; it possessed an upper storey fronted with Ionic columns.

The Olympieum.

The greatest monument, however, of the Hellenistic period is the colossal Olympieum or temple of Olympian Zeus, "unum in terris inchoatum pro magnitudine dei" (Livy xli. 20), the remains of which stand by the Ilissus to the south-east of the Acropolis. The foundations of a temple were laid on the site—probably that of an ancient sanctuary—by Peisistratus, but the building in its ultimate form was for the greater part constructed under the auspices of Antiochus IV. Epiphanes, king of Syria, by the Roman architect Cossutius in the interval between 174 B.C. and 164 B.C., the date of the death of Antiochus. The work was then suspended and its proposed resumption in the time of Augustus seems not to have been realized; finally, in A. D. 129, the temple was completed and dedicated by Hadrian, who set up a chryselephantine statue of Zeus in the cella. The substructure was excavated in 1883 by F. C. Penrose, who proved the correctness of Dörpfeld's theory that the building was octostyle; its length was 318 ft., its breadth 132 ft. With the exception of the foundations and two lower steps of the stylobate, it was entirely of Pentelic marble, and possessed 104 Corinthian columns, 56 ft. 7 in. in height, of which 48 stood in triple rows under the pediments and 56 in double rows at the sides; of these, 16 remained standing in 1852, when one was blown down by a storm. Fragments of Doric columns and foundations were discovered, probably intended for the temple begun by Peisistratus, the orientation of which differed slightly from that of the later structure. The peribolos, a large artificial platform supported by a retaining wall of squared Peiraic blocks with buttresses, was excavated in 1898 without important results; it is to be hoped that the stability of the columns has not been affected by the operations.

The Roman Period.—After 146 B.C. Athens and its territory were included in the Roman province of Achaea. Among the earlier buildings of this period is the Horologium of Andronicus of Cyrrhus (the "Tower of the Winds"), still standing near the eastern end of the Roman Agora. The building may belong to the 2nd or 1st century B.C.; it is mentioned by Varro (*De re rust.* iii. 5. 17), and therefore cannot be of later date than 35 B.C. It is an octagonal marble structure, 42 ft. in height and 26 ft. in diameter; the eight sides, which face the points of the compass, are furnished with a frieze containing inartistic figures in relief representing the winds; below it, on the sides facing the sun, are the lines of a sun-dial. The building was surmounted by a weathercock in the form of a bronze Triton; it contained a water-clock to record the time when the sun was not shining.

The Horologium of Andronicus.

Monuments of the Roman period.

The capture and sack of Athens by Sulla (March 1, 86 B.C.) seems to have involved no great injury to its architectural monuments beyond the burning of the Odeum of Pericles; a portion of the city wall was razed, the groves of the Academy and Lyceum were cut down, and the Peiraeus, with its magnificent arsenal and other great buildings, burnt to the ground. After this catastrophe the benefactors of Athens were for the most part Romans; the influence of Greek literature and art had begun to affect the conquering race. The New, or Roman, Agora to the north of the Acropolis, perhaps mainly an oil market, was constructed after the year 27 B.C. Its dimensions were practically determined by excavation in 1890–1891. It consisted of a large open rectangular space surrounded by an Ionic colonnade into which opened a number of shops or storehouses. The eastern gate was adorned with four Ionic columns on the outside and two on the inside, the

western entrance being the well-known Doric portico of Athena Archegetis with an inscription recording its erection from donations of Julius Caesar and Augustus. The whole conclave may be compared with the enclosed bazaars or khans of Oriental cities which are usually locked at night. The Agrippeum, a covered theatre, derived its name from Vipsanius Agrippa, whose statue was set up, about 27 B.C., beneath the north wing of the Acropolis propylaea, on the high rectangular base still remaining. At the eastern end of the Acropolis a little circular temple of white marble with a peristyle of 9 Ionic columns was dedicated to Rome and Augustus; its foundations were discovered during the excavations of 1885–1888. The conspicuous monument which crowns the Museum Hill was erected as the mausoleum of Antiochus Philopappus of Commagene, grandson of Antiochus Epiphanes, in A.D. 114–116. Excavations carried out in 1898–1899 showed that the structure was nearly square; the only portion remaining is the slightly curved front, with three niches between Corinthian pilasters; in the central niche is the statue of Philopappus.

The emperor Hadrian was the most lavish of all the benefactors of Athens. Besides completing the gigantic Olympieum he enlarged the circuit of the city walls to the east, enclosing the area now covered by the royal and public gardens and the Constitution Square. This was the City of Hadrian (Hadrianapolis) or New Athens (Novae Athenae); a handsome suburb with numerous villas, baths and gardens; some traces remain of its walls, which, like those of Themistocles, were fortified with rectangular towers. An ornamental entrance near the Olympieum, the existing Arch of Hadrian, marked the boundary between the new and the old cities. The arch is surmounted by a triple attic with Corinthian columns; the frieze above the keystone bears, on the north-western side, the inscription *αἷδ' εἶσ' Ἀθῆναι, Θησέως ἡ πρὶν πόλις*, and on the south-eastern, *αἷδ' εἶσ' Ἀδριανοῦ καὶ οὐχὶ Θησέως πόλις*. One of the principal monuments of Hadrian's munificence was the sumptuous library, in all probability a vast rectangular enclosure, immediately north of the New Agora, the eastern side of which was explored in 1885–1886. A portion of its western front, adorned with monolith unfluted Corinthian columns, is still standing—the familiar "Stoa of Hadrian"; another well-preserved portion, with six pilasters, runs parallel to the west side of Aeolus Street. The interior consisted of a spacious court surrounded by a colonnade of 100 columns, into which five chambers opened at the eastern end. A portico of four fluted Corinthian columns on the western side formed the entrance to the quadrangle. This cloistered edifice may be identified with the library of Hadrian mentioned by Pausanias; the books were, perhaps, stored in a square building which occupied a portion of the central area. Strikingly similar in design and construction is a large quadrangular building, the foundations of which were discovered by the British School near the presumed Cynosarges; this may perhaps be the Gymnasium of Hadrian, which Pausanias tells us also possessed 100 columns. A Pantheon and temples of Hera and Zeus Panhellenius were likewise built by Hadrian; the aqueduct, which he began, was completed by Antoninus Pius (A.D. 138–161); it was repaired in 1861–1869 and is still in use.

Novae Atheoae: the buildings of Hadrian.

The Stadium, in which the Panathenaic Games were held, was first laid out by the orator Lycurgus about 330 B.C. It was an oblong structure filling a natural depression near the left bank of the Ilissus beneath the eastern declivity of the Ardettus hill, the parallel sides and semicircular end, or *σφενδόνη*, around the arena being partially excavated from the adjoining slopes. The immense building, however, which was restored in 1896 and the following years, was that constructed in Pentelic marble about A.D. 143 by Tiberius Claudius Herodes Atticus, a wealthy Roman resident, whose benefactions to the city rivalled those of Hadrian. The seats, rising in tiers, as in a theatre, accommodated about 44,000 spectators; the arena was 670 ft. in length and 109 ft. in breadth. The Odeum, built beneath the south-west slope of the Acropolis after A.D. 161 by Herodes Atticus in memory of his wife Regilla, is comparatively well preserved; it was excavated in 1848 and in 1857–1858. The plan is that of the conventional Roman theatre; the semicircular auditorium, which seated some 5000 persons, is, like that of the Dionysiac theatre, partly hollowed from the rock. The orchestra is paved with marble squares. The façade, in Peiraic stone, displays three storeys of arched windows. The whole building was covered with a cedar roof. The Stadium had been already completed and the Odeum had not yet been built when Pausanias visited Athens; these buildings were the last important additions to the architectural monuments of the ancient city. (J. D. B.)

The Stadium and Odeum of Herodes Atticus.

II. The Modern City

At the conclusion of the Greek War of Independence, Athens was little more than a village of the Turkish type, the poorly built houses clustering on the northern and eastern slopes of the Acropolis. The narrow crooked lanes of this quarter still contrast with the straight, regularly laid-out streets of the modern city, which extends to the north-west, north and east of the ancient citadel. The greater commercial advantages offered by Nauplia, Corinth and Patras were outweighed by the historic claims of Athens in the choice of a capital for the newly founded kingdom, and the seat of government was transferred hither from Nauplia in 1833. The new town was, for the most part, laid out by the German architect Schaubert. It contains several squares and boulevards, a large public garden, and many handsome public and private edifices. A great number of the public institutions owe their origin to the munificence of patriotic Greeks, among whom Andreas Syngros and George Averoff may be especially mentioned. The royal palace, designed by Friedrich von Gärtner (1792–1847), is a tasteless structure; attached to it is a beautiful garden laid out by Queen Amalia, which contains a well-preserved mosaic floor of the Roman period. On the south-east is the newly built palace of the crown prince. The Academy, from designs by Theophil Hansen (1813–1891), is constructed of Pentelic marble in the Ionic style: the colonnades and pediments are richly coloured and gilded, and may perhaps convey some idea of the ancient style of decoration. Close by is the university, with a colonnade adorned with paintings, and the Vallianean library with a handsome Doric portico of Pentelic marble. The observatory, which is connected with the university, stands on the summit of the Hill of the Nymphs; like the Academy, it was erected at the expense of a wealthy Greek, Baron Sina of Vienna. In the public garden is the Zappeion, a large building with a Corinthian portico, intended for the display of Greek industries; here also is a monument to Byron, erected in 1896. The Boulē, or parliament-house, possesses a considerable library. Other public buildings are the Polytechnic Institute, built by contributions from Greeks of Epirus, the theatre, the Arsakeion (a school for girls), the Varvakeion (a gymnasium), the military school (*σχολὴ εὐελπίδων*), and several hospitals and orphanages. The cathedral, a large, modern structure, is devoid of architectural merit, but some of the smaller, ancient, Byzantine churches are singularly interesting and beautiful. Among private residences, the mansion built by Dr Schliemann, the discoverer of Troy, is the most noteworthy; its decorations are in the Pompeian style.

The museums of Athens have steadily grown in importance with the progress of excavation. They are admirably arranged, and the remnants of ancient art which they contain have fortunately escaped injudicious restoration. The National Museum, founded in 1866, is especially rich in archaic sculptures and in sepulchral and votive reliefs. A copy of the Diadumenos of Polyclitus from Delos, and temple sculptures from Epidaurus and the Argive Heraeum, are among the more notable of its recent acquisitions. It also possesses the famous collection of prehistoric antiquities found by Schliemann at Tiryns and Mycenae, other "Mycenaean" objects discovered at Nauplia and in Attica, as well as the still earlier remains excavated by Tsountas in the Cyclades and by the British School at Phylakopi in Melos; terra-cottas from Tanagra and Asia

Museums.

Minor; bronzes from Olympia, Delphi and elsewhere, and numerous painted vases, among them the unequalled white *lekythi* from Athens and Eretria. The Epigraphical Museum contains an immense number of inscriptions arranged by H. G. Lolling and A. Wilhelm of the Austrian Institute. The Acropolis Museum (opened 1878) possesses a singularly interesting collection of sculptures belonging to the "archaic" period of Greek art, all found on the Acropolis; here, too, are some fragments of the pedimental statues of the Parthenon and several reliefs from its frieze, as well as the slabs from the balustrade of the temple of Nike. The Polytechnic Institute contains a museum of interesting objects connected with modern Greek life and history. In the Academy is a valuable collection of coins superintended by Svoronos. Of the private collections those of Schliemann and Karapanos are the most interesting: the latter contains works of art and other objects from Dodona. There is a small museum of antiquities at the Peiraeus.

Scientific institutions.

Owing to the numbers and activity of its institutions, both native and foreign, for the prosecution of research and the encouragement of classical studies, Athens has become once more an international seat of learning. The Greek Archaeological Society, founded in 1837, numbers some distinguished scholars among its members, and displays great activity in the conduct of excavations. Important researches at Epidaurus, Eleusis, Mycenae, Amyclae and Rhamnus may be numbered among its principal undertakings, in addition to the complete exploration of the Acropolis and a series of investigations in Athens and Attica. The French École d'Athènes, founded in 1846, is under the scientific direction of the Académie des Inscriptions et Belles-lettres. Among its numerous enterprises have been the extensive and costly excavations at Delos and Delphi, which have yielded such remarkable results. The monuments of the Byzantine epoch have latterly occupied a prominent place in its investigations. The German Archaeological Institute, founded in 1874, has carried out excavations at Thebes, Lesbos, Paros, Athens and elsewhere; it has also been associated in the great researches at Olympia, Pergamum and Troy, and in many other important undertakings. The British School, founded in 1886, has been unable, owing to insufficient endowment, to work on similar lines with the French and German institutions; it has, however, carried out extensive excavations at Megalopolis and in Melos, as well as researches at Abae, in Athens (presumed site of the Cynosarges), in Cyprus, at Naucratis and at Sparta. It has also participated in the exploration of Cnossus and other important sites in Crete. The American School, founded in 1882, is supported by the principal universities of the United States. In addition to researches at Sicyon, Plataea, Eretria and elsewhere, it has undertaken two works of capital importance—the excavation of the Argive Heraeum and of ancient Corinth. An Austrian Archaeological Institute was founded in 1898.

Industry and commerce.

Notwithstanding certain disadvantages inherent in its situation, the trade and manufactures of Athens have considerably increased in recent years. Industrial and commercial activity is mainly centred at the Peiraeus, where 8 cloth and cotton mills, 45 cognac distilleries, 14 steam flour mills, 8 soap manufactories, 13 shipbuilding and engineering works, chair manufactories, dye works, chemical works, tanneries and a dynamite factory have been established. The shipbuilding and engineering trades are active and advancing. The export trade is, however, inconsiderable, as the produce of the local industries is mainly absorbed by home consumption. The principal exports are wine, cognac and marble from Pentelicus. As a place of import, the Peiraeus surpasses Patras, Syra and all the other Greek maritime towns, receiving about 53% of all the merchandise brought into Greece. The principal imports are coal, grain, manufactured articles and articles of luxury. The total value of exports in 1904 was £459,565; of imports, £2,459,278. The number of ships entered and cleared in 1905 was 5020 with a tonnage of 5,796,590 tons, of which 416, with a tonnage of 609,822 tons, were British.

The Peiraeus.

The Peiraeus, which had never revived since its destruction by the Romans in 86 B.C., was at the beginning of the 19th century a small fishing village known as Porto Leone. When Athens became the capital in 1833 the ancient name of its port was revived, and since that time piers and quays have been constructed, and spacious squares and broad regular streets have been laid out. The town now possesses an exchange, a large theatre, a gymnasium, a naval school, municipal buildings and several hospitals and charitable institutions erected by private munificence. The harbour, in which ships of all nations may be seen, as well as great numbers of the picturesque sailing craft engaged in the coasting trade, is somewhat difficult of access to larger vessels, but has been improved by the construction of new breakwaters and dry docks. The port and the capital are now connected by railway with Corinth and the principal towns of the Morea; the line opening up communication with northern Greece and Thessaly, when its proposed connexion with the Continental railway system has been effected, will greatly enhance the importance of the Peiraeus, already one of the most flourishing commercial towns in the Levant.

Population.

The population of Athens has rapidly increased. In 1834 it was below 5000; in 1870 it was 44,510; in 1879, 63,374; in 1889, 107,251; in 1896, 111,486. The Peiraeus, which in 1834 possessed only a few hundred inhabitants, in 1879 possessed 21,618; in 1889, 34,327; in 1896, 43,848. The total population of Athens in 1907 was 167,479 and of Peiraeus 67,982. (J. D. B.)

III. History

1. *The Prehistoric Period.*—The history of primitive Athens is involved in the same obscurity which enshrouds the early development of most of the Greek city-states. The Homeric poems scarcely mention Attica, and the legends, though numerous, are rarely of direct historical value. In the Minoan epoch Athens is proved by the archaeological remains to have been a petty kingdom scarcely more important than many other Attic communities, yet enjoying a more unbroken course of development than the leading states of that period. This accords with the cherished tradition which made the Athenians children of the soil, and free from admixture with conquering tribes. Many legends, however, and the later state organization, point to an immigration of an "Ionian" aristocracy in late Mycenaean days. These Ionian newcomers are almost certainly responsible for the absorption of the numerous independent communities of Attica into a central state of Athens under a powerful monarchy (see THESEUS), for the introduction of new cults, and for the division of the people into four tribes whose names—Geleontes, Hopletes, Argadeis and Aegicoreis—recur in several true Ionian towns. This centralization of power (*Synoecism*), to which many Greek peoples never attained, laid the first foundations of Athenian greatness. But in other respects the new constitution tended to arrest development. When the monarchy was supplanted in the usual Greek fashion by a hereditary nobility—a process accomplished, according to tradition, between about 1000 and 683 B.C.—all power was appropriated by a privileged class of Eupatridae (*q.v.*); the Geomori and Demiurgi, who formed the bulk of the community, enjoyed no political rights. It was to their control over the machinery of law that the Eupatridae owed their predominance. The aristocratic council of the Areopagus (*q.v.*) constituted the chief criminal court, and nominated the magistrates, among whom the chief archon (*q.v.*) passed judgment in family suits, controlled admission to the genos or clan, and consequently the acquisition of the franchise. This system was further supported by religious prescriptions which the nobles retained as a corporate secret. Assisted no doubt by their judicial control, the Eupatridae also tended to become sole owners of the land, reducing the original freeholders or tenants to the position of serfs. During this period Athens seems to have made little use of her militia, commanded by the polemarch, or of her navy, which was raised in special local divisions known as Naucraries (see NAUCRARY); hence no military *esprit de corps* could arise to check the Eupatrid

ascendancy. Nor did the commons obtain relief through any commercial or colonial enterprises such as those which alleviated social distress in many other Greek states. The first attack upon the aristocracy proceeded from a young noble named Cylon, who endeavoured to become tyrant about 630 B.C. The people helped to crush this movement; yet discontent must have been rife among them, for in 621 the Eupatrids commissioned Draco (*q.v.*), a junior magistrate, to draft and publish a code of criminal law. This was a notable concession, by which the nobles lost that exclusive legal knowledge which had formed one of their main instruments of oppression.

2. *The Rise of Athens.*—A still greater danger grew out of the widespread financial distress, which was steadily driving many of the agricultural population into slavery and threatened the entire state with ruin. After a protracted war with the neighbouring Megarians had accentuated the crisis the Eupatridae gave to one of their number, the celebrated Solon (*q.v.*), free power to remodel the whole state (594). By his economic legislation Solon placed Athenian agriculture once more upon a sound footing, and supplemented this source of wealth by encouraging commercial enterprise, thus laying the foundation of his country's material prosperity. His constitutional reforms proved less successful, for, although he put into the hands of the people various safeguards against oppression, he could not ensure their use in practice. After a period of disorder and party-feud among the nobles the new constitution was superseded in fact, if not in form, by the autocratic rule of Peisistratus (*q.v.*), and his sons Hippias and Hipparchus. The age of despotism, which lasted, with interruptions, from 560 to 510, was a period of great prosperity for Athens. The rulers fostered agriculture, stimulated commerce and industry (notably the famous Attic ceramics), adorned the city with public works and temples, and rendered it a centre of culture. Their vigorous foreign policy first made Athens an Aegean power and secured connexions with numerous mainland powers. Another result of the tyranny was the weakening of the undue influence of the nobles and the creation of a national Athenian spirit in place of the ancient clan-feeling.

The equalization of classes was already far advanced when towards the end of the century a nobleman of the Alcmaeonid family, named Cleisthenes (*q.v.*), who had taken the chief part in the final expulsion of the tyrants, acquired ascendancy as leader of the commons. The constitution which he promulgated (508/7) gave expression to the change of political feeling by providing a national basis of franchise and providing a new state organization. By making effective the powers of the Ecclesia (Popular Assembly) the Boulē (Council) and Heliaea, Cleisthenes became the true founder of Athenian democracy.

This revolution was accompanied by a conflict with Sparta and other powers. But a spirit of harmony and energy now breathed within the nation, and in the ensuing wars Athens worsted powerful enemies like Thebes and Chalcis (506). A bolder stroke followed in 500, when a force was sent to support the Ionians in revolt against Persia and took part in the sack of Sardis. After the failure of this expedition the Athenians apparently became absorbed in a prolonged struggle with Aegina (*q.v.*). In 493 the imminent prospect of a Persian invasion brought into power men like Themistocles and Miltiades (*qq.v.*), to whose firmness and insight the Athenians largely owed their triumph in the great campaign of 490 against Persia. After a second political reaction, the prospect of a second Persian war, and the naval superiority of Aegina led to the assumption of a bolder policy. In 483 Themistocles overcame the opposition of Aristides (*q.v.*), and passed his famous measure providing for a large increase of the Athenian fleet. In the great invasion of 480–479 the Athenians displayed an unflinching resolution which could not be shaken even by the evacuation and destruction of their native city. Though the traditional account of this war exaggerates the services of Athens as compared with the other champions of Greek independence, there can be no doubt that the ultimate victory was chiefly due to the numbers and efficiency of the Athenian fleet, and to the wise policy of her great statesman Themistocles (see SALAMIS, PLATAEA).

3. *Imperial Athens.*—After the Persian retreat and the reoccupation of their city the Athenians continued the war with unabated vigour. Led by Aristides and Cimon they rendered such prominent service as to receive in return the formal leadership of the Greek allies and the presidency of the newly formed Delian League (*q.v.*). The ascendancy acquired in these years eventually raised Athens to the rank of an imperial state. For the moment it tended to impair the good relations which had subsisted between Athens and Sparta since the first days of the Persian peril. But so long as Cimon's influence prevailed the ideal of "peace at home and the complete humiliation of Persia" was steadily unheld. Similarly the internal policy of Athens continued to be shaped by the conservatives. The only notable innovations since the days of Cleisthenes had been the reduction of the archonship to a routine magistracy appointed partly by lot (487), and the rise of the ten elective strategi (generals) as chief executive officers (see STRATEGUS). But the triumph of the navy in 480 and the great expansion of commerce and industry had definitely shifted the political centre of gravity from the yeoman class of moderate democrats to the more radical party usually stigmatized as the "sailor rabble." Though Themistocles soon lost his influence, his party eventually found a new leader in Ephialtes and after the failure of Cimon's foreign policy (see CIMON) triumphed over the conservatives. The year 461 marks the reversal of Athenian policy at home and abroad. By cancelling the political power of the Areopagus and multiplying the functions of the popular law-courts, Ephialtes abolished the last checks upon the sovereignty of the commons. His successor, Pericles, who commonly ranked as the "completer of the democracy," merely developed the full democracy so as to secure its effectual as well as its theoretical supremacy. The foreign policy of Athens was now directed towards an almost reckless expansion (see PERICLES). The unparalleled success of the Athenian arms at this period extended the bounds of empire to their farthest limits. Besides securing her Aegean possessions and her commerce by the defeat of Corinth and Aegina, her last rivals on sea, Athens acquired an extensive dominion in central Greece and for a time quite overshadowed the Spartan land-power. The rapid loss of the new conquests after 447 proved that Athens lacked a sufficient land-army to defend permanently so extensive a frontier. Under the guidance of Pericles the Athenians renounced the unprofitable rivalry with Sparta and Persia, and devoted themselves to the consolidation and judicious extension of their maritime influence.

The years of the supremacy of Pericles (443–429) are on the whole the most glorious in Athenian history. In actual extent of territory the empire had receded somewhat, but in point of security and organization it now stood at its height. The Delian confederacy lay completely under Athenian control, and the points of strategic importance were largely held by cleruchies (*q.v.*; see also PERICLES) and garrisons. Out of a citizen body of over 50,000 freemen, reinforced by mercenaries and slaves, a superb fleet exceeding 300 sail and an army of 30,000 drilled soldiers could be mustered. The city itself, with its fortifications extending to the port of Peiraeus, was impregnable to a land attack. The commerce of Athens extended from Egypt and Colchis to Etruria and Carthage, and her manufactures, which attracted skilled operatives from many lands, found a ready sale all over the Mediterranean. With tolls, and the tribute of the Delian League, a fund of 9700 talents (£2,300,000) was amassed in the treasury.

Yet the material prosperity of Athens under Pericles was less notable than her brilliant attainments in every field of culture. Her development since the Persian wars had been extremely rapid, but did not reach its climax till the latter part of the century. No city ever adorned herself with such an array of temples, public buildings and works of art as the Athens of Pericles and Pheidias. Her achievements in literature are hardly less great. The Attic drama of the period produced many great masterpieces, and the scientific thought of Europe in the departments of logic, ethics, rhetoric and history mainly owes its origin to a new movement of Greek thought which was largely fostered

by the patronage of Pericles himself. Besides producing numerous men of genius herself Athens attracted all the great intellects of Greece. The brilliant summary of the historian Thucydides in the famous Funeral Speech of Pericles (delivered in 430), in which the social life, the institutions and the culture of his country are set forth as a model, gives a substantially true picture of Athens in its greatest days.

This brilliant epoch, however, was not without its darker side. The payment for public service which Pericles had introduced may have contributed to raise the general level of culture of the citizens, but it created a dangerous precedent and incurred the censure of notable Greek thinkers. Moreover, all this prosperity was obtained at the expense of the confederates, whom Athens exploited in a somewhat selfish and illiberal manner. In fact it was the cry of "tyrant city" which went furthest to rouse public opinion in Greece against Athens and to bring on the Peloponnesian War (*q.v.*) which ruined the Athenian empire (431–404). The issue of this conflict was determined less by any intrinsic superiority on the part of her enemies than by the blunders committed by a people unable to carry out a consistent foreign policy on its own initiative, and served since Pericles by none but selfish or short-sighted advisers. It speaks well for the patriotic devotion and discipline of her commons that Athens, weakened by plague and military disasters, should have withstood for so long the blows of her numerous enemies from without, and the damage inflicted by traitors within her walls (see ANTIPHON, THERAMENES).

4. *The Fourth Century.*—After the complete defeat of Athens by land and sea, it was felt that her former services on behalf of Greece and her high culture should exempt her from total ruin. Though stripped of her empire, Athens obtained very tolerable terms from her enemies. The democratic constitution, which had been supplanted for a while by a government of oligarchs, but was restored in 403 after the latter's misrule had brought about their own downfall (see CRITIAS, THERAMENES, THRASYBULUS), henceforth stood unchallenged by the Greeks. Indeed the spread of democracy elsewhere increased the prestige of the Athenian administration, which had now reached a high pitch of efficiency. Athenian art and literature in the 4th century declined but slightly from their former standard; philosophy and oratory reached a standard which was never again equalled in antiquity and may still serve as a model. In the wars of the period Athens took a prominent part with a view to upholding the balance of power, joining the Corinthian League in 395, and assisting Thebes against Sparta after 378, Sparta against Thebes after 369. Her generals and admirals, Conon, Iphicrates, Chabrias, Timotheus, distinguished themselves by their military skill, and partially recovered their country's predominance in the Aegean, which found expression in the temporary renewal of the Delian League (*q.v.*). By the middle of the century Athens was again the leading power in Greece. When Philip of Macedon began to grow formidable she seemed called upon once more to champion the liberties of Greece. This ideal, when put forward by the consummate eloquence of Demosthenes and other orators, created great enthusiasm among the Athenians, who at times displayed all their old vigour in opposing Philip, notably in the decisive campaign of 338. But these outbursts of energy were too spasmodic, and popular opinion repeatedly veered back in favour of the peace-party. With her diminished resources Athens could not indeed hope to cope with the great Macedonian king; however much we may sympathize with the generous ambition of the patriots, we must admit that in the light of hard facts their conduct appears quixotic.

5. *The Hellenistic Period.*—Philip and Alexander, who sincerely admired Athenian culture and courted a zealous co-operation against Persia, treated the conquered city with marked favour. But the people would not resign themselves to playing a secondary part, and watched for every opportunity to revolt. The outbreak headed by Athens after Alexander's death (323) led to a stubborn conflict with Macedonia. After his victory the regent Antipater punished Athens by the loss of her remaining dependencies, the proscription of her chief patriots, and the disfranchisement of 12,000 citizens. The Macedonian garrison which was henceforth stationed in Attic territory prevented the city from taking a prominent part in the wars of the Diadochi. Cassander placed Athens under the virtual autocracy of Demetrius of Phalerum (317–307), and after the temporary liberation by Demetrius Poliorcetes (306–300), secured his interests through a dictator named Lachares, who lost the place again to Poliorcetes after a siege (295). After a vain attempt to expel the garrison in 287, the Athenians regained their liberty while Macedonia was thrown into confusion by the Celts, and in 279 rendered good service against the invaders of the latter nation with a fleet off Thermopylae. When Antigonus Gonatas threatened to restore Macedonian power in Greece, the Athenians, supported perhaps by the king of Egypt, formed a large defensive coalition; but in the ensuing "Chremonidean War" (266–263) a naval defeat off Andros led to their surrender and the imposition of a Macedonian garrison. The latter was finally withdrawn in 229 by the good offices of Aratus (*q.v.*). At this period Athens was altogether overshadowed in material strength by the great Hellenistic monarchies and even by the new republican leagues of Greece; but she could still on occasion display great energy and patriotism. The prestige of her past history had now perhaps attained its zenith. Her democracy was respected by the Macedonian kings; the rulers of Egypt, Syria, and especially of Pergamum, courted her favour by handsome donations of edifices and works of art, to which the citizens replied by unbecoming flattery, even to the extent of creating new tribes named after their benefactors. If Athens lost her supremacy in the fields of science and scholarship to Alexandria, she became more than ever the home of philosophy, while Menander and the other poets of the New Comedy made Athenian life and manners known throughout the civilized world.

6. *Relations with the Roman Republic.*—In 228 Athens entered into friendly intercourse with Rome, in whose interest she endured the desperate attacks of Philip V. of Macedonia (200–199). In return for help against King Perseus she acquired some new possessions, notably the great mart of Delos, which became an Athenian cleruchy (166). By her treacherous attack upon the frontier-town of Oropus (156) Athens indirectly brought about the conflict between Rome and the Achaean League which resulted in the eventual loss of Greek independence, but remained herself a free town with rights secured by treaty. In spite of the favours displayed by Rome, the more radical section of the people began to chafe at the loss of their international importance. This discontent was skilfully fanned by Mithradates the Great at the outset of his Roman campaigns. His emissary, the philosopher Aristion, induced the people to declare war against Rome and to place him in chief command. The town with its port stood a long siege against Sulla, but was stormed in 86. The conqueror allowed his soldiers to loot, but inflicted no permanent punishment upon the people. This war left Athens poverty-stricken and stripped of her commerce: her only importance now lay in the philosophical schools, which were frequented by many young Romans of note (Cicero, Atticus, Horace, &c.). Greek became fashionable at Rome, and a visit to Athens a sort of pilgrimage for educated Romans (cf. Propertius iv. 21: "Magnum iter ad doctas proficisci cogor Athenas"). In the great civil wars Athens sided with Pompey and held out against Caesar's lieutenants, but received a free pardon "in consideration of her great dead." Similarly the triumvirs after Philippi condoned her enthusiasm for the cause of Brutus. Antony repeatedly made Athens his headquarters and granted her several new possessions, including Eretria and Aegina—grants which Octavian subsequently revoked.

7. *The Roman Empire.*—Under the new settlement Athens remained a free and sovereign city—a boon which she repaid by zealous Caesar-worship, for the favours bestowed upon her tended to pauperize her citizens and to foster their besetting sin of calculating flattery. Hadrian displayed his special fondness for the city by raising new buildings and relieving

financial distress. He amended the constitution in some respects, and instituted a new national festival, the Panhellenica. In the period of the Antonines the endowment of professors out of the imperial treasury gave Athens a special status as a university town. Her whole energies seem henceforth devoted to academic pursuits; the military training of her youth was superseded by courses in philosophy and rhetoric; the chief organs of administration, the revived Areopagus and the senior Strategus, became as it were an education office. Save for an incursion by Goths in A.D. 267 and a temporary occupation by Alaric in 395, Athens spent the remaining centuries of the ancient world in quiet prosperity. The rhetorical schools experienced a brilliant revival under Constantine and his successors, when Athens became the *alma mater* of many notable men, including Julian, Libanius, Basil and Gregory of Nazianzus, and in her professors owned the last representatives of a humane and moralized paganism. The freedom of teaching was first curtailed by Theodosius I.; the edict of Justinian (529), forbidding the study of philosophy, dealt the death-blow to ancient Athens.

The authorities for the history of ancient Athens will mostly be found under GREECE: *History*, and the various biographies. The following books deal with special periods or subjects only:—(1) *Early Athens*: W. Warde Fowler, *The City-State*, ch. vi. (London, 1893). (2) *The fifth and fourth centuries*: the "Constitution of Athens," ascribed to Xenophon; W. Oncken, *Athen und Hellas* (Leipzig, 1865); U. v. Wilamowitz-Moellendorff, *Aus Kydathen* (Berlin, 1880); L. Whibley, *Political Parties at Athens* (Cambridge, 1889); G. Gilbert, *Beiträge zur inneren Geschichte Athens* (Leipzig, 1877); J. Beloch, *Die attische Politik seit Perikles* (Leipzig, 1884). (3) *The Hellenistic and Roman periods*: J. P. Mahaffy, *Greek Life and Thought*, from 323 to 146 (London, 1887), chs. v., vi., xvii.; A. Holm, *Greek History* (Eng. trans., London, 1898), iv. chs. vi. and xxiii.; Wilamowitz-Moellendorff, *Antigonos von Karystos* (Berlin, 1881), pp. 178-291; W. Capes, *University Life in Ancient Athens* (London, 1877); A. Dumont, *Essai sur l'Ephébie attique* (Paris, 1875). (4) *The Latin rule*: G. Finlay, *History of Greece* (Oxford ed., 1877), vol. iv. ch. vi. (5) *Constitutional History*: The Aristotelian "Constitution of Athens"; U. v. Wilamowitz-Moellendorff, *Aristoteles und Athen* (Berlin and Leipzig, 1893), vol. ii.; G. Gilbert, *Greek Constitutional Antiquities* (Eng. trans., London, 1895), pp. 95-453; A. H. J. Greenidge, *Handbook of Greek Constitutional History* (Oxford, 1896), ch. vi.; J. W. Headlam, *Election by Lot at Athens* (Cambridge, 1891). (6) *Finance and statistics*: A. Boeckh, *The Public Economy of the Athenians* (Eng. trans., London, 1828); Ed. Meyer, *Forschungen zur alten Geschichte* (Halle, 1899), vol. ii. pp. 149-195. (7) *Inscriptions*: *Corpus Inscriptionum Atticarum*, with supplements (Berlin, 1873–1895). (8) *Coins*: B. V. Head, *Historia Numorum* (Oxford, 1887), pp. 309-328. (M. O. B. C.)

8. *Byzantine Period.*—The city now sank into the position of a provincial Byzantine town. Already it had been robbed of many of its works of art, among them the Athena Promachos and the Parthenos of Pheidias, for the adornment of Constantinople, and further spoliation took place when the church of St Sophia was built in A.D. 532. The Parthenon, the Erechtheum, the "Theseum" and other temples were converted into Christian churches and were thus preserved throughout the middle ages. The history of Athens for the next four centuries is almost a blank; the city is rarely mentioned by the Byzantine chronicles of this period. The emperor Constantine II. spent some months here in A.D. 662–663. In 869 the see of Athens became an archbishopric. In 995 Attica was ravaged by the Bulgarians under their tsar Samuel, but Athens escaped; after the defeat of Samuel at Bēlasitza (1014) the emperor Basil II., who blinded 15,000 Bulgarian prisoners, came to Athens and celebrated his triumph by a thanksgiving service in the Parthenon (1018). From the Runic description on the marble lion of the Peiraeus it has been inferred that Harold Hardraada and the Norsemen in the service of the Byzantine emperors captured the Peiraeus in 1040, but this conclusion is not accepted by Gregorovius (bk. i. pp. 170-172). Like the rest of Greece, Athens suffered greatly from the rapacity of its Byzantine administrators. The letters of Acominatus, archbishop of Athens, towards the close of the 12th century, bewail the desolate condition of the city in language resembling that of Jeremiah in regard to Jerusalem.

9. *Period of Latin Rule: 1204–1458.*—After the Latin conquest of Constantinople in 1204, Otho de la Roche was granted the lordship of Athens by Boniface of Montferrat, king of Thessalonica, with the title of Megaskyr (*μέγας κύριος* = great lord). His nephew and successor, Guy I., obtained the title duke of Athens from Louis IX. of France in 1258. On the death of Guy II., last duke of the house of la Roche, in 1308, the duchy passed to his cousin, Walter of Brienne. He was expelled in 1311 by his Catalonian mercenaries; the mutineers bestowed the duchy "of Athens and Neopatras" on their leader, Roger Deslaur, and, in the following year, on Frederick of Aragon, king of Sicily. The Sicilian kings ruled Athens by viceroys till 1385, when the Florentine Nerio Acciajuoli, lord of Corinth, defeated the Catalonians and seized the city. Nerio, who received the title of duke from the king of Naples, founded a new dynasty. His palace was in the Propylaea; the lofty "Tower of the Franks," which adjoined the south wing of that building, was possibly built in his time. This interesting historical monument was demolished by the Greek authorities in 1874, notwithstanding the protests of Penrose, Freeman and other scholars. The Acciajuoli dynasty lasted till June 1458, when the Acropolis after a stubborn resistance was taken by the Turks under Omar, the general of the sultan Mahommed II., who had occupied the lower city in 1456. The sultan entered Athens in the following month; he was greatly struck by its ancient monuments and treated its inhabitants with comparative leniency.

10. *Period of Turkish Rule: 1458–1833.*—After the Turkish conquest Athens disappeared from the eyes of Western civilization. The principal interest of the following centuries lies in the researches of successive travellers, who may be said to have rediscovered the city, and in the fate of its ancient monuments, several of which were still in fair preservation at the beginning of this period. The Parthenon was transformed into a mosque; the existing minaret at its south-western corner was built after 1466. The Propylaea served as the residence of the Turkish commandant and the Erechtheum as his harem. In 1466 the Venetians succeeded in occupying the city, but failed to take the Acropolis. About 1645 a powder magazine in the Propylaea was ignited by lightning and the upper portion of the structure was destroyed. Under Francesco Morosini the Venetians again attacked Athens in September 1687; a shot fired during the bombardment of the Acropolis caused a powder magazine in the Parthenon to explode, and the building was rent asunder. After capturing the Acropolis the Venetians employed material from its ancient edifices in repairing its walls. They withdrew in the following year, when the Turks set fire to the city. The central sculptures of the western pediment of the Parthenon, which Morosini intended to take to Venice, were unskilfully detached by his workmen, and falling to the ground were broken to pieces. Several ancient monuments were sacrificed to provide material for a new wall with which the Turks surrounded the city in 1778.

During the 18th century many works of art, which still remained *in situ*, fell a prey to foreign collectors. The removal to London in 1812 of most of the remaining sculptures of the Parthenon by Lord Elgin possibly rescued many of them from injury in the period of warfare which followed. In 1821 the Greek insurgents surprised the city, and in 1822 captured the Acropolis. Athens again fell into the hands of the Turks in 1826, who bombarded and took the Acropolis in the following year; the Erechtheum suffered greatly, and the monument of Thrasyllus was destroyed. The Turks remained in possession of the Acropolis till 1833, when Athens was chosen as the capital of the newly established kingdom of Greece; since that date the history of the city forms part of that of modern Greece. (See GREECE: *History, modern.*)

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ATHENS, a city and the county-seat of Clarke county, Georgia, U.S.A., in the N.E. part of the state, about 73 m. E. by N. of Atlanta. Pop. (1890) 8639; (1900) 10,245, of whom 5190 were negroes and only 114 were foreign-born; (1910, census) 14,913. It is served by the Georgia, the Central of Georgia, the Southern, the Seaboard Air Line and the Gainesville Midland railways. Athens is an important educational centre. It was founded in 1801 as the seat of the university of Georgia, which had been chartered in 1785. Franklin College, the academic department of the university, was opened in 1801, and afterwards the State College of Agriculture and Mechanic Arts (the School of Science, 1872), the State Normal School (co-educational, 1891), the School of Pharmacy (1903), the University Summer School (1903), the School of Forestry (1906), and the Georgia State College of Agriculture (1906), also branches of the university, were established at Athens, and what had been the Lumpkin Law School (incorporated in 1859) became the law department of the university in 1867. Branches of the university not in Athens are: the North Georgia Agricultural College (established in 1871; became a part of the university in 1872), at Dahlonega; the medical department, at Augusta (1873; founded as the Georgia Medical College in 1829); the Georgia School of Technology (1885), at Atlanta; the Georgia Normal and Industrial College for Girls (1889), at Milledgeville; and the Georgia Industrial College for Colored Youth (1890), near Savannah. At Athens also are several secondary schools, and the Lucy Cobb Institute (for girls), opened in 1858 and named in honour of a daughter of its founder, Gen. T. R. R. Cobb (1823–1862). The city has various manufactures, the most important being fertilizers, cotton goods, and cotton-seed oil and cake; the value of the total factory product in 1905 was $1,158,205, an increase of 70·9% in five years. Athens was chartered as a city in 1872.

ATHENS, a village and the county-seat of Athens county, Ohio, U.S.A., in the township of Athens, on the Hocking river, about 76 m. E.S.E. of Columbus. Pop. (1890) 2620; (1900) 3066; (1910) 5463; of the township (1910) 10,156. It is served by the Baltimore & Ohio Southwestern, the Toledo & Ohio Central (Ohio Central Lines), and the Hocking Valley railways. The village is built on rolling ground rising about 70 ft. above the river (which nearly encircles it), and commands views of some of the most beautiful scenery in the state. There are several ancient mounds in the vicinity. Athens is the seat of Ohio University (co-educational), a state institution established in 1804, and having in 1908 a college of liberal arts, a state normal college (1902), a commercial college, a college of music and a state preparatory school. In 1908 the University had 53 instructors and 1386 students. South of the village, and occupying a fine situation, is a state hospital for the insane. In the vicinity there are many coal mines, and among the manufactures are bricks, furniture, veneered doors, and shirts. The municipality operates the water-works. When the Ohio Company, through Manassch Cutler, obtained from congress their land in what is now Ohio, it was arranged that the income from two townships was to be set aside "for the support of a literary institution." In 1795 the townships (Athens and Alexander) were located and surveyed, and in 1800 Rufus Putnam and two other commissioners, appointed by the Territorial legislature, laid out a town, which was also called Athens. Settlers slowly came; the town became the county-seat in 1805, was incorporated as a village in 1811, and was re-incorporated in 1828.

ATHERSTONE, WILLIAM GUYBON (1813–1898), British geologist, one of the pioneers in South African geology, was born in 1813, in the district of Uitenhage, Cape Colony. Having qualified as M.D. he settled in early life as a medical practitioner at Grahamstown, subsequently becoming F.R.C.S. In 1839 his interest was aroused in geology, and from that date he "devoted the leisure of a long and successful medical practice" to the pursuit of geological science. In 1857 he published an account of the rocks and fossils of Uitenhage (the latter described more fully by R. Tate, *Quart. Journal Geol. Soc.*, 1867). He also obtained many fossil reptilia from the Karroo beds, and presented specimens to the British Museum. These were described by Sir Richard Owen. Atherstone's identification in 1867 as a diamond of a crystal found at De Kalk near the junction of the Riet and Vaal rivers, led indirectly to the establishment of the great diamond industry of South Africa. He encouraged the workings at Jagersfontein, and he also called attention to the diamantiferous neck at Kimberley. He was one of the founders of the Geological Society of South Africa at Johannesburg in 1895; and for some years previously he was a member of the Cape parliament. He died at Grahamstown, on the 26th of June 1898.

See the obituary by T. Rupert Jones, *Natural Science*, vol. xiv. (January 1899).

ATHERSTONE, a market-town in the Nuneaton parliamentary division of Warwickshire, England, 102½ m. N.W. from London by the London & North-Western railway. Pop. (1901) 5248. It lies in the upper valley of the Anker, under well-wooded hills to the west, and is on the Roman Watling Street, and the Coventry canal. The once monastic church of St Mary is rebuilt, excepting the central tower and part of the chancel. The chief industry is hat-making. On the high ground to the west lie ruins of the Cistercian abbey of Merevale, founded in 1149; they include the gatehouse chapel, part of the refectory and other remains exhibiting beautiful details of the 14th century. Coal is worked at Baxterley, 3 m. west of Atherstone.

Atherstone (*Aderestone, Edridestone, Edrichestone*), though not mentioned in any pre-Conquest record, is of unquestionably ancient origin. A Saxon barrow was opened near the town in 1824. It is traversed by Watling Street, and portions of the ancient Roman road have been discovered in modern times. Atherstone is mentioned in Domesday among the possessions of Countess Godiva, the widow of Leofric. In the reign of Henry III. it passed to the monks of Bec in Normandy, who in 1246 obtained the grant of an annual fair at the feast of the Nativity of the Virgin, and the next year of a market every Tuesday. This market became so much frequented

that in 1319 a toll was levied upon all goods coming into the town, in order to defray the cost of the repair to the roads necessitated by the constant traffic, and in 1332 a similar toll was levied on all goods passing over the bridge called Feldenbrigge near Atherstone. The September fair and Tuesday markets are still continued. In the reign of Edward III. a house of Austin Friars was founded at Atherstone by Ralph Lord Basset of Drayton, which, however, never rose to much importance, and at its dissolution in 1536 was valued at 30 shillings and 3 pence only.

ATHERTON, or CHOWBENT, an urban district in the Leigh parliamentary division of Lancashire, England, 13 m. W.N.W. of Manchester on the London & North-Western and Lancashire & Yorkshire railways. Pop. (1901) 16,211. The cotton factories are the principal source of industry; there are also ironworks and collieries. The manor was held by the local family of Atherton from John's reign to 1738, when it passed by marriage to Robert Gwillym, who assumed that name. In 1797 his eldest daughter and co-heiress married Thomas Powys, afterwards the second Lord Lilford. Up to 1891 the lord of the manor held a court-leet and court-baron annually in November, but in that year Lord Lilford sold to the local board the market tolls, stallages and pickages, and since this sale the courts have lapsed. The earliest manufactures were iron and cotton. Silk-weaving, formerly an extensive industry, has now almost entirely decayed. The first chapel or church was built in 1645. James Wood, who became Nonconformist minister in the chapel at Atherton in 1691, earned fame and the familiar title of "General" by raising a force from his congregation, uncouthly armed, to fight against the troops of the Pretender (1715).

ATHETOSIS (Gr. ἄθετος, "without place"), the medical term applied to certain slow, purposeless, deliberate movements of the hands and feet. The fingers are separately flexed and extended, abducted and adducted in an entirely irregular way. The hands as a whole are also moved, and the arms, toes and feet may be affected. The condition is usually due to some lesion of the brain which has caused hemiplegia, and is especially common in childhood. It is occasionally congenital (so called), and is then due to some injury of the brain during birth. It is more usually associated with hemiplegia, in which condition there is first of all complete voluntary immobility of the parts affected: but later, as there is a return of a certain amount of power over the limbs affected, the slow rhythmic movements of athetosis are first noticed. This never develops, however, where there is no recovery of voluntary power. Its distribution is thus nearly always hemiplegic, and it is often associated with more or less mental impairment. The movements may or may not continue during sleep. They cannot be arrested for more than a moment by will power, and are aggravated by voluntary movements. The prognosis is unsatisfactory, as the condition usually continues unchanged for years, though improvement occasionally occurs in slight cases, or even complete recovery.

ATHIAS, JOSEPH (d. 1700), Jewish rabbi and printer, was born in Spain and settled in Amsterdam. His editions of the Hebrew Bible (1661, 1667) are noted for beauty of execution and the general correctness of the text. He also printed a Judaeo-German edition of the Bible in 1679, a year after the appearance of the edition by Uri Phoebus.

ATHLETE (Gr. ἀθλητής; Lat. *athleta*), in Greek and Roman antiquities, one who contended for a prize (ἆθλον) in the games; now a general term for any one excelling in physical strength. Originally denoting one who took part in musical, equestrian, gymnastic, or any other competitions, the name became restricted to the competitors in gymnastic contests, and, later, to the class of professional athletes. Whereas in earlier times competitors, who were often persons of good birth and position, entered the lists for glory, without any idea of material gain, the professional class, which arose as early as the 5th century B.C., was chiefly recruited from the lower orders, with whom the better classes were unwilling to associate, and took up athletics entirely as a means of livelihood. Ancient philosophers, moralists and physicians were almost unanimous in condemning the profession of athletics as injurious not only to the mind but also to the body. The attack made upon it by Euripides in the fragment of the *Autolycus* is well known. The training for the contests was very rigorous. The matter of diet was of great importance; this was prescribed by the *aleiptes*, whose duty it also was to anoint the athlete's body. At one time the principal food consisted of fresh cheese, dried figs and wheaten bread. Afterwards meat was introduced, generally beef or pork; but the bread and meat were taken separately, the former at breakfast, the latter at dinner. Except in wine, the quantity was unlimited, and the capacity of some of the heavy-weights must have been, if such stories as those about Milo are true, enormous. In addition to the ordinary gymnastic exercises of the palaestra, the athletes were instructed in carrying heavy loads, lifting weights, bending iron rods, striking at a suspended leather sack filled with sand or flour, taming bulls, &c. Boxers had to practise delving the ground, to strengthen their upper limbs. The competitions open to athletes were running, leaping, throwing the discus, wrestling, boxing and the pancratium, or combination of boxing and wrestling. Victory in this last was the highest achievement of an athlete, and was reserved only for men of extraordinary strength. The competitors were naked, having their bodies salved with oil. Boxers wore the *caestus*, a strap of leather round the wrists and forearms, with a piece of metal in the fist, which was sometimes employed with great barbarity. An athlete could begin his career as a boy in the contests set apart for boys. He could appear again as a youth against his equals, and though always unsuccessful, could go on competing till the age of thirty-five, when he was debarred, it being assumed that after this period of life he could not improve. The most celebrated of the Greek athletes whose names have been handed down are Milo of Crotona, Hipposthenes, Polydamas, Promachus and Glaucus. Cyrene, famous in the time of Pindar for its athletes, appears to have still maintained its reputation to at least the time of Alexander the Great; for in the British Museum are to be seen six prize vases carried off from the games at Athens by natives of that district. These vases, found in the tombs, probably, of the winners, are made of clay, and painted on one side with a representation of the contest in which they were won, and on the other side with a figure of Pallas Athena, with an inscription telling where they were gained, and in some cases adding the name of the eponymous magistrate of Athens, from which the exact year can be determined.

Amongst the Romans athletic contests had no doubt taken place from the earliest times, but according to Livy (xxxix. 22) professional Greek athletes were first introduced at Rome by M. Fulvius Nobilior in 186 B.C. After the institution of the Actian games by Augustus, their popularity increased, until they finally supplanted the gladiators. In the time of the empire, gilds or unions of athletes were formed, each with a temple, treasury and exercise-ground of its own. The profession, although it ranked above that of a gladiator or an actor, was looked upon as derogatory to the dignity of a Roman, and it is a rare thing to find a Roman name amongst the athletes on inscriptions. The system was entirely, and the athletes themselves nearly always, Greek. (See also GAMES, CLASSICAL.)

Krause, *Gymnastik und Agonistik der Hellenen* (1841); Friedländer, *Sittengeschichte Roms*, ii.; Reisch, in Pauly-Wissowa, *Realencyc.*

ATHLETIC SPORTS. Various sports were cultivated many hundred years before the Christian era by the Egyptians and several Asiatic races, from whom the early Greeks undoubtedly adopted the elements of their athletic exercises (see ATHLETE), which reached their highest development in the Olympic games, and other periodical meetings of the kind (see GAMES, CLASSICAL). The original Celtic inhabitants of Great Britain were an athletic race, and the earliest monuments of Teutonic literature abound in records of athletic prowess. After the Norman conquest of England the nobles devoted themselves to the chase and to the joust, while the people had their games of ball, running at the quintain, fencing with club and buckler, wrestling and other pastimes on green and river. The chroniclers of the succeeding centuries are for the most part silent concerning the sports of the folk, except such as were regarded as a training for war, as archery, while they love to record the prowess of the kings and

their courts. Thus it is told of Henry V. that he "was so swift a runner that he and two of his lords, without bow or other engine, would take a wild buck in a large park." Several romances of the middle ages, quoted by Strutt (*Sports and Pastimes of the People of England*), chronicle the fact that young men of good family were taught to run, leap, wrestle and joust. In spite of the general silence of the historians concerning the sports of the people, it is evident that they were indulged in very largely, since several English sovereigns found it necessary to curtail, and even prohibit, certain popular pastimes, on the ground that they seduced the people from the practice of archery. Thus Edward III. prohibited weight-putting by statute. Nevertheless a variety of this exercise, "casting of the barre," continued to be a popular pastime, and was afterwards one of the favourite sports of Henry VIII., who attained great proficiency at it. The prowess of the same monarch at throwing the hammer is a matter of history, and his reign seems to have been at a time of general athletic revival. We even find his secretary, Richard Pace, advising the sons of noblemen to practise their sports and "leave study and learning to the children of meaner people," and Sir William Forest, in his *Poesye of Princelye Practice*, thus admonishes his high-born readers:—

> "In featis of maistries bestowe some diligence.
> Too ryde, runne, lepe, or caste by violence
> Stone, barre or plummett, or such other thinge,
> It not refuseth any prince or kynge."

Mr Montague Shearman, to whose volume on *Athletics* in the Badminton series the reader is referred, notes that Sir Thomas Elyot, who wrote at about the same period, deprecated too much study and flogging for schoolboys, saying: "A discrete master may with as much or more ease both to himself and his scholler lead him to play at tennis or shoote." Elyot recommends the perusal of Galen's *De sanitate tuenda*, and suggests as suitable athletic exercises within doors "deambulations, labouryng with poyses made of ledde, lifting and throwing the heavy stone or barre, playing at tennis," and dwells upon "rennyng" as a "good exercise and laudable solace." It is probable that the disciples of the "new learning," who had become prominent in Sir Thomas's time, endeavoured to combat the influence of athletic exercises, their point of view being exemplified by the dictum of Roger Ascham, who, in his *Toxophilus*, declares that "running, leaping and quoiting be too vile for scholars."

In the 16th century the great football match played annually at Chester was abolished in favour of a series of foot-races, which took place in the presence of the mayor. A list of the common sports of that time is contained in some verses by Randel Holme, a minstrel of the North country, and makes mention of throwing the sledge, jumping, "wrastling," stool-ball (cricket), running, pitching the bar, shooting, playing loggets, "nine holes or ten pins," "football by the shinnes," leap-frog, morris, shove-groat, leaping the bonfire, stow-ball (golf), and many other outdoor and indoor sports, some of them now obsolete. Shakespeare and the other Elizabethan poets abound in allusions to sport, which formed an important feature in school life and at every fair. The Stuart kings were warm encouragers of sport, the *Basilikon Doron* of James I., written for his son, containing a recommendation to the young prince to practise "running, leaping, wrestling, fencing, dancing, and playing at the caitch, or tennise, archerie, palle-malle, and such like other fair and pleasant field games."

An extraordinary variety of sports has been popular in Great Britain with high and low for the past five centuries, no other country comparing with it in this respect. Nor have Ireland and Scotland lagged behind England in athletic prowess. Indeed, so far as history and legend record, Ireland boasts of by far the most ancient organized sports known, the Tailtin Games, or Lugnasad, traditionally established by Lugaid of the Long Arm, one of the gods of Dia and Ana, in honour of his foster-mother Tailti, some three thousand years ago. For many centuries these games, and others like them, were kept up in Ireland, and though the almost constant wars which harried the country finally destroyed their organization, yet the Irish have always been, and still are, a very important factor in British athletics, as well as in America and the colonies.

The Scottish people have, like the Irish, ever delighted in feats of strength and skill, especially the Celtic highlanders, the character of whose country and mode of life have, however, prevented organized athletics from attaining the same prominence as in England. Nevertheless, the celebrated Highland games held at Braemar, Bridge of Allan, Luss, Aboyne and other places have served to bring into prominence many athletes of the first class, although the records, on account of the roughness of the grounds, have not generally vied with those made farther south.

The Briton does not lose his love of sport upon leaving his native soil, and the development of athletics in the United States and the British colonies has kept step with that of the mother-land. Upon the continent of Europe sports have occupied a more or less prominent place in the life of the nations, but their development has been but an echo of that in Great Britain. A great advance, however, has been made since the institution of the modern Olympic games.

About the year 1812 the Royal Military College at Sandhurst inaugurated regular athletic sports, but the example was not followed until about 1840, when Rugby, Eton, Harrow, Shrewsbury and the Royal Military Academy at Woolwich came to the front, the "Crick Run" at Rugby having been started in 1837. At the two great English universities there were no organized sports of any kind until 1850, when Exeter College, Oxford, held a meeting; this example has been followed, one after the other, by the other colleges of both institutions. The first contest between Oxford and Cambridge occurred at Oxford in 1864, the programme consisting of eight events, of which four were won by each side. The same year saw the first contest of the Civil Servants, still an annual event.

In 1866 the Amateur Athletic Club was formed in London for "gentlemen amateurs," most of its members being old university men. Its first championship meeting, held in that year, was the beginning of a series afterwards continued to the present day by the Amateur Athletic Association, founded in 1880, which has jurisdiction over British athletic sports. The most important individual English athletic organization is the London Athletic Club, which antedated the Amateur Athletic Club, and whose meetings have always been the most important events except the championships.

In America a revival of interest in athletic sports took place about the year 1870. Ten years later was formed the National Association of Amateur Athletes of America, which, in 1888, became the Amateur Athletic Union. This body controls athletics throughout the United States, and is allied with the Canadian Amateur Athletic Association. It is supreme in matters of amateur status, records and licensing of meetings, and has control over the following branches of sport: basket-ball, billiards, boxing, fencing (in connexion with the Amateur Fencers' League of America), gymnastics, hand-ball (fives), running, jumping, walking, weight-putting (hammer, shot, discus, weights), hurdle-racing, lacrosse, pole-vaulting, swimming, tugs-of-war and wrestling. The Amateur Athletic Union has eight sectional groups, and is allied with the Intercollegiate Association of Amateur Athletes of America (founded 1876) and the Western Intercollegiate Association. The first American intercollegiate athletic meeting took place at Saratoga in 1873, only three universities competing, though the next year there were eight and in 1875 thirteen. Professional athletes in America are confined almost entirely to base-ball, boxing, bicycling, wrestling and physical training.

The Canadian athletic championships are held independently of the American. Annual championship meetings are also held in South Africa, New Zealand and the different states of Australia. For the Australasian championships New Zealand joins with Australia.

The organization of university sports in America differs from that at Oxford and Cambridge, where there is no official control on the part of the university authorities, and where a man is eligible to represent his college or university while in residence.

In nearly all American universities and colleges athletic and other sports are under the general control of faculty committees, to which the undergraduate athletic committees are subordinate, and which have the power to forbid the participation of any student who has not attained a certain standard of scholarship. For some years prior to 1906 no student of an American university was allowed to represent his university in any sport for longer than four years. Early in that year, however, many of the most important institutions, including Harvard, Yale, Princeton and Pennsylvania, entered upon a new agreement, that only students who have been in residence one year should play in 'varsity teams in any branch of athletics and that no student should play longer than three years. This, together with many other reformatory changes, was directly due to a widespread outcry against the growing roughness of play exhibited in American football, basket-ball, hockey and other sports, the too evident desire to win at all hazards, the extraordinary luxury of the training equipment, and the enormous gate-receipts of many of the large institutions—the Yale Athletic Association held a surplus of about $100,000 (£20,000) in December 1905, after deducting immense amounts for expenses. The new rule against the participation of freshmen in 'varsity sports was to discourage the practice of offering material advantages of different kinds to promising athletes, generally those at preparatory schools, to induce them to become students at certain universities.

At the present day athletic sports are usually understood to consist of those events recognized in the championship programmes of the different countries. Those in the competitions between Oxford and Cambridge are the 100 yards, 440 yards, 880 yards, 1-mile and 3-mile runs; 120 yards hurdle-race; high and long jumps; throwing the hammer; and putting the weight (shot). To the above list the English A.A.A. adds the 4-mile and 10-mile runs; the 2-mile and 7-mile walking races; the 2-mile steeplechase; and the pole-vault. The American intercollegiate programme is identical with that of the Oxford-Cambridge meeting, except that a 2-mile run takes the place of the 3-mile, and the pole-vault is added. The American A.A.U. programme includes the 100 yards, 220 yards, 440 yards, 880 yards, 1-mile and 5-mile runs; 120 yards high-hurdle race; 220 yards low-hurdle race; high and broad (long) jumps; throwing the hammer; throwing 56-lb weight; putting 16-lb shot; throwing the discus; and pole-vault. Of these the running contests are called "track athletics," and the rest "field" events.

International athletic contests of any importance have, with the exception of the modern Olympic games, invariably taken place between Britons, Americans and Canadians, the continental European countries having as yet produced few track or field athletes of the first class, although the interest in sports in general has greatly increased in Europe during the last ten years. In 1844 George Seward, an American professional runner, visited England and competed with success against the best athletes there; and in 1863 Louis Bennett, called "Deerfoot," a full-blooded Seneca Indian, repeated Seward's triumphs, establishing running records up to 12 miles. In 1878 the Canadian, C. C. McIvor, champion sprinter of America, went to England, but failed to beat his British professional rivals. In 1881 L. E. Myers of New York and E. E. Merrill of Boston competed successfully in England, Myers winning every short-distance championship except the 100-yards, and Merrill all the walking championships save the 7-miles. The same year W. C. Davies of England won the 5-mile championship of America, but, like several other British runners who have had success in America, he competed under the colours of an American club. In 1882 the famous English runner, W. G. George, ran against Myers in America in races of 1 mile, ¾ mile and ½ mile, winning over the first two distances. In 1884 Myers again went to England and made new British records over 500, 600, 800 and 1000 yards, and world's records over ½ mile and 1200 yards. The next year he won both the British ¼-mile and ½-mile championships. The same year a team of Irish athletes, among them W. J. M. Barry, won several Canadian championships. In 1888 a team of the Manhattan Athletic Club, New York, competed in England with fair success, and during the same season an Irish team from the Gaelic Athletic Association visited America without much success. In 1890 a team from the Salford Harriers was invited to America by the Manhattan Athletic Club, but the evidently commercial character of the enterprise caused its failure. One of the Harriers, E. W. Parry, won the American steeplechase championship. The next year saw another visit to Europe of the Manhattan athletes, who had fair success in England and won every event at Paris. In 1895 the London Athletic Club team competed in New York against the New York Athletic Club, but lost every one of the eleven events, several new records being established. During the previous summer (1894) occurred the first of the international matches between British and American universities which still retain their place as the most interesting athletic event. In that contest, which took place at Queen's Club, London, Oxford beat Yale by 5½ to 3½ events. The next summer Cambridge, as the champion English university, visited America and was beaten by Yale (3 to 8). In 1899 both British universities competed at Queen's Club against the combined athletes of Harvard and Yale, who were beaten by the odd event. The return match took place between the same universities at New York in the summer of 1901, the Americans winning 6 to 3 events. In 1904 Harvard and Yale beat Oxford and Cambridge at Queen's Club by the same score.

Outside Great Britain and America the most important athletic events are undoubtedly the revived Olympic games. They were instituted by delegates from the different nations who met in Paris on the 16th of June 1894, principally at the instigation of Baron Pierre de Coubertin, the result being the formation of an International Olympic Games Committee with Baron de Coubertin at its head, which resolved that games should be held every fourth year in a different country. The first modern Olympiad took place at Athens, 6th to 12th April 1896, in the ancient stadium, which was rebuilt through the liberality of a Greek merchant and seated about 45,000 people. The programme of events included the usual field and track sports, gymnastics, wrestling, pole-climbing, lawn tennis, fencing, rifle and revolver shooting, weight-lifting, swimming, the Marathon race and bicycle racing. Among the contestants were representatives of nearly every European nation, besides Americans and Australians. Great Britain took little direct interest in the occasion and was inadequately represented, but the United States sent five men from Boston and four from Princeton University, who, though none of them held American championships, succeeded in winning every event for which they were entered. The Marathon race of 42 kilometres (26 miles), commemorative of the famous run of the Greek messenger to Athens with the news of the victory of Marathon, was won by a Greek peasant. The second Olympiad was held in Paris in June 1900. Again Great Britain was poorly represented, but American athletes won eighteen of the twenty-four championship events. The third Olympiad was held at St Louis in the summer of 1904 in connexion with the Louisiana Purchase Exposition, its success being due in great measure to James E. Sullivan, the physical director of the Exposition, and Caspar Whitney, the president of the American Olympic Games Committee. The games were much more numerous than at the previous Olympiads, including sports of all kinds, handicaps, inter-club competitions, and contests for aborigines. In the track and field competitions the American athletes won every championship except weight-throwing (56 lb) and lifting the bar. The sports of the savages, among whom were American Indians, Africans of several tribes, Moros, Patagonians, Syrians, Ainus and Filipinos, were disappointing; their efforts in throwing the javelin, shooting with bow and arrow, weight-lifting, running and jumping, proving to be feeble compared with those of white races. The Americanized Indians made the best showing.

The Greeks, however, were not altogether satisfied with the cosmopolitan character of the revival of these celebrated games of their ancestors, and resolved to give the revival a more definitely Hellenic stamp by intercalating an additional series,

to take place at Athens, in the middle of the quadrennial period. Their action was justified by the success which attended the first of this additional series at Athens in 1906. This success may have been partly due to the personal interest taken in the games by the king and royal family of Greece, and to the presence of King Edward VII., Queen Alexandra, and the prince and princess of Wales; but to whatever cause it should be assigned it was generally acknowledged that neither in France nor in America had the games acquired the same prestige as those held on the classical soil of Greece. In 1906 the governments of Germany, France and the United States made considerable grants of money to defray the expenses of the competitors from those countries. These games aroused much more interest in England than the earlier ones in the series, but though upwards of fifty British competitors took part in the contests, they were by no means representative in all cases of the best British athletics. The American representatives were slightly less numerous, but they were more successful. It was noteworthy that no British or Americans took part in the rowing races in the Bay of Phalerum, nor in the tennis, football or shooting competitions. The Marathon race, by far the most important event in the games, was won in 1906 by a British athlete, M. D. Sherring, a Canadian by birth. The Americans won a total of 75 prizes, the British 39, and the Swedes and Greeks each 28.

The games of the 4th Olympiad (1908) were held in London in connexion with the Franco-British Exhibition of that year. An immense sensation was caused by the finish for the Marathon race from Windsor Castle to the stadium in the Exhibition grounds in London. The first competitor to arrive was the Italian, Dorando Pietri, whose condition of physical collapse was such that, appearing to be on the point of death, he had to be assisted over the last few yards of the course. He was therefore disqualified, and J. Hayes, an American, was adjudged the winner; a special prize was presented to the Italian by Queen Alexandra. In the whole series of contests the United Kingdom made 38 wins, the Americans 22, and the Swedes 7. In the Olympic games proper, British athletes, including two wins by colonials from Canada and Africa, scored 25 successes, and the Americans 18. In the track events 8 wins fell to the British, including two Colonials, and 6 to American athletes; but the latter gained complete supremacy in the field events, of which they won 9, while British competitors secured only two of minor importance.

For records, &c., see the annual *Sporting and Athletic Register*; for the Olympic games see Theodore Andrea Cook's volume, published in connexion with the Olympiad of 1908.

ATHLONE, a market-town of Co. Westmeath, Ireland, on both banks of the Shannon. Pop. of urban district (1901) 6617. The urban district, under the Local Government (Ireland) Act 1900, is wholly in county Westmeath, but the same area is divided by the Shannon between the parliamentary divisions of South Westmeath and South Roscommon. Athlone is 78 m. W. from Dublin by the Midland Great Western railway, and is also served by a branch from Portarlington of the Great Southern & Western line, providing an alternative and somewhat longer route from the capital. The main line of the former company continues W. to Galway, and a branch N.W. serves counties Roscommon and Mayo. The Shannon divides the town into two portions, known as the Leinster side (east), and the Connaught side (west), which are connected by a handsome bridge opened in 1844. There is a swivel railway bridge. The rapids of the Shannon at this point are obviated by means of a lock communication with a basin, which renders the navigation of the river practicable above the town. The steamers of the Shannon Development Company ply on the river, and some trade by water is carried on with Limerick, and with Dublin by the river and the Grand and Royal canals. Athlone is an important agricultural centre, and there are woollen factories. The salmon fishing both provides sport and is a source of commercial wealth. There are two parish churches, St Mary and St Peter, both erected early in the 19th century, of which the first has near it an isolated church tower of earlier date. There are three Roman Catholic chapels, a court-house and other public offices. Early remains include portions of the castle, of the town walls (1576), of the abbey of St Peter and of a Franciscan foundation. On several islands of the picturesque Lough Ree, to the north, are ecclesiastical and other remains.

The military importance of Athlone dates from the erection of the castle and of a bridge over the river by John de Grey, bishop of Norwich and justiciar of Ireland, in 1210. It became the seat of the presidency of Connaught under Elizabeth, and withstood a siege by the insurgents in 1641. In the war of 1688 the possession of Athlone was considered of the greatest importance, and it consequently sustained two sieges, the first by William III. in person, which failed, and the second by General Godart van Ginkel (*q.v.*), who, on the 30th of June 1691, in the face of the Irish, forded the river and took possession of the town, with the loss of only fifty men. Ginkel was subsequently created earl of Athlone, and his descendants held the title till it became extinct in 1844. In 1797 the town was strongly fortified on the Roscommon side, the works covering 15 acres and containing two magazines, an ordnance store, an armoury with 15,000 stands of arms and barracks for 1500 men. The works are now dismantled. Athlone was incorporated by James I., and returned two members to the Irish parliament, and one member to the imperial parliament till 1885.

ATHOL, a township of Worcester county, northern Massachusetts, U.S.A., having an area of 35 sq. m. Pop. (1900) 7061, of whom 986 were foreign-born; (1910 U.S. census) 8536. Its surface is irregular and hilly. The village of Athol is on Miller's river, and is served by the Boston & Albany and the Boston & Maine railways. The streams of the township furnish good water-power, and manufactures of varied character are its leading interests. Athol was first settled in 1735, and was incorporated as a township in 1762. It was named by its largest landowner Col. James Murray, after the ancestral home of the Murrays, dukes of Atholl.

See L. B. Caswell, *Athol, Mass., Past and Present* (Athol, 1899).

ATHOLL, EARLS AND DUKES OF. The Stewart line of the Scottish earls of Atholl, which ended with the 5th Stewart earl in 1595, the earldom reverting to the crown, had originated with Sir John Stewart of Balveny (d. 1512), who was created earl of Atholl about 1457 (new charter 1481). The 5th earl's daughter, Dorothea, married William Murray, earl of Tullibardine (cr. 1606), who in 1626 resigned his earldom in favour of Sir Patrick Murray, on condition of the revival of the earldom of Atholl in his wife and her descendants. The earldom thus passed to the Murray line, and John Murray, their only son (d. 1642), was accordingly acknowledged as earl of Atholl (the 1st of the Murrays) in 1629.

JOHN STEWART, 4th earl of Atholl, in the Stewart line (d. 1579), son of John, 3rd earl, and of Grizel, daughter of Sir John Rattray, succeeded his father in 1542. He supported the government of the queen dowager, and in 1560 was one of the three nobles who voted in parliament against the Reformation and the Confession of Faith, and declared their adherence to Roman Catholicism. Subsequently, however, he joined the league against Huntly, whom with Murray and Morton he defeated at Corrichie in October 1562, and he supported the projected marriage of Elizabeth with Arran. On the arrival of Mary from France in 1561 he was appointed one of the twelve privy councillors, and on account of his religion obtained a greater share of the queen's favour than either Murray or Maitland. He was one of the principal supporters of the marriage with Darnley, became the leader of the Roman Catholic nobles, and with Lennox obtained the chief power in the government, successfully protecting Mary and Darnley from Murray's attempts to regain his ascendancy by force of arms. According to Knox he openly attended mass in the queen's chapel, and was especially trusted by Mary in her project of reinstating Roman Catholicism. The fortress of Tantallon was placed in his keeping, and in 1565 he was made lieutenant of the north of Scotland. He is described the same year by the French ambassador as "très grand catholique hardi et vaillant et remuant, comme l'on dict, mais de nul

jugement et expérience." He had no share in the murders of Rizzio or Darnley, and after the latter crime in 1567, he joined the Protestant lords against Mary, appeared as one of the leaders against her at Carberry Hill, and afterwards approved of her imprisonment at Lochleven Castle. In July he was present at the coronation of James, and was included in the council of regency on Mary's abdication. He, however, was not present at Langside in May 1568, and in July became once more a supporter of Mary, voting for her divorce from Bothwell (1569). In March 1570 he signed with other lords the joint letter to Elizabeth asking for the queen's intercession and supporting Mary's claims, and was present at the convention held at Linlithgow in April in opposition to the assembly of the king's party at Edinburgh. In 1574 he was proceeded against as a Roman Catholic and threatened with excommunication, subsequently holding a conference with the ministers and being allowed till midsummer to overcome his scruples. He had failed in 1572 to prevent Morton's appointment to the regency, but in 1578 he succeeded with the earl of Argyll in driving him from office. On the 24th of March James took the government into his own hands and dissolved the regency, and Atholl and Argyll, to the exclusion of Morton, were made members of the council, while on the 29th Atholl was appointed lord chancellor. Subsequently, on the 24th of May, Morton succeeded in getting into Stirling Castle and in regaining his guardianship of James. Atholl and Argyll, who were now corresponding with Spain in hopes of assistance from that quarter, then advanced to Stirling with a force of 7000 men, when a compromise was arranged, the three earls being all included in the government. While on his way from a banquet held on the 20th of April 1579 on the occasion of the reconciliation, Atholl was seized with sudden illness, and died on the 25th, not without strong suspicions of poison. He was buried at St Giles's cathedral in Edinburgh. He married (1) Elizabeth, daughter of George Gordon, 4th earl of Huntly, by whom he had two daughters, and (2) Margaret, daughter of Malcolm Fleming, 3rd Lord Fleming, by whom, besides three daughters, he had John, 5th earl of Atholl, at whose death in 1595 the earldom in default of male heirs reverted to the crown.

John Murray, 1st earl of Atholl in the Murray line (see above), died in 1642. On the outbreak of the civil war he called out the men of Atholl for the king, and was imprisoned by the marquess of Argyll in Stirling Castle in 1640.

John Murray, 2nd earl and 1st marquess of Atholl (1631–1703), son of the 1st earl and of Jean, daughter of Sir Duncan Campbell of Glenorchy, was born on the 2nd of May 1631. In 1650 he joined in the unsuccessful attempt to liberate Charles II. from the Covenanters, and in 1653 was the chief supporter of Glencairn's rising, but was obliged to surrender with his two regiments to Monk on the 2nd of September 1654. At the restoration Atholl was made a privy councillor for Scotland and sheriff of Fife, in 1661 lord justice-general of Scotland, in 1667 a commissioner for keeping the peace in the western Highlands, in 1670 colonel of the king's horseguards, in 1671 a commissioner of the exchequer, and in 1672 keeper of the privy seal in Scotland and an extraordinary lord of session. In 1670 he became earl of Tullibardine by the death of his cousin James, 4th earl, and on the 7th of February 1676 he was created marquess of Atholl, earl of Tullibardine, viscount of Balquhidder, Lord Murray, Balvenie and Gask. He at first zealously supported Lauderdale's tyrannical policy, but after the raid of 1678, called the "Highland Host," in which Atholl was one of the chief leaders, he joined in the remonstrance to the king concerning the severities inflicted upon the Covenanters, and was deprived of his office of justice-general and passed over for the chancellorship in 1681. In 1679, however, he was present at the battle of Bothwell Brig; in July 1680 he was made vice-admiral of Scotland, and in 1681 president of parliament. In 1684 he was appointed lord-lieutenant of Argyll, and invaded the country, capturing the earl of Argyll after his return from abroad in June 1685 at Inchinnan. The excessive severities with which he was charged in this campaign were repudiated with some success by him after the Revolution.[1] The same year he was reappointed lord privy seal, and in 1687 was made a knight of the Thistle on the revival of the order. At the Revolution he wavered from one side to the other, showing no settled purpose but waiting upon the event, but finally in April 1689 wrote to William to declare his allegiance, and in May took part in the proclamation of William and Mary as king and queen at Edinburgh. But on the occasion of Dundee's insurrection he retired to Bath to drink the waters, while the bulk of his followers joined Dundee and brought about in great measure the defeat of the government troops at Killiecrankie. He was then summoned from Bath to London and imprisoned during August. In 1690 he was implicated in the Montgomery plot and subsequently in further Jacobite intrigues. In June 1691 he received a pardon, and acted later for the government in the pacification of the Highlands. He died on the 6th of May 1703. He married Amelia, daughter of James Stanley, 7th earl of Derby (through whom the later dukes of Atholl acquired the sovereignty of the Isle of Man), and had, besides one daughter, six sons, of whom John became 2nd marquess and 1st duke of Atholl; Charles was made 1st earl of Dunmore, and William married Margaret, daughter of Sir Robert Nairne, 1st Lord Nairne, becoming in her right 2nd Lord Nairne.

[1] A. Lang, *Hist. of Scotland*, iii. 407.

John Murray, 2nd marquess and 1st duke of Atholl (1660–1724), was born on the 24th of February 1660, and was styled during his father's lifetime Lord Murray, till 1696, when he was created earl of Tullibardine. He was a supporter of William and the Revolution in 1688, taking the oaths in September 1689, but was unable to prevent the majority of his clan, during his father's absence, from joining Dundee under the command of his brother James. In 1693 as one of the commissioners he showed great energy in the examination into the massacre of Glencoe and in bringing the crime home to its authors. In 1694 he obtained a regiment, in 1695 was made sheriff of Perth, in 1696 secretary of state, and from 1696 to 1698 was high commissioner. In the latter year, however, he threw up office and went into opposition. At the accession of Anne he was made a privy councillor, and in 1703 lord privy seal for Scotland. The same year he succeeded his father as 2nd marquess of Atholl, and on the 30th of June he was created duke of Atholl, marquess of Tullibardine, earl of Strathtay and Strathardle, Viscount Balquhidder, Glenalmond and Glenlyon, and Lord Murray, Balvenie and Gask. In 1704 he was made a knight of the Thistle. In 1703–1704 an unsuccessful attempt was made by Simon, Lord Lovat, who used the duke of Queensberry as a tool, to implicate him in a Jacobite plot against Queen Anne; but the intrigue was disclosed by Robert Ferguson, and Atholl sent a memorial to the queen on the subject, which resulted in Queensberry's downfall. But he fell nevertheless into suspicion, and was deprived of office in October 1705, subsequently becoming a strong antagonist of the government, and of the Hanoverian succession. He vehemently opposed the Union during the years 1705–1707, and entered into a project for resisting by force and for holding Stirling Castle with the aid of the Cameronians, but nevertheless did not refuse a compensation of £1000. According to Lockhart, he could raise 6000 of the best men in the kingdom for the Jacobites. On the occasion, however, of the invasion of 1708 he took no part, on the score of illness, and was placed under arrest at Blair Castle. On the downfall of the Whigs and the advent of the Tories to power, Atholl returned to office, was chosen a representative peer in the Lords in 1710 and 1713, in 1712 was an extraordinary lord of session, from 1713 to 1714 was once more keeper of the privy seal, and from 1712 to 1714 was high commissioner. On the accession of George I. he was again dismissed from office, but at the rebellion of 1715, while three of his sons joined the Jacobites, he remained faithful to the government, whom he assisted in various ways, on the 4th of June 1717 apprehending Robert Macgregor (Rob Roy), who, however, succeeded in escaping. He died on the 14th of November 1724. He married (1) Catherine, daughter of William Douglas, 3rd duke of Hamilton, by whom, besides one daughter, he had six sons, of whom John was killed at Malplaquet in 1709, William was marquess of Tullibardine, and James succeeded his father as 2nd duke on

account of the share taken by his elder brother in the rebellion; and (2) Mary, daughter of William, Lord Ross, by whom he had three sons and several daughters.

The *Atholl Chronicles* have been privately printed by the 7th duke of Atholl (b. 1840). See also S. Cowan, *Three Celtic Earldoms* (1909).

ATHOLL, or ATHOLE, a district in the north of Perthshire, Scotland, covering an area of about 450 sq. m. It is bounded on the N. by Badenoch, on the N.E. by Braemar, on the E. by Forfarshire, on the S. by Breadalbane, on the W. and N.W. by Lochaber. The Highland railway bisects it diagonally from Dunkeld to the borders of Inverness-shire. It is traversed by the Grampian mountains and watered by the Tay, Tummel, Garry, Tilt, Bruar and other streams. Glen Garry and Glen Tilt are the chief glens, and Loch Rannoch and Loch Tummel the principal lakes. The population mainly centres around Dunkeld, Pitlochry and Blair Atholl. The only cultivable soil occurs in the valleys of the large rivers, but the deer-forest and the shootings on moor and mountain are among the most extensive in Scotland. It is said to have been named Athfotla (Atholl) after Fotla, son of the Pictish king Cruithne, and was under the rule of a Celtic *mormaer* (thane or earl) until the union of the Picts and Scots under Kenneth Macalpine in 843. The duke of Atholl's seats are Blair Castle and Dunkeld House. What is called Atholl brose is a compound, in equal parts, of whisky and honey (or oatmeal), which was first commonly used in the district for hoarseness and sore throat.

ATHOS (Gr. Ἅγιον Ὄρος; Turk. *Aineros*; Ital. *Monte Santo*), the most eastern of the three peninsular promontories which extend, like the prongs of a trident, southwards from the coast of Macedonia (European Turkey) into the Aegean Sea. Before the 19th century the name Athos was usually confined to the terminal peak of the promontory, which was itself known by its ancient name, *Acte*. The peak rises like a pyramid, with a steep summit of white marble, to a height of 6350 ft., and can be seen at sunset from the plain of Troy on the east, and the slopes of Olympus on the west. On the isthmus are distinct traces of the canal cut by Xerxes before his invasion of Greece in 480 B.C. The peninsula is remarkable for the beauty of its scenery, and derives a peculiar interest from its unique group of monastic communities with their medieval customs and institutions, their treasures of Byzantine art and rich collections of documents. It is about 40 m. in length, with a breadth varying from 4 to 7 m.; its whole area belongs to the various monasteries. It was inhabited in the earliest times by a mixed Greek and Thracian population; of its five cities mentioned by Herodotus few traces remain; some inscriptions discovered on the sites were published by W. M. Leake (*Travels in N. Greece*, 1835, iii. 140) and Kinch. The legends of the monks attribute the first religious settlements to the age of Constantine (274–337), but the hermitages are first mentioned in historical documents of the 9th century. It is conjectured that the mountain was at an earlier period the abode of anchorites, whose numbers were increased by fugitives from the iconoclastic persecutions (726–842). The "coenobian" rule to which many of the monasteries still adhere was established by St Athanasius, the founder of the great monastery of Laura, in 969. Under a constitution approved by the emperor Constantine Monomachos in 1045, women and female animals were excluded from the holy mountain. In 1060 the community was withdrawn from the authority of the patriarch of Constantinople, and a monastic republic was practically constituted. The taking of Constantinople by the Latins in 1204 brought persecution and pillage on the monks; this reminded them of earlier Saracenic invasions, and led them to appeal for protection to Pope Innocent III., who gave them a favourable reply. Under the Palaeologi (1260–1453) they recovered their prosperity, and were enriched by gifts from various sources. In the 14th century the peninsula became the chosen retreat of several of the emperors, and the monasteries were thrown into commotion by the famous dispute over the mystical Hesychasts.

Owing to the timely submission of the monks to the Turks after the capture of Salonica (1430), their privileges were respected by successive sultans: a tribute is paid to the Turkish government, which is represented by a resident *kaimakam*, and the community is allowed to maintain a small police force. Under the present constitution, which dates from 1783, the general affairs of the commonwealth are entrusted to an assembly (*σύναξις*) of twenty members, one from each monastery; a committee of four members, chosen in turn, styled *epistatae* (*ἐπιστάται*), forms the executive. The president of the committee (*ὁ πρῶτος*) is also the president of the assembly, which holds its sittings in the village of Karyes, the seat of government since the 10th century. The twenty monasteries, which all belong to the order of St Basil, are: Laura (*ἡ Λαύρα*), founded in 963; Vatopédi (*Βατοπέδιον*), said to have been founded by the emperor Theodosius; Rossikon (*Ῥωσσικόν*), the Russian monastery of St Panteleïmon; Chiliándari (*Χιλιαντάριον*: supposed to be derived from *χίλιοι ἄνδρες* or *χίλια λεοντάρια*), founded by the Servian prince Stephen Nemanya (1159–1195); Iveron (*ἡ μονὴ τῶν Ἰβήρων*), founded by Iberians, or Georgians; Esphigmenu (*τοῦ Ἐσφιγμένου*: the name is derived from the confined situation of the monastery); Kutlumush (*Κουτλουμούση*); Pandocratoros (*τοῦ Παντοκράτορος*); Philotheu (*Φιλοθέου*); Caracallu (*τοῦ Καρακάλλου*); St Paul (*τοῦ ἁγίου Παύλου*); St Denis (*τοῦ ἁγίου Διονυσίου*); St Gregory (*τοῦ ἁγίου Γρηγορίου*); Simópetra (*Σιμόπετρα*); Xeropotámu (*τοῦ Ξηροποτάμου*); St Xenophon (*τοῦ ἁγίου Ξενοφῶντος*); Dochiaríu (*Δοχειαρείου*); Constamonítu (*Κωνσταμονίτου*); Zográphu (*τοῦ Ζωγράφου*); and Stavronikítu (*τοῦ Σταυρονικίτου*, the last built, founded in 1545). The "coenobian" monasteries (*κοινόβια*), each under the rule of an abbot (*ἡγούμενος*), are subjected to severe discipline; the brethren are clothed alike, take their meals (usually limited to bread and vegetables) in the refectory, and possess no private property. In the "idiorrhythmic" monasteries (*ἰδιόρρυθμα*), which are governed by two or three annually elected wardens (*ἐπίτροποι*), a less stringent rule prevails, and the monks are allowed to supplement the fare of the monastery from their private incomes. Dependent on the several monasteries are twelve *skelae* (*σκῆται*) or monastic settlements, some of considerable size, in which a still more ascetic mode of life prevails: there are, in addition, several farms (*μετοχία*), and many hundred sanctuaries with adjoining habitations (*κελλία*) and hermitages (*ἀσκητήρια*). The monasteries, with the exception of Rossikón (St Panteleïmon) and the Serbo-Bulgarian Chiliándari and Zográphu, are occupied exclusively by Greek monks. The large *skete* of St Andrew and some others belong to the Russians; there are also Rumanian and Georgian *skelae*. The great monastery of Rossikón, which is said to number about 3000 inmates, has been under a Russian abbot since 1875; it is regarded as one of the principal centres of the Russian politico-religious propaganda in the Levant. The tasteless style of its modern buildings is out of harmony with the quaint beauty of the other monasteries. Furnished with ample means, the Russian monks neglect no opportunity of adding to their possessions on the holy mountain; their encroachments are resisted by the Greek monks, whose wealth, however, was much diminished by the secularization of their estates in Rumania (1864). The population of the holy mountain numbers from 6000 to 7000; about 3000 are monks (*καλόγεροι*), the remainder being lay brothers (*κοσμικοί*). The monasteries, which are all fortified, generally consist of large quadrangles enclosing churches; standing amid rich foliage, they present a wonderfully picturesque appearance, especially when viewed from the sea. Their inmates, when not engaged in religious services, occupy themselves with husbandry, fishing and various handicrafts; the standard of intellectual culture is not high. A large academy, founded by the monks of Vatopedi in 1749, for a time attracted students from all parts of the East, but eventually proved a failure, and is now in ruins. The muniment rooms of the monasteries contain a marvellous series of documents, including chrysobulls of various emperors and princes, *sigilla* of the patriarchs, *typica*, iradés and other documents, the study of which will throw an important light on the political and ecclesiastical history and social life of the

East from the middle of the 10th century. Up to comparatively recent times a priceless collection of classical manuscripts was preserved in the libraries; many of them were destroyed during the War of Greek Independence (1821–1829) by the Turks, who employed the parchments for the manufacture of cartridges; others fell a prey to the neglect or vandalism of the monks, who, it is said, used the material as bait in fishing; others have been sold to visitors, and a considerable number have been removed to Moscow and Paris. The library of Simopetra was destroyed by fire in 1891, and that of St Paul in 1905. There is now little hope of any important discovery of classical manuscripts. The codices remaining in the libraries are for the most part theological and ecclesiastical works. Of the Greek manuscripts, numbering about 11,000, 6618 have been catalogued by Professor Spyridion Lambros of Athens; his work, however, does not include the MSS. in some of the *sketae*, or those in the libraries of Laura and Vatopedi, of which catalogues (hitherto unpublished) have been prepared by resident monks. The canonic MSS. only of Vatopedi and Laura have been catalogued by Benessevich in the supplement to vol. ix. of the *Bizantiyskiy Vremennik* (St Petersburg, 1904). The Slavonic and Georgian MSS. have not been catalogued. Apart from the illuminated MSS., the mural paintings, the mosaics, and the goldsmith's work of Mount Athos are of infinite interest to the student of Byzantine art. The frescoes in general date from the 15th or 16th century: some are attributed by the monks to Panselinos, "the Raphael of Byzantine painting," who apparently flourished in the time of the Palaeologi. Most of them have been indifferently restored by local artists, who follow mechanically a kind of hieratic tradition, the principles of which are embodied in a work of iconography by the monk Dionysius, said to have been a pupil of Panselinos. The same spirit of conservatism is manifest in the architecture of the churches, which are all of the medieval Byzantine type. Some of the monasteries were seriously damaged by an earthquake in 1905.

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ATHY (pronounced Athý), a market-town of Co. Kildare, Ireland, in the south parliamentary division, 45 m. S.W. of Dublin on a branch of the Great Southern & Western railway. Pop. of urban district (1901) 3599. It is intersected by the river Barrow, which is here crossed by a bridge of five arches. The crossing of the river here was guarded and disputed from the earliest times, and the name of the town is derived from a king of Munster killed here in the 2nd century. There are picturesque remains of Woodstock Castle of the 12th or 13th century, and White Castle built in 1506, and rebuilt in 1575 by a member of the family whose name it bears, and still occupied. Both were erected to defend the ford of the Barrow. There are also an old town gate, and an ancient cemetery with slight monastic remains. Previous to the Union Athy returned two members to the Irish parliament. The trade, chiefly in grain, is aided by excellent water communication, by a branch of the Grand Canal to Dublin, and by the river Barrow, navigable from here to Waterford harbour.

ATĪNA, the name of three ancient towns of Italy.

1. A town (mod. *Ātena*) of Lucania, upon the Via Popillia, 7 m. N. of Tegianum, towards which an ancient road leads, in the valley of the river now known as Diano. Its ancient importance is vouched for by its walls of rough cyclopean work, which may have had a total extent of some 2 m. (see G. Patroni in *Notizie degli scavi*, 1897, 112; 1901, 498). The date of these walls has not as yet been ascertained, recent excavations, which led to the discovery of a few tombs in which the earliest objects showing Greek influence may go back to the 7th century B.C., not having produced any decisive evidence on the point. To the Roman period belong the remains of an amphitheatre and numerous inscriptions.

2. A town (mod. *Atina*) of the Volsci, 12 m. N. of Casinum, and about 14 m. E. of Arpinum, on a hill 1607 ft. above sea-level. The walls, of carefully worked polygonal blocks of stone, are still preserved in parts, and the modern town does not fill the whole area which they enclose. Cicero speaks of it as a prosperous country town, which had not as yet fallen into the hands of large proprietors; and inscriptions show that under the empire it was still flourishing. One of these last is a boundary stone relating to the assignation of lands in the time of the Gracchi, of which six other examples have been found in Campania and Lucania.

3. A town of the Veneti, mentioned by Pliny, *H. N.* iii. 131.

ATITLÁN, or SANTIAGO DE ATITLÁN, a town in the department of Sololá, Guatemala, on the southern shore of Lake Atitlán. Pop. (1905) about 9000, almost all Indians. Cotton-spinning is the chief industry. Lake Atitlán is 24 m. long and 10 m. broad, with 64 m. circumference. It occupies a crater more than 1000 ft. deep and about 4700 ft. above sea-level. The peaks of the Guatemala Cordillera rise round it, culminating near its southern end in the volcanoes of San Pedro (7000 ft.) and Atitlán (11,719 ft.). Although the lake is fed by many small mountain torrents, it has no visible outlet, but probably communicates by an underground channel with one of the rivers which drain the Cordillera. Mineral springs abound in the neighbourhood. The town of Sololá (*q.v.*) is near the north shore of the lake.

ATKINSON, EDWARD (1827–1905), American economist, was born at Brookline, Massachusetts, on the 10th of February 1827. For many years he was engaged in managing various business enterprises, and became, in 1877, president of the Boston Manufacturers' Mutual Fire Insurance Company, a post which he held till his death. He was a strong controversialist and a prolific writer on such economic subjects as banking, railways, cotton manufacture, the tariff and free trade, and the money question. He was appointed in 1887 a special commissioner to report upon the status of bimetallism in Europe. He also made a special study of mill construction and fire prevention, and invented an improved cooking apparatus, called the "Aladdin oven." He was an active supporter of anti-imperialism. He died at Boston on the 11th of December 1905.

His principal works were *Right Methods of Preventing Fires in Mills* (1881); *Distribution of Products* (1885); *Industrial Progress of the Nation* (1889); *Taxation and Work* (1892); *Science of Nutrition* (10th ed., 1898).

ATKINSON, SIR HARRY ALBERT (1831–1892), British colonial statesman, prime minister and speaker of the legislative council, New Zealand, was born at Chester in 1831, and in 1855 emigrated to Taranaki, New Zealand, where he became a farmer. In 1860 the Waitara war broke out, and from its outset Atkinson, who had been selected as a captain of the New Plymouth Volunteers, distinguished himself by his contempt for appearances and tradition, and by the practical skill, energy and courage which he showed in leading his Forest Rangers in the tiresome and lingering bush warfare of the next five years. For this work he was made a major of militia, and thanked by the government. Elected to the house of representatives in 1863, he joined Sir Frederick Weld's ministry at the end of November 1864 as minister of defence, and, during eleven months of office, was identified with the well-known "self-reliance" policy, a proposal to dispense with imperial regulars, and meet the Maori with colonials only. Parliament accepted this principle, but turned out the Weld ministry for other reasons. For four years Atkinson was out of parliament; in October 1873 he re-entered it, and a year later became minister of lands under Sir Julius Vogel.

Ten months later he was treasurer, and such was his aptitude for finance that, except during six months in 1876, he thenceforth held that post whenever his party was in power. From October 1874 to January 1891 Atkinson was only out of office for about five years. Three times he was premier, and he was always the most formidable debater and fighter in the ranks of the Conservative opponents of the growing Radical party which Sir George Grey, Sir Robert Stout and John Ballance led in succession. It was he who was mainly responsible for the abolition of the provinces into which the colony was divided from 1853 to 1876. He repealed the Ballance land-tax in 1879, and substituted a property-tax. He greatly reduced the cost of the public service in 1880, and again in 1888. In both these years he raised the customs duties, amongst other taxes, and gave them a quasi-protectionist character. In 1880 he struck 10% off all public salaries and wages; in 1887 he reduced the salary of the governor by one-third, and the pay and number of ministers and members of parliament. By these resolute steps revenue was increased, expenditure checked, and the colony's finance reinstated. Atkinson was an advocate of compulsory national assurance, and the leasing as opposed to the selling of crown lands. Defeated in the general election of December 1890, he took the appointment of speaker of the legislative council. There, while leaving the council chamber after the sitting of the 28th of June 1892, he was struck down by heart disease and died in a few minutes. Though brusque in manner and never popular, he was esteemed as a vigorous, upright and practical statesman. He was twice married, and had seven children, of whom three sons and a daughter survived him. (W. P. R.)

ATLANTA, the capital and the largest city of Georgia, U.S.A., and the county-seat of Fulton county, situated at an altitude of 1000–1175 ft., in the N.W. part of the state, near the Chattahoochee river. Pop. (1860) 9554; (1880) 37,409; (1890) 65,533; (1900) 89,872, of whom 35,727 were negroes and 2531 were foreign-born; (1910) 154,839. It is served by the Southern, the Central of Georgia, the Georgia, the Seaboard Air Line, the Nashville, Chattanooga & St Louis (which enters the city over the Western & Atlantic, one of its leased lines), the Louisville & Nashville, the Atlanta, Birmingham & Atlantic, and the Atlanta & West Point railways. These railway communications, and the situation of the city (on the Piedmont Plateau) on the water-parting between the streams flowing into the Atlantic Ocean and those flowing into the Gulf of Mexico, have given Atlanta its popular name, the "Gate City of the South." Atlanta was laid out in the form of a circle, the radius being 1¼ m. and the centre the old railway station, the Union Depot (the new station is called the Terminal); large additions have been made beyond this circle, including West End, Inman Park on the east, and North Atlanta. Among the best residence streets are Peachtree and West Peachtree streets to the north, and the older streets to the south of the business centre of the city—Washington Street, Whitehall, Pryor and Capitol Avenues. Among the principal office buildings are the Empire, the Equitable, the Prudential, the Fourth National, the Austell, the Peters, the Century, the English-American and the Candler buildings; and there are many fine residences, particularly in Peachtree and Washington streets, Inman Park and Ponce de Leon Circle. Among prominent public buildings are the State Capitol (completed 1889), containing a law library of about 65,000 volumes and a collection of portraits of famous Georgians, the north-west front of the Capitol grounds containing an equestrian statue (unveiled in 1907) of John Brown Gordon (1832–1904), a distinguished Confederate general in the American Civil War and governor of Georgia in 1887–1890; the court house; the Carnegie library, in which the young men's library, organized in 1867, was merged in 1902; the post office building; and the Federal prison (about 4 m. south of the city). The principal parks are: the Piedmont (189 acres), the site of the Piedmont Exposition of 1887 and of the Cotton States and International Exposition of 1895; the Grant, given to the city by L. P. Grant, an Atlanta railroad builder, in 1882, and subsequently enlarged by the city (in its south-east corner is Fort Walker); the Lakewood, 6 m. south of the city; and Ponce de Leon Park, owned by an electric railway company and having mineral springs and a fine baseball ground. Four miles south of the centre of Atlanta is Fort McPherson, an important United States military post, occupying a reservation of 40 acres and having barracks for the accommodation of 1000 men. In Oakland Cemetery is a large monument to Confederate soldiers; another monument in Oakland, "To the unknown Confederate Dead," is a reproduction of the Lion of Lucerne; in West View Cemetery (4 m. west of the city) is a memorial erected by the United Confederate Veterans. The city obtains its water-supply from the Chattahoochee river (above the mouth of Peachtree Creek), whence the water is pumped by four pumps, which have a daily capacity of 55,000,000 gallons. Atlanta is widely known for its public spirit and enterprise, to which the expositions of 1881, 1887 and 1895 bear witness. The air is bracing, largely because of the city's altitude; the mean annual temperature is 60·8° F. (winter 44·1°, spring 60·5°, summer 77°, autumn 61·5°).

Atlanta is an important educational centre. Its public-school system was organized in 1871. Here are the Georgia School of Technology, founded in 1885 (opened 1888) as a branch of the university of Georgia; the Atlanta College of Physicians and Surgeons (established in 1898 by the union of the Atlanta Medical College, organized in 1855, and the Southern Medical College, organized in 1878); the Atlanta School of Medicine (1905); the Georgia College of Eclectic Medicine; the Atlanta Theological Seminary (1901, Congregational), the only theological school of the denomination in the South in 1908; the Atlanta Dental College; the Southern College of Pharmacy (1903); Washington Seminary (1877) for girls; and the following institutions for negroes—Atlanta University, founded in 1869, which is one of the best institutions in the country for the higher education of negroes, standing particularly for "culture" education (as opposed to industrial training), which has done particularly good work in the department of sociology, under the direction of Prof. W. E. B. du Bois (b. 1868), one of the most prominent teachers of negro descent in the country, and which had in 1908 339 students; Clark University, founded in 1870 by the Freedman's Aid and Southern Educational Society of the Methodist Episcopal Church; the Atlanta Baptist College, founded in 1867; Morris Brown College (African Methodist Episcopal, founded in 1882, and opened in 1885), which has college preparatory, scientific, academic, normal and missionary courses, correspondence courses in English and theology, an industrial department, and departments of law, theology (Turner Theological Seminary), nurse-training, music and art; the Gammon Theological Seminary (Methodist Episcopal, chartered in 1888), which has its buildings just outside the city limits; and the Spelman Seminary for women and girls (Baptist) opened in 1881 as the Atlanta Baptist Female Seminary—the present name being adopted in 1883 in honour of the parents of Mrs John D. Rockefeller—and incorporated in 1888. At Decatur (pop. 1418 in 1900), a residential suburb, 6 m. east-north-east of Atlanta, is the Agnes Scott College (1890) for white girls; connected with the college is a school of music, art and expression, and an academy.

The city's principal charitable institutions are the Grady Memorial hospital (opened in 1892), supported by the city and named in honour of Henry W. Grady; the Presbyterian hospital; the Baptist Tabernacle Infirmary; the Wesley Memorial hospital; St Joseph's infirmary; the Municipal hospital for contagious diseases; the Florence Crittenden home. Three miles south-east of the city is a (state) soldiers' home, for aged, infirm and disabled Confederate veterans. The Associated Charities of Atlanta was organized in 1905.

The principal newspapers are the *Constitution* (morning), edited from 1880 until 1889 by Henry W. Grady (1851–1889),[1] one of the most eloquent of Southern orators, who did much to promote the reconciliation of the North and the South after the

[1] Grady was succeeded as managing editor by Clark Howell (b. 1863); and Joel Chandler Harris was long a member of the editorial staff.

Civil War, and whose statue stands opposite the post office; the *Journal* (evening), of which Hoke Smith (b. 1855), a prominent political leader, secretary of the interior in President Cleveland's cabinet in 1893–1896, and later governor of Georgia, was long the proprietor; and the *Georgian* (evening), founded in 1906 as a Prohibition organ.

As regards commerce and manufactures, Atlanta ranks first among the cities of Georgia. In 1907 its whosesale and retail trade was estimated at $100,000,000. The city is said to receive two-fifths of the total freight delivered in the state of Georgia. From 1895 to 1907 the bank clearings increased from about $65,000,000 to about $260,000,000. In recognition of the city's financial strength, Atlanta has been designated by the secretary of the treasury as one of the cities whose bonds will be accepted as security for Federal deposits. Atlanta is the Southern headquarters for a number of fire and life insurance companies, and is the third city of the United States in the amount of insurance business written and reported to resident agents, the annual premium receipts averaging about $10,000,000. It is an important horse and mule market, and handles much tobacco.

The development of manufactures has been especially notable. In 1880 the capital invested in manufacturing industries was approximately $2,468,000; in 1890 it was $9,508,962; in 1900 it had increased to $16,045,156; and in 1905, when only establishments under the "factory system" were counted in the census, to $21,631,162. In 1900 the total product was valued at $16,707,027, and the factory product at $14,418,834; and in 1905 the factory product was valued at $25,745,650, an increase of 78·6% in five years. Among the products are cotton goods (the product value of which in 1905 was 14% of the total value of the city's manufactures), foundry and machine-shop products, lumber, patent medicines, confectionery, men's clothing, mattresses, spring-beds and other furniture. Since 1904 part of the power utilized for manufacturing has been obtained from the Chattahoochee river, 15 m. from the city. There are many manufactories just outside the city limits.

History.—Atlanta owes its origin to the development of pioneer railroads of Georgia. In 1836 the Western & Atlantic, the first road built into North Georgia, was chartered, and the present site of Atlanta was chosen as its southern terminal, which it reached in 1843, and which was named "Terminus." The Georgia and the Central of Georgia then projected branches to Terminus in order to connect with the Western & Atlantic, and completed them in 1845 and 1846. The town charter of 1843 changed the name to Marthasville, in honour of the daughter of Governor Wilson Lumpkin; and the city charter of 1847 changed this to Atlanta. The population in 1850 was 2572; in 1860, 9554. Manufacturing interests soon became important, and during the Civil War Atlanta was the seat of Confederate military factories and a depot of supplies. In 1864 it was the objective point of the first stage of General William T. Sherman's invasion of Georgia (see AMERICAN CIVIL WAR), which is therefore generally known as the "Atlanta campaign."

After the battles around Marietta (*q.v.*), and the crossing of the Chattahoochee river on the 8th and 9th of July, Sherman continued his advance against Atlanta. His plan of operations was directed primarily to the seizure of the Decatur railway, by which the Confederate commander, General J. E. Johnston, might receive support from Virginia and the Carolinas. The three Union armies under Sherman's command, outnumbering the Confederates about 3 to 2, began their movement on the 16th of July; the Army of the Cumberland (Gen. G. H. Thomas) on the right marching from Marietta by the fords of the Upper Chattahoochee on Atlanta, the Army of the Ohio (Gen. J. M. Schofield) in the centre direct on Decatur, and the Army of the Tennessee (Gen. J. B. McPherson) still farther east towards Stone Mountain. At the moment of marching out to meet the enemy, Johnston was relieved of his command and was replaced by Gen. J. B. Hood (July 17). Hood at once prepared to attack Thomas as soon as that general should have crossed Peachtree Creek (6 m. north of the city) and thus isolated himself from Schofield and McPherson. Sherman's confidence in Thomas and his troops was, however, justified. Hood's attack (battle of Peachtree Creek, July 20) was everywhere repulsed, and Schofield and McPherson closed up at the greatest speed. Hood had to retire to Atlanta, with a loss of more than 4000 men, and the three Union armies gradually converged on the north and east sides of the city. But Hood, who had been put in command as a fighting general, was soon ready to attack afresh. This time he placed Gen. W. J. Hardee's corps, the largest of his army, to the south of Atlanta, facing the left flank of McPherson's army. As Hardee's attack rolled up the Union army from left to right, the remainder of the Confederate army was to issue from the Atlanta fortifications and join in the battle. Hardee opened his attack at noon on the 22nd of July (battle of Atlanta). The troops of the Army of the Tennessee were swiftly driven back, and their commander, McPherson, killed; but presently the Federals re-formed and a severe struggle ensued, in which most of Hood's army joined. The veterans of the Army of the Tennessee, led by Gen. J. A. Logan, offered a stubborn resistance, however, and Schofield's army now intervened. After prolonged attacks lasting to nightfall, Hood had once more to draw off, with about 10,000 men killed and wounded. The Confederates now abandoned all idea of regaining the Decatur line, and based themselves on Jonesboro' and the Macon railway. Sherman quickly realized this, and the Army of the Tennessee, now commanded by Gen. O. O. Howard, was counter-marched from left to right, until it formed up on the right of the Union line about Ezra Church (about 4 m. west of Atlanta). The railway from Chattanooga to Atlanta, destroyed by Johnston as he fell back in May and June, was now repaired and working up to Thomas's camps. Hood had meanwhile extended his entrenchments southwards to cover the Macon railway, and Howard's movement led to another engagement (battle of Ezra Church, July 28) in which the XV. corps under Logan again bore the brunt of Hood's attack. The Confederates were once more unsuccessful, and the losses were so heavy that the "fighting" policy ordered by the Confederate government was countermanded. Sherman's cavalry had hitherto failed to do serious damage to the railway, and the Federal general now proceeded to manœuvre with his main body so as to cut off Hood from his Southern railway lines (August). Covered by Howard at Ezra Church, Schofield led this advance, but the new Confederate lines baffled him. A bombardment of the Atlanta fortifications was then begun, but it had no material result. Another cavalry raid effected but slight damage to the line, and Sherman now decided to take his whole force to the south side. This apparently dangerous movement (August 25) is a remarkable illustration of Sherman's genius for war, and in fact succeeded completely. Only a small force was left to guard the Chattanooga railway, and the Union forces, Howard on the right, Thomas in the centre, and Schofield on the left, reached the railway after some sharp fighting (action of Jonesboro', September 1). The defence of Atlanta was now hopeless; Hood's forces retreated southward the same evening, and on the 2nd of September the Union detachment left behind on the north side entered Atlanta unopposed.

All citizens were now ordered to leave, the place was turned into a military camp, and when Sherman started on his "March to the Sea," on the 15th of November, a large part of the city was burned. Consequently the present city is a product of the post-bellum development of Georgia. The military government of Georgia was established here in 1865. In 1868 Atlanta was made the capital of the state.

In 1881 an International Cotton Exposition was held in Atlanta. This was American, even local, in character; its inception was due to a desire to improve the cultivation and manufacture of cotton; but it brought to the notice of the whole country the industrial transformation wrought in the Southern states during the last quarter of the 19th century. In 1887 the Piedmont Exposition was held in Atlanta. The Cotton States and International Exposition, also held at Atlanta, in 1895, attracted widespread attention, and had exhibits from thirty-seven states and thirteen foreign countries.

ATLANTIC, a city and the county-seat of Cass county, Iowa, U.S.A., on East Nishnabatna river, about 80 m. W. by S. of Des Moines. Pop. (1890) 4351; (1900) 5046; (1905, state census) 5180 (625 foreign-born); (1910) 4560. It is served by the Chicago, Rock Island & Pacific railway, and by an inter-urban electric line connecting with Elkhorn and Kimballton, and is the trade centre of a fine agricultural country; among its manufactures are machine-shop products, canned corn, flour, umbrellas, drugs and bricks. The municipality owns the water-works and electric-lighting plant. Atlantic was chartered as a city in 1869.

ATLANTIC CITY, a city of Atlantic county, New Jersey, U.S.A., on the Atlantic Ocean, 58 m. S.E. of Philadelphia and 137 m. S. by W. of New York. Pop. (1890) 13,055; (1900) 27,838, of whom 6513 were of negro descent and 3189 were foreign-born; (1910 census) 46,150. It is served by the Atlantic City (Philadelphia & Reading) and the West Jersey & Seashore (Pennsylvania system) railways. Atlantic City is the largest and most popular all-the-year-round resort in the United States, and has numerous fine hotels. The city extends for 3 m. along a low sandy island (Absecon Beach), 10 m. long by ¾ m. wide, separated from the mainland by a narrow strip of salt water and 4 or 5 m. of salt marshes, partly covered with water at highest storm tide. There are good bathing, boating, sailing, fishing and wild-fowl shooting. A "Board Walk" stretches along the beach for about 5 m.—the newest part of it is of concrete—and along or near this walk are the largest hotels, and numerous shops, and places of amusement; from the walk into the ocean extend several long piers. Other features of the place are the broad driveway (Atlantic Avenue) and an automobile boulevard. There are several seaside sanitoriums and hospitals, including the Atlantic City hospital, the Mercer Memorial home, and the Children's Seashore home. On the north end of the beach is Absecon Lighthouse, 160 ft. high. The municipality owns the water-works. Oysters are dredged here and are shipped hence in large quantities. There was a settlement of fishermen on the island in the latter part of the 18th century. In 1852 a movement was made to develop it as a seaside resort for Philadelphia, and after the completion of the Camden & Atlantic City railway in 1854 the growth of the place was rapid. A heavy loss occurred by fire on the 3rd of April 1902.

ATLANTIC OCEAN, a belt of water, roughly of an S-shape, between the western coasts of Europe and Africa and the eastern coasts of North and South America. It extends northward to the Arctic Basin and southward to the Great Southern Ocean. For purposes of measurement the polar boundaries are taken to be the Arctic and Antarctic circles, although in discussing the configuration and circulation it is impossible to adhere strictly to these limits. The Atlantic Ocean consists of two characteristic divisions, the geographical equator forming a fairly satisfactory line of division into North and South Atlantic. The North Atlantic, by far the best-known of the main divisions of the hydrosphere, is remarkable for the immense length of its coast-line and for the large number of enclosed seas connected with it, including on the western side the Caribbean Sea and Gulf of Mexico, the Gulf of St Lawrence and Hudson Bay, and on the eastern side the Mediterranean and Black Sea, the North Sea and the Baltic. The North Atlantic is connected with the Arctic Basin by four main channels: (1) Hudson Strait, about 60 m. wide, communicating with the gulfs and straits of the North American Arctic archipelago; (2) Davis Strait, about 200 m. wide, leading to Baffin Bay; (3) Denmark Strait, between Greenland and Iceland, 130 m. wide; and (4) the "Norwegian Sea," about 400 m. wide, extending from Iceland to the Faeroe Islands, the Shetland Islands and the coast of Norway. The width of the North Atlantic in lat. 60°, approximately where it breaks up into the branches just named, is nearly 2000 m.; in about lat. 50° N. the coasts of Ireland and Newfoundland approach to 1750 m.; the breadth then increases rapidly to lat. 40° N., and attains its maximum of 4500 m. in lat. 25° N.; farther south the minimum breadth is reached between Africa and South America, Cape Palmas being only 1600 m. distant from Cape St Roque. In marked contrast to this, the South Atlantic is distinguished by great simplicity of coast-line; inland seas there are none, and it attains its greatest breadth as it merges with the Southern Ocean; in lat. 35° S. the width is 3700 m.

Extent.

The total area of the North Atlantic, not counting inland seas connected with it, is, according to G. Karstens, 36,438,000 sq. kilometres, or 10,588,000 sq. m.; including the inland seas the area is 45,641,000 sq. kilometres or 13,262,000 sq. m. The area of the South Atlantic is 43,455,000 sq. kilometres, or 12,627,000 sq. m. Although not the most extensive of the great oceans, the Atlantic has by far the largest drainage area. The "long slopes" of the continents on both sides are directed towards the Atlantic, which accordingly receives the waters of a large proportion of the great rivers of the world, including the St Lawrence, the Mississippi, the Orinoco, the Amazon, the rivers of the La Plata, the Congo, the Niger, the Loire, the Rhine, the Elbe and the great rivers of the Mediterranean and the Baltic. Sir J. Murray estimates the total area of land draining to the Atlantic to be 13,432,000 sq. m., or with the Arctic area nearly 20,000,000 sq. m., nearly four times the area draining to the Pacific Ocean, and almost precisely four times the area draining to the Indian Ocean. Murray's calculations give the amount of precipitation received on this area at 15,800 cub. m. annually, and the river discharge from it at 3900 cub. m.

The dominant feature of the relief of the Atlantic basin is a submarine ridge running from north to south from about lat. 50° N. to lat. 40° S., almost exactly in the central line, and following the S-shape of the coasts. Over this ridge the average depth is about 1700 fathoms. Towards its northern end the ridge widens and rises to the plateau of the Azores, and in about 50° N. lat. it merges with the "Telegraph Plateau," which extends across nearly the whole ocean from Ireland to Newfoundland. North of the fiftieth parallel the depths diminish towards the north-east, two long submarine ridges of volcanic origin extend north-eastwards to the south-west of Iceland and to the Faeroe Islands, and these, with their intervening valleys, end in a transverse ridge connecting Greenland, through Iceland and the Faeroe Islands, with North-western Scotland and the continental mass of Europe. The mean depth over this ridge is about 250 fathoms, and the maximum depth nowhere reaches 500 fathoms. The main basin of the Atlantic is thus cut off from the Arctic basin, with which the area north of the ridge has complete deep-water communication. This intermediate region, which has Atlantic characteristics down to 300 fathoms, and at greater depths belongs more properly to the Arctic Sea, commonly receives the name of Norwegian Sea. On both sides of the central ridge deep troughs extend southwards from the Telegraph plateau to the Southern Ocean, the deep water coming close to the land all the way down on both sides. In these troughs the depth is seldom much less than 3000 fathoms, and this is exceeded in a series of patches to which Murray has given the name of "Deeps." In the eastern trough the Peake Deep lies off the Bay of Biscay in 20° W. long., Monaco Deep and Chun Deep off the north-west of Africa, Moseley Deep off the Cape Verde Islands, Krech Deep off the Liberian coast, and Buchanan Deep off the mouth of the Congo. The western trough extends northwards into Davis Strait, forming a depression in the Telegraph plateau; to the south of Newfoundland and Nova Scotia are Sigsbee Deep, Libbey Deep and Suhm Deep, each of small area; north-east of the Bahamas Nares Deep forms the largest and deepest depression in the Atlantic, in which a sounding of 4561 fathoms was obtained (70 m. north of Porto Rico) by the U.S. ship "Blake" in 1883. Immediately to the south of Nares Deep lies the smaller Makarov Deep; and off the coast of South America are Tizard Deep and Havergal Deep.

Relief of the bed.

Before the Antarctic expeditions of 1903–1904 our knowledge of the form of the sea bottom south of 40° S. lat. was almost wholly derived from the soundings of the expedition of Sir J. C. Ross in the "Erebus" and "Terror" (1839–1843), and the

bathymetrical maps published were largely the result of deductions based on one sounding taken by Ross in 68° 34′ S. lat., 12° 49′ W. long., in which he recorded a depth exceeding 4000 fathoms. The Scottish Antarctic expedition has shown this sounding to be erroneous; the "Scotia" obtained samples of bottom, in almost the same spot, from a depth of 2660 fathoms. Combining the results of recent soundings, Dr W. S. Bruce, the leader of the Scottish expedition, finds that there is a ridge "extending in a curve from Madagascar to Bouvet Island, and from Bouvet Island to the Sandwich group, whence there is a forked connexion through the South Orkneys to Graham's Land, and through South Georgia to the Falkland Islands and the South American continent." Again, the central ridge of the South Atlantic extends a thousand miles farther south than was supposed, joining the east and west ridge, just described, between the Bouvet Islands and the Sandwich group.

The foundations of our knowledge of the relief of the Atlantic basin may be said to have been laid by the work of H.M.S. "Challenger" (1873–1876), and the German ship "Gazelle" (1874–1876), the French expedition in the "Travailleur" (1880), and the U.S. surveying vessel "Blake" (1877 and later). Large numbers of additional soundings have been made in recent years by cable ships, by the expeditions of H.S.H. the prince of Monaco, the German "Valdivia" expedition under Professor Chun (1898), and the combined Antarctic expeditions (1903–1904).

Islands.

The Atlantic Ocean contains a relatively small number of islands. The only continental groups, besides some islands in the Mediterranean, are Iceland, the British Isles, Newfoundland, the West Indies, and the Falklands, and the chief oceanic islands are the Azores, Madeira, the Canaries, the Cape Verde Islands, Ascension, St Helena, Tristan da Cunha and Bouvet Island.

Mean depth, and bottom deposits.

The mean depth of the North Atlantic is, according to G. Karstens, 2047 fathoms. If we include the enclosed seas, the North Atlantic has a mean depth of 1800 fathoms. The South Atlantic has a mean depth of 2067 fathoms.

The greater part of the bottom of the Atlantic is covered by a deposit of Globigerina ooze, roughly the area between 1000 and 3000 fathoms, or about 60% of the whole. At a depth of about 3000 fathoms, *i.e.* in the "Deeps," the Globigerina ooze gradually gives place to red clay. In the shallower tropical waters, especially on the central ridge, considerable areas are covered by Pteropod ooze, a deposit consisting largely of the shells of pelagic molluscs. Diatom ooze is the characteristic deposit in high southern latitudes. The terrigenous deposits consist of blue muds, red muds (abundant along the coast of Brazil, where the amount of organic matter present is insufficient to reduce the iron in the matter brought down by the great rivers to produce blue muds), green muds and sands, and volcanic and coral detritus.

The question of the origin of the Atlantic basin, like that of the other great divisions of the hydrosphere, is still unsettled. Most geologists include the Atlantic with the other oceans in the view they adopt as to its age; but E. Suess and M. Neumayr, while they regard the basin of the Pacific as of great antiquity, believe the Atlantic to date only from the Mesozoic age. Neumayr finds evidence of the existence of a continent between Africa and South America, which protruded into the central North Atlantic, in Jurassic times. F. Kossmat has shown that the Atlantic had substantially its present form during the Cretaceous period.

Distribution of temperature.

In describing the mean distribution of temperature in the waters of the Atlantic it is necessary to treat the northern and southern divisions separately. The heat equator, or line of maximum mean surface temperature, starts from the African coast in about 5° N. lat., and closely follows that parallel to 40° W. long., where it bends northwards to the Caribbean Sea. North of this line, near which the temperature is a little over 80° F., the gradient trends somewhat to the east of north, and the temperature is slightly higher on the western than on the eastern side until, in 45° N. lat., the isothermal of 60° F. runs nearly east and west. Beyond this parallel the gradient is directed towards the north-west, and temperatures are much higher on the European than on the American side. From the surface to 500 fathoms the general form of the isothermals remains the same, except that instead of an equatorial maximum belt there is a focus of maximum temperature off the eastern coast of the United States. This focus occupies a larger area and becomes of greater relative intensity as the depth increases until, at 500 fathoms, it becomes an elongated belt extending right across the ocean in about 30° N. lat. Below 500 fathoms the western centres of maximum disappear, and higher temperatures occur in the eastern Atlantic off the Iberian peninsula and north-western Africa down to at least 1000 fathoms; at still greater depths temperature gradually becomes more and more uniform. The communication between the Atlantic and Arctic basins being cut off, as already described, at a depth of about 300 fathoms, the temperatures in the Norwegian Sea below that level are essentially Arctic, usually below the freezing-point of fresh water, except where the distribution is modified by the surface circulation. The isothermals of mean surface temperature in the South Atlantic are in the lower latitudes of an *S*-shape, temperatures being higher on the American than on the African side. In latitudes south of 30° S. the curved form tends to disappear, the lines running more and more directly east and west. Below the surface a focus of maximum temperature appears off the coast of South America in about 30° S. lat., and of minimum temperature north and north-east of this maximum. This distribution is most marked at about 300 fathoms, and disappears at 500 fathoms, beyond which depth the lines tend to become parallel and to run east and west, the gradient slowly diminishing.

Salinity.

The Atlantic is by far the saltest of the great oceans. Its saltest waters are found at the surface in two belts, one extending east and west in the North Atlantic between 20° and 30° N. lat., and another of almost equal salinity extending eastwards from the coast of South America in 10° to 20° S. lat. In the equatorial region between these belts the salinity is markedly less, especially in the eastern part. North of the North Atlantic maximum the waters become steadily fresher as latitude increases until the channels opening into the Arctic basin are reached. In all of these water of relatively high salinity usually appears for a long distance towards the north on the eastern side of the channel, while on the western side the water is comparatively fresh; but great variations occur at different seasons and in different years. In the higher latitudes of the South Atlantic the salinity diminishes steadily and tends to be uniform from east to west, except near the southern extremity of South America, where the surface waters are very fresh. Our knowledge of the salinity of waters below the surface is as yet very defective, large areas being still unrepresented by a single observation. The chief facts already established are the greater saltness of the North Atlantic compared with the South Atlantic at all depths, and the low salinity at all depths in the eastern equatorial region, off the Gulf of Guinea.

Meteorology.

The wind circulation over the Atlantic is of a very definite character. In the South Atlantic the narrow land surfaces of Africa and South America produce comparatively little effect in disturbing the normal planetary circulation. The tropical belt of high atmospheric pressure is very marked in winter; it is weaker during the summer months, and at that season the greater relative fall of pressure over the land cuts it off into an oval-shaped anticyclone, the centre of which rests on the coolest part of the sea surface in that latitude, near the Gulf of Guinea. South of this anticyclone, from about the latitude of the Cape, we find the region where, on account of the uninterrupted sea surface right round the globe, the planetary circulation is developed to the greatest extent known; the pressure gradient is steep, and the region is swept continuously by strong westerly winds—the "roaring forties."

In the North Atlantic the distribution of pressure and resulting wind circulation are very largely modified by the enormous areas of land and frozen sea which surround the ocean on three sides. The tropical belt of high pressure persists all the year

round, but the immense demand for air to supply the ascending currents over the heated land surfaces in summer causes the normal descending movement to be largely reinforced; hence the "North Altantic anticyclone" is much larger, and its circulation more vigorous, in summer than in winter. Again, during the winter months pressure is relatively high over North America, Western Eurasia and the Arctic regions; hence vast quantities of air are brought down to the surface, and circulation must be kept up by ascending currents over the ocean. The Atlantic anticyclone is, therefore, at its weakest in winter, and on its polar side the polar eddy becomes a trough of low pressure, extending roughly from Labrador to Iceland and Jan Mayen, and traversed by a constant succession of cyclones. The net effect of the surrounding land is, in fact, to reverse the seasonal variations of the planetary circulation, but without destroying its type. In the intermediate belt between the two high-pressure areas the meteorological equator remains permanently north of the geographical equator, moving between it and about 11° N. lat.

The part of this atmospheric circulation which is steadiest in its action is the trade winds, and this is, therefore, the most effective in producing drift movement of the surface waters. The trade winds give rise, in the region most exposed to their influence, to two westward-moving drifts—the equatorial currents, which are separated in parts of their course by currents moving in the opposite direction along the equatorial belt. These last may be of the nature of "reaction" currents; they are collectively known as the equatorial counter-current. On reaching the South American coast, the southern equatorial current splits into two parts at Cape St Roque: one branch, the Brazil current, is deflected southwards and follows the coast as a true stream current at least as far as the river Plate. The second branch proceeds north-westwards towards the West Indies, where it mingles with the waters of the northern equatorial; and the two drifts, blocked by the <-shape of the land, raise the level of the surface in the Gulf of Mexico, the Caribbean Sea, and in the whole area outside the West Indies. This congestion is relieved by what is probably the most rapid and most voluminous stream current in the world, the Gulf Stream, which runs along the coast of North America, separated from it by a narrow strip of cold water, the "cold wall," to a point off the south-east of Newfoundland. At this point the Gulf Stream water mixes with that from the Labrador current (see below), and a drift current eastwards is set up under the influence of the prevailing westerly winds: this is generally called the Gulf Stream drift. When the Gulf Stream drift approaches the eastern side of the Atlantic it splits into two parts, one going southwards along the north-west coast of Africa, the Canaries current, and another turning northwards and passing to the west of the British Isles. Most of the Canaries current re-enters the northern equatorial, but a certain proportion keeps to the African coast, unites with the equatorial return currents, and penetrates into the Gulf of Guinea. This last feature of the circulation is still somewhat obscure; it is probably to be accounted for by the fact that on this part of the coast the prevailing winds, although to a considerable extent monsoonal, are off-shore winds, blowing the surface waters out to sea, and the place of the water thus removed is filled up by water derived either from lower levels or from "reaction" currents.

Currents.

The movements of the northern branch of the Gulf Stream drift have been the object of more careful and more extended study than all the other currents of the ocean put together, except, perhaps, the Gulf Stream itself. The cruises of the "Porcupine" and "Lightning," which led directly to the despatch of the "Challenger" expedition, were altogether within its "sphere of influence"; so also was the great Norwegian Atlantic expedition. More recently, the area has been further explored by the German expedition in the ss. "National," the Danish "Ingolf" expedition, and the minor expeditions of the "Michael Sars," "Jackal," "Research," &c., and since 1902 it has been periodically examined by the International Council for the Study of the Sea. Much has also been done by the discussion of observations made on board vessels belonging to the mercantile marine of various countries. It may now be taken as generally admitted that the current referred to breaks into three main branches. The first passes northwards, most of it between the Faeroe and Shetland Islands, to the coast of Norway, and so on to the Arctic basin, which, as Nansen has shown, it fills to a great depth. The second, the Irminger stream, passes up the west side of Iceland; and the third goes up the Greenland side of Davis Strait to Baffin Bay. These branches are separated from one another at the surface by currents moving southwards: one passes east of Iceland; the second, the Greenland current, skirts the east coast of Greenland; and the third, the Labrador current already mentioned, follows the western side of Davis Strait.

The development of the equatorial and the Brazil currents in the South Atlantic has already been described. On the polar side of the high-pressure area a west wind drift is under the control of the "roaring forties," and on reaching South Africa part of this is deflected and sent northwards along the west coast as the cold Benguella current which rejoins the equatorial. In the central parts of the two high-pressure areas there is practically no surface circulation. In the North Atlantic this region is covered by enormous banks of gulf-weed (*Sargassum bucciferum*), hence the name Sargasso Sea. The Sargasso Sea is bounded, roughly, by the lines of 20°–35° N. lat. and 40°–75° W. long.

The sub-surface circulation in the Atlantic may be regarded as consisting of two parts. Where surface water is banked up against the land, as by the equatorial and Gulf Stream drift currents, it appears to penetrate to very considerable depths; the escaping stream currents are at first of great vertical thickness and part of the water at their sources has a downward movement. In the case of the Gulf Stream, which is not much impeded by the land, this descending motion is relatively slight, being perhaps largely due to the greater specific gravity of the water; it ceases to be perceptible beyond about 500 fathoms. On the European-African side the descending movement is more marked, partly because the coast-line is much more irregular and the northward current is deflected against it by the earth's rotation, and partly because of the outflow of salt water from the Mediterranean; here the movement is traceable to at least 1000 fathoms. The northward movement of water across the Norwegian Sea extends down from the surface to the Iceland-Shetland ridge, where it is sharply cut off; the lower levels of the Norwegian Sea are filled with ice-cold Arctic water, close down to the ridge. The south-moving currents originating from melting ice are probably quite shallow. The second part of the circulation in the depth is the slow "creep" of water of very low temperature along the bottom. The North Atlantic being altogether cut off from the Arctic regions, and the vertical circulation being active, this movement is here practically non-existent; but in the South Atlantic, where communication with the Southern Ocean is perfectly open, Antarctic water can be traced to the equator and even beyond.

The tides of the Atlantic Ocean are of great complexity. The tidal wave of the Southern Ocean, which sweeps uninterruptedly round the globe from east to west, generates a secondary wave between Africa and South America, which travels north at a rate dependent only on the depth of the ocean. With this "free" wave is combined a "forced" wave, generated, by the direct action of the sun and moon, within the Atlantic area itself. Nothing is known about the relative importance of these two waves. (H. N. D.)

See also Ocean and Oceanography.

ATLANTIS, Atalantis, or Atlantica, a legendary island in the Atlantic Ocean, first mentioned by Plato in the *Timaeus*. Plato describes how certain Egyptian priests, in a conversation with Solon, represented the island as a country larger than Asia Minor and Libya united, and situated just beyond the Pillars of Hercules (Straits of Gibraltar). Beyond it lay an archipelago of lesser islands. According to the priests, Atlantis had been a powerful kingdom nine thousand years before the birth of Solon, and its armies had overrun the lands which

bordered the Mediterranean. Athens alone had withstood them with success. Finally the sea had overwhelmed Atlantis, and had thenceforward become unnavigable owing to the shoals which marked the spot. In the *Critias* Plato adds a history of the ideal commonwealth of Atlantis. It is impossible to decide how far this legend is due to Plato's invention, and how far it is based on facts of which no record remains. Medieval writers, for whom the tale was preserved by the Arabian geographers, believed it true, and were fortified in their belief by numerous traditions of islands in the western sea, which offered various points of resemblance to Atlantis. Such in particular were the Greek Isles of the Blest, or Fortunate Islands, the Welsh Avalon, the Portuguese Antilia or Isle of Seven Cities, and St Brendan's island, the subject of many sagas in many languages. These, which are described in separate articles, helped to maintain the tradition of an earthly paradise which had become associated with the myth of Atlantis; and all except Avalon were marked in maps of the 14th and 15th centuries, and formed the object of voyages of discovery, in one case (St Brendan's island) until the 18th century. In early legends, of whatever nationality, they are almost invariably described in terms which closely resemble Homer's account of the island of the Phaeacians (*Od.* viii.)—a fact which may be an indication of their common origin in some folk-tale current among several races. Somewhat similar legends are those of the island of Brazil (*q.v.*), of Lyonnesse (*q.v.*), the sunken land off the Cornish coast, of the lost Breton city of Is, and of Mayda or Asmaide—the French *Isle Verte* and Portuguese *Ilha Verde* or "Green Island"—which appears in many folk-tales from Gibraltar to the Hebrides, and until 1853 was marked on English charts as a rock in 44° 48′ N. and 26° 10′ W. After the Renaissance, with its renewal of interest in Platonic studies, numerous attempts were made to rationalize the myth of Atlantis. The island was variously identified with America, Scandinavia, the Canaries and even Palestine; ethnologists saw in its inhabitants the ancestors of the Guanchos, the Basques or the ancient Italians; and even in the 17th and 18th centuries the credibility of the whole legend was seriously debated, and sometimes admitted, even by Montaigne, Buffon and Voltaire.

For the theory that Atlantis is to be identified with Crete in the Minoan period, see "The Lost Continent" in *The Times* (London) for the 19th of February 1909. See also "Dissertation sur l'Atlantide" in T. H. Martin's *Études sur le Timée* (1841).

ATLAS, in Greek mythology, the "endurer," a son of the Titan Iapetus and Clymene (or Asia), brother of Prometheus. Homer, in the *Odyssey* (i. 52) speaks of him as "one who knows the depths of the whole sea, and keeps the tall pillars which hold heaven and earth asunder." In the first instance he seems to have been a marine creation. The pillars which he supported were thought to rest in the sea, immediately beyond the most western horizon. But as the Greeks' knowledge of the west increased, the name of Atlas was transferred to a hill in the north-west of Africa. Later, he was represented as a king of that district, rich in flocks and herds, and owner of the garden of the Hesperides, who was turned into a rocky mountain when Perseus, to punish him for his inhospitality, showed him the Gorgon's head (Ovid, *Metam.* iv. 627). Finally, Atlas was explained as the name of a primitive astronomer, who was said to have made the first celestial globe (Diodorus iii. 60). He was the father of the Pleiades and Hyades; according to Homer, of Calypso. In works of art he is represented as carrying the heavens or the terrestrial globe. The Farnese statue of Atlas in the Naples museum is well known.

The plural form ATLANTES is the classical term in architecture for the male sculptured figures supporting a superstructure as in the baths at Pompeii, and in the temple at Agrigentum in Sicily. In 18th-century architecture half-figures of men with strong muscular development were used to support balconies (see CARYATIDES and TELAMONES).

A figure of Atlas supporting the heavens is often found as a frontispiece in early collections of maps, and is said to have been first thus used by Mercator. The name is hence applied to a volume of maps (see MAP), and similarly to a volume which contains a tabular conspectus of a subject, such as an atlas of ethnographical subjects or anatomical plates. It is also used of a large size of drawing paper.

The name "atlas," an Arabic word meaning "smooth," applied to a smooth cloth, is sometimes found in English, and is the usual German word, for "satin."

ATLAS MOUNTAINS, the general name for the mountain chains running more or less parallel to the coast of North-west Africa. They extend from Cape Nun on the west to the Gulf of Gabes on the east, a distance of some 1500 m., traversing Morocco, Algeria and Tunisia. To their south lies the Saharan desert. The Atlas consist of many distinct ranges, but they can be roughly divided into two main chains: (1) the Maritime Atlas, *i.e.* the ranges overlooking the Mediterranean from Ceuta to Cape Bon; (2) the inner and more elevated ranges, which, starting from the Atlantic at Cape Ghir in Sús, run south of the coast ranges and are separated from them by high plateaus. This general disposition is seen most distinctly in eastern Morocco and Algeria. The western inner ranges are the most important of the whole system, and in the present article are described first as *the Moroccan Ranges*. The maritime Atlas and the inner ranges in Algeria and Tunisia are then treated under the heading *Eastern Ranges*.

The Moroccan Ranges.—This section of the Atlas, known to the inhabitants of Morocco by its Berber name, Idráren Dráren or the "Mountains of Mountains," consists of five distinct ranges, varying in length and height, but disposed more or less parallel to one another in a general direction from south-west to north-east, with a slight curvature towards the Sahara.

1. The main range, that known as the Great Atlas, occupies a central position in the system, and is by far the longest and loftiest chain. It has an average height of over 11,000 ft., whereas the loftiest peaks in Algeria do not exceed 8000 ft., and the highest in Tunisia are under 6000 ft. Towards the Dahra district at the north-east end the fall is gradual and continuous, but at the opposite extremity facing the Atlantic between Agadir and Mogador it is precipitous. Although only one or two peaks reach the line of perpetual snow, several of the loftiest summits are snowclad during the greater part of the year. The northern sides and tops of the lower heights are often covered with dense forests of oak, cork, pine, cedar and other trees, with walnuts up to the limit of irrigation. Their slopes enclose well-watered valleys of great fertility, in which the Berber tribes cultivate tiny irrigated fields, their houses clinging to the hill-sides. The southern flanks, being exposed to the hot dry winds of the Sahara, are generally destitute of vegetation.

At several points the crest of the range has been deeply eroded by old glaciers and running waters, and thus have been formed a number of devious passes. The central section, culminating in Tizi n 'Tagharat or Tinzár, a peak estimated at 15,000 ft. high, maintains a mean altitude of 11,600 ft., and from this great mass of schists and sandstones a number of secondary ridges radiate in all directions, forming divides between the rivers Dra'a, Sús, Um-er-Rabíā, Sebú, Mulwíya and Ghír, which flow respectively to the south-west, the west, north-west, north, north-east and south-east. All are swift and unnavigable, save perhaps for a few miles from their mouths. With the exception of the Dra'a, the streams rising on the side of the range facing the Sahara do not reach the sea, but form marshes or lagoons at one season, and at another are lost in the dry soil of the desert.

For a distance of 100 m. the central section nowhere presents any passes accessible to caravans, but south-westward two gaps in the range afford communication between the Tansíft and Sús basins, those respectively of Gindáfi and Bíbáwan. A few summits in the extreme south-west in the neighbourhood of Cape Ghir still exceed 11,000 ft., and although the steadily rising ground from the coast and the prominence of nearer summits detract from the apparent height, this is on an average greater than that of the European Alps. The most imposing view is to be obtained from the plain of Marrákesh, only some 1000 ft. above sea-level, immediately north of the highest peaks. Besides

huge masses of old schists and sandstones, the range contains extensive limestone, marble, diorite, basalt and porphyry formations, while granite prevails on its southern slopes. The presence of enormous glaciers in the Ice Age is attested by the moraines at the Atlantic end, and by other indications farther east. The best-known passes are: (1) The Bibáwan in the upper Wad Sús basin (4150 ft.); (2) the Gindáfi, giving access from Marrákesh to Tárudánt, rugged and difficult, but low; (3) the Tagharat, difficult and little used, leading to the Dra'a valley (11,484 ft.); (4) the Gláwi (7600 ft.); (5) Tizi n 'Tilghemt (7250 ft.), leading to Tafilet (Tafflált) and the Wad Ghír.

2. The lower portion of the Moroccan Atlas (sometimes called the Middle Atlas), extending north-east and east from an undefined point to the north of the Great Atlas to near the frontier of Algeria, is crossed by the pass from Fez to Tafflált. Both slopes are wooded, and its forests are the only parts of Morocco where the lion still survives. From the north this range, which is only partly explored, presents a somewhat regular series of snowy crests.

3. The Anti-Atlas or Jebel Saghru, also known as the Lesser Atlas, running parallel to and south of the central range, is one of the least elevated chains in the system, having a mean altitude of not more than 5000 ft., although some peaks and even passes exceed 6000 ft. At one point it is pierced by a gap scarcely five paces wide with walls of variegated marbles polished by the transport of goods. As to the relation of the Anti-Atlas to the Atlas proper at its western end nothing certain is known.

The two more or less parallel ranges which complete the western system are less important:—(4) the Jebel Bani, south of the Anti-Atlas, a low, narrow rocky ridge with a height of 3000 ft. in its central parts; and (5) the Mountains of Ghaiáta, north of the Middle Atlas, not a continuous range, but a series of broken mountain masses from 3000 to 3500 ft. high, to the south of Fez, Táza and Tlemçen.

The Eastern Ranges.—The eastern division of the Atlas, which forms the backbone of Algeria and Tunisia, is adequately known with the exception of the small portion in Morocco forming the province of Er-Rif. The lesser range, nearer the sea, known to the French as the Maritime Atlas, calls for little detailed notice. From Ceuta, above which towers Jebel Músa—about 2800 ft.—to Melilla, a distance of some 150 m., the Rif Mountains face the Mediterranean, and here, as along the whole coast eastward to Cape Bon, many rugged rocks rise boldly above the general level. In Algeria the Maritime Atlas has five chief ranges, several mountains rising over 5000 ft. The Jurjura range, extending through Kabylia from Algiers to Bougie, contains the peaks of Lalla Kedija (7542 ft.), the culminating point of the maritime chains, and Babor (6447 ft.). (See further ALGERIA.) The Mejerda range, which extends into Tunisia, has no heights exceeding 3700 ft. It was in these coast mountains of Algeria that the Romans quarried the celebrated Numidian marbles.

The southern or main range of the Eastern division is known by the French as the Saharan Atlas. On its western extremity it is linked by secondary ranges to the mountain system of Morocco. The Saharan Atlas is essentially one chain, though known under different names: Jebel K'sur and Jebel Amur on the west, and Jebel Aures in the east. The central part, the Záb Mountains, is of lower elevation, the Saharan Atlas reaching its culminating point, Jebel Shellia (7611 ft. above the sea), in the Aures. This range sends a branch northward which joins the Mejerda range of the Maritime Atlas, and another branch runs south by Gafsa to the Gulf of Gabes. Here Mount Sidi Ali bu Musin reaches a height of 5700 ft., the highest point in Tunisia. In the Saharan Atlas the passes leading to or from the desert are numerous, and in most instances easy. Both in the east (at Batna) and the west (at Ain Sefra) the mountains are traversed by railways, which, starting from Mediterranean seaports, take the traveller into the Sahara.

History and Exploration.—The name Atlas given to these mountains by Europeans—but never used by the native races—is derived from that of the mythical Greek god represented as carrying the globe on his shoulders, and applied to the high and distant mountains of the west, where Atlas was supposed to dwell. From time immemorial the Atlas have been the home of Berber races, and those living in the least accessible regions have retained a measure of independence throughout their recorded history. Thus some of the mountain districts of Kabylia had never been visited by Europeans until the French military expedition of 1857. But in general the Maritime range was well known to the Romans. The Jebel Amur was traversed by the column which seized El Aghuat in 1852, and from that time dates the survey of the mountains.

The ancient caravan route from Mauretania to the western Sudan crossed the lower Moroccan Atlas by the pass of Tilghemt and passed through the oasis of Tafflált, formerly known as Sajilmása ["Sigilmassa"], on the east side of the Anti-Atlas. The Moroccan system was visited, and in some instances crossed, by various European travellers carried into slavery by the Salli rovers, and was traversed by René Caillé in 1828 on his journey home from Timbuktu, but the first detailed exploration was made by Gerhard Rohlfs in 1861–1862. Previous to that almost the only special report was the misleading one of Lieut. Washington, attached to the British embassy of 1837, who from insufficient data estimated the height of Mount Tagharat, to which he gave the indefinite name of Miltsin (i.e. *Mul et-Tizin*, "Lord of the Peaks"), as 11,400 ft. instead of about 15,000 ft.

In 1871 the first scientific expedition, consisting of Dr (afterwards Sir) J. D. Hooker, Mr John Ball and Mr G. Maw, explored the central part of the Great Atlas with the special object of investigating its flora and determining its relation to that of the mountains of Europe. They ascended by the Ait Mízan valley to the Tagharat pass (11,484 ft.), and by the Amsmiz valley to the summit of Jebel Tezah (11,972 ft.). In the Tagharat pass Mr Maw was the only one of the party who reached the watershed; but from Jebel Tezah a good view was obtained southward across the great valley of the Sús to the Anti-Atlas, which appeared to be from 9000 to 10,000 ft. high. Dr Oskar Lenz in 1879–1880 surveyed a part of the Great Atlas north of Tárudant, determined a pass south of Iligh in the Anti-Atlas, and penetrated thence across the Sahara to Timbuktu. He was followed in 1883–1884 by Vicomte Ch. de Foucauld, whose extensive itineraries include many districts that had never before been visited by any Europeans. Such were parts of the first and middle ranges, crossed once; three routes over the Great Atlas, which was, moreover, followed along both flanks for nearly its whole length; and six journeys across the Anti-Atlas, with a general survey of the foot of this range and several passages over the Jebel Bani. Then came Joseph Thomson, who explored some of the central parts, and made the highest ascent yet achieved, that of Mount Likimt, 13,150 ft., but broke little new ground, and failed to cross the main range (1888); and Walter B. Harris, who explored some of the southern slopes and crossed the Atlas at two points during his expedition to Tafflált in 1894. In 1901 and again in 1905 the marquis de Segonzac, a Frenchman, made extensive journeys in the Moroccan ranges. He crossed the Great Atlas in its central section, explored its southern border, and, in part, the Middle and Anti-Atlas ranges. A member of his expeditions, de Flotte Rocquevaire, made a triangulation of part of the western portion of the main Atlas, his labours affording a basis for the co-ordination of the work of previous explorers. (See also MOROCCO, ALGERIA, TUNISIA and SAHARA.)

AUTHORITIES.—Vicomte Ch. de Foucauld, *Reconnaissance au Maroc 1883–1884* (Paris, 1888, almost the sole authority for the geography of the Atlas; his book gives the result of careful surveys, and is illustrated with a good collection of maps and sketches); Hooker, Ball and Maw, *Morocco and the Great Atlas* (London, 1879, a most valuable contribution, always scientific and trustworthy, especially as to botany and geology); Joseph Thomson, *Travels in the Atlas and Southern Morocco* (London, 1889, valuable geographical and geological data); Louis Gentil, *Mission de Segonzac*, &c. (Paris, 1906: the author was geologist to the 1905 expedition); Gerhard Rohlfs, *Adventures in Morocco* (London, 1874); Walter B. Harris, *Tafilet, a Journey of Exploration in the Atlas Mountains*, &c. (London, 1895), full of valuable information; Budgett Meakin, *The Land of the Moors* (London, 1901), first and last chapters; Dr Oskar Lenz, *Timbuktu: Reise durch Marokko*, vol. i. (Leipzig, 1884).

ATMOLYSIS (Gr. *ἀτμός*, vapour; *λύειν*, to loosen), a term invented by Thomas Graham to denote the separation of a mixture of gases by taking advantage of their different rates of diffusion through a porous septum or diaphragm (see DIFFUSION).

ATMOSPHERE (Gr. *ἀτμός*, vapour; *σφαῖρα*, a sphere), the aeriform envelope encircling the earth; also the envelope of a particular gas or gases about any solid or liquid. Meteorological phenomena seated more directly in the atmosphere obtained early recognition; thus Hesiod, in his *Works and Days*, speculated on the origin of winds, ascribing them to the heating effects of the sun on the air. Ctesibius of Alexandria, Hero and others, founded the science of pneumatics on observations on the physical properties of air. Anaximenes made air the primordial substance, and it was one of the Aristotelian elements. A direct proof of its material nature was given by Galileo, who weighed a copper ball containing compressed air.

Before the development of pneumatic chemistry, air was regarded as a distinct chemical unit or element. The study of calcination and combustion during the 17th and 18th centuries culminated in the discovery that air consists chiefly of a mixture of two gases, oxygen and nitrogen. Cavendish, Priestley, Lavoisier and others contributed to this result. Cavendish made many analyses: from more than 500 determinations of air in winter and summer, in wet and clear weather, and in town and country, he discerned the mean composition of the atmosphere to be, oxygen 20·833 % and nitrogen 79·167 % The same experimenter noticed the presence of an inert gas, in very minute amount ; this gas, afterwards investigated by Rayleigh and Ramsay, is now named argon (*q.v.*).

The constancy of composition shown by repeated analyses of atmospheric air led to the view that it was a chemical compound of nitrogen and oxygen; but there was no experimental confirmation of this idea, and all observations tended to the view that it is simply a mechanical mixture. Thus, the gases are not present in simple multiples of their combining weights; atmospheric air results when oxygen and nitrogen are mixed in the prescribed ratio, the mixing being unattended by any manifestation of energy, such as is invariably associated with a chemical action; the gases may be mechanically separated by atmolysis, *i.e.* by taking advantage of the different rates of diffusion of the two gases; the solubility of air in water corresponds with the "law of partial pressures," each gas being absorbed in amount proportional to its pressure and coefficient of absorption, and oxygen being much more soluble than nitrogen (in the ratio of ·04114 to ·02035 at 0°); air expelled from water by boiling is always richer in oxygen.

Various agencies are at work tending to modify the composition of the atmosphere, but these so neutralize each other as to leave it practically unaltered. Minute variations, however, do occur. Bunsen analysed fifteen examples of air collected at the same place at different times, and found the extreme range in the percentage of oxygen to be from 20·97 to 20·84. Regnault, from analyses of the air of Paris, obtained a variation of 20·999 to 20·913; country air varied from 20·903 to 21·000; while air taken from over the sea showed an extreme variation of 20·940 to 20·850. Angus Smith determined London air to vary in oxygen content from 20·857 to 20·95, the air in parks and open spaces showing the higher percentage; Glasgow air showed similar results, varying from 20·887 in the streets to 20·929 in open spaces.

In addition to nitrogen and oxygen, there are a number of other gases and vapours generally present in the atmosphere. Of these, argon and its allies were the last to be definitely isolated. Carbon dioxide is invariably present, as was inferred by Dr David Macbride (1726–1778) of Dublin in 1764, but in a proportion which is not absolutely constant; it tends to increase at night, and during dry winds and fogs, and it is greater in towns than in the country and on land than on the sea. Water vapour is always present; the amount is determined by instruments termed hygrometers (*q.v.*). Ozone (*q.v.*) occurs, in an amount supposed to be associated with the development of atmospheric electricity (lightning, &c.); this amount varies with the seasons, being a maximum in spring, and decreasing through summer and autumn to a minimum in winter. Hydrogen dioxide occurs in a manner closely resembling ozone. Nitric acid and lower nitrogen oxides are present, being formed by electrical discharges, and by the oxidation of atmospheric ammonia by ozone. The amount of nitric acid varies from place to place; rain-water, collected in the country, has been found to contain an average of 0·5 parts in a million, but town rain-water contains more, the greater amounts being present in the more densely populated districts. Ammonia is also present, but in very varying amounts, ranging from 135 to 0·1 parts (calculated as carbonate) in a million parts of air. Ammonia is carried back to the soil by means of rain, and there plays an important part in providing nitrogenous matter which is afterwards assimilated by vegetable life.

The average volume composition of the gases of the atmosphere may be represented (in parts per 10,000) as follows:—

Oxygen	2065·94	Ozone . . .	0·015
Nitrogen . . .	7711·60	Aqueous vapour	140·00
Argon (about) . .	79·00	Nitric acid . .	0·08
Carbon dioxide .	3·36	Ammonia . .	0·005

In addition to these gases, there are always present in the atmosphere many micro-organisms or bacteria (see BACTERIOLOGY); another invariable constituent is dust (*q.v.*), which plays an important part in meteorological phenomena.

Reference should be made to the articles BAROMETER, CLIMATE and METEOROLOGY for the measurement and variation of the pressure of the atmosphere, and the discussion of other properties.

ATMOSPHERIC ELECTRICITY. 1. It was not until the middle of the 18th century that experiments due to Benjamin Franklin showed that the electric phenomena of the atmosphere are not fundamentally different from those produced in the laboratory. For the next century the rate of progress was slow, though the ideas of Volta in Italy and the instrumental devices of Sir Francis Ronalds in England merit recognition. The invention of the portable electrometer and the water-dropping electrograph by Lord Kelvin in the middle of the 19th century, and the greater definiteness thus introduced into observational results, were notable events. Towards the end of the 19th century came the discovery made by W. Linss (6)[1] and by J. Elster and H. Geitel (7) that even the most perfectly insulated conductors lose their charge, and that this loss depends on atmospheric conditions. Hard on this came the recognition of the fact that freely charged positive and negative ions are always present in the atmosphere, and that a radioactive emanation can be collected. Whilst no small amount of observational work has been done in these new branches of atmospheric electricity, the science has still not developed to a considerable extent beyond preliminary stages. Observations have usually been limited to a portion of the year, or to a few hours of the day, whilst the results from different stations differ much in details. It is thus difficult to form a judgment as to what has most claim to acceptance as the general law, and what may be regarded as local or exceptional.

2. *Potential Gradient.*—In dry weather the electric potential in the atmosphere is normally positive relative to the earth, and increases with the height. The existence of *earth currents* (*q. v.*) shows that the earth, strictly speaking, is not all at one potential, but the natural differences of potential between points on the earth's surface a mile apart are insignificant compared to the normal potential difference between the earth and a point one foot above it. What is aimed at in ordinary observations of atmospheric potential is the measurement of the difference of potential between the earth and a point a given distance above it, or of the difference of potential betweeen two points in the same vertical line a given distance apart. Let a conductor, say a metallic sphere, be supported by a metal rod of negligible electric capacity whose other end is earthed. As the whole conductor must be at zero (*i.e.* the earth's) potential, there must be an induced charge on the sphere, producing at its centre a potential equal but of opposite sign to what would exist at the same spot in free air. This neglects any charge in the air

[1] See *Authorities* below.

displaced by the sphere, and assumes a statical state of conditions and that the conductor itself exerts no disturbing influence. Suppose now that the sphere's earth connexion is broken and that it is carried without loss of charge inside a building at zero potential. If its potential as observed there is −V (volts), then the potential of the air at the spot occupied by the sphere was +V. This method in one shape or another has been often employed. Suppose next that a fixed insulated conductor is somehow kept at the potential of the air at a given point, then the measurement of its potential is equivalent to a measurement of that of the air. This is the basis of a variety of methods. In the earliest the conductor was represented by long metal wires, supported by silk or other insulating material, and left to pick up the air's potential. The addition of sharp points was a step in advance; but the method hardly became a quantitative one until the sharp points were replaced by a flame (fuse, gas, lamp), or by a liquid jet breaking into drops. The matter leaving the conductor, whether the products of combustion or the drops of a liquid, supplies the means of securing equality of potential between the conductor and the air at the spot where the matter quits electrical connexion with the conductor. Of late years the function of the collector is discharged in some forms of apparatus by a salt of radium. Of flame collectors the two best known are Lord Kelvin's portable electrometer with a fuse, or F. Exner's gold leaf electroscope in conjunction with an oil lamp or gas flame. Of liquid collectors the representative is Lord Kelvin's water-dropping electrograph; while Benndorf's is the form of radium collector that has been most used. It cannot be said that any one form of collector is superior all round. Flame collectors blow out in high winds, whilst water-droppers are apt to get frozen in winter. At first sight the balance of advantages seems to lie with radium. But while gaseous products and even falling water are capable of modifying electrical conditions in their immediate neighbourhood, the "infection" produced by radium is more insidious, and other drawbacks present themselves in practice. It requires a radium salt of high radioactivity to be at all comparable in effectiveness with a good water-dropper. Experiments by F. Linke (8) indicated that a water-dropper having a number of fine holes, or having a fine jet under a considerable pressure, picks up the potential in about a tenth of the time required by the ordinary radium preparation protected by a glass tube. These fine jet droppers with a mixture of alcohol and water have proved very effective for balloon observations.

3. Before considering observational data, it is expedient to mention various sources of uncertainty. Above the level plain of absolutely smooth surface, devoid of houses or vegetation, the equipotential surfaces under normal conditions would be strictly horizontal, and if we could determine the potential at one metre above the ground we should have a definite measure of the potential gradient at the earth's surface. The presence, however, of apparatus or observers upsets the conditions, while above uneven ground or near a tree or a building the equipotential surfaces cease to be horizontal. In an ordinary climate a building seems to be practically at the earth's potential; near its walls the equipotential surfaces are highly inclined, and near the ridges they may lie very close together. The height of the walls in the various observatories, the height of the collectors, and the distance they project from the wall vary largely, and sometimes there are external buildings or trees sufficiently near to influence the potential. It is thus futile to compare the absolute voltages met with at two stations, unless allowance can be made for the influence of the environment. With a view to this, it has become increasingly common of late years to publish not the voltages actually observed, but values deduced from them for the potential gradient in the open in volts per metre. Observations are made at a given height over level open ground near the observatory, and a comparison with the simultaneous results from the self-recording electrograph enables the records from the latter to be expressed as potential gradients in the open. In the case, however, of many observatories, especially as regards the older records, no data for reduction exist; further, the reduction to the open is at best only an approximation, the success attending which probably varies considerably at different stations. This is one of the reasons why in the figures for the annual and diurnal variations in Tables I., II. and III., the potential has been expressed as percentages of its mean value for the year or the day. In most cases the environment of a collector is not absolutely invariable. If the shape of the equipotential surfaces near it is influenced by trees, shrubs or grass, their influence will vary throughout the year. In winter the varying depth of snow may exert an appreciable effect. There are sources of uncertainty in the instrument itself. Unless the insulation is perfect, the potential recorded falls short of that at the spot where the radium is placed or the water jet breaks. The action of the collector is opposed by the leakage through imperfect insulation, or natural dissipation, and this may introduce a fictitious element into the apparent annual or diurnal variation. The potentials that have to be dealt with are often hundreds and sometimes thousands of volts, and insulation troubles are more serious than is generally appreciated. When a water jet serves as collector, the pressure under which it issues should be practically constant. If the pressure alters as the water tank empties, a discontinuity occurs in the trace when the tank is refilled, and a fictitious element may be introduced into the diurnal variation. When rain or snow is falling, the potential frequently changes rapidly. These changes are often too rapid to be satisfactorily dealt with by an ordinary electrometer, and they sometimes leave hardly a trace on the photographic paper. Again rain dripping from exposed parts of the apparatus may materially affect the record. It is thus customary in calculating diurnal inequalities either to take no account of days on which there is an appreciable rainfall, or else to form separate tables for "dry" or "fine" days and for "all" days. Speaking generally, the exclusion of days of rain and of negative potential comes pretty much to the same thing, and the presence or absence of negative potential is not infrequently the criterion by reference to which days are rejected or are accepted as normal.

TABLE I.—*Annual Variation Potential Gradient.*

Place and Period.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Karasjok (10), 1903–1904 . .	143	150	137	94	74	65	70	67	67	87	120	126
Sodankylä (31), 1882–1883 . .	94	133	148	155	186	93	53	77	47	72	71	71
Potsdam (9), 1904	167	95	118	88	93	72	73	65	97	101	108	123
Kew (12), 1898–1904 . . .	127	141	113	87	77	70	61	72	76	96	126	153
Greenwich (13), 1893–1894, 1896	110	112	127	107	83	71	76	84	83	104	104	139
Florence (14), 1883–1886 . .	132	110	98	84	86	81	77	90	89	99	129	125
Perpignan (15), 1886–1888 . .	121	112	108	89	91	92	89	82	74	99	122	121
Lisbon (16), 1884–1886 . . .	104	105	104	92	91	93	87	92	100	99	115	117
Tokyo (17), 1897–1898, 1900–1901	165	145	117	86	62	58	41	59	59	97	134	176
Batavia (18) (2 m.), 1887–1890 .	97	115	155	127	129	105	79	62	69	79	90	93
,, (7·8 m.) 1890–1895 .	100	89	103	120	98	103	85	99	73	101	117	112

4. The potential gradient near the ground varies with the season of the year and the hour of the day, and is largely dependent on the weather conditions. It is thus difficult to form even a rough estimate of the mean value at any place unless hourly readings exist, extending over the whole or the greater part of a year. It is even somewhat precipitate to assume that a mean value deduced from a single year is fairly representative of average conditions. At Potsdam, G. Lüdeling (9) found for the mean value for 1904 in volts per metre 242. At Karasjok in the extreme north of Norway G. C. Simpson (10) in 1903–1904 obtained 139. At Kremsmünster for 1902 P. B. Zölss (11) gives 98. At Kew (12) the mean for individual years from 1898 to

1904 varied from 141 in 1900 to 179 in 1899, the mean from the seven years combined being 159. The large difference between the means obtained at Potsdam and Kremsmünster, as compared to the comparative similarity between the results for Kew and Karasjok, suggests that the mean value of the potential gradient may be much more dependent on local conditions than on difference of latitude.

At any single station potential gradient has a wide range of values. The largest positive and negative values recorded are met with during disturbed weather. During thunderstorms the record from an electrograph shows large sudden excursions, the trace usually going off the sheet with every flash of lightning when the thunder is near. Exactly what the potential changes amount to under such circumstances it is impossible to say; what the trace shows depends largely on the type of electrometer. Large rapid changes are also met with in the absence of thunder during heavy rain or snow fall. In England the largest values of a sufficiently steady character to be shown correctly by an ordinary electrograph occur during winter fogs. At such times gradients of +400 or +500 volts per metre are by no means unusual at Kew, and voltages of 700 or 800 are occasionally met with.

5. *Annual Variation.*—Table I. gives the annual variation of the potential gradient at a number of stations arranged according to latitude, the mean value for the whole year being taken in each case as 100. Karasjok as already mentioned is in the extreme north of Norway (69° 17′ N.); Sodankylä was the Finnish station of the international polar year 1882–1883. At Batavia, which is near the equator (6° 11′ S.) the annual variation seems somewhat irregular. Further, the results obtained with the water-dropper at two heights —viz. 2 and 7·8 metres—differ notably. At all the other stations the difference between summer and winter months is conspicuous. From the European data one would be disposed to conclude that

TABLE II.—*Diurnal Variation Potential Gradient.*

Station.	Karasjok.	Sodankylä.	Kew (19, 12).		Greenwich.	Florence.	Perpignan.	Lisbon.	Tokyo.	Batavia.		Cape Horn(20).
Period.	1903–4.	1882–83.	1862–1864.	1898–1904.	1893–96.	1883–85.	1886–88.	1884–86.	1897–98. 1900–1.	1887–1890.	1890–1895.	1882–83.
Days.		All.	All.	Quiet.	All.	All.	Fine.	All.	All.	Dry.	Dry.	Pos.
h	5·5	3·0	3·5	3·35	3·0		8·4	3·0	1·7	2	7·8	3·5
l		2·5	1·0	1·3	1·8		1·5	0·5	2·0			2·0
Hour.												
1	83	91	87	93	97	92	78	84	101	147	125	82
2	73	85	79	88	89	83	72	80	98	141	114	73
3	66	82	74	84	87	77	71	78	97	135	109	85
4	63	84	72	83	86	75	72	81	99	128	102	81
5	60	89	71	85	86	74	77	83	121	127	101	85
6	68	91	77	93	92	82	92	92	154	137	117	95
7	81	97	92	103	100	100	107	101	167	158	147	106
8	87	100	106	112	102	112	114	105	149	104	119	118
9	94	98	107	115	100	113	111	104	117	67	82	119
10	101	102	100	112	101	107	100	104	87	42	55	123
11	99	98	90	101	96	100	96	102	70	35	46	123
Noon.	103	102	92	94	97	95	99	108	61	30	43	115
1	106	105	90	89	96	92	99	111	54	30	42	112
2	108	107	91	87	94	90	97	114	49	30	43	94
3	108	108	92	88	95	89	99	109	53	33	46	89
4	109	108	98	93	97	89	105	108	61	41	53	88
5	110	108	108	99	102	94	113	108	76	67	73	84
6	119	110	121	108	108	113	126	111	95	91	108	110
7	129	102	134	115	111	121	131	116	107	120	145	107
8	136	111	139	118	115	129	129	114	114	137	155	123
9	139	111	138	119	117	132	120	109	119	146	155	112
10	133	104	128	115	117	127	109	102	120	148	147	99
11	121	108	113	108	111	114	97	92	119	151	143	85
12	102	93	99	99	104	100	86	85	112	147	130	98

TABLE III.—*Diurnal Variation Potential Gradient.*

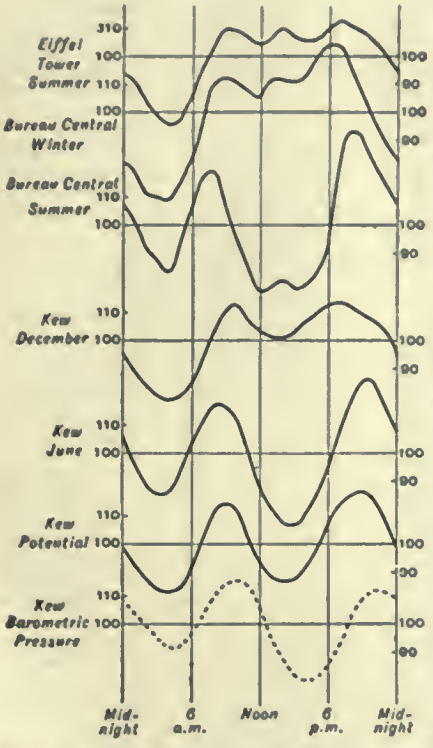
Station.	Karasjok.		Sodankylä.		Kew.			Greenwich.		Bureau Central (21).		Eiffel Tower(21)	Perpignan (21).		Batavia. (2 m.)	
Period.	1903–4.		1882–83.		1898–1904.			1894 and '96.		1894–99.		1896–98.	1885–95.		1887–90.	
	Winter.	Summer.	Winter.	Summer.	Winter.	Equinox.	Summer.	Winter.	Summer.	Winter.	Summer.	Summer.	Winter.	Summer.	Winter.	Summer.
Hour.																
1	76	104	90	99	91	93	96	87	110	79	102	90	72	88	145	149
2	66	96	79	84	86	88	90	84	101	71	92	83	67	83	139	142
3	57	89	78	90	82	85	85	76	98	70	88	79	66	81	137	135
4	55	83	74	99	81	84	84	77	96	69	84	76	67	83	131	127
5	50	79	74	111	82	87	90	78	94	75	94	78	72	92	132	123
6	61	83	80	114	86	97	101	82	101	83	106	87	84	107	138	136
7	78	89	86	117	95	109	113	94	107	98	118	97	104	114	166	153
8	82	93	95	122	104	118	120	97	111	111	120	103	122	108	118	92
9	90	93	91	109	111	119	119	98	102	113	106	110	126	100	74	64
10	104	93	106	101	114	110	110	102	98	111	94	109	114	93	43	40
11	102	92	98	97	107	95	97	103	86	108	84	107	98	90	35	36
Noon.	119	90	98	100	102	86	87	107	94	106	77	104	99	95	31	30
1	116	94	116	97	99	81	80	107	85	112	79	107	96	93	29	33
2	118	97	113	97	97	80	76	109	82	112	81	110	94	90	28	32
3	119	100	121	93	99	82	76	111	78	111	78	107	95	88	24	41
4	115	99	111	96	103	88	80	116	81	113	80	105	102	92	30	49
5	120	106	105	106	108	96	87	112	93	120	85	106	115	98	60	74
6	131	104	115	92	111	109	98	114	98	124	97	109	128	110	88	94
7	136	110	118	102	114	120	111	117	99	124	123	113	133	122	119	122
8	134	113	117	106	112	124	123	113	108	116	134	110	131	127	138	135
9	137	125	115	90	111	123	129	111	118	104	130	109	124	125	145	147
10	125	135	112	90	108	118	125	110	124	97	122	105	111	117	148	148
11	114	126	113	103	103	109	116	102	120	90	115	101	96	108	149	152
12	96	111	95	85	96	99	105	93	116	83	108	94	83	95	148	146

the variation throughout the year diminishes as one approaches the equator. It is decidedly less at Perpignan and Lisbon than at Potsdam, Kew and Greenwich, but nowhere is the seasonal difference more conspicuous than at Tokyo, which is south of Lisbon.

At the temperate stations the maximum occurs near mid-winter; in the Arctic it seems deferred towards spring.

6. *Diurnal Variation.*—Table II. gives the mean diurnal variation for the whole year at a number of stations arranged in order of latitude, the mean from the 24 hourly values being taken as 100. The data are some from "all" days, some from "quiet," "fine" or "dry" days. The height, h, and the distance from the wall, l, where the potential is measured are given in metres when known. In most cases two distinct maxima and minima occur in the 24 hours. The principal maximum is usually found in the evening between 8 and 10 P.M., the principal minimum in the morning from 3 to 5 A.M. At some stations the minimum in the afternoon is indistinctly shown, but at Tokyo and Batavia it is much more conspicuous than the morning minimum.

7. In Table III. the diurnal inequality is shown for "winter" and "summer" respectively. In all cases the mean value for the 24 hours is taken as 100. By "summer" is meant April to September at Sodankylä, Greenwich and Batavia; May to August at Kew, Bureau Central (Paris), Eiffel Tower and Perpignan; and May to July at Karasjok. "Winter" includes October to March at Sodankylä, Greenwich and Batavia; November to February at Kew and Bureau Central; November to January at Karasjok, and December and January at Perpignan. Mean results from March, April, September and October at Kew are assigned to "Equinox."



At Batavia the difference between winter and summer is comparatively small. Elsewhere there is a tendency for the double period, usually so prominent in summer, to become less pronounced in winter, the afternoon minimum tending to disappear. Even in summer the double period is not prominent in the arctic climate of Karasjok or on the top of the Eiffel Tower. The diurnal variation in summer at the latter station is shown graphically in the top curve of fig. 1. It presents a remarkable resemblance to the adjacent curve, which gives the diurnal variation at mid-winter at the Bureau Central. The resemblance between these curves is much closer than that between the Bureau Central's own winter and summer curves. All three Paris curves show three peaks, the first and third representing the ordinary forenoon and afternoon maxima. In summer at the Bureau Central the intermediate peak nearly disappears in the profound afternoon depression, but it is still recognizable. This three-peaked curve is not wholly peculiar to Paris, being seen, for instance, at Lisbon in summer. The December and June curves for Kew are good examples of the ordinary nature of the difference between mid-winter and midsummer. The afternoon minimum at Kew gradually deepens as midsummer approaches. Simultaneously the forenoon maximum occurs earlier and the afternoon maximum later in the day. The two last curves in the diagram contrast the diurnal variation at Kew in potential gradient and in barometric pressure for the year as a whole. The somewhat remarkable resemblance between the diurnal variation for the two elements, first remarked on by J. D. Everett (19), is of interest in connexion with recent theoretical conclusions by J. P. Elster and H. F. K. Geitel and by H. Ebert.

In the potential curves of the diagram the ordinates represent the hourly values expressed—as in Tables II. and III.—as percentages of the mean value for the day. If this be overlooked, a wrong impression may be derived as to the absolute amplitudes of the changes. The Kew curves, for instance, might suggest that the range (maximum less minimum hourly value) was larger in June than in December. In reality the December range was 82, the June only 57 volts; but the mean value of the potential was 243 in December as against 111 in June. So again, in the case of the Paris curves, the absolute value of the diurnal range in summer was much greater for the Eiffel Tower than for the Bureau Central, but the mean voltage was 2150 at the former station and only 134 at the latter.

8. *Fourier Coefficients.*—Diurnal inequalities such as those of Tables II. and III. and intended to eliminate irregular changes, but they also to some extent eliminate regular changes if the hours of maxima and minima or the character of the diurnal variation alter throughout the year. The alteration that takes place in the regular diurnal inequality throughout the year is best seen by analysing it into a Fourier series of the type

$$c_1 \sin(t+a_1)+c_2 \sin(2t+a_2)+c_3 \sin(3t+a_3)+c_4 \sin(4t+a_4)+\dots$$

where t denotes time counted from (local) midnight, $c_1, c_2, c_3, c_4, \dots$ are the amplitudes of the component harmonic waves of periods 24, 12, 8 and 6 hours; a_1, a_2, a_3, a_4, are the corresponding phase angles. One hour of time t is counted as 15°, and a delay of one hour in the time of maximum answers to a diminution of 15° in a_1, of 30° in a_2, and so on. If a_1, say, varies much throughout the year, or if the ratios of $c_2, c_3, c_4, \dots$ to c_1, vary much, then a diurnal inequality derived from a whole year, or from a season composed of several months, represents a mean curve arising from the superposition of a number of curves, which differ in shape and in the positions of their maxima and minima. The result, if considered alone, inevitably leads to an underestimate of the average amplitude of the regular diurnal variation.

It is also desirable to have an idea of the size of the irregular changes which vary from one day to the next. On stormy days, as already mentioned, the irregular changes hardly admit of satisfactory treatment. Even on the quietest days irregular changes are always numerous and often large.

Table IV. aims at giving a summary of the several phenomena for a single station, Kew, on electrically quiet days. The first line gives the mean value of the potential gradient, the second the mean excess of the largest over the smallest hourly value on individual days. The hourly values are derived from smoothed curves, the object being to get the mean ordinate for a 60-minute period. If the actual crests of the excursions had been measured the figures in the second line would have been even larger. The third line gives the range of the *regular* diurnal inequality, the next four lines the amplitudes of the first four Fourier waves into which the regular diurnal inequality has been analysed. These mean values, ranges and amplitudes are all measured in volts per metre (in the open). The last four lines of Table IV. give the phase angles of the first four Fourier waves.

It will be noticed that the difference between the greatest and least hourly values is, in all but three winter months, actually larger than the mean value of the potential gradient for the day; it bears to the range of the regular diurnal inequality a ratio varying from 2·0 in May to 3·6 in November.

At midwinter the 24-hour term is the largest, but near midsummer it is small compared to the 12-hour term. The 24-hour term is very variable both as regards its amplitude and its phase angle (and so

TABLE IV.—*Absolute Potential Data at Kew* (12).

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Mean Potential Gradient . .	201	224	180	138	123	111	98	114	121	153	200	243
Mean of individual daily ranges	203	218	210	164	143	132	117	129	141	196	186	213
Range in Diurnal inequality .	73	94	83	74	71	57	55	60	54	63	52	82
Amplitudes of Fourier waves c_1	22	22	17	13	18	9	6	6	9	7	14	30
Amplitudes of Fourier waves c_2	21	33	34	31	22	23	24	26	23	30	17	21
Amplitudes of Fourier waves c_3	7	10	5	5	3	1	3	2	3	6	5	7
Amplitudes of Fourier waves c_4	2	3	5	6	4	1	4	3	4	3	2	3
	°	°	°	°	°	°	°	°	°	°	°	°
Phase angles of Fourier waves a_1	206	204	123	72	86	79	48	142	154	192	202	208
Phase angles of Fourier waves a_2	170	171	186	193	188	183	185	182	199	206	212	175
Phase angles of Fourier waves a_3	11	9	36	96	100	125	124	107	16	18	38	36
Phase angles of Fourier waves a_4	235	225	307	314	314	277	293	313	330	288	238	249

its hour of maximum). The 12-hour term is much less variable, especially as regards its phase angle; its amplitude shows distinct maxima near the equinoxes. That the 8-hour and 6-hour waves, though small near midsummer, represent more than mere accidental irregularities, seems a safe inference from the regularity apparent in the annual variation of their phase angles.

9. Table V. gives some data for the 24-hour and 12-hour Fourier coefficients, which will serve to illustrate the diversity between different stations. In this table, unlike Table IV., amplitudes are all expressed as decimals of the mean value of the potential gradient for the corresponding season. "Winter" means generally the four midwinter, and "summer" the four midsummer, months; but at Karasjok three, and at Kremsmünster six, months are included in each season. The results for the Sonnblick are derived from a comparatively small number of days in August and September. At Potsdam the data represent the arithmetic means derived from the Fourier analysis for the individual months comprising the season. The 1862–1864 data from Kew—due to J. D. Everett (19)—are based on "all" days; the others, except Karasjok to some extent, represent electrically quiet days. The cause of the large difference between the two sets of data for c_1 at Kew is uncertain. The potential gradient is in all cases lower in summer than winter, and thus the reduction in c_1 in summer would appear even larger than in Table V. if the results were expressed in absolute measure. At Karasjok and Kremsmünster the seasonal variation in a_1 seems comparatively small, but at Potsdam and the Bureau Central it is as large as at Kew. Also, whilst the winter values of a_1 are fairly similar at the several stations the summer values are widely different. Except at Karasjok, where the diurnal changes seem somewhat irregular, the relative amplitude of the 12-hour term is considerably greater in summer than in winter. The values of a_2 at the various stations differ comparatively little, and show but little seasonal change. Thus the 12-hour term has a much greater uniformity than the 24-hour term. This possesses significance in connexion with the view, supported by A. B. Chauveau (21), F. Exner (24) and others, that the 12-hour term is largely if not entirely a local phenomenon, due to the action of the lower atmospheric strata, and tending to disappear even in summer at high altitudes. Exner attributes the double daily maximum, which is largely a consequence of the 12-hour wave, to a thin layer near the ground, which in the early afternoon absorbs the solar radiation of shortest wave length. This layer he believes specially characteristic of arid dusty regions, while comparatively non-existent in moist climates or where foliage is luxuriant. In support of his theory Exner states that he has found but little trace of the double maximum and minimum in Ceylon and elsewhere. C. Nordmann (25) describes some similar results which he obtained in Algeria during August and September 1905. His station, Philippeville, is close to the shores of the Mediterranean, and sea breezes persisted during the day. The diurnal variation showed only a single maximum and minimum, between 5 and 6 P. M. and 4 and 5 A. M. respectively. So again, a few days' observations on the top of Mont Blanc (4810 metres) by le Cadet (26) in August and September 1902, showed only a single period, with maximum between 3 and 4 P. M., and minimum about 3 A.M. Chauveau points to the reduction in the 12-hour term as compared to the 24-hour term on the Eiffel Tower, and infers the practical disappearance of the former at no great height. The close approach in the values for c_1 in Table V. from the Bureau Central and the Eiffel Tower, and the reduction of c_2 at the latter station, are unquestionably significant facts; but the summer value for c_2 at Karasjok—a low level station—is nearly as small as that at the Eiffel Tower, and notably smaller than that at the Sonnblick (3100 metres). Again, Kew is surrounded by a large park, not devoid of trees, and hardly the place where Exner's theory would suggest a large value for c_2, and yet the summer value of c_2 at Kew is the largest in Table V.

TABLE V.—*Fourier Series Amplitudes and Phase Angles.*

Place.	Period.	Winter.				Summer.			
		c_1.	c_2.	a_1.	a_2.	c_1.	c_2.	a_1.	a_2.
				°	°			°	°
Kew	1862–64	0·283	0·160	184	193	0·127	0·229	111	179
,,	1898–1904	·102	·103	206	180	·079	·213	87	186
Bureau Central	1894–98	·220	·104	223	206	·130	·200	95	197
Eiffel Tower	1896–98	..	..	..	..	·133	·085	216	171
Sonnblick (22)	1902–3	..	..	..	..	·208	·120	178	145
Karasjok	1903–4	·356	·144	189	155	·165	·093	141	144
Kremsmünster (23)	1902	·280	·117	224	194	·166	·153	241	209
Potsdam	1904	·269	·101	194	185	·096	·152	343	185

10. Observations on mountain tops generally show high potentials near the ground. This only means that the equipotential surfaces are crowded together, just as they are near the ridge of a house. To ascertain how the increase in the voltage varies as the height in the free atmosphere increases, it is necessary to employ kites or balloons. At small heights Exner (27) has employed captive balloons, provided with a burning fuse, and carrying a wire connected with an electroscope on the ground. He found the gradient nearly uniform for heights up to 30 to 40 metres above the ground. At great heights free balloons seem necessary. The balloon carries two collectors a given vertical distance apart. The potential difference between the two is recorded, and the potential gradient is thus found. Some of the earliest balloon observations made the gradient increase with the height, but such a result is now regarded as abnormal. A balloon may leave the earth with a charge, or become charged through discharge of ballast. These possibilities may not have been sufficiently realized at first. Among the most important balloon observations are those by le Cadet (1) F. Linke (28) and H. Gerdien (29). The following are samples from a number of days' results, given in le Cadet's book. h is the height in metres, P the gradient in volts per metre.

Aug. 9, 1893	h	824	830	1060	1255	1290	1745	1940	2080	2310	2520
	P	37	43	43	41	42	34	25	21	18	16
Sep. 11, 1897	h	1140	1378	1630	1914	2370	2786	3136	3364	3912	4085
	P	43	38	33	25	22	21	19	19	14	13

The ground value on the last occasion was 150. From observations during twelve balloon ascents, Linke concludes that below the 1500-metre level there are numerous sources of disturbance, the gradient at any given height varying much from day to day and hour to hour; but at greater heights there is much more uniformity. At heights from 1500 to 6000 metres his observations agreed well with the formula

$$dV/dh = 34 - 0{\cdot}006\,h,$$

V denoting the potential, h the height in metres. The formula makes the gradient diminish from 25 volts per metre at 1500 metres height to 10 volts per metre at 4000 metres. Linke's mean value for dV/dh at the ground was 125. Accepting Linke's formula, the potential at 4000 metres is 43,750 volts higher than at 1500 metres. If the mean of the gradients observed at the ground and at 1500 metres be taken as an approximation to the mean value of the gradient throughout the lowest 1500 metres of the atmosphere, we find for the potential at 1500 metres level 112,500 volts. Thus at 4000 metres the potential seems of the order of 150,000 volts. Bearing this in mind, one can readily imagine how close together the equipotential surfaces must lie near the summit of a high sharp mountain peak.

11. At most stations a negative potential gradient is exceptional, unless during rain or thunder. During rain the potential is usually but not always negative, and frequent alternations of sign are not uncommon. In some localities, however, negative potential gradient is by no means uncommon, at least at some seasons, in the absence of rain. At Madras, Michie Smith (30) often observed negative potential during bright August and September days. The phenomenon was quite common between 9·30 A.M. and noon during westerly winds, which at Madras are usually very dry and dusty. At Sodankylä, in 1882–1883, K. S. Lemström and F. C. Biese (31) found that out of 255 observed occurrences of negative potential, 106 took place in the absence of rain or snow. The proportion of occurrences of negative potential under a clear sky was much above its average in autumn. At Sodankylä rain or snowfall was often unaccompanied by change of sign in the potential. At the polar station Godthaab (32) in 1882–1883, negative potential seemed sometimes associated with aurora (see AURORA POLARIS).

Lenard, Elster and Geitel, and others have found the potential gradient negative near waterfalls, the influence sometimes extending to a considerable distance. Lenard (33) found that when pure water falls upon water the neighbouring air takes a negative charge. Kelvin, Maclean and Galt (34) found the effect greatest in the air near the level of impact. A sensible effect remained, however, after the influence of splashing was eliminated. Kelvin, Maclean and Galt regard this property of falling water as an objection to the use of a water-dropper indoors, though not of practical importance when it is used out of doors.

12. Elster and Geitel (35) have measured the charge carried by raindrops falling into an insulated vessel. Owing to observational difficulties, the exact measure of success attained is a little difficult to gauge, but it seems fairly certain that raindrops usually carry a charge. Elster and Geitel found the sign of the charge often fluctuate repeatedly during a single rain storm, but it seemed more often than not opposite to that of the simultaneous potential gradient. Gerdien has more recently repeated the experiments, employing an apparatus devised by him for the purpose. It has been found by C. T. R. Wilson (36) that a vessel in which freshly fallen rain or snow has been evaporated to dryness shows radioactive properties lasting for a few hours. The results obtained from equal weights of rain and snow seem of the same order.

13. W. Linss (6) found that an insulated conductor charged either positively or negatively lost its charge in the free atmosphere; the potential V after time t being connected with its initial value V_0 by a formula of the type $V = V_0 e^{-\alpha t}$ where α is constant. This was confirmed by Elster and Geitel (7), whose form of dissipation apparatus has been employed in most recent work. The percentage of the

charge which is dissipated per minute is usually denoted by a_+ or a_- according to its sign. The mean of a_+ and a_- is usually denoted by $a_\pm$ or simply by a, while q is employed for the ratio a_-/a_+. Some observers when giving mean values take $\Sigma(a_-/a_+)$ as the mean value of q, while others take $\Sigma(a_-)/\Sigma(a_+)$. The Elster and Geitel apparatus is furnished with a cover, serving to protect the dissipator from the direct action of rain, wind or sunlight. It is usual to observe with this cover on, but some observers, *e.g.* A. Gockel, have made long series of observations without it. The loss of charge is due to more than one cause, and it is difficult to attribute an absolutely definite meaning even to results obtained with the cover on. Gockel (37) says that the results he obtained without the cover when divided by 3 are fairly comparable with those obtained under the usual conditions; but the appropriate divisor must vary to some extent with the climatic conditions. Thus results obtained for a_+ or a_- without the cover are of doubtful value for purposes of comparison with those found elsewhere with it on. In the case of q the uncertainty is much less.

Table VI. gives the mean values of $a_\pm$ and q found at various places. The observations were usually confined to a few hours of the day, very commonly between 11 A.M. and 1 P.M., and in absence of information as to the diurnal variation it is impossible to say how much this influences the results. The first eight stations lie inland; that at Seewalchen (38) was, however, adjacent to a lake. The next five stations are on the coast or on islands. The final four are at high levels. In the cases where the observations were confined to a few months the representative nature of the results is more doubtful.

On mountain summits q tends to be large, *i.e.* a negative charge is lost much faster than a positive charge. Apparently q has also a tendency to be large near the sea, but this phenomenon is not seen at Trieste. An exactly opposite phenomenon, it may be remarked, is seen near waterfalls, q becoming very small. Only Innsbruck and Mattsee give a mean value of q less than unity. Also, as later observations at Innsbruck give more normal values for q, some doubt may be felt as to the earlier observations there. The result for Mattsee seems less open to doubt, for the observer, von Schweidler, had obtained a normal value for q during the previous year at Seewalchen. Whilst the average q in at least the great majority of stations exceeds unity, individual observations making q less than unity are not rare. Thus in 1902 (51) the percentage of cases in which q fell short of 1 was 30 at Trieste, 33 at Vienna, and 35 at Kremsmünster; at Innsbruck q was less than 1 on 58 days out of 98.

TABLE VI.—*Dissipation. Mean Values.*

Place.	Period.	Season.	Observer or Authority.	$a_\pm$	q
Karasjok	1903–4	Year	Simpson (10)	3·57	1·15
Wolfenbüttel		Year	Elster and Geitel (39)	1·33	1·05
Potsdam	1904	Year	Lüdeling (40)	1·13	1·33
Kremsmünster	1902	Year	Zölss (41)	1·32	1·18
,,	1903	Year	Zölss (42)	1·35	1·14
Freiburg		Year	Gockel (43)	..	1·41
Innsbruck	1902		Czermak (44)	1·95	0·94
,,	1905	Jan. to June	Defant (45)	1·47	1·17
Mattsee (Salzburg)	1905	July to Sept.	von Schweidler (46)	..	0·99
Seewalchen	1904	July to Sept.	von Schweidler (38)	..	1·18
Trieste	1902–3	Year	Mazelle (47)	0·58	1·09
Misdroy	1902		Lüdeling (40)	1·09	1·58
Swinemünde	1904	Aug. and Sept.	Lüdeling (40)	1·23	1·37
Heligoland (sands)	1903	Summer	Elster and Geitel (40)	1·14	1·71
,, plateau	,,	,,	,, ,, (40)	3·07	1·50
Juist (Island)		,,	,, ,, (48)	1·56	1·56
Atlantic and German Ocean	1904	August	Boltzmann (49)	1·83	2·69
Arosa (1800 m.)	1903	Feb. to April	Saake (50)	1·79	1·22
Rothhorn (2300 m.)	1903	September	Gockel (43)	..	5·31
Sonnblick (3100 m.)	1903	September	Conrad (22)	..	1·75
Mont Blanc (4810 m.)	1902	September	le Cadet (43)	..	10·3

In a long series of observations, individual values of q show usually a wide range. Thus during observations extending over more than a year, q varied from 0·18 to 8·25 at Kremsmünster and from 0·11 to 3·00 at Trieste. The values of a_+, a_- and $a_\pm$ also show large variations. Thus at Trieste a_+ varied from 0·12 to 4·07, and a_- from 0·11 to 3·87; at Vienna a_+ varied from 0·32 to 7·10, and a_- from 0·78 to 5·42; at Kremsmünster $a_\pm$ varied from 0·14 to 5·83.

14. *Annual Variation.*—When observations are made at irregular hours, or at only one or two fixed hours, it is doubtful how representative they are. Results obtained at noon, for example, probably differ more from the mean value for the 24 hours at one season than at another. Most dissipation results are exposed to considerable uncertainty on these grounds. Also it requires a long series of years to give thoroughly representative results for any element, and few stations possess more than a year or two's dissipation data. Table VII. gives comparative results for winter (October to March) and summer at a few stations, the value for the season being the arithmetic mean from the individual months composing it. At Karasjuk (10), Simpson observed thrice a day; the summer value there is nearly double the winter both for a_+ and a_-. The Kremsmünster (42) figures show a smaller but still distinct excess in the summer values. At Trieste (47), Mazelle's data from all days of the year show no decided seasonal change in a_+ or a_-; but when days on which the wind was high are excluded the summer value is decidedly the higher. At Freiburg (43), q seems decidedly larger in winter than in summer; at Karasjok and Trieste the seasonal effect in q seems small and uncertain.

TABLE VII.—*Dissipation.*

Place.	Winter.				Summer.			
	a_+	a_-	$a_\pm$	q	a_+	a_-	$a_\pm$	q
Karasjok 1903–1904	2·28	2·69	2·49	1·18	4·38	4·94	4·65	1·13
Kremsmünster 1903	1·14	1·30	1·22	1·14	1·38	1·56	1·47	1·12
Freiburg	..	..	..	1·57	..	..	..	1·26
Trieste 1902–1903	0·56	0·59	0·58	1·07	0·55	0·61	0·58	1·13
,, calm days	..	..	0·35	..	..	..	0·48	..

15. *Diurnal Variation.*—P. B. Zölss (41, 42) has published dirunal variation data for Kremsmünster for more than one year, and independently for midsummer (May to August) and midwinter (December to February). His figures show a double daily period in both a_+ and a_-, the principal maximum occurring about 1 or 2 P.M. The two minima occur, the one from 5 to 7 A.M., the other from 7 to 8 P.M.; they are nearly equal. Taking the figures answering to the whole year, May 1903 to 1904, a_+ varied throughout the day from 0·82 to 1·35, and a_- from 0·85 to 1·47. At midsummer the extreme hourly values were 0·91 and 1·45 for a_+, 0·94 and 1·60 for a_-. The corresponding figures at midwinter were 0·65 and 1·19 for a_+, 0·61 and 1·43 for a_-. Zölss' data for q show also a double daily period, but the apparent range is small, and the hourly variation is somewhat irregular. At Karasjok, Simpson found a_+ and a_- both larger between noon and 1 P.M. than between either 8 and 9 A.M. or 6 and 7 P.M. The 6 to 7 P.M. values were in general the smallest, especially in the case of a_+; the evening value for q on the average exceeded the values from the two earlier hours by some 7%.

Summer observations on mountains have shown diurnal variations very large and fairly regular, but widely different from those observed at lower levels. On the Rothhorn, Gockel (43) found a_+ particularly variable, the mean 7 A.M. value being 4½ times that at 1 P.M. q (taken as $\Sigma(a_-/a_+)$ varied from 2·25 at 5 A.M. and 2·52 at 9 P.M. to 7·82 at 3 P.M. and 8·35 at 7 P.M. On the Sonnblick, in early September, V. Conrad (22) found somewhat similar results for q, the principal maximum occurring at 1 P.M., with minima at 9 P.M. and 6 A.M.; the largest hourly value was, however, scarcely double the least. Conrad found a_- largest at 4 A.M. and least at 6 P.M., the largest value being double the least; a_+ was largest at 5 A.M. and least at 2 P.M., the largest value being fully 2½ times the least. On Mont Blanc, le Cadet (43) found q largest from 1 to 3 P.M., the value at either of these hours being more than double that at 11 A.M. On the Patscherkofel, H. von Ficker and A. Defant (52), observing in December, found q largest from 1 to 2 P.M. and least between 11 A.M. and noon, but the largest value was only 1½ times the least. On mountains much seems to depend on whether there are rising or falling air currents, and results from a single season may not be fairly representative.

16. Dissipation seems largely dependent on meteorological conditions, but the phenomena at different stations vary so much as to suggest that the connexion is largely indirect. At most stations a_+ and a_- both increase markedly as wind velocity rises. From the observations at Trieste in 1902–1903 E. Mazelle (47) deduced an increase of about 3% in a_+ for a rise of 1 km. per hour in wind velocity. The following are some of his figures, the velocity v being in kilometres per hour:—

v	0 to 4.	20 to 24	40 to 49.	60 to 69.
a	0·33	0·64	1·03	1·38
q	1·13	1·19	1·00	0·96

For velocities from 0 to 24 km. per hour q exceeded unity in 74 cases out of 100; but for velocities over 50 km. per hour q exceeded unity

in only 40 cases out of 100. Simpson got similar results at Karasjok; the rise in a_+ and a_- with increased wind velocity seemed, however, larger in winter than in summer. Simpson observed a fall in q for wind velocities exceeding 2 on Beaufort's scale. On the top of the Sonnblick, Conrad observed a *slight* increase of $a_\pm$ as the wind velocity increased up to 20 km. per hour, but for greater velocities up to 80 km. per hour no further decided rise was observed.

At Karasjok, treating summer and winter independently, Simpson (10) found a_+ and a_- both increase in a nearly linear relation with temperature, from below −20° to +15° C. For example, when the temperature was below −20° mean values were 0·76 for a_+ and 0·91 for a_-; for temperatures between −10° and −5° the corresponding means were 2·45 and 2·82; while for temperatures between +10° and +15° they were 4·68 and 5·23. Simpson found no certain temperature effect on the value of q. At Trieste, from 470 days when the wind velocity did not exceed 20 km. per hour, Mazelle (47) found somewhat analogous results for temperatures from 0° to 30° C.; a_-, however, increased faster than a_+, i.e. q increased with temperature. When he considered all days irrespective of wind velocity, Mazelle found the influence of temperature obliterated. On the Sonnblick, Conrad (22) found $a_\pm$ increase appreciably as temperature rose up to 4° or 5° C.; but at higher temperatures a decrease set in.

Observations on the Sonnblick agree with those at low-level stations in showing a diminution of dissipation with increase of relative humidity. The decrease is most marked as saturation approaches. At Trieste, for example, for relative humidities between 90 and 100 the mean $a_\pm$ was less than half that for relative humidities under 40. With certain dry winds, notably Föhn winds in Austria and Switzerland, dissipation becomes very high. Thus at Innsbruck Defant (45) found the mean dissipation on days of Föhn fully thrice that on days without Föhn. The increase was largest for a_+, there being a fall of about 15% in q. In general, a_+ and a_- both tend to be less on cloudy than on bright days. At Kiel (53) and Trieste the average value of q is considerably less for wholly overcast days than for bright days. At several stations enjoying a wide prospect the dissipation has been observed to be specially high on days of great visibility when distant mountains can be recognized. It tends on the contrary to be low on days of fog or rain.

The results obtained as to the relation between dissipation and barometric pressure are conflicting. At Kremsmünster, Zölss (42) found dissipation vary with the absolute height of the barometer, $a_\pm$ having a mean value of 1·36 when pressure was below the normal, as against 1·20 on days when pressure was above the normal. He also found $a_\pm$ on the average about 10% larger when pressure was falling than when it was rising. On the Sonnblick, Conrad (22) found dissipation increase decidedly as the absolute barometric pressure was larger, and he found no difference between days of rising and falling barometer. At Trieste, Mazelle (47) found no certain connexion with absolute barometric pressure. Dissipation was above the average when cyclonic conditions prevailed, but this seemed simply a consequence of the increased wind velocity. At Mattsee, E. R. von Schweidler (46) found no connexion between absolute barometric pressure and dissipation, also days of rising and falling pressure gave the same mean. At Kiel, K. Kaehler (53) found a_+ and a_- both greater with rising than with falling barometer.

V. Conrad and M. Topolansky (54) have found a marked connexion at Vienna between dissipation and ozone. Regular observations were made of both elements. Days were grouped according to the intensity of colouring of ozone papers, 0 representing no visible effect, and 14 the darkest colour reached. The mean values of a_+ and a_- answering to 12 and 13 on the ozone scale were both about double the corresponding values answering to 0 and 1 on that scale.

17. A charged body in air loses its charge in more than one way. The air, as is now known, has always present in it ions, some carrying a positive and others a negative charge, and those having the opposite sign to the charged body are attracted and tend to discharge it. The rate of loss of charge is thus largely dependent on the extent to which ions are present in the surrounding air. It depends, however, in addition on the natural mobility of the ions, and also on the opportunities for convection. Of late years many observations have been made of the ionic charges in air. The best-known apparatus for the purpose is that devised by Ebert. A cylinder condenser has its inner surface insulated and charged to a high positive or negative potential. Air is drawn by an aspirator between the surfaces, and the ions having the opposite sign to the inner cylinder are deposited on it. The charge given up to the inner cylinder is known from its loss of potential. The volume of air from which the ions have been extracted being known, a measure is obtained of the total charge on the ions, whether positive or negative. The conditions must, of course, be such as to secure that no ions shall escape, otherwise there is an underestimate. I_+ is used to denote the charge on positive ions, I_- that on negative ions. The unit to which they are ordinarily referred is 1 electrostatic unit of electricity per cubic metre of air. For the ratio of the mean value of I_+ to the mean value of I_-, the letter Q is employed by Gockel (55), who has made an unusually complete study of ionic charges at Freiburg. Numerous observations were also made by Simpson (10)—thrice a day—at Karasjok, and von Schweidler has made a good many observations about 3 P.M. at Mattsee (46) in 1905, and Seewalchen (38) in 1904. These will suffice to give a general idea of the mean values met with.

Station.	Authority.	I_+	I_-	Q
Freiburg	Gockel	0·34	0·24	1·41
Karasjok	Simpson	0·38	0·33	1·17
Mattsee	von Schweidler	0·35	0·29	1·19
Seewalchen . . .	,,	0·45	0·38	1·17

Gockel's mean values of I_+ and Q would be reduced to 0·31 and 1·38 respectively if his values for July—which appear abnormal—were omitted. I_+ and I_- both show a considerable range of values, even at the same place during the same season of the year. Thus at Seewalchen in the course of a month's observations at 3 P.M., I_+ varied from 0·31 to 0·67, and I_- from 0·17 to 0·67.

There seems a fairly well marked annual variation in ionic contents, as the following figures will show. Summer and winter represent each six months and the results are arithmetic means of the monthly values.

	Freiburg.			Karasjok.		
	I_+	I_-	Q	I_+	I_-	Q
Winter . .	0·29	0·21	1·49	0·33	0·27	1·22
Summer . .	0·39	0·28	1·34	0·44	0·39	1·13

If the exceptional July values at Freiburg were omitted, the summer values of I_+ and Q would become 0·33 and 1·25 respectively.

18. *Diurnal Variation.*—At Karasjok Simpson found the mean values of I_+ and I_- throughout the whole year much the same between noon and 1 P.M. as between 8 and 9 A.M. Observations between 6 and 7 P.M. gave means slightly lower than those from the earlier hours, but the difference was only about 5 % in I_+ and 10 % in I_-. The evening values of Q were on the whole the largest. At Freiburg, Gockel found I_+ and I_- decidedly larger in the early afternoon than in either the morning or the late evening hours. His greatest and least mean hourly values and the hours of their occurrence are as follows:—

Winter.				Summer.			
I_+		I_-		I_+		I_-	
Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
0·333	0·193	0·242	0·130	0·430	0·244	0·333	0·192
2 P.M.	7 P.M.	2 P.M.	8 P.M.	4 P.M.	9 to 10 P.M.	4 P.M.	9 to 10 P.M.

Gockel did not observe between 10 P.M. and 7 A.M.

19. Ionization seems to increase notably as temperature rises. Thus at Karasjok Simpson found for mean values:—

Temp. less than −20° I_+=0·18, I_-=0·16 | −10° to −5° I_+=0·36, I_-=0·30 | 10° to 15° I_+=0·45, I_-=0·43

Simpson found no clear influence of temperature on Q. Gockel observed similar effects at Freiburg—though he seems doubtful whether the relationship is direct—but the influence of temperature on I_+ seemed reduced when the ground was covered with snow. Gockel found a diminution of ionization with rise of relative humidity. Thus for relative humidities between 40 and 50 mean values were 0·306 for I_+ and 0·219 for I_-; whilst for relative humidities between 90 and 100 the corresponding means were respectively 0·222 and 0·134. At Karasjok, Simpson found a slight decrease in I_- as relative humidity increased, but no certain change in I_+. Specially large values of I_+ and I_- have been observed at high levels in balloon ascents. Thus on the 1st of July 1901, at a height of 2400 metres, H. Gerdien (29) obtained 0·86 for I_+ and 1·09 for I_-.

20. In 1901 Elster and Geitel found that a radioactive emanation is present in the atmosphere. Their method of measuring the radioactivity is as follows (48): A wire not exceeding 1 mm. in diameter, charged to a negative potential of at least 2000 volts, is supported between insulators in the open, usually at a height of about 2 metres. After two hours' exposure, it is wrapped round a frame supported in a given position relative to Elster and Geitel's dissipation apparatus, and the loss of charge is noted. This loss is proportional to the length of the wire. The radioactivity is denoted by A, and A=1 signifies that the potential of the dissipation apparatus fell 1 volt in an hour per metre of wire introduced. The loss of the dissipation body due to the natural ionization of the air is first allowed for. Suppose, for instance, that in the absence of the wire the potential falls from 264 to 255 volts in 15 minutes, whilst when the wire (10 metres long) is introduced it falls from 264 to 201 volts in 10 minutes, then

$$10A=(264-201)\times 6-(264-255)\times 4=342;\ \text{or}\ A=34\cdot 2.$$

The values obtained for A seem largely dependent on the station.

At Wolfenbüttel, a year's observations by Elster and Geitel (56) made A vary from 4 to 64, the mean being 20. In the island of Juist, off the Friesland coast, from three weeks' observations they obtained only 5·2 as the mean. On the other hand, at Altjoch, an Alpine station, from nine days' observations in July 1903 they obtained a mean of 137, the maximum being 224, and the minimum 92. At Freiburg, from 150 days' observations near noon in 1903–1904, Gockel (57) obtained a mean of 84, his extreme values being 10 and 420. At Karasjok, observing several times throughout the day for a good many months, Simpson (10) obtained a mean of 93 and a maximum of 432. The same observer from four weeks' observations at Hammerfest got the considerably lower mean value 58, with a maximum of 252. At this station much lower values were found for A with sea breezes than with land breezes. Observing on the pier at Swinemünde in August and September 1904, Lüdeling (40) obtained a mean value of 34.

Elster and Geitel (58), having found air drawn from the soil highly radioactive, regard ground air as the source of the emanation in the atmosphere, and in this way account for the low values they obtained for A when observing on or near the sea. At Freiburg in winter Gockel (55) found A notably reduced when snow was on the ground, I_+ being also reduced. When the ground was covered by snow the mean value of A was only 42, as compared with 81 when there was no snow.

J. C. McLennan (59) observing near the foot of Niagara found A only about one-sixth as large as at Toronto. Similarly at Altjoch, Elster and Geitel (56) found A at the foot of a waterfall only about one-third of its normal value at a distance from the fall.

21. *Annual and Diurnal Variations.*—At Wolfenbüttel, Elster and Geitel found A vary but little with the season. At Karasjok, on the contrary, Simpson found A much larger at midwinter—notwithstanding the presence of snow—than at midsummer. His mean value for November and December was 129, while his mean for May and June was only 47. He also found a marked diurnal variation, A being considerably greater between 3 and 5 A.M. or 8·30 to 10·30 P.M. than between 10 A.M. and noon, or between 3 and 5 P.M.

At all seasons of the year Simpson found A rise notably with increase of relative humidity. Also, whilst the mere absolute height of the barometer seemed of little, if any, importance, he obtained larger values of A with a falling than with a rising barometer. This last result of course is favourable to Elster and Geitel's views as to the source of the emanation.

22. For a wire exposed under the conditions observed by Elster and Geitel the emanation seems to be almost entirely derived from radium. Some part, however, seems to be derived from thorium, and H. A. Bumstead (60) finds that with longer exposure of the wire the relative importance of the thorium emanation increases. With three hours' exposure he found the thorium emanation only from 3 to 5% of the whole, but with 12 hours' exposure the percentage of thorium emanation rose to about 15. These figures refer to the state of the wire immediately after the exposure; the rate of decay is much more rapid for the radium than for the thorium emanation.

23. The different elements—potential gradient, dissipation, ionization and radioactivity— are clearly not independent of one another. The loss of a charge is naturally largely dependent on the richness of the surrounding air in ions. This is clearly shown by the following results obtained by Simpson (10) at Karasjok for the mean values of $a_\pm$ corresponding to certain groups of values of $I_\pm$. To eliminate the disturbing influence of wind, different wind strengths are treated separately.

TABLE VIII.—*Mean Values of* $a_\pm$.

Wind Strength.	$I_\pm$ 0 to 0·1.	0·1 to 0·2.	0·2 to 0·3	0·3 to 0·4.	0·4 to 0·5.
0 to 1	0·45	0·60	1·26	2·04	3·03
1 „ 2	0·65	1·08	1·85	2·92	3·83
2 „ 3	..	..	2·70	3·88	5·33

Simspon concluded that for a given wind velocity dissipation is practically a linear function of ionization.

24. Table IX. will give a general idea of the relations of potential gradient to dissipation and ionization.

If we regard the potential gradient near the ground as representing a negative charge on the earth, then if the source of supply of that charge is unaffected the gradient will rise and become high when the operations by which discharge is promoted slacken their activity. A diminution in the number of positive ions would thus naturally be accompanied by a rise in potential gradient. Table IX. associates with rise in potential gradient a reduced number of both positive and negative ions and a diminished rate of dissipation whether of a negative or a positive charge. The rise in q and Q indicates that the diminished rate of dissipation is most marked for positive charges, and that negative ions are even more reduced then positive.

At Kremsmünster Zölss (41) finds a considerable similarity between the diurnal variations in q and in the potential gradient, the hours of the forenoon and afternoon maxima being nearly the same in the two cases.

No distinct relationship has yet been established between potential gradient and radioactivity. At Karasjok Simpson (10) found fairly similar mean values of A for two groups of observations, one confined to cases when the potential gradient exceeded +400 volts, the other confined to cases of negative gradient.

At Freiburg Gockel (55, 57) found that when observations were grouped according to the value of A there appeared a distinct rise in both a_- and I_+ with increasing A. For instance, when A lay between 100 and 150 the mean value of a_- was 1·27 times greater than when A lay between 0 and 50 ; while when A lay between 120 and 150 the mean value of I_+ was 1·53 times larger than when A lay between 0 and 30. These apparent relationships refer to mean values. In individual cases widely different values of a_- or I_+ are associated with the same value of A.

25. If V be the potential, ρ the density of free electricity at a point in the atmosphere, at a distance r from the earth's centre, then assuming statical conditions and neglecting variation of V in horizontal directions, we have

$$r^{-2}(d/dr)(r^2 dV/dr)+4\pi\rho=0.$$

For practical purposes we may treat r^2 as constant, and replace d/dr by d/dh, where h is height in centimetres above the ground.

We thus find $$\rho=-(1/4\pi)d^2V/dh^2.$$

If we take a tube of force 1 sq. cm. in section, and suppose it cut by equipotential surfaces at heights h_1 and h_2 above the ground, we have for the total charge M included in the specified portion of the tube

$$4\pi M=(dV/dh)h_1-(dV/dh)h_2.$$

Taking Linke's (28) figures as given in § 10, and supposing $h_1=0$, $h_2=15\times10^4$, we find for the charge in the unit tube between the ground and 1500 metres level, remembering that the centimetre is now the unit of length, $M=(1/4\pi)$ (125-25)/100. Taking 1 volt equal 1/300 of an electrostatic unit, we find M = 0·000265. Between 1500 and 4000 metres the charge inside the unit tube is much less, only 0·000040. The charge on the earth itself has its surface density given by $\sigma=-(1/4\pi)\times125$ volts per metre, =0·000331 in electrostatic units. Thus, on the view now generally current, in the circumstances answering to Linke's experiemnts we have on the ground a charge of -331×10^{-6} C.G.S. units per sq. cm. Of the corresponding positive charge, 265×10^{-6} lies below the 1500 metres level, 40×10^{-6} between this and the 4000 metres level, and only 26×10^{-6} above 4000 metres.

There is a difficulty in reconciling observed values of the ionization with the results obtained from balloon ascents as to the variation of the potential with altitude. According to H. Gerdien (61), near the ground a mean value for d^2V/dh^2 is $-(1/10)$ volt/(metre)^2. From this we deduce for the charge ρ per cubic centimetre $(1/4\pi)\times10^{-6}$ (volt/cm^2), or $2{\cdot}7\times10^{-6}$ electrostatic units. But taking, for example, Simpson's mean values at Karasjok, we have observed

$$\rho\equiv I_+-I_-=0{\cdot}05\times(\text{cm./metre})^2=5\times10^{-6},$$

and thus (calculated ρ)/(observed ρ) = 0·05 approximately. Gerdien himself makes I_+-I_- considerably larger than Simpson, and concludes that the observed value of ρ is from 30 to 50 times that calculated. The presumption is either that d^2V/dh^2 near the ground is much larger numerically than Gerdien supposes, or else that the ordinary instruments for measuring ionization fail to catch some species of ion whose charge is preponderatingly negative.

26. Gerdien (61) has made some calculations as to the probable average value of the vertical electric current in the atmosphere in fine weather. This will be composed of a conduction and a convection current, the latter due to rising or falling air currents carrying ions. He supposes the field near the earth to be 100 volts per metre, or 1/300 electrostatic units. For simplicity, he assumes I_+ and I_- each equal $0{\cdot}25\times10^{-6}$ electrostatic units. The specific velocities of the ions—*i.e.* the velocities in unit field—he takes to be $1{\cdot}3\times300$ for the positive, and $1{\cdot}6\times300$ for the negative. The positive and

TABLE IX.—*Potential, Dissipation, Ionization.*

Potential gradients volts per metre.	q			Karasjok (Simpson (10)).				
	Kremsmünster (41).	Freiburg (43).	Rothhorn (43).	a_+	a_-	I_+	I_-	Q
0 to 50	..	1·12	..	..	..	..	..	..
50 „ 100	1·14	1·31	..	4·29	4·67	0·43	0·39	1·11
100 „ 150	1·24	1·69	..	3·38	3·93	0·37	0·32	1·15
150 „ 200	1·48	1·84	..	1·85	2·58	0·36	0·28	1·28
200 „ 300	..	..	3·21	1·37	1·58	0·26	0·19	1·42
300 „ 400	..	..	4·33	0·60	0·85	..	..	..
400 „ 500	..	..	5·46	..	..	..	..	..
500 „ 700	..	..	8·75	..	..	..	..	..

negative ions travel in opposite directions, so the total current is $(1/300)(0{\cdot}25\times10^{-6})(1{\cdot}3\times300+1{\cdot}6\times300)$, or 73×10^{-8} in electrostatic measure, otherwise $2{\cdot}4\times10^{-16}$ amperes per sq. cm. As to the convection current, Gerdien supposes—as in § 25—$\rho=2{\cdot}7\times10^{-9}$ electrostatic units, and on fine days puts the average velocity of rising air currents at 10 cm. per second. This gives a convection current of $2{\cdot}7\times10^{-8}$ electrostatic units, or about 1/27 of the conduction current. For the total current we have approximately $2{\cdot}5\times10^{-16}$ amperes per sq. cm. This is insignificant compared to the size of the currents which several authorities have calculated from considerations as to terrestrial magnetism (*q.v.*). Gerdien's estimate of the convection current is for fine weather conditions. During rainfall, or near clouds or dust layers, the magnitude of this current might well be enormously increased; its direction would naturally vary with climatic conditions.

27. H. Mache (62) thinks that the ionization observed in the atmosphere may be wholly accounted for by the radioactive emanation. If this is true we should have $q=an^2$, where q is the number of ions of one sign made in 1 cc. of air per second by the emanation, a the constant of recombination, and n the number of ions found simultaneously by, say, Ebert's apparatus. Mache and R. Holfmann, from observations on the amplitude of saturation currents, deduce $q=4$ as a mean value. Taking for a Townsend's value $1{\cdot}2+10^{-6}$, Mache finds $n=1800$. The charge on an ion being $3{\cdot}4\times10^{-10}$ Mache deduces for the ionic charge, I_+ or I_-, per cubic metre $1800\times3{\cdot}4\times10^{-10}\times10^6$, or 0·6. This is at least of the order observed, which is all that can be expected from a calculation which assumes I_+ and I_- equal. If, however, Mache's views were correct, we should expect a much closer connexion between I and A than has actually been observed.

28. C. T. R. Wilson (63) seems disposed to regard the action of rainfall as the most probable source of the negative charge on the earth's surface. That great separation of positive and negative electricity sometimes takes place during rainfall is undoubted, and the charge brought to the ground seems preponderatingly negative. The difficulty is in accounting for the continuance in extensive fine weather districts of large positive charges in the atmosphere in face of the processes of recombination always in progress. Wilson considers that convection currents in the upper atmosphere would be quite inadequate, but conduction may, he thinks, be sufficient alone. At barometric pressures such as exist between 18 and 36 kilometres above the ground the mobility of the ions varies inversely as the pressure, whilst the coefficient of recombination a varies approximately as the pressure. If the atmosphere at different heights is exposed to ionizing radiation of uniform intensity the rate of production of ions per cc., q, will vary as the pressure. In the steady state the number, n, of ions of either sign per cc. is given by $n=\sqrt{q/a}$, and so is independent of the pressure or the height. The conductivity, which varies as the product of n into the mobility, will thus vary inversely as the pressure, and so at 36 kilometres will be one hundred times as large as close to the ground. Dust particles interfere with conduction near the ground, so the relative conductivity in the upper layers may be much greater than that calculated. Wilson supposes that by the fall to the ground of a preponderance of negatively charged rain the air above the shower has a higher positive potential than elsewhere at the same level, thus leading to large conduction currents laterally in the highly conducting upper layers.

29. *Thunder.*—Trustworthy frequency statistics for an individual station are obtainable only from a long series of observations, while if means are taken from a large area places may be included which differ largely amongst themselves. There is the further complication that in some countries thunder seems to be on the increase. In temperate latitudes, speaking generally, the higher the latitude the fewer the thunderstorms. For instance, for Edinburgh (64) (1771 to 1900) and London (65) (1763 to 1896) R. C. Mossman found the average annual number of thunderstorm days to be respectively 6·4 and 10·7; while at Paris (1873–1893) E. Renou (66) found 27·3 such days. In some tropical stations, at certain seasons of the year, thunder is almost a daily occurrence. At Batavia (18) during the epoch 1867–1895, there were on the average 120 days of thunder in the year.

As an example of a large area throughout which thunder frequency appears fairly uniform, we may take Hungary (67). According to the statistics for 1903, based on several hundred stations, the average number of days of thunder throughout six subdivisions of the country, some wholly plain, others mainly mountainous, varied only from 21·1 to 26·5, the mean for the whole of Hungary being 23·5. The antithesis of this exists in the United States of America. According to A. J. Henry (68) there are three regions of maximum frequency: one in the south-east, with its centre in Florida, has an average of 45 days of thunder in the year; a second including the middle Mississippi valley has an average of 35 days; and a third in the middle Missouri valley has 30. With the exception of a narrow strip along the Canadian frontier, thunderstorm frequency is fairly high over the whole of the United States to the east of the 100th meridian. But to the west of this, except in the Rocky Mountain region where storms are numerous, the frequency steadily diminishes, and along the Pacific coast there are large areas where thunder occurs only once or twice a year.

30. The number of thunderstorm days is probably a less exact measure of the relative *intensity* of thunderstorms than statistics as to the number of persons killed annually by lightning per million of the population. Table X. gives a number of statistics of this kind. The letter M stands for "Midland."

TABLE X.—*Deaths by Lightning, per annum, per million Inhabitants.*

Hungary	7·7	Upper Missouri and Plains	15
Netherlands	2·8	Rocky Mountains and Plateau	10
England, N.M.	1·8	South Atlantic	8
,, E.	1·3	Central Mississippi	7
,, S.M.	1·2	Upper ,,	7
,, York and W.M.	1·1	Ohio Valley ,,	7
,, N.	1·0	Middle Atlantic	6
Wales	0·9	Gulf States	5
England, S.E.	0·8	New England	4
,, N.W.	0·7	Pacific Coast	<1[1]
,, S.W.	0·6	North and South Dakota	20
London	0·1	California	0

The figure for Hungary is based on the seven years 1897–1903; that for the Netherlands, from data by A. J. Monné (69) on the nine years 1882–1890. The English data, due to R. Lawson (70), are from twenty-four years, 1857–1880; those for the United States, due to Henry (68), are for five years, 1896–1900. In comparing these data allowance must be made for the fact that danger from lightning is much greater out of doors than in. Thus in Hungary, in 1902 and 1903, out of 229 persons killed, at least 171 were killed out of doors. Of the 229 only 67 were women, the only assignable explanation being their rarer employment in the fields. Thus, *ceteris paribus*, deaths from lightning are much more numerous in a country than in an industrial population. This is well brought out by the low figure for London. It is also shown conspicuously in figures given by Henry. In New York State, where the population is largely industrial, the annual deaths per million are only three, but of the agricultural population eleven. In states such as Wyoming and the Dakotas the population is largely rural, and the deaths by lightning rise in consequence. The frequency and intensity of thunderstorms are unquestionably greater in the Rocky Mountain than in the New England states, but the difference is not so great as the statistics at first sight suggest.

31. Even at the same place thunderstorms vary greatly in intensity and duration. Also the times of beginning and ending are difficult to define exactly, so that several elements of uncertainty exist in data as to the seasonal or diurnal variation. The monthly data in Table XI. are percentages of the total for the year. In most cases the figures are based on the number of days of thunder at a particular station, or at the average station of a country; but the second set for Hungary relates to the number of lightning strokes causing fire, and the figures for the United States relate to deaths by lightning. The data for Edinburgh, due to R. C. Mossman (64), refer to 130 years, 1771 to 1900. The data for London (1763–1896) are also due to

TABLE XI.—*Annual Variation of Thunderstorms.*

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Edinburgh	1·8	1·4	1·4	3·8	12·3	20·8	28·2	19·1	7·0	2·3	1·1	0·8
London	0·6	0·5	1·6	6·6	12·7	18·3	25·5	19·2	9·3	3·1	1·7	0·9
Paris	0·2	0·4	2·3	7·5	14·9	21·6	22·0	17·0	9·9	3·5	0·4	0·4
Netherlands	2·2	1·8	3·7	6·5	14·0	14·7	15·6	14·7	10·3	10·1	3·8	2·5
France	2·2	2·8	4·1	8·4	13·8	18·7	14·6	13·5	10·0	6·3	3·1	2·4
Switzerland	0·2	0·3	0·5	4·9	11·9	22·9	29·9	18·0	9·8	1·1	0·3	0·2
Hungary (*a*)	0·0	0·1	1·6	5·7	20·9	25·0	23·2	15·9	5·7	1·3	0·4	0·2
,, (*b*)	0·0	0·0	1·0	3·2	11·8	20·6	30·7	25·3	6·9	0·5	0·0	0·0
United States	0·1	0·1	1·2	4·0	14·3	25·0	27·2	20·4	5·8	1·4	0·3	0·1
Hong-Kong	0·0	2·1	4·3	8·5	12·8	23·4	14·9	21·3	10·6	2·1	0·0	0·0
Trevandrum	3·2	3·8	13·1	20·9	18·6	4·9	1·2	3·5	2·5	12·9	12·0	3·3
Batavia	10·4	9·2	11·1	10·5	7·9	5·5	4·3	3·8	5·4	8·8	12·2	10·9

[1] Note in case of Pacific Coast, Table X., "<1" means "less than 1."

Mossman (65); for Paris (1873–1893) to Renou (66); for the Netherlands (1882–1900) to A. J. Monné (69); for France (71) (1886–1899) to Frou and Hann; for Switzerland to K. Hess (72); for Hungary (67) (1896–1903) to L. von Szalay and others; for the United States (1890–1900) to A. J. Henry (68); for Hong-Kong (73) (1894–1903) to W. Doberck. The Trevandrum (74) data (1853–1864) were due originally to A. Broun; the Batavia data (1867–1895) are from the Batavia *Observations*, vol. xviii.

Most stations in the northern hemisphere have a conspicuous maximum at midsummer with little thunder in winter. Trevandrum (8° 31′ N.) and Batavia (6° 11′ S.), especially the former, show a double maximum and minimum.

32. *Daily Variation.*—The figures in Table XII. are again percentages. They are mostly based on data as to the hour of commencement of thunderstorms. Data as to the hour when storms are most severe would throw the maximum later in the day. This is illustrated by the first two sets of figures for Hungary (67). The first set relate as usual to the hour of commencement, the second to the hours of occurrence of lightning causing fires. Of the two other sets of figures for Hungary (75), (iii.) relates to the central plain, (iv.) to the mountainous regions to north and south of this. The hour of maximum is earlier for the mountains, thunder being more frequent there than in the plains between 8 A.M. and 4 P.M., but less frequent between 2 and 10 P.M. Trevandrum (8° 31′ N., 76° 59′ E., 195 ft. above sea-level) and Agustia (8° 37′ N., 77° 20′ E., 6200 ft. above sea-level) afford a contrast between low ground and high ground in India. In this instance there seems little difference in the hour of maximum, the distinguishing feature being the great concentration of thunderstorm occurrence at Agustia between noon and 6 P.M.

Table XII.—*Diurnal Variation of Thunderstorms.*

Hour.	0–2.	2–4.	4–6.	6–8.	8–10.	10–12.	0′–2′	2′–4′.	4′–6′.	6′–8′.	8′–10′.	10′–12′.
Finland (70)	2·3	2·0	2·2	3·0	4·6	12·1	18·9	19·2	16·1	10·1	6·1	3·4
Edinburgh (64)	1·7	2·0	1·4	1·7	4·7	14·2	22·4	23·7	11·9	9·2	5·1	2·0
Belgium (77)	3·0	2·9	1·7	1·8	2·0	6·4	12·9	21·6	19·4	15·8	8·4	4·1
Brocken (78)	1·6	2·5	1·3	1·3	4·2	3·1	12·1	28·6	22·4	10·1	7·2	5·6
Switzerland (72)	3·1	2·3	2·1	1·6	2·0	7·3	13·8	20·9	20·8	14·6	8·0	3·5
Italy (77)	1·3	1·6	1·4	2·0	3·0	8·5	19·5	26·5	16·6	9·8	8·3	1·5
Hungary (i.) (67)	2·1	1·9	1·9	2·1	2·9	11·5	18·1	22·0	17·9	10·7	6·2	2·8
,, (ii.) (67)	6·9	4·2	2·3	2·0	2·0	5·0	9·9	16·9	18·2	10·7	11·7	10·0
,, (iii.) (75)	2·3	1·9	2·0	2·4	2·7	7·9	16·1	22·1	19·1	12·7	7·6	3·2
,, (iv.) (75)	2·6	2·2	1·9	1·9	3·6	13·3	19·9	20·7	15·2	9·2	6·2	3·3
Trevandrum (74)	5·6	4·9	4·3	1·3	1·4	2·0	13·3	24·5	15·9	13·3	7·6	5·9
Agustia (74)	2·9	2·9	0·3	0·0	1·7	2·9	15·1	36·1	22·2	9·3	4·6	2·0

33. Table XIII. gives some data as to the variability of thunder from year to year. The figures for the Netherlands (69) and France (71) are the number of days when thunder occurred somewhere in the country. Its larger area and more varied climate give a much larger number of days of thunder to France. Notwithstanding the proximity of the two countries, there is not much parallelism between the data. The figures for Hungary (67) give the number of lightning strokes causing fire; those for the United States (68) give the number of persons killed by lightning. The conspicuous maximum in 1901 and great drop in 1902 in Hungary are also shown by the statistics as to the number of days of thunder. This number at the average station of the country fell from 38·4 in 1901 to 23·1 in 1902. On the whole, however, the number of destructive lightning strokes and of days of thunder do not show a close parallelism.

Table XIII.

Year.	Netherlands.	France.	Hungary.	U.S.A.	Year.	Netherlands.	France.	Hungary.	U.S.A.
1882	98	..	141	..	1893	102	288	233	209
1883	117	..	195	..	1894	111	300	333	336
1884	95	..	229	..	1895	119	309	280	426
1885	93	..	192	..	1896	109	266	299	341
1886	102	251	319	..	1897	119	297	350	362
1887	78	292	236	..	1898	95	299	386	367
1888	94	286	232	..	1899	112	299	368	563
1889	126	294	258	..	1900	108	..	401	713
1890	93	299	265	..	1901	..	..	502	..
1891	98	317	302	204	1902	..	..	322	..
1892	86	324	350	251	1903	..	..	256	..

34. Table XIV. deals with the variation of thunder over longer periods. The data for Edinburgh (64) and London (65) due to Mossman, and those for Tilsit, due to C. Kassner (79), represent the average number of days of thunder per annum. The data for Germany, due to O. Steffens (80), represent the average number of houses struck by lightning in a year per million houses: in the first decade only seven years (1854–1860) are really included. Mossman thinks that the apparent increase at Edinburgh and London in the later decades is to some extent at least real. The two sets of figures show some corroborative features, notably the low frequency from 1860 to 1870. The figures for Germany—representing four out of six divisions of that country—are remarkable. In Germany as a whole, out of a million houses the number struck per annum was three and a half times as great in the decade 1890 to 1900 as between 1854 and 1860. Von Bezold (81) in an earlier memoir presented data analogous to Steffens', seemingly accepting them as representing a true increase in thunderstorm destructiveness. Doubts have, however, been expressed by others—*e.g.* A. Gockel, *Das Gewitter*, p. 106—as to the real significance of the figures. Changes in the height or construction of buildings, and a greater readiness to make claims on insurance offices, may be contributory causes.

35. The fact that a considerable number of people sheltering under trees are killed by lightning is generally accepted as a convincing proof of the unwisdom of the proceeding. When there is an option between a tree and an adjacent house, the latter is doubtless the safer choice. But when the option is between sheltering under a tree and remaining in the open it is not so clear. In Hungary (67), during the three years 1901 to 1903, 15% of the total deaths by lightning occurred under trees, as against 57% wholly in the open. In the United States (68) in 1900, only 10% of the deaths where the precise conditions were ascertained occurred under trees, as against 52% in the open. If then the risk under trees exceeds that in the open in Hungary and the United States, at least five or six times as many people must remain in the open as seek shelter under trees. An isolated tree occupying an exposed position is, it should be remembered, much more likely to be struck than the average tree in the midst of a wood. A good deal also depends on the species of tree. A good many years' data for Lippe (82) in Germany make the liability to lightning stroke as follows—the number of each species being supposed the same:—Oak 57, Fir 39, Pine 5, Beech 1. In Styria, according to K. Prohaska (83), the species most liable to be struck are oaks, poplars and pear trees; beech trees again are exceptionally safe. It should, however, be borne in mind that the apparent differences between different species may be partly a question of height, exposure or proximity to water. A good deal may also depend on the soil. According to Hellmann, as quoted by Henry (82), the liability to lightning stroke in Germany may be put at chalk 1, clay 7, sand 9, loam 22.

Table XIV.

Decade ending	1810.	1820.	1830.	1840.	1850.	1860.	1870.	1880.	1890.	1900.
Edinburgh	4·9	5·7	7·7	6·7	5·7	6·5	5·4	10·6	9·4	9·2
London	9·5	8·3	11·5	11·8	10·5	11·9	9·6	15·7	13·0	..
Tilsit	..	..	12·1	12·1	16·1	15·3	11·9	17·6	21·8	..
Germany, South	..	..	..	..	..	49	66	91	143	175
,, West	..	..	..	..	..	92	106	187	244	331
,, North	..	..	..	..	..	124	135	245	288	352
,, East	..	..	..	..	..	102	143	186	210	273
,, Whole	..	..	..	..	..	90	116	189	254	318

36. Numerous attempts have been made to find periodic variations in thunderstorm frequency. Among the periods suggested are the 11-year sunspot period, or half this (cf. v. Szalay (67)). Ekholm and Arrhenius (84) claim to have established the existence of a tropical lunar period, and a 25·929-day period; while P. Polis (85) considers a synodic lunar period probable. A. B. MacDowall (86) and others have advanced evidence in favour of the view that thunderstorms are most frequent near new moon and fewest near full moon. Much more evidence would be required to produce a general acceptance of any of the above periods.

37. *St Elmo's Fire.*—Luminous discharges from masts, lightning conductors, and other pointed objects are not very infrequent, especially during thunderstorms. On the Sonnblick, where the phenomenon is common, Elster and Geitel (87) have found St Elmo's fire to answer to a discharge sometimes of positive sometimes of negative electricity. The colour and appearance differ in the two cases, red predominating in a positive, blue in a negative discharge. The differences characteristic of the two forms of discharge are described and illustrated in Gockel's *Das Gewitter*. Gockel states (*l.c.* p. 74) that during snowfall the sign is positive or negative according as the flakes are large or are small and powdery. The discharge is not infrequently accompanied by a sizzling sound.

38. Of late years many experiments have been made on the influence of electric fields or currents on plant growth. S. Lemström (88), who was a pioneer in this department, found an electric field highly beneficial in some but not in all cases. Attempts have been made to apply electricity to agriculture on a commercial scale, but the exact measure of success attained remains somewhat doubtful. Lemström believed atmospheric electricity to play an important part in the natural growth of vegetation, and he assigned a special rôle to the needles of fir and pine trees.

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ATMOSPHERIC RAILWAY. About 1840–1845 great interest was excited by a method of propelling railway trains through the agency of atmospheric pressure. Various inventors worked at the realization of this idea. On the system worked out in England by Jacob Samuda and S. Clegg, a continuous pipe or main was laid between the rails, and in it a partial vacuum was maintained by means of air pumps. A piston fitting closely in it was connected to the leading vehicle of the train by an iron plate which passed through a longitudinal groove or aperture running the whole length of the pipe. This aperture was covered by a valve consisting of a continuous strip of leather, strengthened on each side with iron plates; one edge was fastened, while the other was free to rise, and was closed against a composition of beeswax and tallow placed in the groove, the surface of which was slightly melted by a heater, carried on each train, in order to secure an air-tight joint. Connected behind the piston was a frame carrying four wheels which lifted and sustained the continuous valve for a distance of about 15 ft. Thus the piston having atmospheric pressure on one side of it and a vacuum equal to 15 or 16 in. of mercury on the other, was forced along the tube, taking the train with it. Various advantages were claimed by the advocates of the system, including cheapness of operation as compared with steam locomotives, and safety from collision, because the main was divided into sections by separating valves and only one train could be in each section at a given time. It was installed on about 2 m. of line between Kingstown and Dalkey (Ireland) in 1843 and worked till 1855; it was also tried on the London and Croydon and on the South Devon lines, but was soon abandoned. The same principle is applied in the system of pneumatic despatch (*q.v.*) to the transmission of small parcels in connexion with postal and telegraph work.

For further particulars see three papers by J. Samuda, P. W. Barlow and G. Berkeley, with reports of the discussions upon them, in *Proc. Inst. C.E.*, 1844 and 1845.

ATOLL (native name *atollon* in the Maldive Islands), a horse-shoe or ring shaped coral reef enclosing a lagoon. The usual shape is that of a partly submerged dish with a broken edge, forming the ring of islands, standing upon a conical pedestal. The dish is formed of coral rock and the shells of various reef-dwelling mollusca, covered, especially at the seaward edges, with a film of living coral polyps that continually extend the fringe, and enlarge the diameter of the atoll. The lagoon tends to deepen when the land is stationary by the death of the coral animals in the still water, and the patchy disintegration of the "hard" coral, while waves and storms tear off blocks of rock and pile them up at the margin, increasing the height of the islands, which become covered by vegetation. The lagoon entrance in the open part of the horse-shoe is always to leeward of prevailing winds, since the coral growth is there slower than where the waves constantly renew the polyps' food supply. The conical pedestal rising from the depths is frequently a submarine volcanic cone or island, though any submerged peak may be crowned by an atoll. For the theory of atoll formation see CORAL-REEFS.

ATOM (Gr. ἄτομος, indivisible, from ἀ- privative, and τέμνειν, to cut), the term given in physical science to the ultimate indivisible particle of matter, and so by analogy to something minutely small in size. If we examine such a substance as sugar we find that it can be broken up into fine grains, and these again into finer, the finest particles still appearing to be of the same nature as sugar. The same is true in the case of a liquid such as water; it can be divided into drops and these again into smaller drops, or into the finest spray the particles of which are too small to be detected by our unaided vision. In fact, so far as the direct evidence of our senses tells us, matter appears to be indefinitely divisible. Moreover, small particles do not seem to exist in the water until it is broken up; so far as we can see, the material of the water is continuous not granular. This conception of matter, *as infinitely divisible and continuous*, was taught by

Anaxagoras more than four centuries before the Christian era, and in the philosophy of Aristotle the same ideas are found.

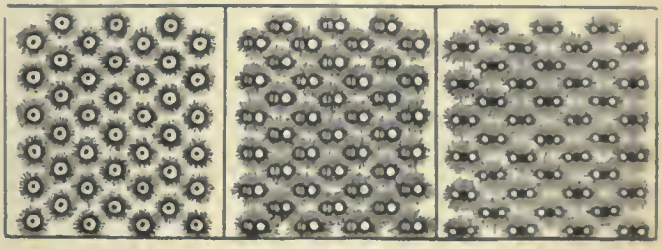
Theories of matter.

But some phenomena are difficult to reconcile with this view; for example, a cubic foot of air can be compressed into less than one five-hundredth of a cubic foot, or, if allowed to expand, the air originally occupying the cubic foot can be made to fill, apparently uniformly, a space of a million cubic feet or more. This enormous capacity for expansion and contraction is astonishing if we believe matter to be continuous, but if we imagine air to be made up of little particles separated by relatively large empty spaces the changes in volume are more easily conceivable. Moreover, if we attribute such a structure to gases, we are led to attribute it to liquids and to solids also, since gases can be liquefied without any abrupt change, and many substances usually solid can be converted into gases by heating them. This conception of the *grained* structure of matter is very ancient; traces of it are to be found in Indian philosophy, perhaps twelve centuries before the Christian era, and the Greek philosophers Democritus and Epicurus, in the 3rd and 4th centuries B.C., taught it very definitely. Their view was that "matter is not indefinitely divisible, but that all substances are formed of indivisible particles or atoms which are eternal and unchangeable, that the atoms are separated from one another by void, and that these atoms, by their combinations, form the matter we are conscious of." The Roman poet Lucretius (*De Rerum Natura*) was an eloquent exponent of this theory, but throughout the middle ages, indeed until the 17th century, it was eclipsed by the prestige of Aristotle. In the time, however, of Boyle[1] and Newton, we again find an atomic theory of matter; Newton[2] regarded a gas as consisting of small separate particles which repelled one another, the tendency of a gas to expand being attributed to the supposed repulsion between the particles.

Let us consider some common phenomena in the light of these rival theories as to the nature of matter. When a few lumps of sugar are added to a glass of water and stirred, the sugar soon disappears and we are left with a uniform liquid resembling water, except that it is sweet. What has become of the sugar? Does it still exist? The atomist would say, "Yes, it is broken up into its atoms, and these are distributed throughout the spaces between the particles of water." The rival philosopher, who believes water to be continuous and without spaces between its particles, has a greater difficulty in accounting for the disappearance of the sugar; he would probably say that the sugar, and the water also, had ceased to exist, and that a new continuous substance had been formed from them, but he could offer no picture of how this change had taken place. Or consider a well-marked case of what we are in the habit of calling *chemical combination*. If 127 parts of iodine, which is an almost black solid, and 100 parts of mercury, which is a white liquid metal, be intimately mixed by rubbing them together in a mortar, the two substances wholly disappear, and we obtain instead a brilliant red powder quite unlike the iodine or the mercury; almost the only property that is unchanged is the weight. The question again arises, what has become of the original substances? The atomist has an easy answer; he says that the new body is made up by the juxtaposition of the atoms of iodine and mercury, which still exist in the red powder. His opponent would be disposed to say that the iodine and the mercury ceased to exist when the red powder was formed, that they were *components* but not *constituents* of it. The fact that the two components can be recovered from the compound by destroying it does not decide the question. It is remarkable that pure chemistry, even to-day, has no very conclusive arguments for the settlement of this controversy; but the sister science of physics is steadily accumulating evidence in favour of the atomic conception.

Until the time of John Dalton, the atomic conception remained purely qualitative, and until then it does not appear to have advanced chemistry or to have found further confirmation in the facts of chemistry. Dalton (1803) gave the atomic theory a quantitative form, and showed that, by means of it, a vast number of the facts of chemistry could be predicted or explained. In fact, he did so much to make the atomic theory of matter probable that he is popularly regarded as its originator. Dalton lived in a period marked by great advances in experimental chemistry. Rather before the commencement of the 19th century the work of Lavoisier had rendered it very probable that chemical changes are not accompanied by any change in weight, and this principle of the conservation of matter was becoming universally accepted; chemists were also acquiring considerable skill in chemical analysis, that is, in the determination of the nature and relative amounts of the elements contained in compounds. But Sir H. E. Roscoe and A. Harden, *New View of the Atomic Theory* (1896), have shown, from a study of Dalton's manuscript notes, that we do not owe his atomic theory to such experiments. If their view is correct, the theory appears to be a remarkable example of deductive reasoning. Dalton, who was a mathematical physicist even more than a chemist, had given much thought to the study of gases. Following Newton, he believed a gas to be made up of particles or atoms,

Dalton.



From Dalton's *New System of Chemical Philosophy*

Hydrogen Gas. Nitrous Gas. Carbonic Acid Gas.

separated from one another by considerable paces. Certain difficulties that he met with in his speculations led him to the conclusion that the particles of any one kind of gas, though all of them alike, must differ from those of another gas both in *size* and *weight*. He thus arrived at the conception of a definite atomic weight peculiar to the particles of each gas, and he thought that he could determine these atomic weights, in terms of one of them, by means of the quantitative analysis of compounds. The conclusion that each element had a definite atomic weight, peculiar to it, was the new idea that made his speculations fruitful, because it allowed of quantitative deduction and verification. He drew simple diagrams, three of which, taken from Dalton's *New System of Chemical Philosophy*, part ii. (1810), are reproduced here, in which gases are represented as composed of atoms. Knowing that the gas which he called "nitrous gas" was composed of oxygen and nitrogen, and believing it to be the simplest compound of these two elements, he naturally represented its atom as formed of an atom of oxygen and an atom of nitrogen in juxtaposition. When two elements form more than one compound, as is the case with oxygen and carbon, he assigned to the compound which he thought the more complex an atom made up of two atoms of the one element and one atom of the other; the diagram for carbonic acid illustrates this, and an extension of the same plan enabled him to represent any compound, however complex its structure. The table here given contains some of Dalton's diagrams of atoms. They are not all considered to be correct at the present time; for example, we now think that the ultimate particle of water is made up of two atoms of hydrogen and one of oxygen, and that that of ammonia contains three atoms of hydrogen to one of nitrogen. But these differences between Dalton's views and our present ones do not impair the accuracy of the arguments which follow.

⊙	hydrogen.
○	oxygen.
①	nitrogen.
●	carbon.
⊙○	water.
⊙①	ammonia.
⊙●	ethylene.
●○	carbon monoxide.
○●○	carbon dioxide.
①○	nitric oxide (nitrous gas).
①○①	nitrous oxide.
○①○	nitrogen peroxide.

[1] Robert Boyle, *The Sceptical Chymist* (1661); *The Usefulness of Natural Philosophy* (1663).

[2] Sir Isaac Newton, *Principia*, bk. ii. prop. 23.

The diagrams show that Dalton formed a very definite conception of the nature of chemical combination; it was the union of a small number of atoms of one kind with a small number of another kind to form a compound atom, or as we now say a "molecule," this identical process being repeated millions of times to form a perceptible amount of a compound. The conceptions of "element," "compound" and "mixture" became more precise than they had been hitherto; in an element all the atoms are alike, in a compound all the molecules are alike, in a mixture there are different kinds of molecules. If we accept the hypothesis that each kind of atom has a specific and invariable weight, we can, with the aid of the above theory, make most important inferences concerning the proportions by weight in which substances combine to form compounds. These inferences are often summarized as the laws of *constant, multiple and reciprocal proportions*.

The law of *constant proportions* asserts that *when two elements unite to form a compound the weights that combine are in an invariable ratio, a ratio that is characteristic of that compound*. Thus if Dalton's diagram for the molecule, or compound atom, of water be correct, it follows that in all samples of water the total number of the hydrogen atoms is equal to that of the oxygen atoms; consequently, the ratio of the weight of oxygen to that of hydrogen in water is the same as the ratio of the weights of an oxygen and a hydrogen atom, and *this is invariable*. Different samples of water cannot therefore differ ever so little in percentage composition, and the same must be true for every compound as distinguished from a mixture. Apart from the atomic theory there is no obvious reason why this should be so. We give the name bread to a substance containing variable proportions of flour and water. Similarly the substance we call wine is undeniably variable in composition. Why should not the substance we call water also vary more or less? The Aristotelian would find no difficulty in such a variability; it is only the disciple of Dalton to whom it seems impossible. It is evident that we have in this law a definite prediction that can be tested by experiment.

Law of constant proportions.

The law of *multiple proportions* asserts that *if two elements form more than one compound, then the weights of the one element which are found combined with unit weight of the other in the different compounds, must be in the ratio of two or more whole numbers*. If we compare Dalton's diagrams of the two oxides of carbon or of the three oxides of nitrogen that are given in the preceding table, we at once see the necessity of this law; for the more complex molecule has to be formed from the simpler one by the addition of one or more whole atoms. In the oxides of carbon the same weight of carbon must be combined with weights of oxygen that are as 1 : 2, and in the oxides of nitrogen a fixed weight of nitrogen must be in union with weights of oxygen that are as $1 : 2 : \frac{1}{2}$, which are the same ratios as 2 : 4 : 1. This law has been abundantly verified by experiment; for example, five oxides of nitrogen are known, and independent analyses show that, if we consider the same weight of nitrogen in every case, the weights of oxygen combined with it are to one another as 1 : 2 : 3 : 4 : 5. The discovery of this law is due to Dalton; it is a direct deduction from his atomic theory. Here again, apart from this theory, there is no obvious reason why the composition of different substances should be related in so simple a way. As Dalton said, "The doctrine of definite proportions appears mysterious unless we adopt the atomic hypothesis." "It appears like the mystical ratios of Kepler which Newton so happily elucidated." The chemists of Dalton's time were not unanimous in accepting these laws; indeed C. L. Berthollet (*Essai de statique chimique*, 1803) expressly controverted them. He maintained that, under varying conditions, two substances could combine in an indefinitely large number of different ratios, that there could in fact be a continuous variation in the combining ratio. This view is clearly inconsistent with the atomic theory, which requires that when the combining ratio of two substances changes it should do so, *per saltum*, to quite another value.

Law of multiple proportions.

The law of *reciprocal proportions*, or, as it might well be named, the law of *equivalence*, cannot be adequately enunciated in a few words. The following gives a partial statement of it. *If we know the weights* a *and* b *of two elements that are found in union with unit weight of a third element, then we can predict the composition of the compounds which the first two elements can form with each other; either the weights* a *and* b *will combine exactly, or if not, these weights must be multiplied by integers to obtain the composition of a compound.* To see how this law follows from Dalton's theory let us consider his diagrams for the molecules of water, ethylene and the oxides of carbon. In water and in ethylene experiment shows that 8 parts by weight of oxygen and 6 parts of carbon, respectively, are in union with one part of hydrogen; also, if the diagrams are correct, these numbers must be in the ratio of the atomic weights of oxygen and carbon. We can therefore predict that all oxides of carbon will have compositions represented by the ratio of $8m$ parts of oxygen to $6n$ parts of carbon, where m and n are whole numbers. This prediction is verified by the result of analysis. Similarly, if we know by experiment the composition of water and of ammonia, we can predict the probable composition of the oxides of nitrogen. Experiment shows that, in water and ammonia, we have, respectively, 8 parts of oxygen and 4·67 parts of nitrogen in union with one part of hydrogen; we can therefore infer that the oxides of nitrogen will all have the composition of $8m$ parts of oxygen to $4{\cdot}67n$ parts of nitrogen. Experiment alone can tell us the values of m and n; all that the theory tells us is that they are whole numbers. In this particular case, n turns out to be 3, and m has in succession the values 1, 2, 3, 4, 5.

Law of reciprocal proportions.

It is evident that these laws all follow from the idea that a compound molecule can only alter through the addition or subtraction of one or more complete atoms, together with the idea that all the molecules in a pure substance are alike. Fortunately, the compounds at first examined by the chemists engaged in verifying these laws were comparatively simple, so that the whole numbers referred to above were small. The astonishing variety of ratios in which carbon and hydrogen combine was not at first realized. Otherwise Berthollet's position would have been a much stronger one, and the atomic theory might have had to wait a long while for acceptance. Even at the present time, it would be too much to say that all the complex organic substances have been proved by analysis to obey these laws; all we can assert is that their composition and properties can be satisfactorily explained on the assumption that they do so.

The above statement does not by any means exhaust the possible predictions that can be made from the atomic theory, but it shows how to test the theory. If chemical compounds can be proved by experiment to obey these laws, then the atomic theory acquires a high degree of probability; if they are contradicted by experiment then the atomic theory must be abandoned, or very much modified. Dalton himself made many analyses with the purpose of establishing his views, but his skill as an analyst was not very great. It is in the work of the great Swedish chemist J. J. Berzelius, and somewhat later, in the experiments of the Belgian chemist J. S. Stas, that we find the most brilliant and vigorous verification of these laws, and therefore of the atomic theory.

We shall now give an outline of the experimental evidence for the truth of these laws.

The law of the conservation of matter, an important element in the atomic theory, has been roughly verified by innumerable analyses, in which, a given weight of a substance having been taken, each ingredient in it is isolated and its weight separately determined; the total weight of the ingredients is always found to be very nearly equal to the weight of the original substance. But on account of experimental errors in weighing and measuring, and through loss of material in the transfer of substances from one vessel to another, such analyses are rarely trustworthy to more than one part in about 500; so that small changes in weight consequent on the chemical change could not with certainty be proved or

Experimental evidence.

disproved. A few experimenters have carried the verification much further. Stas, in his syntheses of silver iodide, weighed the silver and the iodine separately, and after converting them into the compound he weighed this also. In each of a number of experiments he found that the weight of the silver iodide did not differ by one twenty-thousandth of the whole from the sum of the weights of the silver and the iodine used. His analyses of another compound, silver iodate, confirm the law to one part in 78,000. In E. W. Morley's experiments on the synthesis of water the hydrogen, the oxygen and the water that had been formed were separately determined; taking the mean of his results, the sum of the weights of the ingredients is not found to differ from the weight of the product by one part in 10,000. It is evident that if our experiments are solely directed to the verification of this law, they should, if possible, be carried out in a hermetically closed vessel, the vessel and its contents being weighed before and after the chemical change. The extremely careful experiments of this kind, by H. Landolt and others, made it at first appear that the change in weight, if there is any, consequent on a chemical change can rarely exceed one-millionth of the weight of the reacting substances, and that it must often be much less. The small discrepancies found are so easily accounted for by attributing them to experimental errors that, until recently, every chemist would have regarded the law as sufficiently verified. Landolt's subsequent experiments showed, what was already noticed in the earlier ones, that these minute changes in weight are nearly always losses, the products weigh less than the components, while if they had been purely experimental errors, due to weighing, they might have been expected to be as frequently gains as losses. Landolt was disposed to attribute these losses in weight to the containing vessel, which was of glass or quartz, not being absolutely impervious, but in 1908 he showed that, by making allowance for the moisture adsorbed on the vessel, the errors were both positive and negative, and were less than one in ten million. He concluded that *no change of weight can be detected*. Modern researches (see RADIOACTIVITY) on the complex nature of the atom have a little shaken the belief in the absolute permanence of matter. But it seems pretty clear that if there is any change in weight consequent on chemical change, it is *too minute to be of importance to the chemist*, though the methods of modern physics may settle the question. (See ELEMENT.)

The law of constant proportions is easily verified to a moderate degree of accuracy by such experiments as the following. We can prepare, in the laboratory, a white powder that proves to be calcium carbonate, that is, it appears to be wholly composed of carbon dioxide and lime. We find in nature two other unlike substances, marble and Iceland spar, each of which is wholly composed of carbon dioxide and lime. Thus these three substances, unlike in appearance and origin, are composed of the same ingredients: if small variations in the combining ratio of the components were possible, we might expect to find them in such a case as this. But analysis has failed to find such differences; the ratio of the weights of lime and carbon dioxide is found to be the same in all three substances. Such analyses, which do not always admit of great accuracy, have been confirmed by a few carefully planned experiments in which two components were brought together under very varied conditions, and the resulting compound analysed. Stas carried out such experiments on the composition of silver chloride and of ammonium chloride, but he never found a variation of one part in 10,000 in the composition of the substances.

The two laws discussed above were more or less accepted before the promulgation of the atomic theory, but the law of multiple proportions is the legitimate offspring of this theory. Berzelius saw at once that it afforded an admirable test for the correctness of Dalton's views, and he made numerous experiments expressly designed to test the law. One of these experiments may be described. Two chlorides of copper are known, one a highly coloured substance, the other quite white. Berzelius took 8 grams of copper, converted it into the coloured chloride, and sealed up the whole of this in solution, together with a weighed strip of copper. After some time the colour entirely disappeared; the strip of copper was then taken out and reweighed, and it was found to have lost 8·03 grams. Thus the chlorine, which in the coloured compound was in union with 8 grams of copper, appears, in the colourless chloride, to be combined with 16·03 grams, or almost exactly double the amount. It is easy to verify this result. In a series of repetitions of the experiment, by different observers, the following numbers were obtained for the ratio of the copper in the two chlorides: 1·98, 1·97, 2·03, 2·003, the mean value being 1·996. It will be noticed that the ratio found is sometimes above and sometimes below the number 2, which is required by the atomic theory, and therefore the deviations may not unreasonably be attributed to experimental errors. Such experiments—and numerous ones of about this degree of accuracy have been made on a variety of substances—give a high degree of probability to the law, but leave it an open question whether it has the exactitude of the law of the conservation of matter, or whether it is only approximately true. The question is, however, vital to the atomic theory. It is, therefore, worth while to quote a verification of great exactitude from the work of Stas and J. B. A. Dumas[1] on the composition of the two oxides of carbon. From their work it follows that the ratio of the weights of oxygen combined with unit weight of carbon in the two oxides is 1·99995, or with somewhat different data, 1·9996.

The law of reciprocal proportion, of which some examples have been already given, is part of a larger law of equivalence that underlies most of our chemical methods and calculations. One section of the law expresses the fact that the weights of two substances, not necessarily elements, that are equivalent in one reaction, are often found to be equivalent in a number of other reactions. The neutralization of acids by bases affords many illustrations, known even before the atomic theory, of the truth of the statement. It is universally found that the weights of two bases which neutralize the same weight of one acid are equivalent in their power of neutralizing other acids. Thus 5 parts by weight of soda, 7 of potash and 3·5 of quicklime will each neutralize 4·56 parts of hydrochloric acid or 7·875 of nitric or 6·125 parts of sulphuric acid; these weights, in fact, are mutually equivalent to one another. The Daltonian would say that each of these weights represents a certain group of atoms, and that these groups can replace, or combine with, each other, to form new molecules. The change from a binary compound, that is, one containing two elements, to a ternary compound in which these two elements are associated with a third, sometimes affords a very good test for the theory. The atomic theory can picture the change from the binary to the ternary compound simply as the addition of one or more atoms of the third element to the previously existing molecule; in such a case the combining ratio of the first two elements should be absolutely the same in both compounds. Berzelius tested this prediction. He showed that lead sulphide, a black substance containing only lead and sulphur, could be *converted* by oxidation into lead sulphate, a white compound containing oxygen as well as lead and sulphur. The whole of the lead and sulphur of the sulphide was found to be present in the sulphate; in other words, the combining ratio of the lead and sulphur was not altered by the addition of the oxygen. This is found to be a general rule. It was verified very exactly by Stas's experiments, in which he removed the oxygen from the ternary compound silver iodate and found that the whole of the silver and the iodine remained in combination with each other as silver iodide; his results prove, to one part in ten millions, that the combining ratio of the silver and the iodine is unaltered by the removal of the oxygen.

The above gives some idea of the evidence that has been accumulated in favour of the laws of chemical combination, laws which can be deduced from the atomic theory. Whenever any of these laws, or indeed any prediction from the theory, can be tested it has so far proved to be in harmony with experiment. The existence of the periodic law (see ELEMENT), and the

[1] Freund, *The Study of Chemical Composition*.

researches of physicists on the constitution of matter (*q.v.*), also furnish very strong support to the theory.

Dalton was of the opinion that it was possible to determine the weights of the elementary atoms in terms of any one by the analysis of compounds. It is evident that this is practicable if the number and kind of atoms contained in the molecule of a compound can be determined. To take the simplest possible case, if Dalton had been correct in assuming that the molecule of water was made up of one atom of oxygen and one of hydrogen, then the experimental fact that water contains eight parts by weight of oxygen to one part of hydrogen, would at once show that the atom of oxygen is eight times as heavy as the atom of hydrogen, or that, taking the atomic weight of hydrogen as the unit, the atomic weight of oxygen is 8. Similarly, Dalton's diagram for ammonia, together with the fact that ammonia contains 4·67 parts of nitrogen to one of hydrogen, at once leads to the conclusion that the atomic weight of nitrogen is 4·67. But, unfortunately, the assumption as to the number of atoms in the molecules of these two compounds was an arbitrary one, based on no valid evidence. It is now agreed that the molecule of water contains two atoms of hydrogen and one of oxygen, so that the atomic weight of oxygen becomes 16, and similarly that the molecule of ammonia contains three atoms of hydrogen and one of nitrogen, and that consequently the atomic weight of nitrogen is 14. On account of this difficulty, the atomic weights published by Dalton, and the more accurate ones of Berzelius, were not always identical with the values now accepted, but were often simple multiples or submultiples of these.

Atomic weight.

The " symbols " for the elements used by Dalton, apparently suggested by those of the alchemists, have been rejected in favour of those which were introduced by Berzelius. The latter employed the first letter, or the first two letters, of the name of an element as its symbol. The symbol, like that of Dalton, always stands for the atomic weight of the element, that is, while H stands for one part by weight of hydrogen, O stands for 16 parts of oxygen, and so on. The symbols of compounds become very concise, as the number of atoms of one kind in a molecule can be expressed by a sub-index. Thus the symbol or formula H_2O for water expresses the view that the molecule of water consists of one atom of oxygen and two of hydrogen; and if we know the atomic weights of oxygen and hydrogen, it also tells us the composition of water by weight. Similarly, the modern formula for ammonia is NH_3.

Formulae.

The superiority of this notation over that of Dalton is not so obvious when we consider such simple cases as the above, but chemists are now acquainted with very complex molecules containing numerous atoms; cane sugar, for example, has the formula $C_{12}H_{22}O_{11}$. It would be a serious business to draw a Daltonian diagram for such a molecule.

Dalton believed that the molecules of the elementary gases consisted each of one atom; his diagram for hydrogen gas makes the point clear. We now believe that the molecule of an element is frequently made up of two or more atoms; thus the formulae for the gases hydrogen, oxygen and nitrogen are H_2, O_2, N_2, while gaseous phosphorus and sulphur are probably P_4 and S_6, and gaseous mercury is Hg_1,—that is, the molecule of this element is monatomic. This view, as to the frequently complex nature of the elementary molecule, is logically and historically connected with the striking hypothesis of Amadeo Avogadro and A. M. Ampère. These natural philosophers suggested that equal volumes of all gaseous substances must contain, at the same temperature and pressure, the same number of molecules. Their hypothesis explains so many facts that it is now considered to be as well established as the parts of the theory due to Dalton.[1] This principle at once enables the weights of molecules to be compared even when their composition is unknown; it is only necessary to determine the specific gravities of the various gases referred to some one of them, say hydrogen; the numbers so obtained giving the weights of the molecules referred to that of the hydrogen molecule.

[1] It will be seen that in the three gas diagrams of Dalton that are reproduced above, equal numbers of molecules are contained in equal volumes, but if Dalton held this view at one time he certainly afterwards abandoned it.

The atomic theory has been of priceless value to chemists, but it has more than once happened in the history of science that a hypothesis, after having been useful in the discovery and the co-ordination of knowledge, has been abandoned and replaced by one more in harmony with later discoveries. Some distinguished chemists have thought that this fate may be awaiting the atomic theory, and that in future chemists may be able to obtain all the guidance they need from the science of the transformations of energy. But modern discoveries in radioactivity[2] are in favour of the existence of the atom, although they lead to the belief that the atom is not so eternal and unchangeable a thing as Dalton and his predecessors imagined, and in fact, that the atom itself may be subject to that eternal law of growth and decay of which Lucretius speaks. (F. H. Ne.)

Present position of the atomic theory.

ATONEMENT and **DAY OF ATONEMENT.** " Atone " (originally—see below—" at one ") and " atonement " are terms ordinarily used as practically synonymous with satisfaction, reparation, compensation, with a view to reconciliation. As the English technical terms representing a theological doctrine which plays an important part not only in Christianity but in most religions, the underlying ideas require more detailed analysis. A doctrine of atonement makes the following presuppositions. (*a*) There is a natural relation between God and man in which God looks favourably upon man. (*b*) This relation has been disturbed so that God regards man's character and conduct with disapproval, and inflicts suffering upon him by way of punishment. In the higher religions the disturbance is due, as just implied, to unsatisfactory conduct on man's part, *i.e.* sin. (*c*) The normal relation may be restored, *i.e.* sin may be forgiven; and this restoration is the atonement.

The religious doctrine.

The problem of the atonement is the means or condition of the restoration of man to God's favour; this has been variously found (*a*) in the endurance of punishment; (*b*) in the payment of compensation for the wrong done, the compensation consisting of sacrifices and other offerings; (*c*) in the performance of magical or other ritual, the efficacy of the ritual consisting in its being pleasing to or appointed by God, or even in its having a coercive power over the deity; (*d*) in repentance and amendment of life. Most theories of atonement would combine two or more of these, and would include repentance and amendment. Some or all of the conditions of atonement may be fulfilled, according to various views, either by the sinner or vicariously on his behalf by some kinsman; or by his family, clan or nation; or by some one else.

In the Old Testament, " atonement," " make an atonement " represent the Hebrew *kippur* and its derivatives. It is doubtful whether this root meant originally to " cover " or " wipe out "; but probably it is used as a technical term without any consciousness of its etymology. The Old Testament presents very varied teaching on this subject without attempting to co-ordinate its doctrines in a harmonious system. In some cases there is no suggestion of any forgiveness; sinners are " cut off " from the chosen people; individuals and nations perish in their iniquity.[3] Some passages refer exclusively to the endurance of punishment as a condition of pardon;[4] others to the penitence and amendment of the sinner.[5] In Ezekiel xxxvi. 25-31, repentance is called forth by the divine forgiveness.

Old Testament.

Sacrifice and other rites are also spoken of as conditions of the restoration of man to happy relations with God. The Priestly Code (Leviticus and allied passages) seems to confine the efficacy

[2] Rutherford, *Radioactivity*.

[3] Cf. Exodus xii. 15, &c.; Josh. vii. 24 (Achan); Jer. li. 62 (Babylon).

[4] 2 Sam. xii. 13, 14 (David); Isaiah xl. 2 (Jerusalem): in such cases, however, the context implies repentance.

[5] Ezek. xviii., Micah vi.

of sacrifice to ritual, venial and involuntary sins,[1] and requires that the sacrifices should be offered at Jerusalem by the Aaronic priests; but these limitations did not belong to the older religion; and even in later times popular faith ascribed a larger efficacy to sacrifice. On the other hand, other passages protest against the ascription of great importance to sacrifice; or regard the rite as a consequence rather than a cause of forgiveness.[2] The Old Testament has no theory of sacrifice; in connexion with sin the sacrifice was popularly regarded as payment of penalty or compensation. Lev. xvii. 11 suggests a mystic or symbolic explanation by its statement "the life of the flesh is in the blood; and I have given it to you upon the altar to make atonement for your lives:[3] for it is the blood that maketh atonement by reason of the life." The Old Testament nowhere explains why this importance is attached to the blood, but the passage is often held to mean that the life of the victim represented the forfeited life of the offerer.

Jewish day of atonement.

The atoning ritual reached its climax on the Day of Atonement יום כפרים, ἡμέρα ἐξιλασμοῦ, in the Mishna simply "the Day" *Yōmā*), observed annually on the 10th day of the 7th month (Tisri), in the autumn, about October, shortly before the Feast of Tabernacles or vintage festival. At one time the year began in Tisri. The laws of the Day of Atonement belong to the Priestly Code.[4] There is no trace of this function before the exile; the earliest reference to any such special time of atonement being the proposal of Ezek. xlv. 18-20 to establish two days of atonement, in the first and seventh months.[5] No doubt, however, both the principles and ritual are partly derived from earlier times. The object of the observances was to cleanse the sanctuary, the priesthood and the people from all their sins, and to renew and maintain favourable relations between Yahweh and Israel. The ritual includes features found on other holy days, sacrifices, abstinence from work, &c.; and also certain unique acts. The Day of Atonement is the only fast provided in the Law; it is only on this occasion that (*a*) the Jews are required to "afflict their souls," (*b*) the High Priest enters the Holy of Holies, (*c*) the High Priest offers incense before the mercy seat and sprinkles it with blood, and (*d*) the scapegoat or Azazel is sent away into the wilderness, bearing upon him all the iniquities of the people. In later Judaism, especially from about 100 B.C., great stress was laid on the Day of Atonement, and it is now the most important religious function of the Jews. On that day many attend the synagogues who are seldom or never seen in them at other times.

The idea of vicarious atonement appears in the Old Testament in different forms. The nation suffers for the sin of the individual;[6] and the individual for the sin of his kinsfolk[7] or of the nation.[8] Above all the Servant of Yahweh[9] appears as atoning for sinners by his sufferings and death. Again, the Old Testament speaks of the restoration of heathen nations, and of the salvation of the heathen;[10] but does not formulate any theory of atonement in this connexion. The Old Testament, however, only prepares the way for the Christian doctrine of the atonement; this is clear, inasmuch as its teaching is largely concerned with the nation, and hardly touches on the future life. Moreover, it could not define the relation of Christ to the atonement. Later Judaism emphasized the idea of vicarious atonement for Israel through the sufferings of the righteous, especially the martyrs; but it is very doubtful whether the idea of the atonement through the death of the Messiah is a pre-Christian Jewish doctrine.[11]

In the New Testament, the English version uses "atonement" once, Rom. v. 11, for καταλλαγή (R.V. here and elsewhere "reconciliation"). This Greek word corresponds to the idea suggested by the etymology of at-one-ment, the re-uniting in amity of those at variance, a sense which the word had in the 17th century but has since lost. But the idea which is now usually expressed by "atonement" is rather represented in the New Testament by ἱλασμός and its cognates, *e.g.* 1 John ii. 2 R.V., "He (Jesus) is the propitiation (ἱλασμός) for our sins." But these words are rare, and we read more often of "salvation" (σωτηρία) and "being saved," which includes or involves that restoration to divine favour which is called atonement. The leading varieties of teaching, the Sayings of Jesus, Paul, the Johannine writings, the Epistle to the Hebrews, connect the atonement with Christ especially with His death, and associate it with faith in Him and with repentance and amendment of life.[12]

New Testament.

These ideas are also common to Christian teaching generally. The New Testament, however, does not indicate that its writers were agreed as to any formal dogma of the atonement, as regards the relation of the death of Christ to the sinner's restoration to God's favour; but various suggestions are made as to the solution of the problem. St Paul's teaching connects with the Jewish doctrine of vicarious suffering, represented in the Old Testament by Is. liii., and probably, though not expressly, with the ritual sacrifices. Christ suffering on behalf of sinners satisfies the divine righteousness, which was outraged by their sin.[13] His work is an expression of God's love to man;[14] the redeeming power of Christ's death is also explained by his solidarity with humanity as the second Adam,[15]—the redeemed sinner has "died with Christ."[16] Some atoning virtue seems also attributed to the Resurrection;[17] Christ's sayings connect admission to the kingdom of God with susceptibility to the influence of His personality, faith in Himself and His mission, and the loyalty that springs from faith.[18] In John, Christ is a "propitiation" (ἱλασμός) provided by the love of God that man may be cleansed from sin; He is also their advocate (Παράκλητος) with God that they may be forgiven, for His name's sake.[19] *Hebrews* speaks of Christ as transcending the rites and officials of the law; He accomplishes the realities which they could only foreshadow; in relation to the perfect, heavenly sacrifice which atones for sin, He is both priest and victim.[20]

Later interpretation.

The subsequent development of the Christian doctrine has chiefly shaped itself according to the Pauline formula of vicarious atonement; the sufferings of Christ were accepted as a substitute for the punishment which men deserved, and so the divine righteousness was satisfied—a formula, however, which left much room for controversy. The creeds and confessions are usually vague. Thus the Apostles' Creed, "I believe in the forgiveness of sins"; the Nicene Creed, "I believe in one Lord Jesus Christ . . . who for us men and for our salvation came down from heaven . . . I acknowledge one baptism for the remission of sins"; the Athanasian Creed, "Who (Christ) suffered for our salvation." In the Thirty-nine Articles of the Church of England we have (ii.) "Christ suffered . . . to reconcile his Father to us, and to be a sacrifice, not only for original guilt, but also for all actual sins of men"; and (xxxi.) "The offering of Christ once made is that perfect redemption, propitiation, and satisfaction, for all the sins of the whole world." The council of Trent declared that "*Christus . . . nobis sua sanctissima passione ligno crucis justificationem meruit et pro nobis deo patri satisfecit*," "Christ earned our justification by His most holy passion and satisfied God the Father for us." The Confession of Augsburg uses words equivalent to the Articles quoted above which were based upon it. The Westminster Confession declares: "The Lord Jesus Christ, by His perfect obedience and sacrifice of Himself, which He through the Eternal Spirit once offered up to God, hath

[1] Lev. iv. 2, "sin unwittingly" *bishegagā*, *c.* 450 B.C., &c.
[2] Psalm l. 10, li. 16-19; Isaiah i. 11; Micah vi. 6-8.
[3] Heb. *nephesh*, also translated "soul."
[4] Lev. xvi., xxiii. 27-32; Numb. xxix. 7-11.
[5] So Davidson, &c. with LXX. The A.V. with Hebrew text has "seventh day of the month."
[6] *e.g.* Achan, Josh. vii. 10-15.
[7] 2 Sam. xxi. 1-9; Deut. v. 9, 10.
[8] Ezek. xxi. 3, 4. [9] Isaiah liii. [10] Isaiah xix. 25, xlix. 6.
[11] Köberle, *Sünde und Gnade*, pp. 592 ff.
[12] Mark x. 45; Matt. xxvi. 28; 1 Cor. xv. 3; John xi. 48-52; Heb. ii. 9.
[13] Rom. iii. 25. [14] Rom. v. 8. [15] Rom. v. 15-19.
[16] Rom. vi. 8. [17] Rom. iv. 25.
[18] Matt. xxv. 34 f.; Mark viii. 34 ff., ix. 36 f., x. 21.
[19] 1 John ii. 1, 2, 12, iii. 5, 8, iv. 10. [20] Heb. ii. 17, ix. 14.

fully satisfied the justice of His Father, and purchased not only reconciliation, but an everlasting inheritance in the kingdom of heaven, for all those whom the Father hath given unto Him."

Individual theologians have sought to define more exactly the points on which the standards are vague. For instance, how was justice satisfied by Christ? The early Fathers, from Irenaeus (d. *c.* 200) to Anselm (d. 1109),[1] held, *inter alia*, that Christ paid a ransom to Satan to induce him to release men from his power. Anselm and the scholastics regarded the atonement as an offering to God of such infinite value as to outweigh men's sins, a view sometimes styled the "Commerical Theory."[2] The leading reformers emphasized the idea that Christ bore the punishment of sin, sufferings equivalent to the punishments deserved by men, a view maintained later on by Jonathan Edwards junior. But the intellectual activity of the Reformation also developed other views; the Socinians, with their humanitarian theory of the Person of Christ, taught that He died only to assure men of God's forgiving love and to afford them an example of obedience—"Forgiveness is granted upon the ground of repentance and obedience."[3] Grotius put forward what has been called the *Governmental* Theory, viz. that the atonement took place not to satisfy the wrath of God, but in the practical interests of the divine government of the world, "The sufferings and death of the Son of God are an exemplary exhibition of God's hatred of moral evil, in connexion with which it is safe and prudent to remit that penalty, which so far as God and the divine attributes are concerned, might have been remitted without it."[4]

The formal legal view continued to be widely held, though it was modified in many ways by various theologians. For instance, it has been held that Christ atoned for mankind not by enduring the penalty of sin, but by identifying Himself with the sinner in perfect sympathy, and feeling for him an "equivalent repentance" for his sin. Thus McLeod Campbell (*q.v.*) held that Christ atoned by offering up to God a perfect confession of the sins of mankind and an adequate repentance for them, with which divine justice is satisfied, and a full expiation is made for human guilt. A similar view was held by F. D. Maurice.[5] Others hold that the effect of the atoning death of Christ is not to propitiate God, but to reconcile man to God; it manifests righteousness, and thus reveals the heinousness of sin; it also reveals the love of God, and conveys the assurance of His willingness to forgive or receive the sinner; thus it moves men to repentance and faith, and effects their salvation; so substantially Ritschl.[6] In England much influence has been exerted by Dr R. W. Dale's *Atonement* (1875), the special point of which is that the death of Christ is not required by the personal demand of God to be propitiated, but by the necessity of honouring an ideal law of righteousness; thus, "the death of Christ is the objective ground on which the sins of men are remitted, because it was an act of submission to the righteous authority of the law by which the human race was condemned . . . and because in consequence of the relation between Him and us—His life being our own—His submission is the expression of ours, and carries ours with it . . . (and) because in His submission to the awful penalty of sin . . . there was a revelation of the righteousness of God, which must otherwise have been revealed in the infliction of the penalties of sin on the human race."[7] This view, however, leads to a dilemma; if the law of righteousness is simply an expression of the divine will, satisfaction to law is equivalent to propitiation offered to God; if the law has an independent position, the view is inconsistent with pure monotheism.

Modern views.

The present position may be illustrated from a work representing the more liberal Anglican theology. Bishop Lyttelton in *Lux Mundi*[8] stated that the death of Christ is propitiatory towards God because it expressed His perfect obedience, it manifested God's righteous wrath against sin, and in virtue of Christ's human nature involved man's recognition of the righteousness of God's condemnation of sin; also because in some mysterious way death has a propitiatory value; and finally because Christ is the representative of the human race. Towards man, the death of Christ has atoning efficacy because it delivers from sin, bestows the divine gift of life and conveys the assurance of pardon. The benefits of the atonement are appropriated by "the acceptance of God's forgiveness in Christ, our self-identification with Christ's atoning attitude, and then working out, by the power of the life bestowed upon us, all the (moral and spiritual) consequence of forgiveness."

At present the belief in an objective atonement is still widely held; whether in the form of penal theories—the old forensic view that the death of Christ atones by paying the penalty of man's sin—or in the form of governmental theories; that the Passion fulfilled a necessity of divine government by expressing and vindicating God's righteousness. But there is also a widespread inclination to minimize, ignore or deny the objective aspect of the atonement, the effect of the death of Christ on God's attitude towards men; and to follow the moral theories in emphasizing the subjective aspect of the atonement, the influence of the Passion on man. There is a tendency to eclectic views embracing the more attractive features of the various theories; and attempts are made to adapt, interpret and qualify the imagery and language of older formulae, in order so to speak, to issue them afresh in new editions, compatible with modern natural science, psychology and historical criticism. Such attempts are necessary in a time of transition, but they involve a measure of obscurity and ambiguity.

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Day of Atonement: articles in Hastings' *Bible Dictionary*, and in the *Encyclopaedia Biblica*. (W. H. Be.)

ATRATO, a river of western Colombia, South America, rising on the slopes of the Western Cordilleras, in 5° 36′ N. lat., and flowing almost due north to the Gulf of Uraba, or Darien, where it forms a large delta. Its length is about 400 m., but owing to the heavy rainfall of this region it discharges no less than 175,000 cub. ft. of water per second, together with a very large quantity of sediment, which is rapidly filling the gulf. The river is navigable to Quibdo (250 m.), and for the greater part of its course for large vessels, but the bars at its mouth prevent the entrance of sea-going steamers. Flowing through the narrow valley between the Cordillera and coast range, it has only short tributaries, the principal ones being the Truando, Sucio and Murri. The gold and platinum mines of Choco were on some of its affluents, and the river sands are auriferous. The Atrato at one time attracted considerable attention as a feasible route for a trans-isthmian canal, which, it was estimated, could be excavated at a cost of £11,000,000.

ATREK, a river which rises in 37° 10′ N. lat. and 59° E., in the mountains of the north-east of the Persian province of Khorasan, and flows west along the borders of Persia and the Russian Transcaspian province, till it falls, after a course of 350 m., into the south-eastern corner of the Caspian, a short distance north-north-west of Astarabad.

ATREUS, in Greek legend, son of Pelops and Hippodameia, and elder brother of Thyestes. Having murdered his stepbrother Chrysippus, Atreus fled with Thyestes to Mycenae, where he succeeded Eurystheus in the sovereignty. His wife Aërope was seduced by Thyestes, who was driven from Mycenae. To avenge himself, Thyestes sent Pleisthenes (Atreus' son whom Thyestes had brought up as his own) to kill Atreus, but Pleisthenes was himself slain by his own father. After this Atreus, apparently reconciled to his brother, recalled him to Mycenae

[1] Stevens, *Christian Doctrine of Salvation*, p. 138.
[2] *Ibid.* p. 151.
[3] Shedd, *Hist. of Christ. Doctr.* ii. 385 ff.; cf. van Oosterzee, *Christ. Dogmatics*, 611.
[4] Shedd ii. 358 f.
[5] Crawford, *Scripture Doctrine of the Atonement*, pp. 327 ff.
[6] Orr, *Ritschlian Theology*, pp. 149 ff.
[7] Dale, *Atonement*, pp. 430 ff.
[8] Pp. 209, 212, 214, 216, 219, 221, 225.

and invited him to a banquet to eat of his son, whom Atreus had slain. Thyestes fled in horror. Subsequently Atreus married the daughter of Thyestes, Pelopia, who had by her own father a son, Aegisthus, who was adopted by Atreus. Thyestes was found by Agamemnon and Menelaus, the sons of Atreus, and imprisoned at Mycenae. Aegisthus being sent to murder Thyestes, mutual recognition took place, and Atreus was slain by the father and son, who seized the throne, and drove Agamemnon and Menelaus out of the country (Thucydides i. 9; Hyginus, *Fabulae*; Apollodorus). Homer does not speak of the horrors of the story, which are first found in the tragedians; he merely states (*Iliad*, ii. 105) that Atreus at his death left the kingdom to Thyestes.

See T. Voigt in *Dissert. philol. Halenses.* vi. (1886).

ATRI, a town of the Abruzzi, Italy, in the province of Teramo, 6 m. W. of the station of that name on the railway from Ancona to Foggia, and 18 m. due E.S.E. of Teramo, on the site of the ancient *Hadria* (*q.v.*). Pop. (1901) 13,448. Its Gothic cathedral (1285–1305) is remarkably fine; and the interior, though spoilt by restoration in 1657, contains some important frescoes of the end of the 15th century by Andrea di Lecce and his pupils. The crypt was originally a cistern of the Roman period. The palace of the Acquaviva family, who were dukes of Atri from 1398 to 1775, is a massive building situated in the principal square.

ATRIUM (either from *ater*, black, referring to the blackening of the walls from the smoke of the hearth, or from the Greek *αἴθριον*, open to the sky, or from an Etruscan town, Atria, where the style of building is supposed to have originated), the principal entrance hall or court of a Roman dwelling, giving access and light to the rooms round it. The centre of the roof over the atrium was open to the sky and called the *compluvium*; the rain-water from the roof collected in the gutters was discharged into a marble tank underneath, which was known as the *impluvium*. In the early periods of Roman civilization the atrium was the common public apartment, and was used for the reception of visitors and clients, and for ordinary domestic purposes, as cooking and dining. In it were placed the ancestral pictures, the marriage-couch, the hearth and generally a small altar. At a somewhat later period, and among the wealthy, separate apartments were built for kitchens and dining-rooms, and the atrium was kept as a general reception-room for clients and visitors. There were many varieties of the atrium, depending on the way in which the roof was carried. These are described by Vitruvius under the title of *cavaedium*.

Other buildings, both consecrated and unconsecrated, were called by the term (corresponding to the English "hall"), such as the Atrium Vestae, where the vestal virgins lived, and the Atrium Libertatis, the residence of the censor, where Asinius Pollio established the first public library at Rome.

The word *atrium* in Rome had a second signification, being given to an open court with porticos round, sometimes placed in front of a temple. A similar arrangement was adopted by the early Christians with relation to the Basilica, in front of which there was an open court surrounded by colonnades or arcades. The church of San Clemente at Rome, that of Sant' Ambrogio at Milan and the cathedral of Parenzo in Istria still retain their atria.

ATROPHY (Gr. ἀ- priv., *τροφή*, nourishment), a term in medicine used to describe a state of wasting due to some interference with the function of healthy nutrition (see PATHOLOGY). In the living organism there are always at work changes involving the waste of its component tissues, which render necessary, in order to maintain and preserve life, the supply and proper assimilation of nutritive material. It is also essential for the maintenance of health that a due relation exist between these processes of waste and repair, so that the one may not be in excess of the other. When the appropriation of nutriment exceeds the waste, hypertrophy (*q.v.*) or increase in bulk of the tissues takes place. When, on the other hand, the supply of nutritive matter is suspended or diminished, or when the power of assimilation is impaired, atrophy or wasting is the result. Thus the whole body becomes atrophied in many diseases; and in old age every part of the frame, with the single exception of the heart, undergoes atrophic change. Atrophy may, however, affect single organs or parts of the body, irrespective of the general state of nutrition, and this may be brought about in a variety of ways. One of the most frequently observed of such instances is atrophy from disuse, or cessation of function. Thus, when a limb is deprived of the natural power of motion, either by paralysis or by painful joint disease, the condition of exercise essential to its nutrition being no longer fulfilled, atrophy of all its textures sooner or later takes place. The brain in imbeciles is frequently observed to be shrivelled, and in many cases of blindness there is atrophy of the optic nerve and optic tract. This form of atrophy is likewise well exemplified in the case of those organs and structures of the body which subserve important ends during foetal life, but which, ceasing to be necessary after birth, undergo a sort of natural atrophy, such as the thymus gland, and certain vessels specially concerned in the foetal circulation. The uterus after parturition undergoes a certain amount of atrophy, and the ovaries, after the child-bearing period, become shrunken. Atrophy of a part may also be caused by interruption to its normal blood-supply, as in the case of the ligature or obstruction of an artery. Again, long-standing disease, by affecting the nutrition of an organ and by inducing the deposit of morbid products, may result in atrophy, as frequently happens in affections of the liver and kidneys. Parts that are subjected to continuous pressure are liable to become atrophied, as is sometimes seen in internal organs which have been pressed upon by tumours or other morbid growths, and is well illustrated in the Chinese practice of foot-binding. Atrophy may manifest itself simply by loss of substance; but, on the other hand, it is often found to co-exist with degenerative changes in the textures affected and the formation of adventitious growth, so that the part may not be reduced in bulk although atrophied as regards its proper structure. Thus, in the case of the heart, when affected with fatty degeneration, there is atrophy of the proper muscular texture, but as this is largely replaced by fatty matter, the organ may undergo no diminution in volume, but may, on the contrary, be increased in size. Atrophy is usually a gradual and slow process, but sometimes it proceeds rapidly. In the disease known by the name of *acute yellow atrophy of the liver*, that organ undergoes such rapidly destructive change as results in its shrinking to half, or one-third, of its normal size in the course of a few days. The term *progressive muscular atrophy* (synonyms, *wasting* or *creeping palsy*) is applied to an affection of the muscular system, which is characterized by the atrophy and subsequent paralysis of certain muscles, or groups of muscles, and is associated with morbid changes in the anterior roots of the nerves of the spinal cord. This disease begins insidiously, and is often first observed to affect the muscles of one hand, generally the right. The attention of the sufferer is first attracted by the power of the hand becoming weakened, and then there is found to be a wasting of certain of its muscles, particularly those of the ball of the thumb. Gradually other muscles in the arms and legs become affected in a similar manner, their atrophy being attended with a corresponding diminution in power. Although sometimes arrested, this disease tends to progress, until in course of time the greater part of the muscular system is implicated and a fatal result ensues.

ATROPOS, in Greek mythology, the eldest of the three Fates (see FATE). Her name, the "Unalterable" (ἀ- privative, and *τρέπειν*, to turn), indicates her function, that of rendering the decisions of her sisters irreversible or immutable. Atropos is most frequently represented with scales, a sun-dial or a cutting instrument, the "abhorred shears," with which she slits the thin-spun thread of life that has been placed on the spindle by Clotho and drawn off by Lachesis.

ATTA, TITUS QUINCTIUS, or QUINTICIUS (d. 77 B.C.), Roman comedy writer, was, like Titinius and Afranius, distinguished as a writer of *fabulae togatae*, national comedies. He had the reputation of being a vivid delineator of character, especially female. He also seems to have published a collection of epigrams. The scanty fragments contain many archaisms, but are lively in

style. According to Horace (*Epistles*, ii 1. 79) the plays of Atta were still put on the stage in his time.

Aulus Gellius vii. 9; fragments in Neukirch, *De fabula togata Romanorum* (1833); Ribbeck, *Comicorum Latinorum reliquiae* (1855).

ATTACAPA (Choctaw for "cannibal"), a tribe of North-American Indians, whose home was in south-west Louisiana; they are now practically extinct.

ATTACHMENT,[1] in law, a process from a court of record, awarded by the justices at their discretion, on a bare suggestion, or on their own knowledge, and properly grantable in cases of contempt. It differs from arrest (*q.v.*), in that he who arrests a man carries him to a person of higher power to be forthwith disposed of; but he that attaches keeps the party attached, and presents him in court at the day assigned, as appears by the words of the writ. Another difference is, that arrest is only upon the body of a man, whereas an attachment is often upon his goods. It is distinguished from distress in not extending to lands, as the latter does; nor does a distress touch the body, as an attachment does. Every court of record has power to fine and imprison for contempt of its authority. Attachment being merely a process to bring the defendant before the court, is not necessary in cases of contempt in the presence of the court itself. Attachment will be granted in England against peers and members of parliament only for such gross contempts as rescues, disobedience to the sovereign's writs and the like. Attachment will not lie against a corporation. The county courts in this respect are regulated by acts of 1846 and 1849. They can only punish for contempts committed in presence of the court (see CONTEMPT OF COURT). Attachments are granted on a rule in the first instance to show cause, which must be personally served before it can be made absolute, except for non-payment of costs on a master's allocatur, and against a sheriff for not obeying a rule to return a writ or to bring in the body. The offender is then arrested, and when committed will be compelled to answer interrogatories, exhibited against him by the party at whose instance the proceedings have been had; and the examination when taken is referred to the master, who reports thereon, and on the contempt being reported, the court gives judgment according to its discretion, in the same manner as upon a conviction for a misdemeanour at common law. Sir W. Blackstone observes that "this method of making the defendant answer upon oath to a criminal charge is not agreeable to the genius of the common law in any other instance"; and the elasticity of the legal definitions of contempt of court, especially with respect to comments on judicial proceedings, is the subject of much complaint.

Attachment of Debts.—It was suggested by the common law commissioners in 1853 that a remedy analogous to that of Foreign Attachment (see below) might be made available to creditors, after judgment, against debts due to their debtors. Accordingly, the Common Law Procedure Act 1854 enacted that any creditor, having obtained judgment in the superior courts, should have an order that the judgment debtor might be examined as to any debts due and owing to him before a master of the court. The rules and regulations under the Judicature Act 1873 retained the process for attachment of debts as established by the Procedure Act of 1854. On affidavit that the judgment was still unsatisfied, and that any other person within the jurisdiction was indebted to the judgment debtor, the judge was empowered to attach all debts due from such third person (called the *garnishee*) to the judgment debtor, to answer the judgment debt. This order binds the debts in the hands of the garnishee, and if he does not dispute his liability execution issues against him at once. If he disputes his liability the question must be tried. Payment by the garnishee or execution against him is a complete discharge as against the judgment debtor. These provisions were, by an order in council of the 18th of November 1867, extended to the county courts. By the Wages Attachment Abolition Act 1870 it is enacted that no order for the attachment of the wages of any servant, labourer or workman shall be made by the judge of any court of record or inferior court, and by the Merchant Shipping Act 1894 it is enacted that the wages of a seaman or apprentice are not subject to attachment.

In the United States attachment of debts is a statutory remedy accorded in most of the states in certain circumstances for the security of creditors, by the seizure by the sheriff of the debtor's goods or the imposition of a lien upon his land, before judgment, and sometimes at the very commencement of the action. In some states it is only allowed in special cases, as when the debtor has absconded, or is a non-resident or guilty of fraud; in a few it may be had, as of right, at the commencement of ordinary actions. The common-law courts of the United States (by act of Congress) follow the practice in this regard of the state in which they sit. Such attachments (on mesne process) can generally be dissolved by the substitution of a bond with surety. The body can also be attached in most states on civil actions of tort (for a wrongful or negligent act to the damage of another), but not in actions on contract.

Foreign Attachment is an important custom prevailing in the city of London, whereby a creditor may attach money owing to his debtor, or property belonging to him in the possession of third parties. The person holding the property or owing the money must be within the city at the time of being served with the process, but all persons are entitled to the benefit of the custom. The plaintiff having commenced his action, and made a satisfactory affidavit of his debt, is entitled to issue attachment, which thereupon affects all the money or property of the defendant in the hands of the third party, the garnishee. The garnishee, of course, has as against the attachment all the defences which would be available to him against the defendant, his alleged creditor. The garnishee may plead payment under the attachment, if there has been no fraud or collusion, in bar to an action by the defendant for his debt or property. The court to which this process belongs is the mayor's court of London, the procedure in which is regulated by the Mayor's Court of London Procedure Act 1857. This custom, and all proceedings relating thereto, are expressly exempted from the operation of the Debtor's Act 1869. Similar customs exist in Bristol and a few other towns in England and also in Scotland.

A Writ of Attachment enforces answers and obedience to decrees and orders of the High Court of Justice, and is made out without order upon an affidavit of the due service of the process, &c., with whose requirements compliance is sought. A corporation, however, is proceeded against by distringas and not by attachment. It was formerly competent to the plaintiff to compel the appearance of a defendant in chancery by attachment, but the usual course was to enter appearance for him in case of default. It is one of the modes of execution allowed for the recovery of property other than land or money.

Attachment of the Forest was the proceeding in the courts of attachments, Woodmote, or Forty Days' courts. These courts have fallen into desuetude. They were held before the verderers of the royal forests in different parts of the kingdom once in every forty days, for the purpose of inquiring into all offences against "vert (greensward) and venison." The attachment was by the bodies of the offenders, if taken in the very act of killing venison, or stealing wood, or preparing so to do, or by fresh and immediate pursuit after the act was done; else they must be attached by their goods. These attachments were received by the verderers and enrolled, and certified under their seals to the Swainmote, or Court of Justice-seat, which was the superior of the forest courts.

ATTAINDER (from the O. Fr. *ataindre*, *ateindre*, to attain, *i.e.* to strike, accuse, condemn; Lat. *attingere*, *tangere*, to touch; the meaning has been greatly affected by the confusion with Fr. *taindre*, *teindre*, to taint, stain, Lat. *tingere*, to dye), in English

[1] "To attach" is first used in English in the legal sense of arrest or seizure, and the sense of "fasten to" is comparatively late. The Old French *atachier*, modern *attacher*, from which the English "attach" is derived, is from a word for a peg or nail, in English "tack," which is found in many forms in Scandinavian and Celtic languages, and is ultimately connected with the root seen in Latin *tangere*, to touch. The Italian *attacare*, especially in the phrase *attacare battaglia*, to join battle, gave the French *attaquer*, whence the English "attack," which is therefore by origin a doublet of "attach."

law, was the immediate and inseparable consequence from the common law upon the sentence of death. When it was clear beyond all dispute that the criminal was no longer fit to live he was called *attaint*, and could not, before the Evidence Act 1843, be a witness in any court. This attainder took place after judgment of death, or upon such circumstances as were equivalent to judgment of death, such as judgment of outlawry on a capital crime, pronounced for absconding from justice. Conviction without judgment was not followed by attainder. The consequences of attainder were (1) forfeiture, (2) corruption of blood. On attainder for treason, the criminal forfeited to the crown his lands, rights of entry on lands, and any interest he might have in lands for his own life or a term of years. For murder, the offender forfeited to the crown the profit of his freeholds during life, and in the case of lands held in fee-simple, the lands themselves for a year and a day; subject to this, the lands escheated to the lord of the fee. These forfeitures related back to the time of the offence committed. Forfeitures of goods and chattels ensued not only on attainder, but on conviction for a felony of any kind, or on flight from justice, and had no relation backwards to the time of the offence committed. By *corruption of blood*, "both upwards and downwards," the attainted person could neither inherit nor transmit lands. The lands escheated to the lord of the fee, subject to the crown's right of forfeiture. The doctrine of attainder has, however, ceased to be of much importance. The Forfeiture Act 1870 enacted that henceforth no confession, verdict, inquest, conviction or judgment of or for any treason or felony, or *felo de se*, should cause any attainder or corruption of blood, or any forfeiture or escheat. Sentence of death, penal servitude or imprisonment with hard labour for more than twelve months, after conviction for treason or felony, disqualifies from holding or retaining a seat in parliament, public offices under the crown or otherwise, right to vote at elections, &c., and such disability is to remain until the punishment has been suffered or a pardon obtained. Provision was made for the due administration of convicts' estates, in the interests of themselves and their families. Forfeiture consequent on outlawry was exempted from the provisions of the act. The United States constitution (Art. III. s. 3) says: "The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood, or forfeiture except during the life of the person attainted."

Bills of Attainder, in English legal procedure, were formerly a parliamentary method of exercising judicial authority. They were ordinarily initiated in the House of Lords and the proceedings were the same as on other bills, but the parties against whom they were brought might appear by counsel and produce witnesses in both Houses. In the case of an impeachment (*q.v.*), the House of Commons was prosecutor and the House of Lords judge; but such bills being *legislative* in form, the consent of crown, lords and commons was necessary to pass them. Bishops, who do not exercise but who claim the right to vote in cases of impeachment (*q.v.*), have a right to vote upon bills of attainder, but their vote is not conclusive in passing judgment upon the accused. First passed in 1459, such bills were employed, more particularly during the reigns of the Tudor kings, as a species of extrajudicial procedure, for the direct punishment of political offences. Dispensing with the ordinary judicial forms and precedents, they took away from the accused whatever advantages he might have gained in the courts of law; such evidence only was admitted as might be necessary to secure conviction; indeed, in many cases bills of attainder were passed without any evidence being produced at all. In the reign of Henry VIII. they were much used, through a subservient parliament, to punish those who had incurred the king's displeasure; many distinguished victims who could not have been charged with any offence under the existing laws being by this means disposed of. In the 17th century, during the disputes with Charles I., the Long Parliament made effective use of the same procedure, forcing the sovereign to give his consent. After the Restoration it became less frequent, though the Jacobite movement in Scotland produced several instances of attainder, without, however, the infliction of the extreme penalty of death. The last bill of attainder passed in England was in the case of Lord Edward Fitzgerald, one of the Irish rebel leaders of 1798.

A bill for reversing attainder took a form contrary to the usual rule. It was first signed by the sovereign and presented by a peer to the House of Lords by command of the crown, then passed through the ordinary stages and on to the commons, to whom the sovereign's assent was communicated before the first reading was taken, otherwise the whole proceedings were null and void.

A *Bill of Pains and Penalties* resembles a bill of attainder in object and procedure, but imposes a lesser punishment than death. The most notable instances of the passing of a bill of pains and penalties are those of Bishop Atterbury in 1722, and of Queen Caroline, wife of George IV., in 1820.

The constitution of the United States declares that "no bill of attainder or *ex post facto* law shall be passed."

ATTAINT, WRIT OF, an obsolete method of procedure in English law, for inquiring by a jury of twenty-four whether a false verdict had been given in a trial before an ordinary jury of twelve. If it were found that an erroneous judgment had been given, the wrong was redressed and the original jury incurred infamy, with imprisonment and forfeiture of their goods, which punishments were, however, commuted later for a pecuniary penalty. In criminal cases a writ of attaint was issued at suit of the king, and in civil cases at the suit of either party. In criminal cases it appears to have become obsolete by the end of the 15th century. Procedure by attaint in civil cases had also been gradually giving place to the practice of granting new trials, and after the decision in Bushell's case in 1670 (see JURY) it became obsolete, and was finally abolished by the Juries Act 1825, except as regards jurors guilty of embracery (*q.v.*).

ATTALIA, an ancient city of Pamphylia, which derived its name from Attalus II., king of Pergamum; the modern Adalia (*q.v.*). It was important as the nearest seaport to the rich districts of south-west Phrygia. A much-frequented "half-sea" route led through it to the Lycus and Maeander valleys, and so to Ephesus and Smyrna. This was the natural way from any part of central Asia Minor to Syria and Egypt, and accordingly we hear of Paul and Barnabas taking ship at Attalia for Antioch. Originally the port of Perga, Attalia eclipsed the old Pamphylian capital in early Christian times and became the metropolis. There are extensive remains of the ancient walls, including some portions which go back to the foundation of the Pergamenian city. The most conspicuous monument is the triple Gate of Hadrian, flanked by a tower built by the empress Julia. This lies about half-way round the *enceinte* and formerly admitted the road from Perga.

ATTAR [or OTTO] **OF ROSES** (Pers. *'aṭar*, essence), a perfume consisting of essential oil of roses, prepared by distilling, or, in some districts, by macerating the flowers. The manufacture is chiefly carried out in India, Persia and the Balkans; the last named supplying the bulk of the European demand. It is used by perfumery manufacturers as an ingredient. The genuine attar of roses is costly and it is frequently adulterated.

ATTEMPT (Lat. *adtemptare*, *attentare*, to try), in law, an act done with intent to commit a crime, and forming one of a series of acts which would constitute its actual commission if it were not interrupted. An attempt must proceed beyond mere preparation, but at the same time it must fall short of the ultimate purpose in any part of it. The actual point, however, at which an act ceases to be an attempt, and becomes criminal, depends upon the circumstances of each particular case. A person may be guilty of an attempt to commit a crime, even if its commission in the manner proposed was impossible. Every attempt to commit a treason, felony or indictable misdemeanour is in itself an indictable misdemeanour, punishable by fine or imprisonment, unless the attempt to commit is specifically punishable by statute as a felony, or in a defined manner as a misdemeanour; and a person who has been indicted for a felony or misdemeanour may,

if the evidence so warrants, be found guilty only of the attempt, provided that it too is a misdemeanour.

ATTENTION (from Lat. *ad-tendo*, await, expect; the condition of being "stretched" or "tense"), in psychology, the concentration of consciousness upon a definite object or objects. The result is brought about, not by effecting any change in the perceptions themselves, but simply by isolating them from other objects. Since all consciousness involves this isolation, attention may be defined generally as the necessary condition of consciousness. Such a definition, however, throws no light upon the nature of the psychological process, which is partly explained by the general law that the greater the number of objects on which attention is concentrated the less will each receive ("pluribus intentus, minor est ad singula sensus"), and conversely. There are also special circumstances which determine the amount of attention, *e.g.* influences not subject to the will, such as the vividness of the impression (*e.g.* in the case of a shock), strong change in pleasurable or painful sensations. Secondly, an exercise of volition is employed in fixing the mind upon a definite object. This is a purely voluntary act, which can be strengthened by habit and is variable in different individuals; to it the name "attention" is sometimes restricted. The distinction is expressed by the words "reflex" or "passive," and "volitional" or "active." It is important to notice that in every case of attention to an object, there must be in consciousness an implicit apprehension of surrounding objects from which the particular object is isolated. These objects are known as the "psychic fringe," and are essential to the systematic unity of the attention-process. Attempts have been made to examine the attention-process from the physiological standpoint by investigating the muscular and neural changes which accompany it, and even to assign to it a specific local centre. It has, for example, been remarked that uniformity of environment, resulting in practically automatic activity, produces mental equilibrium and the comparative disappearance of attention-processes; whereas the necessity of adapting activity to abnormal conditions produces a comparatively high degree of attention. In other words, attention is absent where there is uniformity of activity in accordance with uniform, or uniformly changing, environment. In spite of the progress made in this branch of study, it has to be remembered that all psycho-physical experiments are to some extent vitiated by the fact that the phenomena can scarcely remain normal under inspection.

See G. F. Stout, *Analytic Psychology* (London, 1896), especially part ii. chap. 2; also PSYCHOLOGY, BRAIN, &c.

ATTERBOM, PER DANIEL AMADEUS (1790–1855), Swedish poet, son of a country parson, was born in the province of Östergötland on the 19th of January 1790. He studied in the university of Upsala from 1805 to 1815, and became professor of philosophy there in 1828. He was the first great poet of the romantic movement which, inaugurated by the critical work of Lorenzo Hammersköld, was to revolutionize Swedish literature. In 1807, when in his seventeenth year, he founded at Upsala an artistic society, called the Aurora League, the members of which included V. F. Palmblad, A. A. Grafström (d. 1870), Samuel Hedborn (d. 1849), and other youths whose names were destined to take a foremost rank in the literature of their generation. Their first newspaper, *Polyfem*, was a crude effort, soon abandoned, but in 1810 there began to appear a journal, *Fosforos*, edited by Atterbom, which lasted for three years and finds a place in classic Swedish literature. It consisted entirely of poetry and aesthetico-polemical essays; it introduced the study of the newly arisen Romantic school of Germany, and formed a vehicle for the early works, not of Atterbom only, but of Hammersköld, Dahlgren, Palmblad and others. Later, the members of the Aurora League established the *Poetisk Kalender* (1812–1822), in which their poems appeared, and a new critical organ, *Svensk Litteraturtidning* (1813–1824). Among Atterbom's independent works the most celebrated is *Lycksalighetens Ö* (*The Fortunate Island*), a romantic drama of extraordinary beauty, published in 1823. Before this he had published a cycle of lyrics, *Blommorna* (*The Flowers*), of a mystical character, somewhat in the manner of Novalis. Of a dramatized fairy tale, *Fågel blå* (*The Blue Bird*), only a fragment, which is among the most exquisite of his writings, is preserved. As a purely lyrical poet he has not been excelled in Sweden, but his more ambitious works are injured by his weakness for allegory and symbolism, and his consistent adoption of the mannerisms of Tieck and Novalis. In his later years he became less violent in literary controversy. He became in 1835 professor of aesthetics and literature at Upsala, and four years later he was admitted to the Swedish Academy. He died on the 21st of July 1855. His *Svenska Siare och Skalder* (6 vols., 1841–1855, supplement, 1864) consists of a series of biographies of Swedish poets and men of letters, which forms a valuable history of Swedish letters down to the end of the "classical" period. Atterbom's works were collected (13 vols., Örebro) in 1854–1870.

ATTERBURY, FRANCIS (1662–1732), English man of letters, politician and bishop, was born in the year 1662, at Milton or Middleton Keynes in Buckinghamshire, a parish of which his father was rector. He was educated at Westminster school and at Christ Church, Oxford, where he became a tutor. In 1682 he published a translation of *Absalom and Ahithophel* into Latin verse; but neither the style nor the versification was that of the Augustan age. In English composition he succeeded much better. In 1687 he published *An Answer to some Considerations on the Spirit of Martin Luther and the Original of the Reformation*, a reply to Obadiah Walker, who, elected master of University College in 1676, had printed in a press set up by him there an attack on the Reformation, written by Abraham Woodhead. Atterbury's treatise, though highly praised by Bishop Burnet, is perhaps more distinguished for the vigour of his rhetoric than for the soundness of his arguments, and the Papists were so much galled by his sarcasms and invectives that they accused him of treason, and of having, by implication, called King James a Judas.

After the Revolution, Atterbury, though bred in the doctrines of non-resistance and passive obedience, readily swore fealty to the new government. He had taken holy orders in 1687, preached occasionally in London with an eloquence which raised his reputation, and was soon appointed one of the royal chaplains. But he ordinarily resided at Oxford, where he was the chief adviser and assistant of Dean Aldrich, under whom Christ Church was a stronghold of Toryism. Thus he became the inspirer of his pupil, Charles Boyle, in the attack (1698) on the Whig scholar, Richard Bentley (*q.v.*), arising out of Bentley's impugnment of the genuineness of the *Epistles of Phalaris*. He was figured by Swift in the *Battle of the Books* as the Apollo who directed the fight, and was, no doubt, largely the author of Boyle's essay. Bentley spent two years in preparing his famous reply, which proved not only that the letters ascribed to Phalaris were spurious, but that all Atterbury's wit, eloquence and skill in controversial fence was only a cloak for an audacious pretence of scholarship.

Atterbury was soon occupied, however, in a dispute about matters still more important and exciting. The rage of religious factions was extreme. High Church and Low Church divided the nation. The great majority of the clergy were on the High Church side; the majority of King William's bishops were inclined to latitudinarianism. In 1700 Convocation, of which the lower house was overwhelmingly Tory, had not been suffered to meet for ten years. This produced a lively controversy, into which Atterbury threw himself with characteristic energy, publishing a series of treatises written with much wit, audacity and acrimony. By the mass of the clergy he was regarded as the most intrepid champion that had ever defended their rights against the oligarchy of Erastian prelates. In 1701 he was rewarded with the archdeaconry of Totnes and a prebend in Exeter cathedral. The lower house of Convocation voted him thanks for his services; the university of Oxford created him a doctor of divinity; and in 1704, soon after the accession of Anne, while the Tories still had the chief weight in the government, he was promoted to the deanery of Carlisle.

Soon after he had obtained this preferment the Whig party

came into power. From that party he could expect no favour. Six years elapsed before a change of fortune took place. At length, in the year 1710, the prosecution of Sacheverell produced a formidable explosion of High Church fanaticism. At such a moment Atterbury could not fail to be conspicuous. His inordinate zeal for the body to which he belonged, his turbulent and aspiring temper, his rare talents for agitation and for controversy, were again signally displayed. He bore a chief part in framing that artful and eloquent speech which the accused divine pronounced at the bar of the Lords, and which presents a singular contrast to the absurd and scurrilous sermon which had very unwisely been honoured with impeachment. During the troubled and anxious months which followed the trial, Atterbury was among the most active of those pamphleteers who inflamed the nation against the Whig ministry and the Whig parliament. When the ministry had been changed and the parliament dissolved, rewards were showered upon him. The lower house of Convocation elected him prolocutor, in which capacity he drew up, in 1711, the often-cited *Representation of the State of Religion*; and, in August 1711, the queen, who had selected him as her chief adviser in ecclesiastical matters, appointed him dean of Christ Church on the death of his old friend and patron Aldrich.

At Oxford he was as conspicuous a failure as he had been at Carlisle, and it was said by his enemies that he was made a bishop because he was so bad a dean. Under his administration Christ Church was in confusion, scandalous altercations took place, and there was reason to fear that the great Tory college would be ruined by the tyranny of the great Tory doctor. In 1713 he was removed to the bishopric of Rochester, which was then always united with the deanery of Westminster. Still higher dignities seemed to be before him. For, though there were many able men on the episcopal bench, there was none who equalled or approached him in parliamentary talents. Had his party continued in power it is not improbable that he would have been raised to the archbishopric of Canterbury. The more splendid his prospects the more reason he had to dread the accession of a family which was well known to be partial to the Whigs, and there is every reason to believe that he was one of those politicians who hoped that they might be able, during the life of Anne, to prepare matters in such a way that at her decease there might be little difficulty in setting aside the Act of Settlement and placing the Pretender on the throne. Her sudden death confounded the projects of these conspirators, and, whatever Atterbury's previous views may have been, he acquiesced in what he could not prevent, took the oaths to the house of Hanover, and did his best to ingratiate himself with the royal family. But his servility was requited with cold contempt; and he became the most factious and pertinacious of all the opponents of the government. In the House of Lords his oratory, lucid, pointed, lively and set off with every grace of pronunciation and of gesture, extorted the attention and admiration even of a hostile majority. Some of the most remarkable protests which appear in the journals of the peers were drawn up by him; and, in some of the bitterest of those pamphlets which called on the English to stand up for their country against the aliens who had come from beyond the seas to oppress and plunder her, critics easily detected his style. When the rebellion of 1715 broke out, he refused to sign the paper in which the bishops of the province of Canterbury declared their attachment to the Protestant succession, and in 1717, after having been long in indirect communication with the exiled family, he began to correspond directly with the Pretender.

In 1721, on the discovery of the plot for the capture of the royal family and the proclamation of King James, Atterbury was arrested with the other chief malcontents, and in 1722 committed to the Tower, where he remained in close confinement during some months. He had carried on his correspondence with the exiled family so cautiously that the circumstantial proofs of his guilt, though sufficient to produce entire moral conviction, were not sufficient to justify legal conviction. He could be reached only by a bill of pains and penalties. Such a bill the Whig party, then decidedly predominant in both Houses, was quite prepared to support, and in due course a bill passed the Commons depriving him of his spiritual dignities, banishing him for life, and forbidding any British subject to hold intercourse with him except by the royal permission. In the Lords the contest was sharp, but the bill finally passed by eighty-three votes to forty-three.

Atterbury took leave of those whom he loved with a dignity and tenderness worthy of a better man, to the last protesting his innocence with a singular disingenuousness. After a short stay at Brussels he went to Paris, and became the leading man among the Jacobite refugees there. He was invited to Rome by the Pretender, but Atterbury felt that a bishop of the Church of England would be out of place at the Vatican, and declined the invitation. During some months, however, he seemed to stand high in the good graces of James. The correspondence between the master and the servant was constant. Atterbury's merits were warmly acknowledged, his advice was respectfully received, and he was, as Bolingbroke had been before him, the prime minister of a king without a kingdom. He soon, however, perceived that his counsels were disregarded, if not distrusted. His proud spirit was deeply wounded. In 1728 he quitted Paris, fixed his residence at Montpelier, gave up politics, and devoted himself entirely to letters. In the sixth year of his exile he had so severe an illness that his daughter, Mrs Morice, herself very ill, determined to run all risks that she might see him once more. She met him at Toulouse, received the communion from his hand, and died that night.

Atterbury survived the severe shock of his daughter's death two years. He even returned to Paris and to the service of the Pretender, who had found out that he had not acted wisely in parting with one who, though a heretic, was the most able man of the Jacobite party. In the ninth year of his banishment he published a luminous, temperate and dignified vindication of himself against John Oldmixon, who had accused him of having, in concert with other Christ Church men, garbled the new edition of Clarendon's *History of the Rebellion*. The charge, as respected Atterbury, had not the slightest foundation; for he was not one of the editors of the *History*, and never saw it till it was printed. A copy of this little work he sent to the Pretender, with a letter singularly eloquent and graceful. It was impossible, the old man said, that he should write anything on such a subject without being reminded of the resemblance between his own fate and that of Clarendon. They were the only two English subjects who had ever been banished from their country and debarred from all communication with their friends by act of parliament. But here the resemblance ended. One of the exiles had been so happy as to bear a chief part in the restoration of the royal house. All that the other could now do was to die asserting the rights of that house to the last. A few weeks after this letter was written Atterbury died, on the 22nd of February 1732. His body was brought to England, and laid, with great privacy, under the nave of Westminster Abbey. No inscription marks his grave.

It is agreeable to turn from Atterbury's public to his private life. His turbulent spirit, wearied with faction and treason, now and then required repose, and found it in domestic endearments, and in the society of the most illustrious literary men of his time. Of his wife, Katherine Osborn, whom he married while at Oxford, little is known; but between him and his daughter there was an affection singularly close and tender. The gentleness of his manners when he was in the company of a few friends was such as seemed hardly credible to those who knew him only by his writings and speeches. Though Atterbury's classical attainments were not great, his taste in English literature was excellent; and his admiration of genius was so strong that it overpowered even his political and religious antipathies. His fondness for Milton, the mortal enemy of the Stuarts and of the Church, was such as to many Tories seemed a crime; and he was the close friend of Addison. His favourite companions, however, were, as might have been expected, men whose politics had at least a tinge of Toryism. He lived on friendly terms with Swift, Arbuthnot and Gay. With Prior he had a close intimacy,

which some misunderstanding about public affairs at last dissolved. Pope found in Atterbury not only a warm admirer, but a most faithful, fearless and judicious adviser.

See F. Williams, *Memoirs and Correspondence of Atterbury with Notes*, &c. (1869); *Stuart Papers*, vol. i.: *Letters of Atterbury to the Chevalier St George*, &c. (1847); J. Nichols, *Epistolary Correspondence*, &c. (1783–1796); and H. C. Beeching, *Francis Atterbury*, (1909).

ATTESTATION (Lat. *adtestare*, *attestare*, to bear witness, *testis*, a witness), the verification of a deed, will or other instrument by the signature to it of a witness or witnesses, who endorse or subscribe their names under a memorandum, to the effect that it was signed or executed in their presence. The essence of attestation is to show that at the execution of the document there was present some disinterested person capable of giving evidence as to what took place. The clause at the end of the instrument, immediately preceding the signatures of the witnesses to the execution, and stating that they have witnessed it, is known as the attestation clause. In Scots law, the corresponding clause is called the testing-clause (see DEED; WILL OR TESTAMENT; WITNESS).

ATTHIS (an adjective meaning "Attic"), the name given to a monograph or special treatise on the religious and political history, antiquities and topography of Attica and Athens. During the 4th and 3rd centuries B.C., a class of writers arose, who, making these subjects their particular study, were called atthidographi, or compilers of atthides. The first of these was Clidemus or Clitodemus (about 378 B.C.); the last, Ister of Cyrene (died 212 B.C.); the most important was Philochorus (first half of the 3rd century B.C.), of whose work considerable fragments have been preserved. The names of the other atthidographi known to us are Phanodemus, Demon, Androtion, Andron, Melanthius. They laid no claim to literary skill; their style was monotonous and soon became wearisome. They were in fact chroniclers or annalists—not historians. Their only object was to set down, in plain and simple language, all that seemed worthy of note in reference to the legends, history, constitution, religion and civilization of Attica. They followed the order of the olympiads and archons, and their work was supported by the authority of original documents, monuments and inscriptions. Their writings were much used by historians, as well as by the scholiasts and grammarians.

Fragments in Müller, *Fragmenta Historicorum Graecorum*, i.

ATTIC (*i.e.* "in the Attic style"), an architectural term given to the masonry rising above the main cornice of a building, the earliest example known being that of the monument of Thrasyllus at Athens. It was largely employed by the Romans, who in their arches of triumph utilized it for inscriptions or for bas-relief sculpture. It was used also to increase the height of enclosure walls such as those of the Forum of Nerva. By the Italian revivalists it was utilized as a complete storey, pierced with windows, as found in Palladio's work at Vicenza and in Greenwich hospital. The largest attic in existence is that which surmounts the entablature of St Peter's at Rome, which measures 39 ft. in height. The term is also employed in modern terminology to designate an upper storey in a roof, and the feature is sometimes introduced to hide a roof behind.

ATTICA, a district of ancient Greece, triangular in shape, projecting in a south-easterly direction into the Aegean Sea, the base line being formed by the continuous chain of Mounts Cithaeron and Parnes, the apex by the promontory of Sunium. It was washed on two sides by the sea, and the coast is broken up into numerous small bays and harbours, which, however, are with few exceptions exposed to the south wind. The surface of Attica, as of the rest of Greece, is very mountainous, and between the mountain chains lie several plains of no great size, open on one side to the sea. On the west its natural boundary is the Corinthian Gulf, so that it would include Megaris; indeed, before the Dorian invasion, which resulted in the foundation of Megara, the whole country was politically one, in the hands of the Ionian race. This is proved by the column which, as we learn from Strabo, once stood on the Isthmus of Corinth, bearing on one side in Greek the inscription, "This land is Peloponnesus, not Ionia," and on the other, "This land is not Peloponnesus, but Ionia."

The position of Attica was one main cause of its historical importance. Hence in part arose the maritime character of its inhabitants; and when they had once taken to the sea, the string of neighbouring islands, Ceos, Cythnos and others, some of which lay within sight of their coasts, and from one to another of which it was possible to sail without losing sight of land, served to tempt them on to further enterprises. Similarly on land, the post it occupied between northern Greece and the Peloponnese materially influenced its relation to other states, both in respect of its alliances, such as that with Thessaly, towards which it was drawn by mutual hostility to Boeotia, which lay between them; and also in respect of offensive combinations of other powers, as that between Thebes and Sparta, which throughout an important part of Greek history were closely associated in their politics, through mutual dread of their powerful neighbour.

Mountains.

The mountains of Attica, which form its most characteristic feature, are a continuation of that chain which, starting from Tymphrestus at the southern extremity of Pindus, passes through Phocis and Boeotia under the names of Parnassus and Helicon; from this proceeds the range which, as Cithaeron in its western and Parnes in its eastern portion, separates Attica from Boeotia, throwing off spurs southward towards the Saronic Gulf in Aegaleos and Hymettus, which bound the plain of Athens. Again, the eastern extremity of Parnes is joined by another line of hills, which, separating from Mount Oeta, skirts the Euboic Gulf, and, after entering Attica, throws up the lofty pyramid of Pentelicus, overlooking the plain of Marathon, and then sinks towards the sea at Sunium to rise once more in the outlying islands. Finally, at the extreme west of the whole district, Cithaeron is bent round at right angles in the direction of the isthmus, at the northern approach to which it abuts against the mighty mass of Mount Geraneia, which is interposed between the Corinthian and the Saronic Gulf. Both Cithaeron and Parnes are about 4600 ft. high, Pentelicus 3635, and Hymettus 3370, while Aegaleos does not rise higher than 1534 ft. At the present day they are extremely bare, and in this respect almost repellent; but the lack of colour is compensated by the delicacy of the outlines, the minute articulation of the minor ridges and valleys, and the symmetrical grouping of the several mountains.

Soil.

The soil is light and thin, and requires very careful agriculture not only on the rocky mountain sides but to some extent also in the maritime plains. This fact had considerable influence on the inhabitants, both by enforcing industrious habits and by leading them at an early period to take to the sea. Still, the level ground was sufficiently fertile to form a marked contrast to the rest of the district. Thucydides attributes to the nature of the soil (i. 2 τὸ λεπτόγεων), which presented no attraction to invaders, the permanence of the same inhabitants in the country, whence arose the claim to indigenousness on which the Athenians so greatly prided themselves; while at the same time the richer ground fostered that fondness for country life, which is proved by the enthusiastic terms in which it is always spoken of by Aristophanes. That we are not justified in judging of the ancient condition of the soil by the aridity which prevails at the present day, is shown by the fact that out of the 182 demes (see CLEISTHENES) into which Attica was divided, one-tenth were named from trees or plants.

Climate.

The climate of Attica has always been celebrated. In approaching Attica from Boeotia a change of temperature is felt as soon as a person descends from Cithaeron or Parnes, and the sea breeze, which in modern times is called ὁ ἐμβάτης, or that which sets towards shore, moderates the heat in summer. The Attic comedians and Plato speak with enthusiasm of their native climate, and the fineness of the Athenian intellect was attributed to the clearness of the Attic atmosphere. It was in the neighbourhood of Athens itself that

the air was thought to be purest. So Euripides describes the inhabitants as "ever walking gracefully through the most luminous ether" (*Med.* 829); and Milton—

> "Where, on the Aegean shore, a city stands,
> Built nobly, pure the air, and light the soil—
> Athens, the eye of Greece."

Or again Xenophon says "one would not err in thinking that this city is placed near the centre of Greece—nay, of the civilized world—because, the farther removed persons are from it, the severer is the cold or heat they meet with" (*Vectigal.* 1. 6). The air is so clear that one can see from the Acropolis the lines of white marble that streak the sides of Pentelicus. The brilliant colouring which is so conspicuous in an Athenian sunset is due to the same cause. The epithet "violet-crowned," used of Athens by Pindar, is due either to the blue haze on the surrounding hills, or to the use of violets (or irises) for festal wreaths. This otherwise perfect climate is slightly marred by the prevalence of the north wind. This is expressed on the Horologium of Andronicus Cyrrhestes, called the Temple or Tower of the Winds, at Athens, where Boreas is represented as a bearded man of stern aspect, thickly clad, and wearing strong buskins; he blows into a conch shell, which he holds in his hand as a sign of his tempestuous character.

Of the flora of Attica, the olive is the most important. This tree, we learn from Herodotus (v. 82), was thought at one time to have been found in that country only; and the enthusiastic praises of Sophocles (*Oed. Col.* 700) teach us that it was the land in which it flourished best. So great was the esteem in which it was held, that in the early legend of the struggle between the gods of sea and land, Poseidon and Athena, for the patronage of the country, the sea-god is represented as having to retire vanquished before the giver of the olive; and at a later period the evidences of this contention were found in an ancient olive tree in the Acropolis, together with three holes in the rock, said to have been made by the trident of Poseidon, and to be connected with a salt well hard by. The fig also found its favourite home in this country, for Demeter was said to have bestowed it as a gift on the Eleusinian Phytalus, *i.e.* "the gardener." Both Cithaeron and Parnes must have been wooded in former times; for on the former are laid the picturesque silvan scenes in the *Bacchae* of Euripides, and it was from the latter that the wood came which caused the neighbouring deme of Acharnae to be famous for its charcoal—the *ἀνθρακες Παρνήσιοι* of the *Acharnians* of Aristophanes (348). From the thymy slopes of Hymettus came the famous Hymettian honey. Among the other products we must notice the marble—both that of Pentelicus, which afforded a material of unrivalled purity and whiteness for building the Athenian temples, and the blue marble of Hymettus—the *trabes Hymettiae* of Horace—which used to be transported to Rome for the construction of palaces. But the richest of all the sources of wealth in Attica was the silver mines of Laurium, the yield of which was so considerable as to render silver the principal medium of exchange in Greece, so that "a silver piece" (*ἀργύριον*) was the Greek equivalent term for money. Hence Aeschylus speaks of the Athenians as possessing a "fountain of silver" (*Pers.* 235), and Aristophanes makes his chorus of birds promise the audience that, if they show him favour, owls from Laurium (*i.e.* silver pieces with the emblem of Athens) shall never fail them (*Birds*, 1106). The reputation of these coins for purity of metal and accuracy of weight was so great that they had a very wide circulation, and in consequence it was thought undesirable to make any alteration in the types lest their genuineness should be doubted. This accounts for the somewhat inartistic character which the Athenian coins maintained to the last (see further NUMISMATICS: *Greek*, § Athens). In Strabo's time, though the mines had almost ceased to yield, silver was obtained in considerable quantities from the scoriae; and at the present day a large amount of lead is got in the same way, the work being chiefly carried on by two companies, one of which is French and the other Greek. In the ancient workings, many of which are in the same condition as they were left 1800 years ago, there are in all 2000 shafts and galleries.

Vegetation.

Minerals.

It has been already mentioned that the base line of Attica is formed by the chain of Cithaeron and Parnes, running from west to east; and that from this transverse chains run southward, dividing Attica into a succession of plains. The westernmost of these, which is separated from the innermost bay of the Corinthian Gulf, called the Mare Alcyonium, by an offshoot of Cithaeron, and is bounded on the east by a ridge which ends towards the Saronic Gulf in a striking two-horned peak called Kerata, is the plain of Megara. It is only for geographical purposes that we include this district under Attica, for both the Dorian race of the inhabitants, and its dangerous proximity to Athens, caused it to be at perpetual feud with that city; but its position as an outpost for the Peloponnesians, together with the fact of its having once been Ionian soil, sufficiently explains the bitter hostility of the Athenians towards the Megarians. The great importance of Megara arose from its commanding all the passes into the Peloponnese. These were three in number: one along the shores of the Corinthian Gulf, which, owing to the nature of the ground, makes a long detour; the other two starting from Megara, and passing, the one by a lofty though gradual route over the ridge of Geraneia, the other along the Saronic Gulf, under the dangerous precipices of the Scironian rocks.

Plain of Megara.

To the east of the plain of Megara lies that of Eleusis, bounded on the one side by the chain of Kerata, and on the other by that of Aegaleos, through a depression in which was the line of the sacred way, where the torchlight processions from Athens used to descend to the coast, the "brightly gleaming shores" (*λαμπάδες ἀκταί*) of Sophocles (*Oed. Col.* 1049). The deep bay which here runs into the land is bounded on its southern side by the rocky island of Salamis, which was at all times an important possession to the Athenians on account of its proximity to their city; and the winding channel which separates that island from the mainland in the direction of the Peiraeus was the scene of the battle of Salamis, while on the last declivities of Mt. Aegaleos, which here descends to the sea, was the spot where, as Byron wrote—

Plain of Eleusis.

> "A king sate on the rocky brow
> Which looks o'er sea-born Salamis."

The eastern portion of the plain of Eleusis was called the Thriasian plain, and the city itself was situated in the recesses of the bay just mentioned.

Next in order to the plain of Eleusis came that of Athens, which is the most extensive of all, reaching from the foot of Parnes to the sea, and bounded on the west by Aegaleos, and on the east by Hymettus. Its most conspicuous feature is the broad line of dark green along its western side, formed by the olive-groves of Colonus and the gardens of the Academy, which owe their fertility to the waters of the Cephisus. This river is fed by copious sources on the side of Mt. Parnes, and thus, unlike the other rivers of Attica, has a constant supply of water, which was diverted in classical times, as it still is, into the neighbouring plantations (cf. Sophocles, *Oed. Col.* 685). The position of Colonus itself is marked by two bare knolls of light-coloured earth, which caused the poet in the same chorus to apply the epithet "white" (*ἀργῆτα*) to that place. On the opposite side of the plain runs the other river, the Ilissus, which rises from two sources on the side of Mt. Hymettus, and skirts the eastern extremity of the city of Athens; but this, notwithstanding its celebrity, is a mere brook, which stands in pools a great part of the year, and in summer is completely dry. The situation of Athens relatively to the surrounding objects is singularly harmonious; for, while it forms a central point, so as to be the eye of the plain, and while the altar-rock of the Acropolis and the hills by which it is surrounded are conspicuous from every point of view, there is no such exactness in its position as to give formality, since it is nearer to the sea than to Parnes, and nearer to Hymettus than to Aegaleos. The most striking summit in the neighbourhood of the city is that of Lycabettus,

Plain of Athens.

on the north-eastern side; and the variety is still further increased by the continuation of the ridge which it forms for some distance northwards through the plain. Three roads lead to Athens from the Boeotian frontier over the intervening mountain barrier—the easternmost over Parnes, from Delium and Oropus by Decelea, which was the usual route of the invading Lacedaemonians during the Peloponnesian War; the westernmost over Cithaeron, by the pass of Dryoscephalae, or the "Oakheads," leading from Thebes by Plataea to Eleusis, and so to Athens, which we hear of in connexion with the battle of Plataea, and with the escape of the Plataeans at the time of the siege of that city in the Peloponnesian War; the third, midway between the two, by the pass of Phyle, near the summit of which, on a rugged height overlooking the Athenian plain, is the fort occupied by Thrasybulus in the days of the Thirty Tyrants. On the sea-coast to the south-west of Athens rises the hill of Munychia, a mass of rocky ground, forming the acropolis of the town of Peiraeus. It was probably at one time an island; this was Strabo's opinion, and at the present day the ground which joins it to the mainland is low and swampy, and seems to have been formed by alluvial soil brought down by the Cephisus. On one side of this, towards Hymettus, lay the open roadstead of Phalerum, on the other the harbour of Peiraeus, a completely land-locked inlet, safe, deep and spacious, the approach to which was still further narrowed by moles. The eastern side of the hill was further indented by two small but commodious havens, which were respectively called Zea and Munychia.

The north-eastern boundary of the plain of Athens is formed by the graceful pyramid of Pentelicus, which received its name from the deme of Pentele at its foot, but was far more commonly known as Brilessus in ancient times. This mountain did not form a continous chain with Hymettus, for between them intervenes a level space of ground 2 m. in width, which formed the entrance to the Mesogaea, an elevated undulating plain in the midst of the mountains, reaching nearly to Sunium. At the extremity of Hymettus, where it projects into the Saronic Gulf, was the promontory of Zoster ("the Girdle"), which was so called because it girdles and protects the neighbouring harbour; but in consequence of the name, a legend was attached to it, to the effect that Latona had loosed her girdle there. From this promontory to Sunium there runs a lower line of mountains, and between these and the sea a fertile strip of land intervenes, which was called the Paralia. Beyond Sunium, on the eastern coast, were two safe ports, that of Thoricus, which is defended by the island of Helene, forming a natural breakwater in front of it, and that of Prasiae, now called Porto Raphti ("the Tailor"), from a statue at the entrance to which the natives have given that name. In the north-east corner is the little plain of Marathon (*q.v.*), the scene of the battle against the Persians (490 B.C.). It lies between Parnes, Pentelicus and the sea. The bay in front is sheltered by Euboea, and on the north by a projecting tongue of land, called Cynosura. The mountains in the neighbourhood were the home of the Diacrii or Hyperacrii, who, being poor mountaineers, and having nothing to lose, were the principal advocates of political reform; while, on the other hand, the Pedieis, or inhabitants of the plains, being wealthy landholders, formed the strong conservative element, and the Parali, or occupants of the sea-coast, representing the mercantile interest, held an intermediate position between the two (see CLEISTHENES). Finally, there was one district of Attica, the territory of Oropus, which properly belonged to Boeotia, as it was situated to the north of Parnes; but on this the Athenians always endeavoured to retain a firm hold, because it facilitated their communications with Euboea. The command of that island was of the utmost importance to them; for, if Aegina could rightly be called "the eyesore of the Peiraeus," Euboea was quite as truly a thorn in the side of Attica; for we learn from Demosthenes (*De Cor.* p. 307) that at one period the pirates that made it their headquarters so infested the neighbouring sea as to prevent all navigation.

Eastern Attica.

The place in Attica which has been the chief scene of excavations (independently of Athens and its vicinty) is Eleusis (*q.v.*), where the remains of the sanctuary of Demeter, the home of the Eleusinian Mysteries, together with other buildings in its neighbourhood, were cleared by the Greek Archaeological Society in 1882–1887 and 1895–1896. Of the other classical ruins in Attica the best-known is the temple of Athena at Sunium, which forms a conspicuous object on the headland, to which it gave the name of Cape Colonnae, still used by the peasants. It is in the Doric style, of white marble, and eleven columns of the peristyle and one of the pronaos are now standing. At Thoricus there is a theatre, which was cleared of earth by the archaeologists of the American School in 1886. In the neighbourhood of Rhamnus are the remains of two temples that stood side by side, the larger of which was dedicated to Nemesis, the smaller probably to Themis, of which goddess a fine statue was discovered in its ruins in the course of the excavations of the Greek Archaeological Society in 1890. The same Society, in 1884, 1886 and 1887, excavated the sanctuary of Amphiaraus, 4 m. from Oropus; in ancient times this was the resort of numerous invalids, who came thither to consult the healing divinity. Within it were found a temple of Amphiaraus, a large altar, and a long colonnade, which may have been the dormitory where the patients slept in hope of obtaining counsel in dreams. There were also baths and a small theatre, and numerous inscriptions relating to the arrangement and observances of the sanctuary and oracle. The walls and towers also of the city of Eleutherae and the fortress of Phyle are fine specimens of Hellenic fortifications.

Excavations.

Of the condition of Attica in medieval and modern times little need be said, for it has followed for the most part the fortunes of Athens. The population, however, has undergone a great change, independently of the large admixture of Slavonic blood that has affected the Greeks of the mainland generally, by the immigration of Albanian colonists, who now occupy a great part of the country. The district formed part of the *nome* (administrative division) of Boeotia and Attica until 1899, when it became a separate *nome*.

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ATTIC BASE, the term given in architecture to the base of the Roman Ionic order, consisting of an upper and lower torus, separated by a scotia (*q.v.*) and fillets. It was the favourite base of the Romans, and was employed by them for columns of the Corinthian and Composite orders, and in Byzantine and Romanesque work would seem to have been generally adopted as a model.

ATTICUS, TITUS POMPONIUS (109–32 B.C.), Roman patron of letters, was born at Rome three years before Cicero, with whom he and the younger Marius were educated. His name was Titus Pomponius, that of Atticus, by which he is known, being given him afterwards from his long residence in Athens (86–65) and his intimate acquaintance with the Greek literature and language. His family is said to have been of noble and ancient descent; his father belonged to the equestrian order, and was very wealthy. When Pomponius was still a young man his father died, and he at once took the prudent resolution of transferring himself and his fortune to Athens, in order to escape the dangers of the civil war, in which he might have been involved through his connexion with the murdered tribune, Sulpicius Rufus. Here he lived in retirement, devoting himself entirely to study. On his return to Rome, he took possession of an inheritance left him by his uncle and assumed the name of Quintus Caecilius Pomponianus. From this time he kept aloof from political strife, attaching himself to no particular party, and continuing on intimate terms with men so opposed as Caesar and Pompey, Antony and Octavian. His most intimate friend,

however, was Cicero, whose correspondence with him extended over many years, and who seems to have found his prudent counsel and sympathy a remedy for all his many troubles. His private life was tranquil and happy. He did not marry till he was fifty-three years of age, and his only child became the wife of Marcus Vipsanius Agrippa, the distinguished minister of Augustus. In 32, being seized with an illness believed to be incurable, he starved himself to death. Of his writings none is extant, but mention is made of two: a Greek history of Cicero's consulship, and some annals, in Latin, an epitome of the events of Roman history down to the year 54. His most important work was his edition of the letters addressed to him by Cicero. He also formed a large library at Athens, and engaged a staff of slaves to make copies of valuable works.

See Life by Cornelius Nepos; Berwick, *Lives of Messalla Corvinus and T.P.A.* (1813); Fialon, *Thesis in T.P.A.* (1861); Boissier, *Cicéron et ses amis* (1888; Eng. trans. A. D. Jones, 1897); Peter, *Historicorum Romanorum Fragmenta.*

ATTICUS HERODES, TIBERIUS CLAUDIUS (c. A.D. 101–177), Greek rhetorician, was born at Marathon in Attica. He belonged to a wealthy and distinguished family, and received a careful education under the most distinguished masters of the time, especially in rhetoric and philosophy. His talents gained him the favourable notice of Hadrian, who appointed him praefect of the free towns in the province of Asia (125). On his return to Athens, he attained great celebrity as an orator and teacher of rhetoric, and was elected to the office of archon. In 140 he was summoned by Antoninus Pius to undertake the education of Marcus Aurelius and Lucius Verus, and received many marks of favour, amongst them the consulship (143). He is principally celebrated, however, for the vast sums he expended on public purposes. He built at Athens a great race-course of Pentelic marble, and a splendid musical theatre, called the Odeum in memory of his wife Regilla, which still exists. At Corinth he built a theatre, at Delphi a stadium, at Thermopylae hot baths, at Canusium in Italy an aqueduct. He even contemplated cutting a canal through the Isthmus of Corinth, but was afraid to carry out his plan because the same thing had been unsuccessfully attempted before by the emperor Nero. Many of the partially ruined cities of Greece were restored by Atticus, and numerous inscriptions testify their gratitude to their benefactor. His latter years were embittered by family misfortune, and having incurred the enmity of the Athenians, he withdrew from Athens to his villa near Marathon, where he died. He enjoyed a very high reputation amongst his contemporaries, and wrote numerous works, of which the only one to come down to us is a rhetorical exercise *On the Constitution* (ed. Hass, 1880), advocating an alliance of the Thebans and Peloponnesians against Archelaus, king of Macedonia. The genuineness of this speech, which is of little merit, has been disputed.

Philostratus, *Vit. Soph.* ii. 1; Fiorillo, *Herodis Attici quae supersunt* (1801); *A Biographical Notice of A.H.* (London, 1832), privately printed; Fuelles, *De Herodis Attici Vita* (1864); Vidal-Lablache, *Hérode Atticus* (1871).

ATTILA (d. 453), king of the Huns, became king in 433, along with his brother Bleda, on the death of his uncle Roua. We hear but little as to Bleda, who died about 445, possibly slain by his brother's orders. In the first eight years of his reign Attila was chiefly occupied in the wars with other barbarian tribes, by which he made himself virtually supreme in central Europe. His own special kingdom comprised the countries which are now called Hungary and Transylvania, his capital being possibly not far from the modern city of Buda-Pest; but having made the Ostrogoths, the Gepidae and many other Teutonic tribes his subject-allies, and having also sent his invading armies into Media, he seems for nearly twenty years to have ruled practically without a rival from the Caspian to the Rhine. Very early in his reign, Honoria, grand-daughter of the emperor Theodosius II., being subjected to severe restraint on account of an amorous intrigue with one of the chamberlains of the palace, sent her ring to the king of the Huns and called on him to be her husband and her deliverer. Nothing came of the proposed engagement, but the wrongs of Honoria, his affianced wife, served as a convenient pretext for some of the constantly recurring embassies with which Attila, fond of trampling on the fallen majesty of Rome, worried and bullied the two courts of Constantinople and Ravenna. Another frequent subject of complaint was found in certain sacred vessels which the bishop of Sirmium had sent as a bribe to the secretary of Attila, and which had been by him, fraudulently, as his master contended, pawned to a silversmith at Rome. There were also frequent and imperious demands for the surrender of fugitives who had sought shelter from the wrath of Attila within the limits of the empire. One of the return embassies from Constantinople, that sent in 448, had the great advantage of being accompanied by a rhetorician named Priscus, whose minute journalistic account of the negotiations, including as it does a vivid picture of the great Hun in his banquet-hall, is by far the most valuable source of information as to the court and camp of Attila. What lends additional interest to the story is the fact that in the ambassador's suite there was an interpreter named Vigilas, who for fifty pounds of gold had promised to assassinate Attila. This base design was discovered by the Hunnish king, but had never been revealed to the head of the embassy or to his secretary. The situations created by this strange combination of honest diplomacy and secret villainy are described by Priscus with real dramatic power.

In 450 Theodosius II., the incapable emperor of the East, died, and his throne was occupied by a veteran soldier named Marcian, who answered the insulting message of Attila in a manlier tone than his predecessor. Accordingly the Hun, who had something of the bully in his nature, now turned upon Valentinian III., the trembling emperor of the West, and demanded redress for the wrongs of Honoria, and one-half of Valentinian's dominions as her dowry. Allying himself with the Franks and Vandals, he led his vast many-nationed army to the Rhine in the spring of 451, crossed that river, and sacked, apparently, most of the cities in Belgic Gaul. Most fortunately for Europe, the Teutonic races already settled in Gaul rallied to the defence of the empire against invaders infinitely more barbarous than themselves. Prominent in this new coalition was Theodoric, king of the Visigoths, whose capital city was Toulouse. His firm fighting alliance with the Roman general Aëtius, with whom he had had many a conflict in previous years, was one of the best auguries for the new Europe that was to arise out of the ruins of the Roman empire. Meanwhile Attila had reached the Loire and was besieging the strong city of Orléans. The citizens, under the leadership of their bishop Anianus, made a heroic defence, but the place was on the point of being taken when, on the 24th of June, the allied Romano-Gothic army was seen on the horizon. Attila, who knew the difficulty that he should have in feeding his immense army if his march was further delayed, turned again to the north-east, was persuaded by the venerable bishop Lupus to spare the city of Troyes, but halted near that place in the Catalaunian plains and offered battle to his pursuers Aëtius and Theodoric. The battle which followed—certainly one of the decisive battles of the world—has been well described by the Gothic historian Jordanes as "ruthless, manifold, immense, obstinate." It lasted for the whole day, and the number of the slain is variously stated at 175,000 and 300,000. All such estimates are, of course, untrustworthy, but there is no doubt that the carnage was terrible. The Visigothic king was slain, but the victory, though hardly earned, remained with his people and his allies. Attila did not venture to renew the engagement on the morrow, but retreated, apparently in good order, on the Rhine, recrossed that river and returned to his Pannonian home. From thence in the spring of 452 he again set forth to ravage or to conquer Italy. Her great champion Aëtius showed less energy in her cause than he had shown in his defence of Gaul. After a stubborn contest, Attila took and utterly destroyed Aquileia, the chief city of Venetia, and then proceeded on his destructive course, capturing and burning the cities at the head of the Adriatic, Concordia, Altinum and Patavium (Padua). The fugitives from these cities, but especially from the last, seeking shelter in the lagoons of the Adriatic, laid the foundations of

that which was one day to become the glorious city of Venice. Upon Milan and the cities of western Lombardy the hand of Attila seems to have weighed more lightly, plundering rather than utterly destroying; and at last when Pope Leo I., at the head of a deputation of Roman senators, appeared in his camp on the banks of the Mincio, entreating him not to pursue his victorious career to the gates of Rome, he yielded to their entreaties and consented to cross the Alps, with a menace, however, of future return, should the wrongs of Honoria remain unredressed. As he himself jokingly said: he knew how to conquer men, but the Lion and the Wolf (Leo and Lupus) were too strong for him. No further expeditions of Italy were undertaken by Attila, who died suddenly in 453, in the night following a great banquet which celebrated his marriage with a damsel named Ildico. Notwithstanding some rumours of violence it is probable that his death was natural and due to his own intemperate habits.

Under his name of Etzel, Attila plays a great part in Teutonic legend (see NIBELUNGENLIED) and under that of Atli in Scandinavian Saga, but his historic lineaments are greatly obscured in both. He was short of stature, swarthy and broad-chested, with a large head which early turned grey, snub nose and deep-set eyes. He walked with proud step, darting a haughty glance this way and that as if he felt himself lord of all. -

The chief authorities for the life of Attila are Priscus, Jordanes, the *Historia Miscella*, Apollonius Sidonius and Gregory of Tours. (T. H.)

ATTIS, or ATYS, a deity worshipped in Phrygia, and later throughout the Roman empire, in conjunction with the Great Mother of the Gods. Like Aphrodite and Adonis in Syria, Baal and Astarte at Sidon, and Isis and Osiris in Egypt, the Great Mother and Attis formed a duality which symbolized the relations between Mother Earth and her fruitage. Their worship included the celebration of mysteries annually on the return of the spring season. Attis was also known as Papas, and the Bithynians and Phrygians, according to evidence of the time of the late Empire, called him Zeus. He was never worshipped independently, however, though the worship of the Great Mother was not always accompanied by his. He was confused with Pan, Sabazios, Men and Adonis, and there were resemblances between the orgiastic features of his worship and that of Dionysus. His resemblance to Adonis has led to the theory that the names of the two are identical, and that Attis is only the Semitic companion of Syrian Aphrodite grafted on to the Phrygian Great Mother worship (Haakh, *Stuttgarter-Philolog.-Vers.*, 1857, 176 ff.). It is likely, however, that Attis, like the Great Mother, was indigenous to Asia Minor, adopted by the invading Phrygians, and blended by them with a deity of their own.

Legends.—According to Pausanias (vii. 17), Attis was a beautiful youth born of the daughter of the river Sangarius, who was descended from the hermaphroditic Agdistis, a monster sprung from the earth by the seed of Zeus. Having become enamoured of Attis, Agdistis struck him with frenzy as he was about to wed the king's daughter, with the result that he deprived himself of manhood and died. Agdistis in repentance prevailed upon Zeus to grant that the body of the youth should never decay or waste. In Arnobius (v. 5-8) Attis emasculates himself under a pine tree, which the Great Mother bears into her cave as she and Agdistis together wildly lament the death of the youth. Zeus grants the petition as in the version of Pausanias, but permits the hair of Attis to grow, and his little finger to move. The little finger, *digitus*, δάκτυλος, is interpreted as the phallus by Georg Kaibel (*Göttinger Nachrichten*, 1901, p. 513). In Diodorus (iii. 58, 59) the Mother is the carnal lover of Attis, and, when her father the king discovers her fault and kills her lover, roams the earth in wild grief. In Ovid (*Fasti*, iv. 223 ff.) she is inspired with chaste love for him, which he pledges himself to reciprocate. On his proving unfaithful, the Great Mother slays the nymph with whom he has sinned, whereupon in madness he mutilates himself as a penalty. Another form of the legend (Paus. vii. 17), showing the influence of the Aphrodite-Adonis myth, relates that Attis, the impotent son of the Phrygian Caläus, went into Lydia to institute the worship of the Great Mother, and was there slain by a boar sent by Zeus.

See GREAT MOTHER OF THE GODS; J. G. Frazer, *Adonis, Attis, Osiris* (1906). (G. SN.)

ATTLEBOROUGH, a township of Bristol county, in south-east Massachusetts, U.S.A. Pop. (1890) 7577; (1900) 11,335, of whom 3237 were foreign-born; (1906, estimate) 12,975. It is traversed by the New York, New Haven & Hartford railway, and by inter-urban electric lines. It has an area of 28 sq. m. The population is largely concentrated in and about the village which bears the name of the township. In Attleborough are the Attleborough Home Sanitarium, and a public library (1885). The principal manufactures of the township are jewelry, silverware, cotton goods, cotton machinery, coffin trimmings, and leather. In 1905 the total value of the township's factory products was $10,050,384, of which $5,544,285 was the value of jewelry, Attleborough ranking fourth among the cities of the country in this industry, and producing 10·4% of the total jewelry product of the United States. Attleborough was incorporated in 1694, though settled soon after 1661 (records since 1672) as part of Rehoboth. In 1887 the township was divided in population, wealth and area by the creation of the township of NORTH ATTLEBOROUGH—pop. (1890) 6727; (1900) 7253, of whom 1786 were foreign-born; (1905, state census) 7878. This township produced manufactured goods in 1900 to the value of $3,990,731, jewelry valued at $2,785,567; it maintains the Richards memorial library.

See J. Daggett, *A Sketch of the History of Attleborough to 1887* (Boston, 1894).

ATTOCK, a town and fort of British India, in the Rawalpindi district of the Punjab, 47 m. by rail from Peshawar, and situated on the eastern bank of the Indus. Pop. (1901) 2822. The place is of both political and commercial importance, as the Indus is here crossed by the military and trade route through the Khyber Pass into Afghanistan. Alexander the Great, Tamerlane and Nadir Shah are believed to have successively crossed the Indus at or about this spot in their respective invasions of India. The river runs past Attock in a deep rapid channel about 200 yds. broad, but is easily crossed in boats or on inflated skins of oxen. The rocky gorges through which it flows, with a distant view of the Hindu Kush, form some of the finest scenery in the world. In 1883 an iron girder bridge of five spans was opened, which carries the North-Western railway to Peshawar, and has also a subway for wheeled traffic and foot passengers. The fort of Attock was built by the emperor Akbar in 1581, on a low hillock beside the river. The walls are of polished stone, and the whole structure is handsome; but from a military point of view it is of little importance, being commanded by a hill, from which it is divided only by a ravine. On the opposite side of the river is the village of Khairabad, with a fort, also erected by Akbar according to some, or by Nadir Shah according to others. The military importance of Attock has diminished, but it still has a small detachment of British troops.

ATTORNEY (from O. Fr. *atorné*, a person appointed to act for another, from *atourner*, legal Lat. *attornare*, attorn, literally to turn over to another or commit business to another), in English law, in its widest sense, any substitute or agent appointed to act in " the turn, stead or place of another." Attorneys are of two kinds, attorneys-in-fact and attorneys-at-law. An attorney-in-fact is simply an agent, the extent of whose capacity to act is bounded only by the powers embodied in his authority, his *power of attorney*. An attorney-at-law was a public officer, conducting legal proceedings on behalf of others, known as his clients, and attached to the supreme courts of common law at Westminster. Attorneys-at-law corresponded to the solicitors of the courts of chancery and the proctors of the admiralty, ecclesiastical, probate and divorce courts. Since the passing of the Judicature Act of 1873, however, the designation " attorney" has become obsolete in England, all persons admitted as solicitors,

attorneys or proctors of an English court being henceforth called "solicitors of the supreme court" (see SOLICITOR).

In the United States an attorney-at-law exercises all the functions distributed in England between barristers, attorneys and solicitors, and his full title is "attorney and counsellor-at-law." When acting in a court of admiralty he is styled "proctor" or "advocate." Formerly, in some states, there existed a grade among lawyers of attorneys-at-law, which was inferior to that of counsellors-at-law, and in colonial times New Jersey established a higher rank still—that of serjeant-at-law. Now the term attorney-at-law is precisely equivalent to that of lawyer. Attorneys are admitted by some court to which the legislature confides the power, and on examination prescribed by the court, or by a board of state examiners, as the case may be. The term of study required is generally two or three years, but in some states less. In one no examination is required. College graduates are often admitted to examination after a shorter term of study than that required from those not so educated. In the courts of the United States, admission is regulated by rules of court and based upon a previous admission to the state bar. In almost all states aliens are not admitted as attorneys, and in many states women are ineligible, but during recent years several states have passed statutes permitting them to practise. Since 1879 women have been eligible to practise before the U. S. Supreme Court, if already admitted to practise in some state court, under the same conditions as men. A *state attorney* or *district attorney* is the local public prosecutor. He is either elected by popular vote at the state elections for the district in which he resides and goes out of office with the political party for which he was elected, or he is appointed by the governor of the state for that district and for the same term. He represents the state in criminal prosecutions and also in civil actions within his district. There is a *United States district attorney* in each federal district, similarly representing the federal government before the courts.

An attorney is an officer of the court which admits him to practise, and he is subject to its discipline. He is liable to his client in damages for failure to exercise ordinary care and skill, and he can bring action for the value of his services. He has a lien on his client's papers, and usually on any judgment in favour of his client to secure the payment of his fees. (See also under BAR, THE.)

ATTORNEY-GENERAL, in England, the chief law officer appointed to manage all the legal affairs and suits in which the crown is interested. He is appointed by letters-patent authorizing him to hold office during the sovereign's pleasure. He is *ex officio* the leader of the bar, and only counsel of the highest eminence are appointed to the office. The origin of the office is uncertain, but as far back as 1277 we find an *attornatus regis* appointed to look after the interests of the crown, in proceedings affecting it before the courts. He has precedence in all the courts, and in the House of Lords he has precedence of the lord advocate, even in Scottish appeals, but unlike the lord advocate and the Irish attorney-general he is not necessarily made a privy councillor. He is a necessary party to all proceedings affecting the crown, and has extensive powers of control in matters relating to charities, lunatics' estates, criminal prosecutions, &c. The attorney-general and the solicitor-general are always members of the House of Commons (except for temporary difficulties in obtaining a seat) and of the ministry, being selected from the party in power, and their advice is at the disposal of the government and of each department of the government, while in the House of Commons they defend the legality of ministerial action if called in question. Previously to 1895 there was no restriction placed on the law officers as to their acceptance of private practice, but since that date this privilege has been withdrawn, and the salary of the attorney-general is fixed at £7000 a year and in addition such fees according to the ordinary professional scales as he may receive for any litigious business he may conduct on behalf of the crown. The crown has also as a legal adviser an attorney-general in Ireland. In Scotland he is called lord advocate (*q.v.*). There is also an attorney-general in almost all the British colonies, and his duties are very similar to those of the same officer in England. In the self-governing colonies he is appointed by the administration of the colony, and in the crown colonies by royal warrant under the signet and sign-manual. There is an attorney-general for the duchy of Cornwall and also one for the duchy of Lancaster, each of whom sues in matters relating to that duchy.

The United States has an officer of this name, who has a seat in the cabinet. His duties are in general to represent the federal government before the United States Supreme Court, to advise the president on questions of law, and to advise similarly the heads of the state departments with reference to matters affecting their department. His opinions are published by the government periodically for the use of its officials and they are frequently cited by the courts. Every state but one or two has a similar officer. He represents the state in important legal matters, and is often required to assist the local prosecutor in trials for capital offences. He appears for the public interest in suits affecting public charities. He is generally elected by the people for the same term as the governor and on the same ticket.

ATTORNMENT (from Fr. *tourner*, to turn), in English real property law, the acknowledgment of a new lord by the tenant on the alienation of land. Under the feudal system, the relations of landlord and tenant were to a certain extent reciprocal. So it was considered unreasonable to the tenant to subject him to a new lord without his own approval, and it thus came about that alienation could not take place without the consent of the tenant. Attornment was also extended to all cases of lessees for life or for years. The necessity for attornment was abolished by an act of 1705. The term is now used to indicate an acknowledgment of the existence of the relationship of landlord and tenant. An attornment-clause, in mortgages, is a clause whereby the mortgagor attorns tenant to the mortgagee, thus giving the mortgagee the right to distrain, as an additional security.

ATTRITION (Lat. *attritio*, formed from *atterere*, to rub away), a rubbing away; a term used in pathology and geology. Theologians have also distinguished "attrition" from "contrition" in the matter of sin, as an imperfect stage in the process of repentance; attrition being due to servile fear of the consequences of sin, contrition to filial fear of God and hatred of sin for His sake. It has been held among the Roman Catholics that in the sacrament of penance attrition becomes contrition.

ATTWOOD, THOMAS (1765–1838), English composer, the son of a coal merchant who had musical tastes, was born in London on the 23rd of November 1765. At the age of nine he became a chorister in the Chapel Royal, where he remained for five years. In 1783 he was sent to study abroad at the expense of the prince of Wales (afterwards George IV.), who had been favourably impressed by his skill at the harpsichord. After spending two years at Naples, Attwood proceeded to Vienna, where he became a favourite pupil of Mozart. On his return to London in 1787 he held for a short time an appointment as one of the chamber musicians to the prince of Wales. In 1796 he was chosen organist of St Paul's, and in the same year he was made composer to the Chapel Royal. His court connexion was further confirmed by his appointment as musical instructor to the duchess of York, and afterwards to the princess of Wales. For the coronation of George IV. he composed the anthem, "The King shall rejoice," a work of high merit. The king, who had neglected him for some years on account of his connexion with the princess of Wales, now restored him to favour, and in 1821 appointed him organist to his private chapel at Brighton. Soon after the institution of the Royal Academy of Music in 1823, Attwood was chosen one of the professors. He was also one of the original members of the Philharmonic Society, founded in 1813. He wrote the anthem, "O Lord, grant the King a Long Life," which was performed at the coronation of William IV., and he was composing a similar work for the coronation of Queen Victoria when he died at his house in Cheyne Walk, Chelsea, on the 24th of March 1838. He was buried under the organ in St Paul's cathedral. His services and anthems

were published in a collected form after his death by his pupil Walmisley. Of his secular compositions several songs and glees are well known and popular. The numerous operas which he composed in early life are now practically forgotten. Of his songs the most popular was "The Soldier's Dream," and the best of his glees were "In peace Love tunes the shepherd's reed," and "To all that breathe the air of Heaven." Attwood was a friend of Mendelssohn, for whom he professed an admiration at a time when the young German's talent was little appreciated by the majority of English musicians.

ATTWOOD, THOMAS (1783–1856), English political reformer, was born at Halesowen, Worcestershire, on the 6th of October 1783. In 1800 he entered his father's banking business in Birmingham, where he was elected high bailiff in 1811. He took a leading part in the public life of the city, and became very popular with the artisan class. He is now remembered for his share in the movement which led to the carrying of the Reform Act of 1832. He was one of the founders, in January 1830, of the Political Union, branches of which were soon formed throughout England. Under his leadership vast crowds of workingmen met periodically in the neighbourhood of Birmingham to demonstrate in favour of reform of the franchise, and Attwood used his power over the multitude to repress any action on their part which might savour of illegality. His successful exertions in favour of reform made him a popular hero all over the country, and he was presented with the freedom of the city of London. After the passing of the Reform Act in 1832 he was elected one of the members for the new borough of Birmingham, for which he sat till 1839. He failed in the House of Commons to maintain the reputation which he had made outside it, for in addition to an eager partisanship in favour of every ultra-democratic movement, he was wearisomely persistent in advocating his peculiar monetary theory. This theory, which became with him a monomania, was that the existing currency should be rectified in favour of state-regulated and inconvertible paper-money, and the adoption of a system for altering the standard of value as prices fluctuated. His waning influence with his constituents led him to retire from parliament in 1837, and, though invited to re-enter political life in 1843, he had by that time become a thoroughly spent force. He died at Great Malvern on the 6th of March 1856.

His grandson, C. M. Wakefield, wrote his life "for private circulation" (there is a copy in the British Museum), and his economic theories are set forth in a little book, *Gemini*, by T. B. Wright and J. Harlow, published in 1844.

ATWOOD, GEORGE (1746–1807), English mathematician, was born in the early part of the year 1746. He entered Westminster school, and in 1759 was elected to a scholarship at Trinity College, Cambridge. He graduated in 1769, with the rank of third wrangler and first Smith's prizeman. Subsequently he became a fellow and a tutor of the college, and in 1776 was elected a fellow of the Royal Society of London. In the year 1784 he left Cambridge, and soon afterwards received from William Pitt the office of a patent searcher of the customs, which required but little attendance, and enabled him to devote a considerable portion of his time to his special studies. He died in July 1807. Atwood's published works, exclusive of papers contributed to the *Philosophical Transactions*, for one of which he obtained the Copley medal, are as follows:—*Analysis of a Course of Lectures on the Principles of Natural Philosophy* (Cambridge, 1784); *Treatise on the Rectilinear Motion and Rotation of Bodies* (Cambridge, 1784), which gives some interesting experiments, by means of which mechanical truths can be ocularly exhibited and demonstrated, and describes the machine, since called by Atwood's name, for verifying experimentally the laws of simple acceleration of motion; *Review of the Statutes and Ordinances of Assize which have been established in England from the 4th year of King John, 1202, to the 37th of his present Majesty* (London, 1801), a work of some historical research; *Dissertation on the Construction and Properties of Arches* (London, 1801), with supplement, pt. i., 1801, pt. ii., 1804, an elaborate work, now completely superseded.

AUBADE (a French word from *aube*, the dawn), the dawn-song of the troubadours of Provence, developed by the Minnesingers (*q.v.*) of Germany into the *Tagelied*, the song of the parting at dawn of lovers at the warning of the watchman. In France in modern times the term is applied to the performance of a military band in the early morning in honour of some distinguished person.

AUBAGNE, a town of south-eastern France, in the department of Bouches-du-Rhône on the Huveaune, 11 m. E. of Marseilles by rail. Pop. (1906) 6039. The town carries on the manufacture of earthenware and pottery, leather, &c. and the cultivation of fruit and wine. There is a fountain to the memory of the statesman, F. Barthélemy (d. 1830), born at Aubagne.

AUBE, a department of north-eastern France, bounded N. by the department of Marne, N.W. by Seine-et-Marne, W. by Yonne, S. by Yonne and Cote-d'Or, and E. by Haute-Marne; it was formed in 1790 from Basse-Champagne, and a small portion of Burgundy. Area, 2326 sq. m. Pop. (1906) 243,670. The department belongs to the Seine basin, and is watered chiefly by the Seine and the Aube. These rivers follow the general slope of the department, which is from south-east, where the Bois du Mont (1200 ft.), the highest point, is situated, to north-west. The southern and eastern districts are fertile and well wooded. The remainder of the department, with the exception of a more broken and picturesque district in the extreme north-west, forms part of the sterile and monotonous plain known as Champagne Pouilleuse. The climate is mild but damp. The annual rainfall over the greater part varies from 24 to 28 in.; but in the extreme south-east it at times reaches a height of 36 in. Aube is an agricultural department; more than one-third of its surface consists of arable land of which the chief products are wheat and oats, and next to them rye, barley and potatoes; vegetables are extensively cultivated in the valleys of the Seine and the Aube. The vine flourishes chiefly on the hills of the south-east; the wines of Les Riceys, Bar-sur-Aube, Bouilly and Laines-aux-Bois are most esteemed. The river valleys abound in natural pasture, and sainfoin, lucerne and other forage crops are largely grown; cattle-raising is an important source of wealth, and the cheeses of Troyes are well known. There are excellent nurseries and orchards in the neighbourhood of Troyes, Bar-sur-Seine, Méry-sur-Seine and Brienne. Chalk, from which *blanc de Troyes* is manufactured, and clay are abundant; and there are peat workings and quarries of building-stone and limestone. The spinning and weaving of cotton and the manufacture of hosiery, of both of which Troyes is the centre, are the main industries of the department; there are also a large number of distilleries, tanneries, oil works, tile and brick works, flour-mills, saw-mills and dye-works. The Eastern railway has works at Romilly, and there are iron works at Clairvaux and wire-drawing works at Plaines; but owing to the absence of coal and iron mines, metal working is of small importance. The exports of Aube consist of timber, cereals, agricultural products, hosiery, wine, dressed pork, &c.; its imports include wool and raw cotton, coal and machinery, especially looms. The department is served by the Eastern railway, of which the main line to Belfort crosses it. The river Aube is navigable for 28 m. (from Arcis-sur-Aube to its confluence with the Seine); the Canal de la Haute-Seine extends beside the Seine from Bar-sur-Seine to Marcilly (just outside the department) a distance of 46 m.; below Marcilly the Seine is canalized.

Aube is divided into 5 arrondissements with 26 cantons and 446 communes. It falls within the educational circumscription (*académie*) of Dijon and the military circumscription of the XX. army corps; its court of appeal is in Paris. It constitutes the diocese of Troyes and part of the archiepiscopal province of Sens. The capital of the department is Troyes; of the arrondissements the capitals are Troyes, Bar-sur-Aube, Arcis-sur-Aube, Bar-sur-Seine and Nogent-sur-Seine. The architecture of the department is chiefly displayed in its churches, many of which possess stained glass of the 16th century. Besides the cathedral and other churches of Troyes, those of Mussy-sur-Seine (13th century), Chaource (16th century) and Nogent-sur-Seine (15th and 16th

centuries), are of note. The abbey buildings of Clairvaux are the type of the Cistercian abbey.

AUBENAS, a town of south-eastern France, in the department of Ardèche, 19 m. S.W. of Privas by road. Pop. (1906) 3976 (town), 7064 (commune). Aubenas is beautifully situated on the slope of a hill, on the right bank of the Ardèche, but its streets generally are crooked and narrow. It has a castle of the 13th and 16th centuries, now occupied by several of the public institutions of the town. These include a tribunal and chamber of commerce, and a conditioning-house for silk. Iron and coal mines are worked in the vicinity. As the centre of the silk trade of southern France Aubenas is a place of considerable traffic. It has also a large silk spinning and weaving industry, and carries on tanning and various minor industries together with trade in silk. The district is rich in plantations of mulberries and olives.

AUBER, DANIEL FRANÇOIS ESPRIT (1782–1871), French musical composer, the son of a Paris printseller, was born at Caen in Normandy on the 29th of January 1782. Destined by his father to the pursuits of trade, he was allowed, nevertheless, to indulge his fondness for music, and learnt to play at an early age on several instruments, his first teacher being the Tirolean composer, I. A. Ladurner. Sent at the age of twenty to London to complete his business training, he was obliged to leave England in consequence of the breach of the treaty of Amiens (1804). He had already attempted musical composition, and at this period produced several *concertos pour basse*, in the manner of the violoncellist, Lamarre, in whose name they were published. The praise given to his concerto for the violin, which was played at the Conservatoire by Mazas, encouraged him to undertake the resetting of the old comic opera, *Julie* (1811). Conscious by this time of the need of regular study of his chosen art, he placed himself under the severe training of Cherubini, by which the special qualities of the young composer were admirably developed. In 1813 he made his *début* in an opera in one act, the *Séjour militaire*, the unfavourable reception of which put an end for some years to his attempts as composer. But the failure in business and death of his father, in 1819, compelled him once more to turn to music, and to make that which had been his pastime the serious employment of his life. He produced another opera, the *Testament et les billets-doux* (1819), which was no better received than the former. But he persevered, and the next year was rewarded by the complete success of his *Bergère châtelaine*, an opera in three acts. This was the first in a long series of brilliant successes. In 1822 began his long association with A. E. Scribe, who shared with him, as librettist, the success and growing popularity of his compositions. The opera of *Leicester*, in which they first worked together (1823), is remarkable also as showing evidences of the influence of Rossini. But his own style was an individual one, marked by lightness and facility, sparkling vivacity, grace and elegance, clear and piquant melody—characteristically French. In *La Muette de Portici*, familiarly known as *Masaniello*, Auber achieved his greatest musical triumph. Produced at Paris in 1828, it rapidly became a European favourite, and its overture, songs and choruses were everywhere heard. The duet, "Amour sacré de la patrie," was welcomed like a new *Marseillaise*; sung by Nourrit at Brussels in 1830, it became the signal for the revolution which broke out there. Of Auber's remaining operas (about 50 in all) the more important are: *Le Maçon* (1825), *La Fiancée* (1829), *Fra Diavolo* (1830), *Lestocq* (1834), *Le Cheval de bronze* (1835), *L'Ambassadrice* (1836), *Le Domino noir* (1837), *Le Lac des fées* (1839), *Les Diamants de la couronne* (1841), *Haydée* (1847), *Marco Spada* (1853), *Manon Lescaut* (1856), and *La Fiancée du roi des Garbes* (1S64). Official and other dignities testified the public appreciation of Auber's works. In 1829 he was elected member of the Institute, in 1830 he was named director of the court concerts, and in 1842, at the wish of Louis Philippe, he succeeded Cherubini as director of the Conservatoire. He was also a member of the Legion of Honour from 1S25, and attained the rank of commander in 1847. Napoleon III. made Auber his Imperial Maître de Chapelle in 1857.

One of Auber's latest compositions was a march, written for the opening of the International Exhibition in London in 1862. His fascinating manners, his witty sayings, and his ever-ready kindness and beneficence won for him a secure place in the respect and love of his fellow-citizens. He remained in his old home during the German siege of Paris, 1870–71, but the miseries of the Communist war which followed sickened his heart, and he died in Paris on the 13th of May 1871.

See Adolph Kohut, "Auber," vol. xvii. of *Musiker Biographien* (Leipzig, 1895).

AUBERGINE (diminutive of Fr. *auberge*, a variant of *alberge*, a kind of peach), or EGG PLANT (*Solanum melongena*, var. *ovigerum*), a tender annual widely cultivated in the warmer parts of the earth, and in France and Italy, for the sake of its fruits, which are eaten as a vegetable. The seed should be sown early in February in a warm pit, where the plants are grown till shifted into 8-in. or 10-in. pots, in well-manured soil. Liquid manure should be given occasionally while the fruit is swelling; about four fruits are sufficient for one plant. The French growers sow them in a brisk heat in December, or early in January, and in March plant them out four or eight in a hot-bed with a bottom heat of from 60° to 68°, the sashes being gradually more widely opened as the season advances, until at about the end of May they may be taken off. The two main branches which are allowed are pinched to induce laterals, but when the fruits are set all young shoots are taken off in order to increase their size. The best variety is the large purple, which produces oblong fruit, sometimes reaching 6 or 7 in. in length and 10 or 12 in. in circumference. The fruit of the ordinary form almost exactly resembles the egg of the domestic fowl. It is also grown as an ornamental plant, for covering walls or trellises; especially the black-fruited kind.

AUBERVILLIERS, or AUBERVILLIERS-LES-VERTUS, a town of northern France, in the department of Seine, on the canal St Denis, 2 m. from the right bank of the Seine and 1 m. N. of the fortifications of Paris. Pop. (1906) 33,358. Its manufactures include cardboard, glue, oils, colours, fertilizers, chemical products, perfumery, &c. During the middle ages and till modern times Aubervilliers was the resort of numerous pilgrims, who came to pay honour to Notre Dame des Vertus. In 1814 the locality was the scene of a stubborn combat between the French and the Allies.

AUBIGNAC, FRANÇOIS HÉDELIN, ABBÉ D' (1604–1676), French author, was born at Paris on the 4th of August 1604. His father practised at the Paris bar, and his mother was a daughter of the great surgeon Ambroise Paré. François Hédelin was educated for his father's profession, but, after practising for some time at Nemours he abandoned law, took holy orders, and was appointed tutor to one of Richelieu's nephews, the duc de Fronsac. This patronage secured for him the abbey of Aubignac and of Mainac. The death of the duc de Fonsac in 1646 put an end to hopes of further preferment, and the Abbé d'Aubignac retired to Nemours, occupying himself with literature till his death on the 25th of July 1676. He took an energetic share in the literary controversies of his time. Against Gilles Ménage he wrote a *Térence justifié* (1656); he laid claim to having originated the idea of the "*Carte de tendre*" of Mlle de Scudéry's *Clélie*; and after being a professed admirer of Corneille he turned against him because he had neglected to mention the abbé in his *Discours sur le poème dramatique*. He was the author of four tragedies: *La Cyminde* (1642), *La Pucelle d'Orléans* (1642), *Zénobie* (1647) and *Le Martyre de Sainte Catherine* (1650). *Zénobie* was written with the intention of affording a model in which the strict rules of the drama, as understood by the theorists, were observed. In the choice of subjects for his plays, he seems to have been guided by a desire to illustrate the various kinds of tragedy—patriotic, antique and religious. The dramatic authors whom he was in the habit of criticizing were not slow to take advantage of the opportunity for retaliation offered by the production of these mediocre plays. It is as a theorist that D'Aubignac still arrests attention. It has been proved that to Jean Chapelain belongs the credit of having been the first to

establish as a practical law the convention of the unities that plays so large a part in the history of the French stage; but the laws of dramatic method and construction generally were codified by d'Aubignac in his *Pratique du théâtre*. The book was only published in 1657, but had been begun at the desire of Richelieu as early as 1640. His *Conjectures académiques sur l'Iliade d'Homère*, which was not published until nearly forty years after his death, threw doubts on the existence of Homer, and anticipated in some sense the conclusions of Friedrich August Wolf in his *Prolegomena ad Homerum* (1795).

The contents of the *Pratique du théâtre* are summarized by F. Brunetière in his notice of Aubignac in the *Grande Encyclopédie*. See also G. Saintsbury, *Hist. of Criticism*, bk. v., and H. Rigault, *Hist. de la querelle des anciens et modernes*. (1859).

AUBIGNÉ, CONSTANT D' [Baron de Surineau] (*c.* 1584–1647), French adventurer, was the son of Théodore Agrippa d'Aubigné, and the father of Madame de Maintenon. Born a Protestant, he became by turns Catholic or Protestant as it suited his interests. He betrayed the Protestants in 1626, revealing to the court, after a voyage to England, the projects of the English upon La Rochelle. He was renounced by his father; then imprisoned by Richelieu's orders at Niort, where he was detained ten years. After having tried his fortunes in the Antilles, he died in Provence, leaving in destitution his wife, Jeanne de Cardillac, whom he had married in 1627. He had two children, Charles, father of the duchess of Noailles, and Françoise, known in history as Madame de Maintenon.

See T. Lavallée, *La Famille d'Aubigné et l'enfance de Madame de Maintenon* (Paris, 1863).

AUBIGNÉ, JEAN HENRI MERLE D' (1794–1872), Swiss Protestant divine and historian, was born on the 16th of August 1794, at Eaux Vives, near Geneva. The ancestors of his father, Aimé Robert Merle d'Aubigné (1755–1799), were French Protestant refugees. Jean Henri was destined by his parents to a commercial life; but at college he decided to be ordained. He was profoundly influenced by Robert Haldane, the Scottish missionary and preacher who visited Geneva. When in 1817 he went abroad to further his education, Germany was about to celebrate the tercentenary of the Reformation; and thus early he conceived the ambition to write the history of that great epoch. At Berlin he received stimulus from teachers so unlike as J. A. W. Neander and W. M. L. de Wette. After presiding for five years over the French Protestant church at Hamburg, he was, in 1823, called to become pastor of a congregation in Brussels and preacher to the court. He became also president of the consistory of the French and German Protestant churches. At the Belgian revolution of 1830 he thought it advisable to undertake pastoral work at home rather than to accept an educational post in the family of the Dutch king. The Evangelical Society had been founded with the idea of promoting evangelical Christianity in Geneva and elsewhere, but it was found that there was also needed a theological school for the training of pastors. On his return to Switzerland, d'Aubigné was invited to become professor of church history in an institution of the kind, and continued to labour in the cause of evangelical Protestantism. In him the Evangelical Alliance found a hearty promoter. He frequently visited England, was made a D.C.L. by Oxford University, and received civic honours from the city of Edinburgh. He died suddenly in 1872.

His principal works are—*Discours sur l'étude de l'histoire de Christianisme* (Geneva, 1832); *Le Luthéranisme et la Réforme* (Paris, 1844); *Germany, England and Scotland, or Recollections of a Swiss Pastor* (London, 1848); *Trois siècles de lutte en Écosse, ou deux rois et deux royaumes; Le Protecteur ou la république d'Angleterre aux jours de Cromwell* (Paris, 1848); *Le Concile et l'infaillibilité* (1870); *Histoire de la Réformation au XVIième siècle* (Paris, 1835–1853; new ed., 1861–1862, in 5 vols.); and *Histoire de la Réformation en Europe au temps de Calvin* (8 vols., 1862–1877).

The first portion of his *Histoire de la Réformation*, which was devoted to the earlier period of the movement in Germany, gave him at once a foremost place amongst modern French ecclesiastical historians, and was translated into most European tongues. The second portion, dealing with reform in the time of Calvin, was not less thorough, and had a subject hitherto less exhaustively treated, but it did not meet with the same success. This part of the subject, with which he was most competent to deal, was all but completed at the time of his death. Among his minor treatises, the most important are the vindication of the character and aims of Oliver Cromwell, and the sketch of the contendings of the Church of Scotland.

Indefatigable in sifting original documents, Aubigné had amassed a wealth of authentic information; but his desire to give in all cases a full and graphic picture, assisted by a vivid imagination, betrayed him into excess of detail concerning minor events, and in a few cases into filling up a narrative by inference from later conditions. Moreover, in his profound sympathy with the Reformers, he too frequently becomes their apologist. But his work is a monument of painstaking sincerity, and brings us into direct contact with the spirit of the period.

AUBIGNÉ, THÉODORE AGRIPPA D' (1552–1630), French poet and historian, was born at St Maury, near Pons, in Saintonge, on the 8th of February 1552. His name Agrippa (*aegre partus*) was given him through his mother dying in childbirth. In his childhood he showed a great aptitude for languages; according to his own account he knew Latin, Greek and Hebrew at six years of age; and he had translated the *Crito* of Plato before he was eleven. His father, a Huguenot who had been one of the conspirators of Amboise, strengthened his Protestant sympathies by showing him, while they were passing through that town on their way to Paris, the heads of the conspirators exposed upon the scaffold, and adjuring him not to spare his own head in order to avenge their death. After a brief residence he was obliged to flee from Paris to avoid persecution, but was captured and threatened with death. Escaping through the intervention of a friend, he went to Montargis. In his fourteenth year he was present at the siege of Orléans, at which his father was killed. His guardian sent him to Geneva, where he studied for a considerable time under the direction of Beza. In 1567 he made his escape from tutelage, and attached himself to the Huguenot army under the prince of Condé. Subsequently he joined Henry of Navarre, whom he succeeded in withdrawing from the corrupting influence of the house of Valois (1576), and to whom he rendered valuable service, both as a soldier and as a counsellor, in the wars that issued in his elevation to the throne as Henry IV. After a furious battle at Casteljaloux, and suffering from fever from his wounds, he wrote his *Tragiques* (1571). He was in the battle of Coutras (1587), and at the siege of Paris (1590). His career at camp and court, however, was a somewhat chequered one, owing to the roughness of his manner and the keenness of his criticisms, which made him many enemies and severely tried the king's patience. In his *tragédie-ballet Circe* (1576) he did not hesitate to indulge in the most outspoken sarcasm against the king and other members of the royal family. Though he more than once found it expedient to retire into private life he never entirely lost the favour of Henry, who made him governor of Maillezais. After the conversion of the king to Roman Catholicism, d'Aubigné remained true to the Huguenot cause, and a fearless advocate of the Huguenot interests. The first two volumes of the work by which he is best known, his *Histoire universelle depuis 1550 jusqu'à l'an 1601*, appeared in 1616 and 1618 respectively. The third volume was published in 1619, but, being still more free and personal in its satire than those which had preceded it, it was immediately ordered to be burned by the common hangman. The work is a lively chronicle of the incidents of camp and court life, and forms a very valuable source for the history of France during the period it embraces. In September 1620 its author was compelled to take refuge in Geneva, where he found a secure retreat for the last ten years of his life, though the hatred of the French court showed itself in procuring a sentence of death to be recorded against him more than once. He devoted the period of his exile to study, and the superintendence of works for the fortifications of Bern and Basel which were designed as a material defence of the cause of Protestantism. He died at Geneva on the 29th of April 1630.

A complete edition of his works according to the original MSS.

was begun by E. Réaume and F. de Caussade (1879). It contains all the literary works, the *Aventures du baron de Faeneste* (1617), and the *Mémoires* (6 vols., 1873–1892). The best edition of the *Histoire universelle* is by A. de Ruble. The *Mémoires* were edited by L. Lalanne (1854).

AUBIN, a town of southern France, in the department of Aveyron on the Enne, 30 m. N.W. of Rodez. In 1906 the urban population was 2229, the communal population 9986. Aubin is the centre of important coal-mines worked in the middle ages, and also has iron-mines, the product of which supplies iron works close to the town. Sheep-breeding is important in the vicinity. The church dates from the 12th century.

AUBREY, JOHN (1626–1697), English antiquary, was born at Easton Pierse or Percy, near Malmesbury, Wiltshire, on the 12th of March 1626, his father being a country gentleman of considerable fortune. He was educated at the Malmesbury grammar school under Robert Latimer, who had numbered Thomas Hobbes among his earlier pupils, and at his schoolmaster's house Aubrey first met the philosopher about whom he was to leave so many curious and interesting details. He entered Trinity College, Oxford, in 1642, but his studies were interrupted by the Civil War. In 1646 he became a student of the Middle Temple, but was never called to the bar. He spent much of his time in the country, and in 1649 he brought into notice the megalithic remains at Avebury. His father died in 1652, leaving to Aubrey large estates, and with them, unfortunately, complicated lawsuits. Aubrey, however, lived gaily, and used his means to gratify his passion for the company of celebrities and for every sort of knowledge to be gleaned about them. Anthony à Wood prophesied that he would one day break his neck while running downstairs after a retreating guest, in the hope of extracting a story from him. He took no active share in the political troubles of the time, but from his description of a meeting of the Rota Club, founded by James Harrington, the author of *Oceana*, he appears to have been a theorizing republican. His reminiscences on this subject date from the Restoration, and are probably softened by considerations of expediency. In 1663 he became a member of the Royal Society, and in the next year he met Joan Somner, "in an ill hour," he tells us. This connexion did not end in marriage, and a lawsuit with the lady complicated his already embarrassed affairs. He lost estate after estate, until in 1670 he parted with his last piece of property, Easton Pierse. From this time he was dependent on the hospitality of his numerous friends. In 1667 he had made the acquaintance of Anthony à Wood at Oxford, and when Wood began to gather materials for his invaluable *Athenae Oxonienses*, Aubrey offered to collect information for him. From time to time he forwarded memoranda to him, and in 1680 he began to promise the "Minutes for Lives," which Wood was to use at his discretion. He left the task of verification largely to Wood. As a hanger-on in great houses he had little time for systematic work, and he wrote the "Lives" in the early morning while his hosts were sleeping off the effects of the dissipation of the night before. He constantly leaves blanks for dates and facts, and many queries. He made no attempt at a fair copy, and, when fresh information occurred to him, inserted it at random. He made some distinction between hearsay and authentic information, but had no pretence to accuracy, his retentive memory being the chief authority. The principal charm of his "Minutes" lies in the amusing details he has to recount about his personages, and in the plainness and truthfulness that he permits himself in face of established reputations. In 1592 he complained bitterly that Wood had destroyed forty pages of his MS., probably because of the dangerous freedom of Aubrey's pen. Wood was prosecuted eventually for insinuations against the judicial integrity of the earl of Clarendon. One of the two statements called in question was certainly founded on information provided by Aubrey. This perhaps explains the estrangement between the two antiquaries and the ungrateful account that Wood gives of the elder man's character. "He was a shiftless person, roving and magotie-headed, and sometimes little better than crased. And being exceedingly credulous, would stuff his many letters sent to A. W. with follies and misinformations, which sometimes would guide him into the paths of errour."[1] In 1673 Aubrey began his "Perambulation" or "Survey" of the county of Surrey, which was the result of many years' labour in collecting inscriptions and traditions in the country. He began a "History of his Native District of Northern Wiltshire," but, feeling that he was too old to finish it as he would wish, he made over his material, about 1695, to Thomas Tanner, afterwards bishop of St Asaph. In the next year he published his only completed, though certainly not his most valuable work, the *Miscellanies*, a collection of stories on ghosts and dreams. He died at Oxford in June 1697, and was buried in the church of St Mary Magdalene.

Beside the works already mentioned, his papers included: "Architectonica Sacra," notes on ecclesiastical antiquities; and "Life of Thomas Hobbes of Malmesbury," which served as the basis of Dr Blackburn's Latin life, and also of Wood's account. His survey of Surrey was incorporated in R. Rawlinson's *Natural History and Antiquities of Surrey* (1719); his antiquarian notes on Wiltshire were printed in *Wiltshire; the Topographical Collections of John Aubrey*, corrected and enlarged by J. E. Jackson (Devizes, 1862); part of another MS. on "The Natural History of Wiltshire" was printed by John Britton in 1847 for the Wiltshire Topographical Society; the *Miscellanies* were edited in 1890 for the *Library of Old Authors*; the "Minutes for Lives" were partially edited in 1813. A complete transcript, *Brief Lives chiefly of Contemporaries set down by John Aubrey between the Years 1669 and 1696*, was edited for the Clarendon Press in 1898 by the Rev. Andrew Clark from the MSS. in the Bodleian, Oxford.

See also John Britton, *Memoir of John Aubrey* (1845); David Masson, in the *British Quarterly Review*, July 1856; Émile Montégut, *Heures de lecture d'un critique* (1891); and a catalogue of Aubrey's collections in *The Life and Times of Anthony Wood . . .*, by Andrew Clark (Oxford, 1891–1900, vol. iv. pp. 191-193), which contains many other references to Aubrey.

AUBURN, a city and the county-seat of Androscoggin county, Maine, U.S.A., on the Androscoggin river, opposite Lewiston (with which it practically forms an industrial unit), in the S.W. part of the state. Pop. (1890) 11,250; (1900) 12,951, of whom 2076 were foreign-born; (1906, estimate) 13,971. It is served by the Grand Trunk and the Maine Central railways. The river furnishes abundant water-power, and the city ranked fourth in the state as a manufacturing centre in 1905. Boots and shoes are the principal products; in 1905 seven-tenths of the city's wage-earners were engaged in their manufacture, and Auburn's output ($4,263,162 = 66·5 % of the total factory product of the city) was one-third of that of the whole state. Other manufactures are butter, bread and other bakery products, cotton goods, furniture and leather. The municipality owns and operates its waterworks. Auburn was first settled in 1786, and was incorporated in 1842, but the present charter dates only from 1869.

AUBURN, a city and the county-seat of Cayuga county, New York, U.S.A., 25 m. S.W. of Syracuse, on an outlet of Owasco Lake. Pop. (1890) 25,858; (1900) 30,345, of whom 5436 were foreign-born, 2084 being from Ireland and 1023 from England; (1910) 34,668. It is served by the Lehigh Valley and the New York Central & Hudson River railways, and by inter-urban electric lines. The city is attractively situated amidst a group of low hills in the heart of the lake country of western New York; the streets are wide, with a profusion of shade trees. Auburn has a city hall, the large Burtis Auditorium, the Auburn hospital, two orphan asylums, and the Seymour library in the Case Memorial building. There is a fine bronze statue of William H. Seward, who made his home here after 1823, and was buried in Fort Hill Cemetery. In Auburn are the Auburn (State) prison (1816), in connexion with which there is a women's prison; the Auburn Theological Seminary (Presbyterian), founded in 1819, chartered in 1820, and opened for students in 1821; the Robinson school for girls; and the Women's Educational and Industrial Union, for the education of working girls, with a building erected in 1907. The city owns its water-supply system, the water being pumped from Owasco Lake, about 2½ m. S.S.E. of the city. There is a good water-power, and the city has important manufacturing

[1] "Life of Anthony à Wood written by Himself" (*Athen. Oxon.*, ed. Bliss).

interests. The principal manufactures are cordage and twine, agricultural implements, engines, pianos, boots and shoes, cotton and woollen goods, carpets and rugs, rubber goods, flour and machinery. The total factory product in 1905 was valued at $13,420,863; of this $2,890,301 was the value of agricultural implements, in the manufacture of which Auburn ranked fifth among the cities of the United States. There are a number of grey and blue limestone quarries, one of which is owned and operated by the municipality.

Settled soon after the close of the War of Independence, Auburn was laid out in 1793 by Captain John L. Hardenburgh, a veteran of the war, and for some years was known as Hardenburgh's Corners. In 1805, when it was made the county-seat, it was renamed Auburn. It was incorporated in 1814, and was chartered as a city in 1848.

See C. Hawley, *Early Chapters of Cayuga History* (Auburn, 1879).

AUBURN (from the Low Lat. *alburnus*, whitish, light-coloured), ruddy-brown; the meaning has changed from the original one of brownish-white or light yellow (*citrinus*, in *Promptorium Parvulorum*), probably through the intensification of the idea of brown caused by the early spelling "abron" or "abrown."

AUBUSSON, PIERRE D' (1423–1503), grand-master of the order of St John of Jerusalem, and a zealous opponent of the Turks, was born in 1423. He belonged to a noble French family, and early devoted himself to the career of a soldier in the service of the emperor Sigismund. Under the archduke Albert of Austria he took part in a campaign against the Turks, and on his return to France sided with the Armagnacs against the Swiss, greatly distinguishing himself at the battle of St Jacob in 1444. He then joined the order of the knights of Rhodes, and successfully conducted an expedition against the pirates of the Levant and an embassy to Charles VII. He soon rose to the most important offices in the order, and in 1476 was elected grand-master. It was the period of the conquests of Mahommed II., who, supreme in the East, now began to threaten Europe. In December 1479 a large Turkish fleet appeared in sight of Rhodes; a landing was effected, and a vigorous attack made upon the city. But in July of the next year, being reinforced from Spain, the knights forced the Mussulmans to retire, leaving behind them 9000 dead. The siege, in which d'Aubusson was seriously wounded, enhanced his renown throughout Europe. Mahommed was furious, and would have attacked the island again but for his death in 1481. His succession was disputed between his sons Bayezid and Jem. The latter, after his defeat by Bayezid, sought refuge at Rhodes under a safe-conduct from the grand-master and the council of the knights. What followed remains a stain on d'Aubusson's memory. Rhodes not being considered secure, Jem with his own consent was sent to France. Meanwhile, in spite of the safe-conduct, d'Aubusson accepted an annuity of 45,000 ducats from the sultan, in return for which he undertook to guard Jem in such a way as to prevent his design of appealing to the Christian powers to aid him against his brother. For six years Jem, in spite of frequent efforts to escape, was kept a close prisoner in various castles of the Rhodian order in France, until in 1489 he was handed over to Pope Innocent VIII., who had been vying with the kings of Hungary and Naples for the possession of so valuable a political weapon. D'Aubusson's reward was a cardinal's hat (1489), and the power to confer all benefices connected with the order without the sanction of the papacy; the order of St John received the wealth of the suppressed orders of the Holy Sepulchre and St Lazarus. The remaining years of his life d'Aubusson spent in the attempt to restore discipline and zeal in his order, and to organize a grand international crusade against the Turks. The age of the Renaissance, with Alexander Borgia on the throne of St Peter, was, however, not favourable to such an enterprise; the death of Jem in 1495 had removed the most formidable weapon available against the sultan; and when in 1501 d'Aubusson led an expedition against Mytilene, dissensions among his motley host rendered it wholly abortive. The old man's last years were embittered by chagrin at his failure, which was hardly compensated by his success in extirpating Judaism in Rhodes, by expelling all adult Jews and forcibly baptizing their children. In the summer of 1503 he died.

See P. Bouhours, *Hist. de Pierre d'Aubusson* (Paris, 1676; Hague, 1793; abridged ed. Bruges, 1887); G. E. Streck, *Pierre d'Aubusson, Grossmeister*, &c. (Chemnitz, 1873); J. B. Bury in *Cambridge Mod. Hist.* vol. i. p. 85, &c. (for relations with Jem).

AUBUSSON, a town of France, capital of an arrondissement in the department of Creuse, picturesquely situated on the river Creuse 24 m. S.E. of Guéret by rail. Pop. (1906) 6475. It has celebrated manufactories of carpets, &c., employing about 2000 workmen, the artistic standard of which is maintained by a national school of decorative arts, founded in 1869. Nothing certain is known as to the foundation of this industry, but it was in full activity at least as far back as 1531. From the 10th to the 13th century Aubusson was the centre of a viscounty, and the viscountess Marguerite, wife of Rainaud VI., was sung by many a troubadour. After the death of the viscount Guy II. (a little later than 1262) Aubusson was incorporated in the countship of La Marche by Hugh XII. of Lusignan, and shared in its fortunes. Louis XIV. revived the title of viscount of Aubusson in favour of François, first marshall de la Feuillade (1686). From the family of the old viscounts was descended Pierre d'Aubusson (*q.v.*). Admiral Sallandrouze de Lamornaix (1840–1902) belonged to a family of tapestry manufacturers established at Aubusson since the beginning of the 19th century. Aubusson was also the native place of the novelists Léonard Sylvain, Julien Sandeau and Alfred Assollant (1827–1886).

See Le Père Anselme, *Hist. généalogique de la maison de France*, vol. v. pp. 318 et seq.; P. Mignaton, *Hist. de la maison d'Aubusson* (Paris, 1886); Cyprien Pérathon, *Hist. d'Aubusson* (Limoges, 1886). (A. T.)

AUCH, a city of south-western France, capital of the department of Gers, 55 m. W. of Toulouse on the Southern railway. Pop. (1906) 9294. Auch is built on the summit and sides of a hill at the foot of which flow the yellow waters of the Gers. It consists of a lower and upper quarter united in several places by flights of steps. The streets are in general steep and narrow, but there is a handsome promenade in the upper town, laid out in the 18th century by the *intendant* Antoine Mégret d'Etigny. Three bridges lead from the left to the right bank of the Gers, on which the suburb of Patte d'Oie is situated. The most interesting part of the town lies in the old quarter around the Place Salinis, a spacious terrace which commands an extensive view over the surrounding country. On its eastern side it communicates with the left bank of the river by a handsome series of steps; on its north side rises the cathedral of Sainte-Marie. This church, built from 1489 to 1662, belongs chiefly to the Gothic style, of which it is one of the finest examples in southern France. The façade, however, with its two square and somewhat heavy flanking towers dates from the 17th century, and is Greco-Roman in architecture. Sainte-Marie contains many artistic treasures, the chief of which are the magnificent stained-glass windows of the Renaissance which light the apsidal chapels, and the 113 choir-stalls of carved oak, also of Renaissance workmanship. The archbishop's palace adjoins the cathedral; it is a building of the 18th century with a Romanesque hall and a tower of the 14th century. Opposite the south side of the cathedral stands the lycée on the site of a former Jesuit college. Only scanty remains are left of the once celebrated abbey of St Orens. The ecclesiastical seminary contains an important library with a collection of manuscripts, and there is a public library in the Carmelite chapel, a building of the 17th century. The former palace of the *intendants* of Gascony is now used as the *préfecture*. Auch is the seat of an archbishopric, a prefect and a court of assizes, and has tribunals of first instance and of commerce, a chamber of commerce, a lycée, training-colleges, a school of design, a branch of the Bank of France and an important lunatic asylum. The manufactures include agricultural implements, leather, vinegar and plaited sandals, and there is a trade in brandy, wine, cattle, poultry and wool; there are quarries of building-stone in the neighbourhood.

Auch (Elimberris) was the capital of a Celtiberian tribe, the Ausci, and under the Roman domination was one of the most

important cities in Gaul. In the 4th century this importance was increased by the foundation of its bishopric, and after the destruction of Eauze in the 9th century it became the metropolis of Novempopulana. Till 732, Auch stood on the right bank of the Gers, but in that year the ravages of the Saracens drove the inhabitants to take refuge on the left bank of the river, where a new city was formed. In the 10th century Count Bernard of Armagnac founded the Benedictine abbey of St Orens, the monks of which, till 1308, shared the jurisdiction over Auch with the archbishops—an arrangement which gave rise to constant strife. The counts of Armagnac possessed a castle in the city, which was the capital of Armagnac in the middle ages. During the Religious Wars of the 16th century Auch remained Catholic, except for a short occupation in 1569 by the Huguenots under Gabriel, count of Montgomery. In the 18th century it was capital of Gascony, and seat of a generality. Antoine Mégret d'Etigny, intendant from 1751 to 1767, did much to improve the city and its commerce.

AUCHMUTY, SIR SAMUEL (1756–1822), British general, was born at New York in 1756, and served as a loyalist in the American War of Independence, being given an ensigncy in the royal army in 1777, and in 1778 a lieutenancy in the 45th Foot, without purchase. When his regiment returned to England after the war, having neither private means nor influence, he exchanged into the 52nd, in order to proceed to India. He took part in the last war against Hyder Ali; he was given a staff appointment by Lord Cornwallis in 1790, served in the operations against Tippoo Sahib, and continued in various staff appointments up to 1797, when he returned to England a brevet lieut.-colonel. In 1800 he was made lieut.-colonel and brevet colonel; and in the following year, as adjutant-general to Sir David Baird in Egypt, took a distinguished share in the march across the desert and the capture of Alexandria. On his return to England in 1803 he was knighted, and three years later he went out to the River Plate as a brigadier-general. Auchmuty was one of the few officers who came out of the disastrous Buenos Aires expedition of 1806–7 with enhanced reputation. While General Whitelocke, the commander, was cashiered, Auchmuty was at once re-employed and promoted major-general, and was sent out in 1810 to command at Madras. In the following year he commanded the expedition organized for the conquest of Java, which the governor-general, Lord Minto, himself accompanied. The storming of the strongly fortified position of Meester Cornelis (28th August 1811), stubbornly defended by the Dutch garrison under General Janssens, practically achieved the conquest of the island, and after the action of Samarang (September 8th) Janssens surrendered. Auchmuty received the thanks of parliament and the order of K.C.B. (G.C.B. in 1815), and in 1813, on his return home, was promoted to the rank of lieut.-general. In 1821 he became commander-in-chief in Ireland, and a member of the Irish privy council. He died suddenly on the 11th of August 1822.

AUCHTERARDER (Gaelic, "upper high land"), a police burgh of Perthshire, Scotland, 13¾ m. S.W. of Perth by the Caledonian railway. Pop. (1901) 2276. It is situated on Ruthven Water, a right-hand tributary of the Earn. The chief manufactures are those of tartans and other woollens, and of agricultural implements. At the beginning of the 13th century it obtained a charter from the earl of Strathearn, afterwards became a royal burgh for a period, and was represented in the Scottish parliament. Its castle, now ruinous, was built as a hunting-lodge for Malcolm Canmore, but of the abbey which it possessed as early as the reign of Alexander II. (1198–1249) no remains exist. The ancient church of St Mungo, now in ruins, was a building in the Norman or Early Pointed style. The town was almost entirely burned down by the earl of Mar in 1716 during the abortive Jacobite rising. It was in connexion with this parish that the ecclesiastical dispute arose which led to the disruption in the Church of Scotland in 1843. The estate of Kincardine, 1 m. south, gives the title of earl of Kincardine to the duke of Montrose. The old castle, now in ruins, was dismantled in 1645 by the marquis of Argyll in retaliation for the destruction of Castle Campbell in Dollar Glen on the south side of the Ochils. The old ruined castle of Tullibardine, 2 m. west of the burgh, once belonged to the Murrays of Tullibardine, ancestors of the duke of Atholl, who derives the title of marquis of Tullibardine from the estate. The ancient chapel adjoining, also ruinous, was a burial-place of the Murrays.

AUCHTERMUCHTY (Gaelic, "the high ground of the wild sow"), a royal and police burgh of Fifeshire, Scotland, built on an elevation about 9 m. W. by S. of Cupar, with a station on a branch of the North British railway from Ladybank to Mawcarse Junction. Pop. 1387. The rapid Loverspool Burn divides the town. The principal industries include the weaving of linen and damasks, bleaching, distilling and malting. John Glas, founder of the sect known as Glassites or Sandemanians, was a native of the town. A mile and a half to the south-west is the village of Strathmiglo (pop. 966), on the river Eden, with a linen factory and bleaching works.

AUCKLAND, GEORGE EDEN, EARL OF (1784–1849), English statesman, was the second son of the 1st Baron Auckland. He completed his education at Oxford, and was admitted to the bar in 1809. His elder brother was drowned in the Thames in the following year; and in 1814, on the death of his father, he took his seat in the House of Lords as Baron Auckland. He supported the Reform party steadily by his vote, and in 1830 was made president of the Board of Trade and master of the Mint. In 1834 he held office for a few months as first lord of the admiralty, and in 1835 he was appointed governor-general of India. He proved himself to be a painstaking and laborious legislator, and devoted himself specially to the improvement of native schools, and the expansion of the commercial industry of the nation committed to his care. These useful labours were interrupted in 1838 by complications in Afghanistan, which excited the fears not only of the Anglo-Indian government but of the home authorities. Lord Auckland resolved to enter upon a war, and on the 1st of October 1838 published at Simla his famous manifesto dethroning Dost Mahommed. The early operations were crowned with success, and the governor-general received the title of earl of Auckland. But reverses followed quickly, and in the ensuing campaigns the British troops suffered the most severe disasters. Lord Auckland had the double mortification of seeing his policy a complete failure and of being superseded before his errors could be rectified. In the autumn of 1841 he was succeeded in office by Lord Ellenborough, and returned to England in the following year. In 1846 he was made first lord of the admiralty, which office he held until his death, on the 1st of January 1849. He died unmarried, and the earldom became extinct, the barony (see below) passing to his brother Robert.

See S. J. Trotter, *The Earl of Auckland* ("Rulers of India" series), 1893.

AUCKLAND, WILLIAM EDEN, 1ST BARON (1745–1814), English statesman, son of Sir Robert Eden, 3rd Bart., of Windlestone Hall, Durham, and of Mary, daughter of William Davison, was born in 1745, educated at Eton and Christ Church, Oxford, and called to the bar at the Middle Temple in 1768. In 1771 he published *Principles of Penal Law*, and was early recognized as an authority on commercial and economic questions, and in 1772 he was appointed an under secretary of state. He represented New Woodstock in the parliaments of 1774 and 1780, and Heytesbury in those of 1784 and 1790. In 1776 he was appointed a commissioner on the board of trade and plantations. In 1778 he carried an act for the improvement of the treatment of prisoners, and accompanied the earl of Carlisle as a commissioner to North America on an unsuccessful mission to settle the disputes with the colonists. On his return in 1779 he published his widely read *Four Letters to the Earl of Carlisle*, and in 1780 became chief secretary for Ireland. He was elected to the Irish House of Commons as member for Dungannon in 1781 and sworn of the Irish privy council, and while in Ireland established the National Bank. He advised the increase of the secret service fund, and was reputed, according to Lord Charlemont (a political opponent), as especially skilful in the arts of

corruption and in overcoming political prejudices. He resigned in 1782, but in the following year he took office again as vice-treasurer of Ireland under the coalition ministry, which he had been instrumental in arranging, and was included in the privy council, resigning with the government in December. He opposed strongly Pitt's propositions for free trade between England and Ireland in 1785, but took office with Pitt as a member of the committee on trade and plantations, and negotiated in 1786 and 1787 Pitt's important commercial treaty with France, and agreements concerning the East India Companies and Holland. In 1787 he published his *History of New Holland*. Next year he was sent as ambassador to Spain, and after his return was created (September 1789) Baron Auckland in the Irish peerage. The same year he was sent on a mission to Holland, and represented English interests there with great zeal and prudence during the critical years of 1790 to 1793, obtaining the assistance of the Dutch fleet in 1790 on the menace of a war with Spain, signing the convention relating to the Netherlands the same year, and in 1793 attending the congress at Antwerp. He retired from the public service in the latter year, received a pension of £2300, and was created Baron Auckland of West Auckland, Durham, in the English peerage. During his retirement in the country at Beckenham, he continued his intimacy with Pitt, his nearest neighbour at Holwood, who at one time had thoughts of marrying his daughter; and with Pitt's sanction he published his *Remarks on the Apparent Circumstances of the War* in 1795, to prepare public opinion for a peace. In 1798 he was included in Pitt's government as joint postmaster-general, and supported strongly the income tax and the Irish Union, assisting in drawing up the act embodying the latter. In 1799 he brought in a bill to check adultery by preventing the marriage of the guilty parties, and the same year took a mischievous part in the cabal against Sir Ralph Abercromby. He severely criticized Pitt's resignation in 1801, from which he had endeavoured to dissuade him, and retained office under Addington. This terminated his friendship with Pitt, who excluded him from his administration in 1804 though he increased his pension. Auckland was included in Granville's ministry of "All the Talents" as president of the board of trade in 1806. He held the appointments of auditor and director of Greenwich hospital, recorder of Grantham, and chancellor of the Marischal College in Aberdeen. He died on the 28th of May 1814.

He had married in 1776 Eleanor, sister of the first Lord Minto, and had a large family. Emily Eden (1797–1869), the novelist, was one of his daughters. On the death of his son George, 2nd baron and earl of Auckland (*q.v.*), the barony passed to the 1st baron's younger son Robert John (1799–1870), bishop of Bath and Wells, from whom the later barons were descended, and who was also the father of Sir Ashley Eden (1831–1887), lieutenant-governor of Bengal. The 1st baron had two distinguished brothers—Morton Eden (1752–1830), a diplomatist, who married Lady Elizabeth Henley, and in 1799 was created 1st Baron Henley (his family, from 1831, taking the name of Henley instead of Eden); and Sir Robert Eden, governor of Maryland, whose son, Sir Frederic Morton Eden (1766–1809), was a well-known economist.

Lord Auckland's *Journal and Correspondence*, published in 1861–1862, throws much light on the political history of the time.

AUCKLAND, a city and seaport on the east coast of North Island, New Zealand, in Eden county; capital of the province of its name, and the seat of a bishop. Pop. (1906) 37,736; including suburbs, 82,101. It is situated at the mouth of an arm of Hauraki Gulf, and is only 6 m. distant from the head of Manukau harbour on the western coast. The situation is extremely beautiful. The Hauraki Gulf, a great square inlet opening northward, is studded with islands of considerable elevation; Rangitoto, which protects the harbour, is a volcanic cone reaching nearly 1000 ft. The isthmus on which the town stands (which position has caused it to be likened to Corinth) can be crossed without surmounting any great elevation, and offers a feasible canal route. A number of small extinct volcanoes, however, appear in all directions. To the west the Titirangi hills exceed 1400 ft. Some of the volcanic soil is barren, but much of the district is clothed in luxuriant vegetation.

Auckland harbour, one of the best in New Zealand, is approachable by the largest vessels at the lowest tide. There are two graving docks. Queen Street, the principal thoroughfare, leads inland from the main dock, and contains the majority of the public buildings. There is a small government house, standing in beautiful grounds, adjoining Albert Park, with plantations of oaks and pines. The government offices, art gallery and exchange, with St Mary's cathedral (Anglican), a building in a combination of native timbers, St Paul's and St Patrick's cathedral (Roman Catholic), are noteworthy buildings. The art gallery and free library contain excellent pictures, and valuable books and MSS. presented by Sir G. Grey. The museum contains one of the best existing collections of Maori art. There are an opera-house and an academy of music. The Auckland University College and the grammar school are the principal educational establishments. The parks are the Domain, with a botanical garden, the Albert Park near the harbour, with a bronze statue of Queen Victoria, the extensive grounds at One Tree Hill on the outskirts, and Victoria Park on Freeman's Bay. The principal thoroughfares are served by electric tramway. Of the suburbs, Newton, Parnell and Newmarket are in reality outlying parts of the town itself. Devonport, Birkenhead and Northcote are beautifully situated on the north shore of the inlet, and are served by steam-ferries. Several other residential suburbs lie among the hills on the mainland, such as Mount Albert, Mount Eden and Epsom. Onehunga is a small port on Manukau harbour, served by rail. In Parnell is the former residence of Bishop Selwyn, who, arriving in the colony in 1842, assisted to draw up the constitution of the Anglican church. There are many associations with his name in the neighbourhood. The prospect over the town and its environs from Mount Eden is justly famous. The hill is terraced with former native fortifications.

Auckland has industries of sugar-refining, ship-building and paper-, rope- and brick-making, and timber is worked. The town was founded as capital of the colony in 1840 by Governor Hobson. There is communication both south and north by rail, and regular steamers serve the ports of the colony, the principal Pacific Islands, Australia, &c. From 1853 to 1876 Auckland was the seat of the provincial government, and until 1865 that of the central government, which was then transferred to Wellington. The first session of the general assembly took place here in 1854. Auckland is under municipal government.

AUCKLAND ISLANDS, a group in the Pacific Ocean, discovered in 1806 by Captain Briscoe, of the English whaler "Ocean," in 50° 24′ S., 166° 7′ E. The islands, of volcanic origin, are very fertile, and are covered with forest. They were granted to the Messrs Enderby by the British government as a whaling station, but the establishment was abandoned in 1852. The islands belong politically to New Zealand.

AUCTION PITCH, a card game which is a popular variation of All Fours (*q.v.*). The name is derived from the rule that the first card played, or *pitched*, is the trump suit, and that the eldest hand has the privilege of pitching it or of selling out to the highest bidder. A full pack is used, and the cards rank as in All Fours, namely from ace down to 2, ace being highest in cutting also. From four to seven may play, each player being provided with seven white counters, and also with red counters in case stakes are played for. Each player receives six cards in every deal, three at a time, no trump being turned. The object is to get rid of the white counters, one of which may be put into the pool either (1) for holding the highest trump played; (2) for having the lowest trump dealt to one; (3) for taking the Jack (knave) of trumps; or (4) for winning the *game*, namely the greatest number of pips that count. In case of a tie of pips no game is scored. If the eldest hand decides to pitch and not to sell out, he may do so, but is obliged to make four points or be set back that number. If he decides to sell, he says "I pass," and the player at his left bids for the privilege of pitching the trump or passes, &c. When a bid has been made the rest must

pass or bid higher, and the eldest hand must either accept a bid or undertake to make as many points as the bidder. If no bid is made he pitches the trump himself, without the obligation of making anything. The first card played is the trump suit, the winner of the trick leading again. In trumps a player must follow suit if he can, and the same rule applies in plain suits, excepting that a trump may be played at any time ("follow suit or trump"). In play the highest card wins the trick unless trumped. When the hand is played out each player puts a white counter into the pool for every point won, and the first player to get rid of all his seven white counters wins the pool and takes from it all the red counters, which represent cash. This ends the game. In case two players count out during the same deal, the bidder has the first right to the pool, the rule being "bidder counts out first." If the two players who count out are neither of them bidder, then they go out in regular order, *i.e.* high first, then low, Jack and game. If a bidder fails to make his points he is set back that number. A revoke is punished by the offender being set back the number of points bid and forfeiting a red counter to the pool.

AUCTIONS and **AUCTIONEERS.** An auction (Lat. *auctio*, increase) is a proceeding at which people are invited to compete for the purchase of property by successive offers of advancing sums. The advantages of conducting a sale in this way are obvious, and we naturally find that auctions are of great antiquity. Herodotus describes a custom which prevailed in Babylonian villages of disposing of the maidens in marriage by delivering them to the highest bidders in an assembly annually held for the purpose (Book i. 196). So also among the Romans the quaestor sold military booty and captives in war by auction—*sub hasta*—the spear being the symbol of quiritarian ownership. The familiarity of such proceedings is forcibly suggested by the conduct of the Praetorian Guard when Sulpicianus was treating for the imperial dignity after the murder of Pertinax. Apprehending that they would not obtain a sufficient price by private contract, the Praetorians proclaimed from their ramparts that the Roman world was to be disposed of by public auction to the best bidder. Thereupon Julian proceeded to the foot of the ramparts and outbid his competitor (Gibbon, vol. i. ch. v.). Though, however, auctions were undoubtedly common among the Romans both in public and private transactions, the rules whereby they were governed are by no means clearly enunciated in the *Corpus Juris Civilis*.

In England the method of conducting auctions has varied. In some places it has been usual to set up an inch of lighted candle, the person making the last bid before the fall of the wick becoming the purchaser. By an act of William III. (1698), this method of sale was prescribed for goods and merchandise imported from the East Indies. Lord Eldon speaks of "candlestick biddings," where the several bidders did not know what the others had offered. A "dumb bidding" was the name given to a proceeding at which a price was put by the owner under a candlestick with a stipulation that no bidding should avail if not equal to it. In a "Dutch auction" property is offered at a certain price and then successively at lower prices until one is accepted.

According to the practice now usual in England, a proposed auction is duly advertised, and a printed catalogue in the case of chattels, or particulars of sale in the case of land, together with conditions of sale, are circulated. Sometimes, in sales of goods, the conditions are merely suspended in the auction room. At the appointed time and place, the auctioneer, standing in a desk or rostrum, "puts up" the several lots in turn by inviting biddings from the company present. He announces the acceptance of the last bid by a tap with his hammer and so "knocks down" the lot to the person who has made it. Sometimes property is offered on lease to the highest bidder. "Roup" is the Scottish term for an auction. A bid in itself is only an offer, and may accordingly be retracted at any time before its acceptance by the fall of the hammer or otherwise. Puffing is unlawful. Unless a right to bid is expressly reserved on behalf of the vendor, he must neither bid himself nor employ any one else to bid. When a right to bid has been expressly reserved, the seller or any one person (but no more) on his behalf may bid at the auction. If it is simply announced that the sale is to be subject to a reserved or upset price, no bidding by or on behalf of the seller is permissible: it is only lawful to declare by some appropriate terms that the property is withdrawn. Where a sale is expressed to be without reserve, or where an upset price has been reached, the auctioneer must, after the lapse of a reasonable interval, accept the bid of the highest *bona fide* bidder. By not doing so he would render the vendor liable in damages. The auctioneer must not make a pretence of receiving bids which are not in fact made, as it would be fraudulent to run up the price by such an artifice. A "knock-out" is a combination of persons to prevent competition between themselves at an auction by an arrangement that only one of their number shall bid, and that anything obtained by him shall be afterwards disposed of privately among themselves. Such a combination is not illegal. A "mock auction" is a proceeding at which persons conspire by artifice to make it appear, contrary to the fact, that a *bona fide* sale is being conducted, and so attempt to induce the public to purchase articles at prices far above their value. Those who invite the public to enter the room where the supposed auction is proceeding, or otherwise endeavour to attract bidders, are called "barkers." A conspiracy to defraud in this way is an indictable offence.

American law is in general the same as the English law with regard to auctions. As to bidding by the vendor, however, it is less stringent. For, though puffing or by-bidding, as it is often called, will, under both systems alike, render an auction sale voidable at the option of a purchaser when it amounts to fraud, the weight of authority in the United States is in favour of the view that an owner may, without notice, employ a person to bid for him, if he does so with no other purpose than to prevent a sacrifice of the property under a given price.

By a charter of Henry VII., confirmed by Charles I., the business of selling by auction was confined to an officer called an *outroper*, and all other persons were prohibited from selling goods or merchandise by public claim or outcry (see Henry Blackstone's *Reports*, vol. ii. p. 557). The only qualification now required by an auctioneer is a licence on which a duty of £10 has to be paid, and which must be renewed before the 5th of July in each year. A liability to a penalty of £100 is incurred by acting as an auctioneer without being duly licensed. The duty formerly imposed upon the purchase-money payable by virtue of a sale at auction was abolished by an act of 1845. An auctioneer is bound under a penalty of £20 to see that his full name and address are displayed before the commencement of an auction and during its continuance in the place where he conducts it. He is the agent of the vendor only, except in so far that, after he has knocked down a lot to the highest bidder, he has authority to affix the name of the latter to a memorandum of the transaction, so as to render the contract of sale enforceable where written evidence is necessary. An auctioneer does not, by merely announcing that a sale of certain articles will take place, render himself liable to those who, in consequence, attend at the time and place advertised, if the sale is not in fact proceeded with, provided he acts in good faith. One of the chief risks run by an auctioneer is that of being held liable for the conversion of goods which he has sold upon the instructions of a person whom he believed to be the owner, but who in fact had no right to dispose of them.

The number of auctioneers' licences issued during the year ended the 31st of March 1908 was in England 6639, in Scotland 760, and in Ireland 839. A central organization having its headquarters in London, the Auctioneers' Institute of the United Kingdom, was founded in 1886, in order to elevate the status and further the interests of auctioneers, estate agents and valuers. It has nearly 2000 members. (H. Ha.)

AUCUBA, the Japanese name for a small genus of the Dogwood order (Cornaceae). The familiar Japanese laurel of gardens and shrubberies is *Aucuba japonica*. It bears male and female flowers on distinct plants; the red berries often last till the

next season's flowers appear. There are numerous varieties in cultivation, differing in the variegation of their leaves.

AUDAEUS, or AUDIUS, a church reformer of the 4th century, by birth a Mesopotamian. He suffered much persecution from the Syrian clergy for his fearless censure of their irregular lives, and was expelled from the church, thereupon establishing an episcopal monastic community. He was afterwards banished into Scythia, where he worked successfully among the Goths, not living to see the destruction of his labours by Athanaric. The Audaeans celebrated the feast of Easter on the same day as the Jewish Passover, and they were also charged with attributing to the Deity a human shape, an opinion which they appear to have founded on Genesis i. 26. Theodoret groundlessly accuses them of Manichean tendencies.

The main source of information is Epiphanius (*Haer.* 70).

AUDE, a river of south-western France, rising in the eastern Pyrenees and flowing into the Golfe du Lion. Rising in a small lake a short distance east of the Puy de Carlitte, it soon takes a northerly direction and flows for many miles through deep gorges of great beauty as far as the plain of Axat. Beyond Axat its course again lies through defiles which become less profound as the river nears Carcassonne. Below that town it receives the waters of the Fresquel and turns abruptly east. From this point to its junction with the Cesse its course is parallel with that of the Canal du Midi. The river skirts the northern spurs of the Corbières, some distance below which it is joined by the Orbieu and the Cesse. It then divides into two branches, the northernmost of which, the Aude proper, runs east and empties into the Mediterranean some 12 m. east-north-east of Narbonne, while the other branch, the Canal de la Robine, turning south, traverses that town, below which its course to the sea lies between two extensive lagoons, the Étang de Bages et de Sigean and the Étang de Gruissan. The Aude has a length of 140 m. and a basin 2061 sq. m. in extent. There is practically no traffic upon it.

AUDE, a maritime department of southern France, formed in 1790 from part of the old province of Languedoc. Area, 2448 sq. m. Pop. (1906) 308,327. It is bounded E. by the Mediterranean, N. by the departments of Hérault and Tarn, N.W. by Haute-Garonne, W. by Ariège, and S. by Pyrénées-Orientales. The department is traversed on its western boundary from S. to N. by a mountain range of medium height, which unites the Pyrenees with the southern Cévennes; and its northern frontier is occupied by the Montagne Noire, the most westerly portion of the Cévennes. The Corbières, a branch of the Pyrenees, run in a south-west and north-east direction along the southern district. The Aude (*q.v.*), its principal river, has almost its entire length in the department, and its lower course, together with its tributary the Fresquel, forms the dividing line between the Montagne Noire and the Pyrenean system.

The lowness of the coast causes a series of large lagoons, the chief of which are those of Bages et Sigean, Gruissan, Lapalme and Leucate. The climate is warm and dry, but often sudden in its alterations. The wind from the north-west, known as the *cers*, blows with great violence, and the sea-breeze is often laden with pestilential effluvia from the lagoons. The agriculture of the department is in a flourishing condition. The meadows are extensive and well watered, and are pastured by numerous flocks and herds. The grain produce, consisting mainly of wheat, oats, rye and Indian corn, exceeds the consumption, and the vineyards yield an abundant supply of both white and red wines, those of Limoux and the Narbonnais being most highly esteemed. Truffles are abundant. The olive and chestnut are the chief fruits. Mines of iron, manganese, and especially of mispickel, are worked, and there are stone-quarries and productive salt-marshes. Brewing, distilling, cooperage, iron-founding, hat-making and machine construction are carried on, and there are flour-mills, brick-works, saw-mills, sulphur refineries and leather and paper works. The formerly flourishing textile industries are now of small importance. The department imports coal, lime, stone, salt, raw sulphur, skins and timber and exports agricultural and mineral products, bricks and tiles, and other manufactured goods. It is served by the Southern railway. The Canal du Midi, following the courses of the Fresquel and the Aude, traverses it for 76 m.; and a branch, the Canal de la Robine, which passes through Narbonne to the sea, has a length of 24 m. The capital is Carcassonne, and the department is divided into the four arrondissements of Carcassonne, Limoux, Narbonne and Castelnaudary, with 31 cantons and 439 communes. It belongs to the 16th military region, and to the académie (educational division) of Montpellier, where also is its court of appeal. It forms the diocese of Carcassonne, and part of the province of the archbishop of Toulouse. Carcassonne, Narbonne and Castelnaudary are the principal towns. At Alet, which has hot springs of some note, there are ruins of a fine Romanesque cathedral destroyed in the religious wars of the 16th century. The extensive buildings of the Cistercian abbey of Fontfroide, near Bizanet, include a Romanesque church, a cloister, dormitories and a refectory of the 12th century. A curious polygonal church of the 11th century at Rieux-Minervois, the abbey-church at St Papoul, with its graceful cloister of the 14th century, and the remains of the important abbey of St Hilaire, founded in the 6th century and rebuilt from the 12th to the 15th century, are also of antiquarian interest. Rennes-les-Bains has mineral springs of repute.

AUDEBERT, JEAN BAPTISTE (1759–1800), French artist and naturalist, was born at Rochefort in 1759. He studied painting and drawing at Paris, and gained considerable reputation as a miniature-painter. Employed in preparing plates for the *Histoire des coléoptères* of G. A. Olivier (1756–1814), he acquired a taste for natural history. In 1800 appeared his first original work, *L'Histoire naturelle des singes, des makis et des galéopithèques*, illustrated by sixty-two folio plates, drawn and engraved by himself. The colouring in these plates was unusually beautiful, and was applied by a method devised by himself. Audebert died in Paris in 1800, leaving complete materials for another great work, *Histoire des colibris, des oiseaux-mouches, des jacamars et des promérops*, which was published in 1802. Two hundred copies were printed in folio, one hundred in large quarto, and fifteen were printed with the whole text in letters of gold. Another work, left unfinished, was also published after the author's death, *L'Histoire des grimpereaux et des oiseaux de paradis*. The last two works also appeared together in two volumes, *Oiseaux dorés ou à reflets métalliques* (1802).

AUDEFROI LE BATARD, French *trouvère*, flourished at the end of the 12th century and was born at Arras. Of his life nothing is known. The seigneur de Nesles, to whom some of his songs are addressed, is probably the châtelain of Bruges who joined the crusade of 1200. Audefroi was the author of at least five lyric romances: *Argentine*, *Belle Idoine*, *Belle Isabeau*, *Belle Emmelos* and *Béatrix*. These romances follow older *chansons* in subject, but the smoothness of the verse and beauty of detail hardly compensate for the spontaneity of the shorter form.

See A. Jeanroy, *Les Origines de la poésie lyrique en France au moyen âge* (Paris, 1889).

AUDIENCE (from Lat. *audire*, to hear), the act or state of hearing, the term being therefore transferred to those who hear or listen, as in a theatre, at a concert or meeting. In a more technical sense, the term is applied to the right of access to the sovereign enjoyed by the peers of the realm individually and by the House of Commons collectively. More particularly it means the ceremony of the admission of ambassadors, envoys or others to an interview with a sovereign or an important official for the purpose of presenting their credentials. In France, *audience* is the term applied to the sitting of a law court for hearing actions. In Spain, *audiencia* is the name given to certain tribunals which try appeals from minor courts. The Spanish judges were originally known as *oidores*, hearers, from the Spanish *oir*, to hear; but they are now called *ministros*, or *magistrados togados*, robed judges, as the gown of the Spanish judge is called a *toga*. The *audiencia pretorial*, *i.e.* of the praetor, was a court in Spanish America from which there was no appeal

to the viceroy, but only to the council of the Indies in Spain. It is not the custom in Spain to speak of *audiencias reales*, royal courts, but of the *audiencias del Reino*, courts of the kingdom.

In England the *Audience-court* was an ecclesiastical court, held by the archbishops of Canterbury and York, in which they once exercised a considerable part of their jurisdiction, dealing with such matters as they thought fit to reserve for their own hearing. It has been long disused and is now merged in the court of arches.

AUDIFFRET-PASQUIER, EDMÉ ARMAND GASTON, Duc d' (1823–1905), French statesman, was the grand-nephew and adopted son of Baron Etienne Denis Pasquier. He was created duke in 1844, and became auditor at the council of state in 1846. After the revolution of 1848 he retired to private life. Under the empire he was twice an unsuccessful candidate for the legislature, but was elected in February 1871 to the National Assembly, and became president of the right centre in 1873. After the fall of Thiers, he directed the negotiations between the different royalist parties to establish a king in France, but as he refused to give up the tricolour for the flag of the old *régime*, the project failed. Yet he retained the confidence of the chamber, and was its president in 1875 when the constitutional laws were being drawn up. Nominated senator under the new constitution, he likewise was president of the senate from March 1876 to 1879 when his party lost the majority. Henceforth he was less prominent in politics. He was distinguished by his moderation and uprightness; and he did his best to dissuade MacMahon from taking violent advisers. In 1878 he was elected to the French Academy, but never published anything.

AUDIT and **AUDITOR.** An audit is the examination of the accounts kept by the financial officers of a state, public corporations and bodies, or private persons, and the certifying of their accuracy. In the United Kingdom the public accounts were audited from very early times, though, until the reign of Queen Elizabeth, in no very systematic way. Prior to 1559 this duty was carried out, sometimes by auditors specially appointed, at other times by the auditors of the land revenue, or by the auditor of the exchequer, an office established as early as 1314. But in 1559 an endeavour was made to systematize the auditing of the public accounts, by the appointment of two auditors of the imprests. These officers were paid by fee and did their work by deputy, but as the results were thoroughly unsatisfactory the offices were abolished in 1785. An audit board, consisting of five commissioners, was appointed in their place, but in order to concentrate under one authority the auditing of the accounts of the various departments, some of which had been audited separately, as the naval accounts, the Exchequer and Audit Act of 1866 was passed. This statute, which sets forth at length the duties of the audit office, empowered the sovereign to appoint a "comptroller and auditor-general," with the requisite staff to examine and verify the accounts prepared by the different departments of the public service. In examining accounts of the appropriation of the several supply grants, the comptroller and auditor-general "ascertains first whether the payments which the account department has charged to the grant are supported by vouchers or proofs of payments; and second, whether the money expended has been applied to the purpose or purposes for which such grant was intended to provide." The treasury may also submit certain other accounts to the audit of the comptroller-general. All public moneys payable to the exchequer (*q.v.*) are paid to the "account of His Majesty's exchequer" at the Bank of England, and daily returns of such payments are forwarded to the comptroller. Quarterly accounts of the income and charge of the consolidated fund are prepared and transmitted to him, and in case of any deficiency in the consolidated fund, he may certify to the bank to make advances.

In the United States the auditing of the Federal accounts is in the charge of the treasury department, under the supervision of the comptroller of the treasury, under whom are six auditors, (1) for the treasury department, (2) for the war, (3) for the interior, (4) for the navy, (5) for the state, &c., (6) for the post office, as well as a register and assistant register, who keep all general receipt and expenditure ledgers; there are official auditors in most of the states and in many cities. In practically all European countries there is a department of the administration, charged with the auditing of the public accounts, as the *cour des comptes* in France, the *Rechnungshof des deutschen Reiches* in Germany, &c. All local boards, large cities, corporations, and other bodies have official auditors for the purpose of examining and checking their accounts and looking after their expenditure. So far as regards the work which auditors discharge in connexion with the accounts of joint-stock companies, building societies, friendly societies, industrial and provident societies, savings banks, &c., the word auditor is now almost synonymous with "skilled accountant," and his duties are discussed in the article Accountants.

In Scotland there is an "auditor" who is an official of the court of session, appointed to tax costs in litigation, and who corresponds to the English taxing-master. In France there are legal officers, called auditors, attached to the *Conseil d'État*, whose duties consist in drawing up briefs and preparing documents. On the continent of Europe, lawyers skilled in military law are called "auditors" (see Military Law).

Auditor is also the designation of certain officials of the Roman curia. The *auditores Rotae* are the judges of the court of the Rota (so called, according to Hinschius, probably from the form of the panelling in the room where they originally met). These were originally ecclesiastics appointed to *hear* particular questions in dispute and report to the pope, who retained the decision in his own hands. In the *Speculum juris* of Durandus (published in 1272 and re-edited in 1287 and 1291) the *auditores palatii domini papae* are cited as permanent officials appointed to instruct the pope on questions as they arose. The court of the Rota appears for the first time under this name in the bull *Romani Pontificis* of Martin V. in 1422, and the auditores by this time had developed into a permanent tribunal to which the definitive decision of certain disputes, hitherto relegated to a commission of cardinals or to the pope himself, was assigned. From this time the powers of the auditores increased until the reform of the curia by Sixtus V., when the creation of the congregations of cardinals for specific purposes tended gradually to withdraw from the Rota its most important functions. It still, however, ranks as the supreme court of justice in the papal curia, and, as members of it, the auditores enjoy special privileges. They are prelates, and, besides the rights enjoyed by these, have others conceded by successive popes, *e.g.* that of holding benefices in plurality, of non-residence, &c. When the pope says mass pontifically the subdeacon is always an auditor. The auditores must be in priest's or deacon's orders, and have always been selected—nominally at least—after severe tests as to their moral and intellectual qualifications. They are twelve in number, and, by the constitution of Pius IV., four of them were to be foreigners: one French, one Spanish, one German and one Venetian; while the nomination of others was the privilege of certain cities. No bishop, unless *in partibus* (see Bishop), may be an auditor. On the other hand, from the auditores, as the intellectual *élite* of the curia, the episcopate, the nunciature and the cardinalate are largely recruited. The *auditor camerae* (*uditore generale della reverenda camera apostolica*) is an official formerly charged with important executive functions. In 1485, by a bull of Innocent VIII., he was given extensive jurisdiction over all civil and criminal causes arising in the curia, or appealed to it from the papal territories. In addition he received the function of watching over the execution of all sentences passed by the curia. This was extended later, by Pius IV., to a similar executive function in respect of all papal bulls and briefs, wherever no special executor was named. This right was confirmed by Gregory XVI. in 1834, and the auditor may still in principle issue letters monitory. In practice, however, this function was at all times but rarely exercised, and, since 1847, has fallen to a prelate *locum tenens*, who also took over the auditor's jurisdiction in the papal states (Hinschius, *Kathol. Kirchenrecht*, i. 409, &c.).

Auditores (listeners), in the early Church, was another name for catechumens (*q.v.*).

AUDLEY, or AUDELEY, **SIR JAMES** (*c.* 1316–1386), one of the original knights, or founders, of the order of the Garter, was the eldest son of Sir James Audley of Stratton Audley in Oxfordshire. When the order of the Garter was founded, he was instituted as one of the first founders, and his stall in St George's chapel, Windsor, was the eleventh on the side of Edward, the Black Prince. He appears to have served in France in 1346, and in August 1350 took part in the naval fight off Sluys. When hostilities were renewed between England and France in 1354 Sir James was in constant attendance upon the Black Prince, and earned a great reputation for valour. At the battle of Poitiers on the 19th of September 1356 he took his stand in front of the English army, and after fighting for a long time was severely wounded and carried from the fight. After the victory, the prince inquired for Sir James, who was brought to the royal tent, where Edward told him he had been the bravest knight on his side, and granted him an annuity of five hundred marks. Sir James made over this gift to the four esquires who had attended him during the battle, and received from the prince a further pension of six hundred marks. In 1359 he was one of the leaders of an expedition into France, in 1360 he took the fortress of Chaven in Brittany, and was present at Calais when peace was made between England and France in October 1360. He was afterwards governor of Aquitaine and great seneschal of Poitou, and took part in the capture of the town of La Roche-sur-Yon by Edmund, earl of Cambridge. He died in 1386 at Fontenay-le-Comte, where he had gone to reside, and was buried at Poitiers.

See Jean Froissart, *Chroniques*, translated by T. Johnes (Hafod, 1810); G. F. Beltz, *Memorials of the Most Noble Order of the Garter* (London, 1841).

AUDLEY, THOMAS AUDLEY, BARON (*c.* 1488–1544), lord chancellor of England, whose parentage is unknown, is believed to have studied at Buckingham College, Cambridge. He was educated for the law, entered the Middle Temple (becoming autumn reader in 1526), was town clerk of Colchester, and was on the commission of the peace for Essex in 1521. In 1523 he was returned to parliament for Essex, and represented this constituency in subsequent parliaments. In 1527 he was groom of the chamber, and became a member of Wolsey's household. On the fall of the latter in 1529, he was made chancellor of the duchy of Lancaster, and the same year speaker of the House of Commons, presiding over the famous assembly styled the Black or Long Parliament of the Reformation, which abolished the papal jurisdiction. The same year he headed a deputation of the Commons to the king to complain of Bishop Fisher's speech against their proceedings. He interpreted the king's "moral" scruples to parliament concerning his marriage with Catherine, and made himself the instrument of the king in the attack upon the clergy and the preparation of the act of supremacy. In 1531 he had been made a serjeant-at-law and king's serjeant; and on the 20th of May 1532 he was knighted, and succeeded Sir Thomas More as lord keeper of the great seal, being appointed lord chancellor on the 26th of January 1533. He supported the king's divorce from Catherine and the marriage with Anne Boleyn; and presided at the trial of Fisher and More in 1535, at which his conduct and evident intention to secure a conviction has been generally censured. Next year he tried Anne Boleyn and her lovers, was present on the scaffold at the unfortunate queen's execution, and recommended to parliament the new act of succession. In 1537 he condemned to death as traitors the Lincolnshire and the Yorkshire rebels. On the 29th of November 1538 he was created Baron Audley of Walden; and soon afterwards presided as lord steward at the trials of Henry Pole, Lord Montacute, and of the unfortunate marquess of Exeter. In 1539, though inclining himself to the Reformation, he made himself the king's instrument in enforcing religious conformity, and in the passing of the Six Articles Act. On the 24th of April 1540 he was made a knight of the Garter, and subsequently managed the attainder of Thomas Cromwell, earl of Essex, and the dissolution of Henry's marriage with Anne of Cleves. In 1542 he warmly supported the privileges of the Commons in the case of George Ferrers, member for Plymouth, arrested and imprisoned in London, but his conduct was inspired as usual by subservience to the court, which desired to secure a subsidy, and his opinion that the arrest was a flagrant contempt has been questioned by good authority. He resigned the great seal on the 21st of April 1544, and died on the 30th, being buried at Saffron Walden, where he had prepared for himself a splendid tomb. He received several grants of monastic estates, including the priory of Christ Church in London and the abbey of Walden in Essex, where his grandson, Thomas Howard, earl of Suffolk, built Audley End, doubtless named after him. In 1542 he re-endowed and re-established Buckingham College, Cambridge, under the new name of St Mary Magdalene, and ordained in the statutes that his heirs, "the possessors of the late monastery of Walden," should be visitors of the college *in perpetuum*. *A Book of Orders for the Warre both by Sea and Land* (Harleian MS. 297, f. 144) is attributed to his authorship. He married (1) Christina, daughter of Sir Thomas Barnardiston, and (2) Elizabeth, daughter of Thomas Grey, marquess of Dorset, by whom he had two daughters. His barony became extinct at his death.

AUDOUIN, JEAN VICTOR (1797–1841), French naturalist, was born at Paris on the 27th of April 1797. He began the study of law, but was diverted from it by his strong predilection for natural history, and entered the medical profession. In 1824 he was appointed assistant to P. A. Latreille (1762–1833) in the entomological chair at the Paris museum of natural history, and succeeded him in 1833. In 1838 he became a member of the Academy of Sciences. He died in Paris on the 9th of November 1841. His principal work, *Histoire des insectes nuisibles à la vigne* (1842), was completed after his death by Henry Milne-Edwards and Émile Blanchard. His papers mostly appeared in the *Annales des sciences naturelles*, which, with A. T. Brongniart and J. B. A. Dumas, he founded in 1824, and in the proceedings of the Société Entomologique de France, of which he was one of the founders in 1832.

AUDRAN, the name of a family of French artists and engravers. The first who devoted himself to the art of engraving was Claude Audran, born 1597, and the last was Benoit, Claude's great-grandson, who died in 1772. The two most distinguished members of the family are Gérard and Jean.

GÉRARD, or GIRARD, AUDRAN, the most celebrated French engraver, was the third son of Claude Audran, and was born at Lyons in 1640. He was taught the first principles of design and engraving by his father; and, following the example of his brother, went to Paris to perfect himself in his art. He there, in 1666, engraved for Le Brun "Constantine's Battle with Maxentius," his "Triumph," and the "Stoning of Stephen," which gave great satisfaction to the painter, and placed Audran in the very first rank of engravers at Paris. Next year he set out for Rome, where he resided three years, and engraved several fine plates. That great patron of the arts, J. B. Colbert, was so struck with the beauty of Audran's works, that he persuaded Louis XIV. to recall him to Paris. On his return he applied himself assiduously to engraving, and was appointed engraver to the king, from whom he received great encouragement. In the year 1681 he was admitted to the council of the Royal Academy. He died at Paris in 1703. His engravings of Le Brun's "Battles of Alexander" are regarded as the best of his numerous works. "He was," says the Abbé Fontenay, "the most celebrated engraver that ever existed in the historical line. We have several subjects, which he engraved from his own designs, that manifested as much taste as character and facility. But in the 'Battles of Alexander' he surpassed even the expectations of Le Brun himself." Gérard published in 1683 a work entitled *Les Proportions du corps humain mesurées sur les plus belles figures de l'antiquité.*

JEAN AUDRAN, nephew of Gérard, was born at Lyons in 1667. After having received instructions from his father, he went to Paris to perfect himself in the art of engraving under his uncle, next to whom he was the most distinguished member of his family. At the age of twenty his genius began to display itself in a surprising manner; and his subsequent success was such, that

in 1707 he obtained the title of engraver to the king, Louis XIV., who allowed him a pension, with apartments in the Gobelins; and the following year he was made a member of the Royal Academy. He was eighty years of age before he quitted the graver, and nearly ninety when he died. The best prints of this artist are those which appear not so pleasing to the eye at first sight. In these the etching constitutes a great part; and he has finished them in a bold, rough style. The "Rape of the Sabines," after Poussin, is considered his masterpiece.

AUDRAN, EDMOND (1842–1901), French musical composer, was born at Lyons on the 11th of April 1842. He studied music at the École Niedermeyer, where he won the prize for composition in 1859. Two years later he accepted the post of organist of the church of St Joseph at Marseilles. He made his first appearance as a dramatic composer at Marseilles with *L'Ours et le Pacha* (1862), a musical version of one of Scribe's vaudevilles. This was followed by *La Chercheuse d'Esprit* (1864), a comic opera, also produced at Marseilles. Audran wrote a funeral march on the death of Meyerbeer, which was performed with some success, and made various attempts to win fame as a writer of sacred music. He produced a mass (Marseilles, 1873), an oratorio, *La Sulamite* (Marseilles, 1876), and numerous minor works, but he is known almost entirely as a composer of the lighter forms of opera. His first Parisian success was made with *Les Noces d'Olivette* (1879), a work which speedily found its way to London and (as *Olivette*) ran for more than a year at the Strand theatre (1880–1881). Audran's music has, in fact, met with as much favour in England as in France, and all save a few of his works have been given in a more or less adapted form in London theatres. Besides those already mentioned, the following have been the most undeniably successful of Audran's many comic operas: *Le Grand Mogol* (Marseilles, 1876; Paris, 1884; London, as *The Grand Mogul*, 1884), *La Mascotte* (Paris, 1880; London, as *The Mascotte*, 1881), *Gillette de Narbonne* (Paris, 1882; London, as *Gillette*, 1883), *La Cigale et la Fourmi* (Paris, 1886; London, as *La Cigale*, 1890), *Miss Hélyett* (Paris, 1890; London, as *Miss Decima* 1891), *La Poupée* (Paris, 1896; London, 1897). Audran was one of the best of the successors of Offenbach. He had little of Offenbach's humour, but his music is distinguished by an elegance and a refinement of manner which lift it above the level of opéra bouffe to the confines of genuine opéra comique. He was a fertile if not a very original melodist, and his orchestration is full of variety, without being obtrusive or vulgar. Many of his operas, *La Mascotte* in particular, reveal a degree of musicianship which is rarely associated with the ephemeral productions of the lighter stage. He died in Paris on the 16th of August 1901.

AUDREHEM, ARNOUL D' (*c.* 1305–1370), French soldier, was born at Audrehem, in the present department of Pas de Calais, near St Omer. Nothing is known of his career before 1332, when he is heard of at the court of the king of France. Between 1335 and 1342 he went three times to Scotland to aid King David Bruce in his wars. In 1342 he became captain for the king of France in Brittany; then he seems to have served in the household of the duke of Normandy, and in 1346, as one of the main defenders of Calais, was taken as a prisoner to England by Edward III. From 1349 he holds an important place in the military history of France, first as captain in Angoulême, and from June 1351, in succession to the lord of Beaujeu, as marshal of France. In March 1352 he was appointed lieutenant for the king in the territory between the Loire and the Dordogne, in June 1353 in Normandy, and in 1355 in Artois, Picardy and the Boulonnais. It was Audrehem who arrested Charles the Bad, king of Navarre, and his partisans, at the banquet given by the dauphin at Rouen in 1356. At Poitiers he was one of those who advised King John to attack the English, and, charging in the front line of the French army, was slightly wounded and taken prisoner. From England he was several times given safe-conducts to France, and he took an active part in the negotiations for the treaty of Bretigny, recovering his liberty the same time as King John. In 1361, as the king's lieutenant in Languedoc, he prevented the free companies from seizing the castles, and negotiated the treaty with their chiefs under which they followed Henry, count of Trastamara (later Henry II. of Castile), into Spain. In 1365 he himself joined du Guesclin in the expedition to Spain, was taken prisoner with him by the Black Prince at the battle of Najera (1367), and was unable to pay his ransom until 1369. In 1368, on account of his age, he was relieved of the office of marshal, being appointed bearer of the oriflamme, with a pension of 2000 livres. He was sent to Spain in 1370 by Charles V., to urge his friend du Guesclin to return to France, and in spite of his age he took part in the battle of Pontvallain (December 1370), but fell ill and died, probably at Saumur, in the latter part of December 1370.

See Émile Molinier, "Étude sur la vie d'Arnoul d'Audrehem, maréchal de France," in *Mémoires présentés par divers savants à l'académie des inscriptions et belles-lettres*, 2e série, iv. (1883).

AUDUBON, JOHN JAMES (1780–1851), American naturalist, is said to have been born on the 5th of May 1780 in Louisiana, his father being a French naval officer and his mother a Spanish creole. He was educated in Paris, where he had lessons from the painter, J. L. David. Returning to America in 1798 he settled on a farm near Philadelphia, and gave himself up to the study of natural history, and especially to drawing birds. In 1826 he went to England in the hope of getting his drawings published, and by the following year he had obtained sufficient subscribers to enable him to begin the publication of his *Birds of America*, which on its completion in 1838 consisted of 435 coloured plates, containing 1055 figures of birds the size of life. Cuvier called it "le plus magnifique monument que l'art ait encore élevé à la nature." The descriptive matter to accompany the plates appeared at Edinburgh in 5 vols. from 1831 to 1839 under the title of *American Ornithological Biography*. During the publication of these works Audubon divided his time between Great Britain and America, devoting his leisure to expeditions to various parts of the United States and Canada for the purpose of collecting new material. In 1842 he bought an estate on the Hudson, now Audubon Park in New York City. In 1844 he published in America a popular octavo edition of his *Birds of America*. He also took up the preparation of a new work, *The Quadrupeds of America*, with the collaboration of John Bachman, the publication of which was begun in New York in 1846 and finished in 1853–1854. He died at New York on the 27th of January 1851.

See Ornithology; also *Audubon and his Journals* (1897), by his grand-daughter Maria R. Audubon, with notes by Elliot Coues.

AUE, a town of Germany, in the kingdom of Saxony, at the confluence of the Mulde and Schwarzwasser, 21 m. S.W. from Chemnitz on the railway to Adorf. It has a school of lace-making, foundries, and manufactures of machinery, tin-plate and cotton goods. Pop. (1905) 17,102.

AUERBACH, BERTHOLD (1812–1882), German novelist, was born on the 28th of February 1812 at Nordstetten in the Württemberg Black Forest. His parents were Jews, and he was intended for the ministry; but after studying philosophy at Tübingen, Munich and Heidelberg, and becoming estranged from Jewish orthodoxy by the study of Spinoza, he devoted himself to literature. He made a fortunate beginning in a romance on the life of Spinoza (1837), so interesting in itself, and so close in its adherence to fact, that it may be read with equal advantage as a novel or as a biography. *Dichter und Kaufmann* followed in 1839, and a translation of Spinoza's works in 1841, when Auerbach turned to the class of fiction which has made him famous, the *Schwarzwälder Dorfgeschichten* (1843), stories of peasant life in the Black Forest. In these, as well as in *Barfüssele* (1856), *Edelweiss* (1861), and other novels of greater compass, he depicts the life of the south German peasant as "Jeremias Gotthelf" (Albrecht Bitzius) had painted the peasantry of Switzerland, but in a less realistic spirit. When this vein was exhausted Auerbach returned to his first phase as a philosophical novelist, producing *Auf der Höhe* (1865), *Das Landhaus am Rhein* (1869), and other romances of profound speculative tendencies, turning on plots invented by himself. With the exception of *Auf der Höhe*, these works did not enjoy much popularity, and suffer from lack of form and concentration.

Auerbach's fame continues to rest upon his *Dorfgeschichten*, although the celebrity of even these has been impaired by the growing demand for a more uncompromising realism. Auerbach died at Cannes on the 8th of February 1882.

The first collected edition of Auerbach's *Schriften* appeared in 22 vols. in 1863–1864; the best edition is in 18 vols. (1892–1895). Auerbach's *Briefe an seinen Freund J. Auerbach* (with a preface by F. Spielhagen) were published in 2 vols. (1884). See E. Zabel, *B. Auerbach* (1882); and E. Lasker, *B. Auerbach, ein Gedenkblatt* (1882).

AUERSPERG, ANTON ALEXANDER, Graf von (1806–1876), Austrian poet, who wrote under the pseudonym of Anastasius Grün, was born on the 11th of April 1806, at Laibach, the capital of the Austrian duchy of Carniola, and was head of the Thurn-am-Hart branch of the Carniolan cadet line of the house of Auersperg. He received his university education first at Graz and then at Vienna, where he studied jurisprudence. In 1830 he succeeded to his ancestral property, and in 1832 appeared as a member of the estates of Carniola on the *Herrenbank* of the diet at Laibach. Here he distinguished himself by his outspoken criticism of the Austrian government, leading the opposition of the duchy to the exactions of the central power. In 1832 the title of "imperial chamberlain" was conferred upon him, and in 1839 he married Maria, daughter of Count Attems. After the revolution of 1848 at Vienna he represented the district of Laibach at the German national assembly at Frankfort-on-the-Main, to which he tried in vain to persuade his Slovene compatriots to send representatives. After a few months, however, disgusted with the violent development of the revolution, he resigned his seat, and again retired into private life. In 1860 he was summoned to the remodelled *Reichsrat* by the emperor, who next year nominated him a life member of the Austrian upper house (*Herrenhaus*), where, while remaining a keen upholder of the German centralized empire, as against the federalism of Slavs and Magyars, he greatly distinguished himself as one of the most intrepid and influential supporters of the cause of liberalism, in both political and religious matters, until his death at Graz on the 12th of September 1876.

Count Auersperg's first publication, a collection of lyrics, *Blätter der Liebe* (1830), showed little originality; but his second production, *Der letzte Ritter* (1830), brought his genius to light. It celebrates the deeds and adventures of the emperor Maximilian I. (1493–1519) in a cycle of poems written in the strophic form of the *Nibelungenlied*. But Auersperg's fame rests almost exclusively on his political poetry; two collections entitled *Spaziergänge eines Wiener Poeten* (1831) and *Schutt* (1835) created a sensation in Germany by their originality and bold liberalism. These two books, which are remarkable not merely for their outspoken opinions, but also for their easy versification and powerful imagery, were the forerunners of the German political poetry of 1840–1848. His *Gedichte* (1837), if anything, increased his reputation; his epics, *Die Nibelungen im Frack* (1843) and *Der Pfaff vom Kahlenberg* (1850), are characterized by a fine ironic humour. He also produced masterly translations of the popular Slovenic songs current in Carniola (*Volkslieder aus Krain*, 1850), and of the English poems relating to "Robin Hood" (1864).

Anastasius Grün's *Gesammelte Werke* were published by L. A. Frankl in 5 vols. (Berlin, 1877); his *Briefwechsel mit L. A. Frankl* (Berlin, 1897). A selection of his *Politische Reden und Schriften* has been published by S. Hock (Vienna, 1906). See P. von Radics, *Anastasius Grün* (2nd ed., Leipzig, 1879).

AUFIDENA, an ancient city of the Samnites Caraceni, the site of which is just north of the modern Alfedena,[1] Italy, a station on the railway between Sulmona and Isernia, 37 m. from the latter. Its remains are fully and accurately described by L. Mariani in *Monumenti dei Lincei* (1901), 225 seq.: cf. *Notizie degli scavi*, 1901, 442 seq.; 1902, 516 seq. The ancient city occupied two hills, both over 3800 ft. above sea-level (in the valley between were found the supposed remains of the later forum), and the walls, of rough Cyclopean work, were over a mile in length. A fortified outpost lay on a still higher hill to the north. Not very much is as yet known of the city itself (though one public building of the 5th century B.C. was excavated in 1901, and a small sanctuary in 1902), attention having been chiefly devoted to the necropolis which lay below it; 1400 tombs had already been examined in 1908, though this number is conjectured to be only a sixteenth of the whole. They are all inhumation burials, of the advanced iron age, and date from the 7th to the 4th century B.C., falling into three classes—those without coffin, those with a coffin formed of stone slabs, and those with a coffin formed of tiles. The objects discovered are preserved in a museum on the spot. In the Roman period we find Aufidena figuring as a post station on the road between Sulmo and Aesernia, which, however, runs past Castel di Sangro, crossing the river by an ancient bridge some 5 m. to the north-east. Castel di Sangro has remains of ancient walls, but these are attributed to a road by Mariani, and in any case the fortified area there was quite small, only one-sixteenth the size of Aufidena. The attempted identification of Castel di Sangro with Aufidena must therefore be rejected, though we must allow that it was probably the Roman post station; the ancient city, since its capture by the Romans in the 3rd century B.C., having lost something of its importance. (T. As.)

[1] Two churches here contain paintings of interest in the history of Abruzzese art, and one of them, the Madonna del Campo, contained fragments of a temple of considerable size.

AUGEAS, or Augeias, in Greek legend, a son of Helios, the sun-god, and king of the Epeians in Elis. He possessed an immense wealth of herds, including twelve bulls sacred to Helios, and white as swans. Eurystheus imposed upon Heracles the task of clearing out all his stalls unaided in one day. This he did by turning the rivers Alpheus and Peneus through them. Augeas had promised him a tenth of the herd, but refused this, alleging that Heracles had acted only in the service of Eurystheus. Heracles thereupon sent an army against him, and, though at first defeated, finally slew Augeas and his sons.

Apollodorus ii. 5, 7; Pindar, *Olympia*, xi, 24; Diodorus iv. 13; Theocritus, *Idyll* 25.

AUGER (from the O. Eng. *nafu-gâr*, nave-borer; the original initial *n* having been lost, as in "adder," through a confusion in the case of a preceding indefinite article), a tool for boring (*q.v.*) or drilling.

AUGEREAU, PIERRE FRANÇOIS CHARLES, duke of Castiglione (1757–1816), marshal of France, was born in Paris in a humble station of life. At the age of seventeen he enlisted in the carabineers and thereafter came into note as a ducllist. Having drawn his sword upon an officer who insulted him, he fled from France and roamed about in the Levant. He served in the Russian army against the Turks; but afterwards escaped into Prussia and enlisted in the guards. Tiring of this, he deserted with several others and reached the Saxon frontier. Service in the Neapolitan army and a sojourn in Portugal filled up the years 1788–1791; but the events of the French Revolution brought him back to his native land. He served with credit against the Vendeans and then joined the troops opposing the Spaniards in the south. There he rose rapidly, becoming general of division on the 23rd of December 1793. His division distinguished itself even more when transferred to the army of Italy; and under Bonaparte he was largely instrumental in gaining the battle of Millesimo and in taking the castle of Cosseria and the camp of Ceva. At the battle of Lodi (May 10, 1796), the turning movement of Augereau and his division helped to decide the day. But it was at Castiglione that he rendered the most signal services. Marbot describes him as encouraging even Bonaparte himself in the confused situation that prevailed before that battle, and, though this is exaggerated, there is no doubt that Augereau largely decided the fortunes of those critical days. Bonaparte thus summed up his military qualities: "Has plenty of character, courage, firmness, activity; is inured to war; is well liked by the soldiery; is fortunate in his operations." In 1797 Bonaparte sent him to Paris to encourage the Jacobinical Directors, and it was Augereau and the troops led by him that coerced the "moderates" in the councils and carried through the *coup d'état* of 18 Fructidor (4th of September) 1797. He was then sent to lead the united French forces in Germany; but peace

speedily ensued; and he bore a grudge against the Directors and Bonaparte for their treatment of him at that time. He took no part in the *coup d'état* of Brumaire 1799, and did not distinguish himself in the Rhenish campaign which ensued. Nevertheless, owing to his final adhesion to Bonaparte's fortunes, he received a marshal's baton at the beginning of the Empire (May 19, 1804). In the campaign of 1805 he did good service around Constance and Bregenz, and at Jena (October 14, 1806) his corps distinguished itself. Early in 1807 he fell ill of a fever, and at the battle of Eylau he had to be supported on his horse, but directed the movements of his corps with his wonted bravery. His corps was almost annihilated and the marshal himself received a wound from which he never quite recovered. When transferred to Catalonia, he gained some successes but tarnished his name by cruelty. In the campaign of 1812 in Russia and in the Saxon campaign of 1813 his conduct was little more than mediocre. Before the battle of Leipzig (October 16, 18, 19, 1813), Napoleon reproached him with not being the Augereau of Castiglione; to which he replied, "Give me back the old soldiers of Italy, and I will show you that I am." In 1814 he had command of the army of Lyons, and his slackness exposed him to the charge of having come to an understanding with the Austrian invaders. Thereafter he served Louis XVIII., but, after reviling Napoleon, went over to him during the Hundred Days. The emperor repulsed him and charged him with being a traitor to France in 1814. Louis XVIII., when restored to the throne, deprived him of his military title and pension. He died at his estate of La Houssaye on the 12th of June 1816. In person he was tall and commanding, but his loud and vulgar behaviour frequently betrayed the soldier of fortune.

As authorities consult: Kock's *Mémoires de Masséna*; Bouvier, *Bonaparte en Italie*; Count A. F. Andréossi, *La Campagne sur le Mein, 1800–1801*; Baron A. Ducasse, *Précis de la campagne de l'armée de Lyon en 1814*; and the *Memoirs* of Marbot. (J. Hl. R.)

AUGHRIM, or Aghrim, a small village in Co. Galway, Ireland, 4 m. W. by S. of Ballinasloe. It is rendered memorable by the decisive victory gained here on the 12th of July 1691 by the forces of William III. under General Ginkel, over those of James II. under the French general St Ruth, who fell in the fight. The Irish numbering 25,000, and strongly posted behind marshy ground, at first maintained a vigorous resistance; but Ginkel having penetrated their line of defence, and their general being struck down by a cannon ball at this critical moment, they were at length overcome and routed with terrible slaughter. The loss of the English did not exceed 700 killed and 1000 wounded; while the Irish, in their disastrous flight, lost about 7000 men, besides the whole material of the army. This defeat rendered the adherents of James in Ireland incapable of further efforts, and was speedily followed by the complete submission of the country.

AUGIER, GUILLAUME VICTOR ÉMILE (1820–1889), French dramatist, was born at Valence, Drôme, on the 17th of September 1820. He was the grandson of Pigault Lebrun, and belonged to the well-to-do *bourgeoisie* in principles and in thought as well as by actual birth. He received a good education and studied for the bar. In 1844 he wrote a play in two acts and in verse, *La Ciguë*, refused at the Théâtre Français, but produced with considerable success at the Odéon. This settled his career. Thenceforward, at fairly regular intervals, either alone or in collaboration with other writers—Jules Sandeau, Eugène-Marie Labiche, Éd. Foussier—he produced plays which were in their way eventful. *Le Fils de Giboyer* (1862)—which was regarded as an attack on the clerical party in France, and was only brought out by the direct intervention of the emperor—caused some political excitement. His last comedy, *Les Fourchambault*, belongs to the year 1879. After that date he wrote no more, restrained by an honourable fear of producing inferior work. The Academy had long before, on the 31st of March 1857, elected him to be one of its members. He died in his house at Croissy on the 25th of October 1889. Such, in briefest outline, is the story of a life which Augier himself describes as "without incident"—a life in all senses honourable. Augier, with Dumas *fils* and Sardou, may be said to have held the French stage during the Second Empire. The man respected himself and his art, and his art on its ethical side—for he did not disdain to be a teacher—has high qualities of rectitude and self-restraint. Uprightness of mind and of heart, generous honesty, as Jules Lemaître well said, constituted the very soul of all his dramatic work. *L'Aventurière* (1848), the first of Augier's important works, already shows a deviation from romantic models; and in the *Mariage d'Olympe* (1855) the courtesan is shown as she is, not glorified as in Dumas's *Dame aux Camélias*. In *Gabrielle* (1849) the husband, not the lover, is the sympathetic, poetic character. In the *Lionnes pauvres* (1858) the wife who sells her favours comes under the lash. Greed of gold, social demoralization, ultramontanism, lust of power, these are satirized in *Les Effrontés* (1861), *Le Fils de Giboyer* (1862), *Contagion*, first announced under the title of *Le Baron d'Estrigaud* (1866), *Lions et renards* (1869)—which, with *Le Gendre de M. Poirier* (1854), written in collaboration with Jules Sandeau, reach the high-water mark of Augier's art; in *Philiberte* (1853) he produced a graceful and delicate drawing-room comedy; and in *Jean de Thommeray*, acted in 1873 after the great reverses of 1870, the regenerating note of patriotism rings high and clear. His last two dramas, *Madame Caverlet* (1876) and *Les Fourchambault* (1879), are problem plays. But it would be unfair to suggest that Émile Augier was a preacher only. He was a moralist in the great sense, the sense in which the term can be applied to Molière and the great dramatists—a moralist because of his large and sane outlook on life. Nor does the interest of his dramas depend on elaborate plot. It springs from character and its evolution. His men and women move as personality, that mysterious factor, dictates. They are real, several of them typical. Augier's first drama, *La Ciguë*, belongs to a time (1844) when the romantic drama was on the wane; and his almost exclusively domestic range of subject scarcely lends itself to lyric outbursts of pure poetry. But his verse, if not that of a great poet, has excellent dramatic qualities, while the prose of his prose dramas is admirable for directness, alertness, sinew and a large and effective wit. Perhaps it wanted these qualities to enlist laughter on his side in such a war as he waged against false passion and false sentiment. (F. T. M.)

AUGITE, an important member of the pyroxene (*q.v.*) group of rock-forming minerals. The name (from *αὐγή*, lustre) has at various times been used in different senses; it is now applied to aluminous pyroxenes of the monoclinic series which are dark-greenish, brownish or black in colour. Like the other pyroxenes it is characterized crystallographically by its distinct cleavages parallel to the prism-faces (*M*), the angle between which is 87°. A typical crystal is represented in fig. 1, whilst fig. 2 shows a crystal twinned on the orthopinacoid (*r'*). Such crystals, of short prismatic habit and black in colour, are common as phenocrysts in many basalts, and are hence known as "basaltic augite": when the containing rock weathers to a clayey material the augite is left as black isolated crystals, and such specimens, usually from Bohemia, are represented in all mineral collections. Though typical of basaltic rocks, augite is also an important constituent of many other kinds of igneous rocks, and a rock composed almost wholly of augite is known as augitite. It also occurs in metamorphic rocks; for example, in the crystalline limestones of the Fassathal in Tirol, where the variety known as fassaite is found as pistachio-green crystals resembling epidote in appearance.

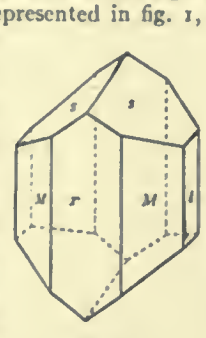


Fig. 1.

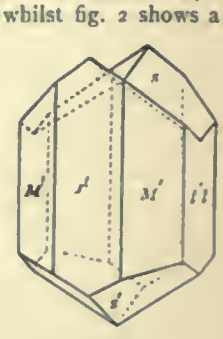


Fig. 2.

Chemically, augite resembles diopside in consisting mainly of $CaMgSi_2O_6$, but it contains in addition alumina and ferric iron as (Mg, Fe″) (Al, Fe″′)$_2$ SiO_6; the acmite ($NaFe'''Si_2O_6$)

and jadeite ($NaAlSi_2O_6$) molecules are also sometimes present. Variations in the amount of iron in mixtures of these isomorphous molecules are accompanied by variations in the optical characters of the augite. (L. J. S.)

AUGMENT (Lat. *augere*, to increase), in Sanskrit and Greek grammar the vowel prefixed to indicate the past tenses of a verb; in Greek grammar it is called *syllabic*, when only the ε is prefixed; *temporal*, when it causes an initial vowel in the verb to become a diphthong or long vowel.

AUGMENTATION, or enlargement, a term in heraldry for an addition to a coat of arms; in music, for the imitation in longer notes of an original theme; in biology, an addition to the normal number of parts; in Scots law, an increase of a minister's stipend by an action called "Process of Augmentation." The "Court of Augmentation" in Henry VIII.'s time was established to try cases affecting the suppression of monasteries, and was dissolved in Mary's reign.

AUGSBURG, a city and episcopal see of Germany, in the kingdom of Bavaria, chief town of the district of Swabia. Pop. (1885) 65,905; (1900) 89,109; (1905) 93,882. It lies on a high plateau, 1500 ft. above the sea, between the rivers Wertach and Lech, which unite below the city, 39 m. W.N.W. from Munich, with which, as with Regensburg, Ingolstadt and Ulm, it is connected by main lines of railway. It consists of an upper and a lower town, the old Jakob suburb and various modern suburbs. Its fortifications were dismantled in 1703 and have since been converted into public promenades. Maximilian Street is remarkable for its breadth and architectural beauty. One of its most interesting edifices is the Fugger Haus, of which the entire front is painted in fresco. Among the public buildings of Augsburg most worthy of notice is the town-hall in Renaissance style, one of the finest in Germany, built by Elias Holl in 1616–1620. One of its rooms, called the "Golden Hall," from the profusion of its gilding, is 113 ft. long, 59 broad and 53 high. The palace of the bishops, where the memorable Confession of Faith was presented to Charles V., is now used for government offices. Among the seventeen Roman Catholic churches and chapels, the cathedral, a basilica with two Romanesque towers, dates in its oldest portions from the 10th century. The church of St Ulrich and St Afra, built 1474–1500, is a Late Gothic edifice, with a nave of magnificent proportions and a tower 300 ft. high. The church stands on the spot where the first Christians of the district suffered martyrdom, and where a chapel was erected in the 6th century over the grave of St Afra. There are also a Protestant church, St Anne's, a school of arts, a polytechnic institution, a picture gallery in the former monastery of St Catherine, a museum, observatory, botanical gardens, an exchange, gymnasium, deaf-mute institution, orphan asylum, several remarkable fountains dating from the 16th century, &c. Augsburg is particularly well provided with special and technical schools. The newer buildings, all in the modern west quarter of the city, include law courts, a theatre, and a municipal library with 200,000 volumes. The "Fuggerei," built in 1519 by the brothers Fugger, is a miniature town, with six streets or alleys, three gates and a church, and consists of a hundred and six small houses let to indigent Roman Catholic citizens at a nominal rent. The manufactures of Augsburg are of great importance. It is the chief seat of the textile industry in south Germany, and its cloth, cotton goods and linen manufactories employ about 10,000 hands. It is also noted for its bleach and dye works, its engine works, foundries, paper factories, and production of silk goods, watches, jewelry, mathematical instruments, leather, chemicals, &c. Augsburg is also the centre of the acetylene gas industry of Germany. Copper-engraving, for which it was formerly noted, is no longer carried on; but printing, lithography and publishing have acquired a considerable development, one of the best-known Continental newspapers being the *Allgemeine Zeitung* or *Augsburg Gazette*. On the opposite side of the river, which is here crossed by a bridge, lies the township of Lechhausen.

Augsburg (the *Augusta Vindelicorum* of the Romans) derives its name from the Roman emperor Augustus, who, on the conquest of Rhaetia by Drusus, established here a Roman colony about 14 B.C. In the 5th century it was sacked by the Huns, and afterwards came under the power of the Frankish kings. It was almost entirely destroyed in the war of Charlemagne against Tassilo III., duke of Bavaria; and after the dissolution and division of that empire, it fell into the hands of the dukes of Swabia. After this it rose rapidly into importance as a manufacturing and commercial town, becoming, after Nuremberg, the centre of the trade between Italy and the north of Europe; its merchant princes, the Fuggers and Welsers, rivalled the Medici of Florence; but the alterations produced in the currents of trade by the discoveries of the 15th and 16th centuries occasioned a great decline. In 1276 it was raised to the rank of a free imperial city, which it retained, with many changes in its internal constitution, till 1806, when it was annexed to the kingdom of Bavaria. Meanwhile, it was the scene of numerous events of historical importance. It was besieged and taken by Gustavus Adolphus in 1632, and in 1635 it surrendered to the imperial forces; in 1703 it was bombarded by the electoral prince of Bavaria, and forced to pay a contribution of 400,000 dollars; and in the war of 1803 it suffered severely. Of its conventions the most memorable are those which gave birth to the Augsburg confession (1530) and to the Augsburg alliance (1686).

See Wagenseil, *Geschichte der Stadt Augsburg* (Augs., 1820–1822); Werner, *Geschichte der Stadt Augsburg* (1899); Roth, *Augsburg's Reformationsgeschichte* (1902).

AUGSBURG, CONFESSION OF, the most important Protestant statement of belief drawn up at the Reformation. In summoning a diet for April 1530, Charles V. offered a fair hearing to all religious parties in the Empire. Luther, Justus Jonas, Melanchthon and Johann Bugenhagen were appointed to draw up a statement of the Saxon position. These "Torgau Articles" (March 1530) tell merely why Saxony had abolished certain ecclesiastical abuses. Melanchthon, however, soon found that, owing to attacks by Johann Eck of Ingolstadt ("404 Articles"), Saxony must state its position in doctrinal matters as well. Taking the Articles of Marburg (see MARBURG, COLLOQUY OF) and of Schwabach as the point of departure, he repudiated all connexion with heretics condemned by the ancient church. On the 11th of May he sent the draft to Luther, who approved it, adding that he himself "could not tread so softly and gently." On the 23rd of June the Confession, originally intended as the statement of Electoral Saxony alone, was discussed and signed by a number of other Protestant princes and cities, and read before the diet on the 25th of June. Articles 1-21 attempt to show that the Evangelicals had deviated from current doctrine only in order to restore the pure and original teaching of the church. In spite of significant omissions (the sole authority of scripture; rejection of transubstantiation), the Confession contains nothing contradictory to Luther's position, and in its emphasis on justification by faith alone enunciates a cardinal concept of the Evangelical churches. Articles 22-28 describe and defend the reformation of various "abuses." On the 3rd of August, shorn of much of its original bitterness, the so-called *Confutatio pontificia* was read; it well expresses the views approved in substance by the emperor and all the Catholic party. In answer, Melanchthon was ordered to prepare an Apology of the Confession, which the emperor refused to receive; so Melanchthon enlarged it and published the *editio princeps* of both Confession and Apology in 1531.

As he felt free to make slight changes, the first edition does not represent the exact text of 1530; the edition of 1533 was further improved, while that of 1540, rearranged and in part rewritten, is known as the *Variata*. Dogmatic changes in this seem to have drawn forth no protest from Luther or Brenz, so Melanchthon made fresh alterations in 1542. Later, the *Variata* of 1540 became the creed of the Melanchthonians and even of the Crypto-calvinists; so the framers of the Formula of Concord, promulgated in 1580, returned to the text handed in at the Diet. By mistake they printed from a poor copy and not from the original, from which their German text varies at over 450 places. Their Latin text, that of Melanchthon's *editio princeps*, is more nearly accurate. The *textus receptus* is that of the Formula of Concord, the divergent Latin and German forms being equally binding.

Acceptance of the Confession and Apology was made a condition of membership in the Schmalkalden League. The

Wittenberg Concord (1536) and the Articles of Schmalkalden (1537) reaffirmed them. The Confession was the ultimate source of much of the Thirty-nine Articles. The Religious Peace of Augsburg (1555) recognized no Protestants save adherents of the Confession; this was modified in 1648. To-day the *Invariata* is of symbolical authority among Lutherans generally, while the *Variata* is accepted by the Reformed churches of certain parts of Germany (see Löber, pp. 79-83.)

Editions of the received text: J. T. Müller, *Die symbolischen Bücher der evangelisch-lutherischen Kirche* (10th ed., Gütersloh, 1907), with a valuable historical introduction by Th. Kolde; Theodor Kolde, *Die Augsburgische Konfession* (Gotha, 1896), (contains also the Marburg, Schwabach and Torgau Articles, the *Confutatio* and the *Variata* of 1540). For translations of these, as well as of Zwingli's Reckoning of his Faith, and of the Tetrapolitan Confession, see H. E. Jacobs, *The Book of Concord* (Philadelphia, 1882–83). The texts submitted to the emperor, lost before 1570, are reconstructed and compared with the *textus receptus* by P. Tschackert, *Die unveränderte Augsburgische Konfession* (Leipzig, 1901). For the genesis of the Confession, see Th. Kolde, *Die älteste Redaktion der Augsburger Konfession* (Gütersloh, 1906), also Kolde's article, "Augsburger Bekenntnis," in Herzog-Hauck, *Realencyklopädie* (3rd ed., vol. ii., Leipzig, 1897). The standard commentary is still G. L. Plitt, *Einleitung in die Augustana* (Erlangen, 1867 ff.); compare also J. Ficker, *Die Konfutation des Augsburgischen Bekenntnisses in ihrer ersten Gestalt* (Leipzig, 1891); also A. Petzold, *Die Konfutation des Vierstädtebekenntnisses* (Leipzig, 1900). On its present use see G. Löber, *Die im evangelischen Deutschland geltenden Ordinationsverpflichtungen geschichtlich geordnet* (Leipzig, 1905), 79 ff. (W. W. R.*)

AUGSBURG, WAR OF THE LEAGUE OF, the name applied to the European war of 1688–1697. The league of Augsburg was concluded on the 9th of July 1686 by the emperor, the elector of Brandenburg and other princes, against the French. Spain, Sweden, England and other non-German states joined the league, and formed the Grand Alliance by the treaty of Vienna (July 12, 1689). (See GRAND ALLIANCE, WAR OF THE.)

AUGURS, in ancient Rome, members of a religious college whose duty it was to observe and interpret the signs (auspices) of approval or disapproval sent by the gods in reference to any proposed undertaking. The *augures* were originally called *auspices*, but, while *auspex*[1] fell into disuse and was replaced by *augur*, *auspicium* was retained as the scientific term for the observation of signs.

The early history of the college is obscure. Its institution has been attributed to Romulus or Numa. It probably consisted originally of three members, of whom the king himself was one. This number was doubled by Tarquinius Priscus, but in 300 B.C. it was only four, two places, according to Livy (x. 6), being vacant. The Ogulnian law in the same year increased the number to nine, five plebeian being added to the four patrician members. In the time of Sulla the number was fifteen, which was increased to sixteen by Julius Caesar. This number continued in imperial times; the college itself was certainly in existence as late as the 4th century. The office of augur, which was bestowed only upon persons of distinguished merit and was much sought after by reason of its political importance, was held for life. Vacancies were originally filled by co-optation, but by the Domitian law (104) the selection was made, by seventeen out of the thirty-five tribes chosen by lot, from candidates previously nominated by the college. The insignia of office were the *lituus*, a staff free from knots and bent at the top, and the *trabea*, a kind of toga with bright scarlet stripes and a purple border. The science of augury was contained in various written works, which were consulted as occasion arose: such were the *libri augurum*, a manual of augural ritual, and the *commentarii augurum*, a collection of decrees or answers given by the college to the senate in certain definite cases.

[1] There is no doubt that *auspex*=*avi-spex* ("observer of birds"), but the derivation of *augur* is still unsettled. The following have been suggested: (1) *augur* (or *augus*) is a substantive originally meaning "increase" (related to *augustus* as *robur* to *robustus*), then transferred to the priest as the giver of increase or blessing; (2) =*avi-gur*, the second part of the word pointing to (*a*) *garrire*, "chatter," or (*b*) *gerere*, the augur being conceived as "carrying" or guiding the flight of the birds; (3) from a lost verb *augo*="tell," "declare." It is now generally agreed that the science of augury is of Italian, not Etruscan, origin.

The natural region to look to for signs of the will of Jupiter was the sky, where lightning and the flight of birds seemed directed by him as counsel to men. The latter, however, was the more difficult of interpretation, and upon it, therefore, mainly hinged the system of divination with which the augurs were occupied. It was the duty of the augur, before the auspices properly so called (those from the sky and from birds) were taken, to mark out with his staff the templum or consecrated space within which his observations were intended to be made. The method of procedure was as follows. At midnight, when the sky was clear and there was an absence of wind, the augur, in the presence of a magistrate, took up his position on a hill which afforded a wide view. After prayer and sacrifice, he marked out the templum both in the sky and on the ground and dedicated it. Within its limits he then pitched a tent, in which he sat down with covered head, asked the gods for a sign, and waited for an answer. As the augur looked south he had the east, the lucky quarter, on his left, and therefore signs on the left side were considered favourable, those on the right unfavourable. The practice was the reverse in Greece; the observers of signs looked towards the north, so that signs on the right were regarded as the favourable ones, and this is frequently adopted in the Roman poets. The augur afterwards announced the result of his observations in a set form of words, by which the magistrate was bound. Signs of the will of the gods were of two kinds, either in answer to a request (*auspicia impetrativa*), or incidental (*auspicia oblativa*). Of such signs there were five classes: (1) Signs in the sky (*caelestia auspicia*), consisting chiefly of thunder and lightning, but not excluding falling stars and other phenomena. Lightning from left to right was favourable, from right to left unfavourable; but on its mere appearance, in either direction, all business in the public assemblies was suspended for the day. Since the person charged to take the auspices for a certain day was constitutionally subject to no other authority who could test the truth or falsehood of his statement that he had observed lightning, this became a favourite device for putting off meetings of the public assembly. Restrictions were, however, imposed in later republican times. When a new consul, praetor or quaestor entered on his first day of office and prayed the gods for good omens, it was a matter of custom to report to him that lightning from the left had been seen. (2) Signs from birds (*signa ex avibus*), with reference to the direction of their flight, and also to their singing, or uttering other sounds. To the first class, called *alites*, belonged the eagle and the vulture; to the second, called *oscines*, the owl, the crow and the raven. The mere appearance of certain birds indicated good or ill luck, while others had a reference only to definite persons or events. In matters of ordinary life on which divine counsel was prayed for, it was usual to have recourse to this form of divination. For public affairs it was, by the time of Cicero, superseded by the fictitious observation of lightning. (3) Feeding of birds (*auspicia ex tripudiis*), which consisted in observing whether a bird—usually a fowl—on grain being thrown before it, let fall a particle from its mouth (*tripudium sollistimum*). If it did so, the will of the gods was in favour of the enterprise in question. The simplicity of this ceremony recommended it for very general use, particularly in the army when on service. The fowls were kept in cages by a servant, styled *pullarius*. In imperial times *decuriales pullarii* are mentioned. (4) Signs from animals (*pedestria auspicia*, or *ex quadrupedibus*), *i.e.* observation of the course of, or sounds uttered by, quadrupeds and reptiles within a fixed space, corresponding to the observations of the flight of birds, but much less frequently employed. It had gone out of use by the time of Cicero. (5) Warnings (*signa ex diris*), consisting of all unusual phenomena, but chiefly such as boded ill. Being accidental in their occurrence, they belonged to the *auguria oblativa*, and their interpretation was not a matter for the augurs, unless occurring in the course of some public transaction, in which case they formed a divine veto against it. Otherwise, reference was made for an interpretation to the pontifices in olden times, afterwards frequently to the Sibylline books, or the Etruscan haruspices, when the incident was not already provided for by a rule, as, for example, that it was unlucky for a person leaving his

house to meet a raven, that the sudden death of a person from epilepsy at a public meeting was a sign to break up the assembly.

Among the other means of discovering the will of the gods were the casting of lots, oracles of Apollo (in the hands of the college *sacris faciundis*), but chiefly the examination of the entrails of animals slain for sacrifice (see OMEN). Anything abnormal found there was brought under the notice of the augurs, but usually the Etruscan haruspices were employed for this. The persons entitled to ask for an expression of the divine will on a public affair were the magistrates. To the highest offices, including all persons of consular and praetorian rank, belonged the right of taking *auspicia maxima*; to the inferior offices of aedile and quaestor, the *auspicia minora*; the differences between these, however, must have been small. The subjects for which *auspicia publica* were always taken were the election of magistrates, their entering on office, the holding of a public assembly to pass decrees, the setting out of an army for war. They could only be taken in Rome itself; and in case of a commander having to renew his *auspicia*, he must either return to Rome or select a spot in the foreign country to represent the hearth of that city. The time for observing auspices was, as a rule, between midnight and dawn of the day fixed for any proposed undertaking. In military affairs this course was not always possible, as in the case of taking auspices before crossing a river. The founding of colonies, the beginning of a battle, the calling together an army, the sittings of the senate, decisions of peace or war, were occasions, not always but frequently, for taking auspices. The place where the ceremony was performed was not fixed, but selected with a view to the matter in hand. A spot being selected, the official charged to make the observation pitched his tent there some days before. A matter postponed through adverse signs from the gods could on the following or some future day be again brought forward for the auspices. If an error (*vilium*) occurred in the auspices, the augurs could, of their own accord or at the request of the senate, inform themselves of the circumstances, and decree upon it. A consul could refuse to accept their decree while he remained in office, but on retiring he could be prosecuted. *Auspicia oblativa* referred mostly to the comitia. A magistrate was not bound to take notice of signs reported merely by a private person, but he could not overlook such a report from a brother magistrate. For example, if a quaestor on his entry to office observed lightning and announced it to the consul, the latter must delay the public assembly for the day.

On the subject generally, see A. Bouché-Leclercq, *Histoire de la divination dans l'antiquité* (1879), and his articles, with bibliography, in Daremberg and Saglio's *Dictionnaire des antiquités*; also articles "Augures," "Auspicium," by Wissowa in Pauly's *Realencyclopädie* (II. pt. ii., 1896), and by L. C. Purser (and others) in Smith's *Dictionary of Greek and Roman Antiquities* (3rd ed., 1890). (See also DIVINATION, OMEN, ASTROLOGY, &c.)

AUGUST (originally *Sextilis*), the sixth month in the pre-Julian Roman year, which received its present name from the emperor Augustus. The preceding month, *Quintilis*, had been called "July" after Julius Caesar, and the emperor chose August to be rechristened in his own honour because his greatest good fortune had then happened. In that month he had been admitted to the consulate, had thrice celebrated a triumph, had received the allegiance of the soldiers stationed on the Janiculum, had concluded the civil wars, and had subdued Egypt. As July contained thirty-one days, and August only thirty, it was thought necessary to add another day to the latter month, in order that the month of Augustus might not be in any respect inferior to that of Julius.

AUGUSTA, a city and the county-seat of Richmond county, Georgia, U.S.A., at the head of steamboat navigation on the Savannah river, 132 m. N.W. of Savannah by rail and 240 m. by river course. Pop. (1890) 33,300; (1900) 39,441, of whom 18,487 were negroes and only 995 were foreign-born; (1910 census) 41,040. Augusta is served by the Southern, the Augusta Southern (controlled by the Southern), the Atlantic Coast Line, the Charleston & Western Carolina (controlled by the Atlantic Coast Line), the Georgia and the Central of Georgia railways, by an electric line to Aiken, South Carolina, and by a line of steamers to Savannah. The city extends along the river bank for a distance of more than 3 m., and is connected by a bridge with Hamburg, and with North Augusta, South Carolina, two residential suburbs. Augusta is well known as a winter resort (mean winter temperature, 47° F.), and there are many fine winter homes here of wealthy Northerners. There are good roads, stretching from Augusta for miles in almost every direction. In North Augusta there is a large hotel, and there is another in Summerville (pop. in 1910, 4361), 2½ m. N.W., an attractive residential suburb and winter resort, in which there are a country club and a large United States arsenal, established in 1831. Broad Street is the principal thoroughfare of Augusta, and Greene Street, with a park in the centre and flanking rows of oaks and elms, is the finest residential street. Of historical interest is St Paul's church (Protestant Episcopal); the present building was erected in 1819 and is the third St Paul's church on the same site. The first church was "built by the gentlemen of Augusta" in 1750. In the crypt of the church General Leonidas Polk is buried; and in the churchyard are the graves of George Steptoe Washington, a nephew of George Washington, and of William Longstreet, the inventor. Among the city's principal buildings are the Federal building, the Richmond county court house, the Augusta orphan asylum, the city hospital, the Lamar hospital for negroes, and the buildings of Richmond Academy (incorporated in 1783), of the Academy of the Sacred Heart (for girls), of Paine's Institute (for negroes), of Houghton Institute, endowed in 1852 to be "free to all the children of Augusta," and of the medical school of the university of Georgia, founded in 1829, and a part of the university since 1873. A granite obelisk 50 ft. high was erected in 1861 as a memorial to the signers for Georgia of the Declaration of Independence; beneath it are buried Lyman Hall (1726–1790) and George Walton (1740–1804). There are two Italian marble monuments in honour of Confederate soldiers, and monuments to the Southern poets, Paul Hamilton Hayne and Richard Henry Wilde (1789–1847).

In commerce and manufacturing, Augusta ranks second among the cities of Georgia. As a centre of trade for the "Cotton Belt," it has a large wholesale and retail business; and it is an important cotton market. The principal manufacture is cotton goods; among the other products are lumber, flour, cotton waste, cotton-seed oil and cake, ice, silk, boilers and engines, and general merchandise staples. Water-power for factories is secured by a system of "water-power canals" from a large dam across the Savannah, built in 1847 and enlarged in 1871; the principal canal, owned by the city, is so valuable as nearly to pay the interest on the municipal debt. In 1905 the value of the city's total factory product was $8,829,305, of which $3,832,009, or 43·4 %, was the value of the cotton goods. The principal newspaper is the *Augusta Chronicle*, founded in 1785.

Augusta was established in 1735–1736 by James Edward Oglethorpe, the founder of Georgia, and was named in honour of the princess of Wales. The Carolina colonists had a trading post in its vicinity before the settlement by Oglethorpe. The fort, built in 1736, was first named Fort Augusta, and in 1780, at the time of the British occupation, was enlarged and renamed Fort Cornwallis; its site is now marked by a Memorial Cross, erected by the Colonial Dames of Georgia in the churchyard of St Paul's. Tobacco was the principal agricultural product during the 18th century, and for its culture negro slaves were introduced from Carolina, before the restrictions of the Georgia Trustees on slavery were removed. During the colonial period several treaties with Indians were made at Augusta; by the most important, that of 1763, the Choctaws, Creeks, Chickasaws, Cherokees and Catawbas agreed (in a meeting with the governors of North and South Carolina, Virginia and Georgia) to the terms of the treaty of Paris. At the opening of the American War of Independence, the majority of the people of Augusta were Loyalists. The town was taken by the British under Lieut.-Col. Archibald Campbell (1739–1791) in January 1779, but was evacuated a month later; it was the seat of government of Georgia for almost the entire period from the capture of Savannah in December 1778 until May 1780, and was then abandoned by the Patriots and was occupied chiefly by Loyalists under Lieut.-Col.

Thomas Brown. In September 1780 a force of less than 500 patriots under Col. Elijah Clarke marched against the town in three divisions, and while one division, attacking a neighbouring Indian camp, drew off most of the garrison, the other two divisions entered the town; but British reinforcements arrived before Brown could be dislodged from a building in which he had taken refuge, and Clarke was forced to withdraw. A stronger American force, under Lieut.-Col. Henry Lee, renewed the siege in May 1781 and gained possession on the 5th of June. From 1783 until 1795 Augusta was again the seat of the state government. It was the meeting-place of the Land Court which confiscated the property of the Loyalists of Georgia, and of the convention which ratified for Georgia the Constitution of the United States. In 1798 it was incorporated as a town, and in 1817 it was chartered as a city. Augusta was the home of the inventor, William Longstreet (1759–1814), who as early as 1788 received a patent from the state of Georgia for a steamboat, but met with no practical success until 1808; as early as 1801 he had made experiments in the application of steam to cotton gins and saw-mills at Augusta. Near Augusta, on the site now occupied by the Eli Whitney Country Club, Eli Whitney is said to have first set up and operated his cotton gin; he is commemorated by a mural tablet in the court house. The establishment of a steamboat line to Savannah in 1817 aided Augusta's rapid commercial development. There was a disastrous fire in 1829, an epidemic of yellow fever in 1839, and a flood in 1840, but the growth of the city was not seriously checked; the cotton receipts of 1846 were 212,019 bales, and in 1847 a cotton factory was built. During the Civil War Augusta was the seat of extensive military factories, the tall chimney of the Confederate powder mills still standing as a memorial. The economic development has, since the Civil War, been steady and continuous. An exposition was held in Augusta in 1888, and another in 1893.

AUGUSTA, the capital of Maine, U.S.A., and the county-seat of Kennebec county, on the Kennebec river[1] (at the head of navigation), 44 m. from its mouth, 62 m. by rail N.E. of Portland, and 74 m. S.W. of Bangor. Pop. (1890) 10,527; (1900) 11,683, of whom 2131 were foreign-born; (1910, census) 13,211. It is served by the Maine Central railway, by several electric lines, and by steamboat lines to Portland, Boston and several other ports. It is built on a series of terraces, mostly on the west bank of the river, which is spanned here by a bridge 1100 ft. long. The state house, built of granite quarried in the vicinity, occupies a commanding site along the south border of the city, and in it is the state library. The Lithgow library is a city public library. Near the state house is the former residence of James G. Blaine. On the other side of the river, nearly opposite, is the Maine insane hospital. Among other prominent buildings are the court house, the post office and the city hall. In one of the parks is a soldiers' and sailors' monument. By means of a dam across the river, 17 ft. high and nearly 600 ft. long, good water-power is provided, and the city manufactures cotton goods, boots and shoes, paper, pulp and lumber. A leading industry is the printing and publishing of newspapers and periodicals, several of the periodicals published here having an enormous circulation. The total value of the factory products in 1905 was $3,886,833. Augusta occupies the site of the Indian village, Koussinoc, at which the Plymouth Colony established a trading post about 1628. In 1661 Plymouth sold its interests, and soon afterward the four purchasers abandoned the post. In 1754, however, their heirs brought about the erection here of Fort Western, the main building of which is still standing at the east end of the bridge, opposite the city hall. Augusta was originally a part of the township of Hallowell (incorporated in 1771); in 1797 the north part of Hallowell was incorporated as a separate town and named Harrington; and later in the same year the name was changed to Augusta. It became the county-seat in 1799; was chosen by the Maine legislature as the capital of the state in 1827, but was not occupied as such until the completion of the state house in 1831; and was chartered as a city in 1849.

[1] The Kennebec was first explored to this point in 1607.

AUGUSTA, a seaport of the province of Syracuse, Sicily, 19 m. N. of it by rail. Pop. (1901) 16,402. It occupies a part of the former peninsula of Xiphonia, now a small island, connected with the mainland by a bridge. It was founded by the emperor Frederick II. in 1232, and almost entirely destroyed by an earthquake in 1693, after which it was rebuilt. The castle is now a large prison. The fortified port, though unfrequented except as a naval harbour of refuge, is a very fine one. There are considerable saltworks at Augusta. To the south, on the left bank of the Molinello, 1½ m. from its mouth, Sicel tombs and Christian catacombs, and farther up the river a cave village of the early middle ages, have been explored (*Notizie degli Scavi*, 1902, 411, 631; *Römische Quartalschrift*, 1902, 205). Whether there was ever a town bearing the name Xiphonia is doubted by E. A. Freeman (*Hist. of Sic.* i. 583); cf., however, E. Pais, *Atakta* (Pisa, 1891), 55, who attributes its foundation, under the name of Tauromenion (which it soon lost), to the Zancleans of Hybla (afterwards Megara Hyblaea). (T. As.)

AUGUSTA BAGIENNORUM, the chief town of the Ligurian tribe of the Bagienni, probably identical with the modern Bene Vagienna, on the upper course of the Tanaro, about 35 m. due south of Turin. The town retained its position as a tribal centre in the reorganization of Augustus, whose name it bears, and was erected on a systematic plan. Considerable remains of public buildings, constructed in concrete faced with small stones with bands of brick at intervals, an amphitheatre with a major axis of 390 ft. and a minor axis of 305 ft., a theatre with a stage 133 ft. in length, and near it the foundations of what was probably a basilica, an open space (no doubt the forum), an aqueduct, baths, &c., have been discovered by recent excavations, and also one of the city gates, flanked by two towers 22 ft. sq.

See G. Assandria and G. Vacchetta in *Notizie degli Scavi* (1894), 155; (1896), 215; (1897), 441; (1898), 299; (1900), 389; (1901), 413. (T. As.)

AUGUSTAN HISTORY, the name given to a collection of the biographies of the Roman emperors from Hadrian to Carinus (A.D. 117–284). The work professes to have been written during the reigns of Diocletian and Constantine, and is to be regarded as the composition of six authors,—Aelius Spartianus, Julius Capitolinus, Aelius Lampridius, Vulcacius Gallicanus, Trebellius Pollio and Flavius Vopiscus—known as Scriptores Historiae Augustae, writers of Augustan history. It is generally agreed, however, that there is a large number of interpolations in the work, which are referred to the reign of Theodosius; and that the documents inserted in the lives are almost all forgeries. The more advanced school of critics holds that the names of the supposed authors are purely fictitious, as those of some of the authorities which they profess to quote certainly are. The lives, which (with few exceptions) are arranged in chronological order, are distributed as follows:—To Spartianus: the biographies of Hadrian, Aelius Verus, Didius Julianus, Septimius Severus, Pescennius Niger, Caracallus, Geta (?); to Vulcacius Gallicanus: Avidius Cassius; to Capitolinus: Antoninus Pius, Marcus Aurelius Antoninus, Verus, Pertinax, Clodius Albinus, the two Maximins, the three Gordians, Maximus and Balbinus, Opilius Macrinus (?); to Lampridius: Commodus, Diadumenus, Elagabalus, Alexander Severus; to Pollio: the two Valerians, the Gallieni, the so-called Thirty Tyrants or Usurpers, Claudius (his lives of Philip, Decius, and Gallus being lost); to Vopiscus: Aurelian, Tacitus, Florian, Probus, the four tyrants (Firmus, Saturninus, Proculus, Bonosus), Carus, Numerian, Carinus.

The importance of the Augustan history as a repertory of information is very considerable, but its literary pretensions are of the humblest order. The writers' standard was confessedly low. "My purpose," says Vopiscus, "has been to provide materials for persons more eloquent than I." Considering the perverted taste of the age, it is perhaps fortunate that the task fell into the hands of no showy declaimer who measured his success by his skill in making surface do duty for substance, but of homely, matter-of-fact scribes, whose sole concern was to record what they knew. Their narrative is unmethodical and inartificial; their style is tame and plebeian; their conception of biography is that of a collection of anecdotes; they have

no notion of arrangement, no measure of proportion, and no criterion of discrimination between the important and the trivial; they are equally destitute of critical and of historical insight, unable to sift the authorities on which they rely, and unsuspicious of the stupendous social revolution comprised within the period which they undertake to describe. Their value, consequently, depends very much on that of the sources to which they happen to have recourse for any given period of history, and on the fidelity of their adherence to these when valuable. Marius Maximus and Aelius Junius Cordus, to whose qualifications they themselves bear no favourable testimony, were their chief authorities for the earlier lives of the series. Marius Maximus, who lived about 165–230, wrote biographies of the emperors, in continuation of those of Suetonius, from Nerva to Elagabalus; Junius Cordus dealt with the less-known emperors, perhaps down to Maximus and Balbinus. The earlier lives, however, contain a substratum of authentic historical fact, which recent critics have supposed to be derived from a lost work by a contemporary writer, described by one of these scholars as "the last great Roman historian." For the later lives the Scriptores were obliged to resort more largely to public records, and thus preserved matter of the highest importance, rescuing from oblivion many imperial rescripts and senatorial decrees, reports of official proceedings and speeches on public occasions, and a number of interesting and characteristic letters from various emperors. Their incidental allusions sometimes cast vivid though undesigned light on the circumstances of the age, and they have made large contributions to our knowledge of imperial jurisprudence in particular. Even their trivialities have their use; their endless anecdotes respecting the personal habits of the subjects of their biographies, if valueless to the historian, are most acceptable to the archaeologist, and not unimportant to the economist and moralist. Their errors and deficiencies may in part be ascribed to the contemporary neglect of history as a branch of instruction. Education was in the hands of rhetoricians and grammarians; historians were read for their style, not for their matter, and since the days of Tacitus, none had arisen worth a schoolmaster's notice. We thus find Vopiscus acknowledging that when he began to write the life of Aurelian, he was entirely misinformed respecting the latter's competitor Firmus, and implying that he would not have ventured on Aurelian himself if he had not had access to the MS. of the emperor's own diary in the Ulpian library. The writers' historical estimates are superficial and conventional, but report the verdict of public opinion with substantial accuracy. The only imputation on the integrity of any of them lies against Trebellius Pollio, who, addressing his work to a descendant of Claudius, the successor and probably the assassin of Gallienus, has dwelt upon the latter versatile sovereign's carelessness and extravagance without acknowledgment of the elastic though fitful energy he so frequently displayed in defence of the empire. The caution of Vopiscus's references to Diocletian cannot be made a reproach to him.

No biographical particulars are recorded respecting any of these writers. From their acquaintance with Latin and Greek literature they must have been men of letters by profession, and very probably secretaries or librarians to persons of distinction. There seems no reason to accept Gibbon's contemptuous estimate of their social position. They appear particularly versed in law. Spartianus's reference to himself as "Diocletian's own" seems to indicate that he was a domestic in the imperial household. They address their patrons with deference, acknowledging their own deficiencies, and seem painfully conscious of the profession of literature having fallen upon evil days.

Editio princeps (Milan, 1475); Casaubon (1603) showed great critical ability in his notes, but for want of a good MS. left the restoration of the text to Salmasius (1620), whose notes are a most remarkable monument of erudition, combined with acuteness in verbal criticism and general vigour of intellect. Of recent years considerable attention has been devoted by German scholars to the *History*, especially by Peter, whose edition of the text in the Teubner series (2nd ed., 1884) contains (praef. xxxv.-xxxvii.) a bibliography of works on the subject preceding the publication of his own special treatise. The edition by Jordan-Eyssenhardt (1863) should also be mentioned. Amongst the most recent treatises on the subject are: A. Gemoll, *Die Scriptores Historiae Augustae* (1886); H. Peter, *Die Scriptores Historiae Augustae* (1892); G. Tropea, *Studi sugli Scriptores Historiae Augustae* (1899–1903); J. M. Heer, *Der historische Wert der Vita Commodi in der Sammlung der Scriptores Historiae Augustae* (1901); C. Lécrivain, *Études sur l'histoire Auguste* (1904); E. Kornemann, *Kaiser Hadrian und der letzte grosse Historiker von Rom* (1905), according to whom "the last great historian of Rome" is Lollius Urbicus; O. Schulz, *Das Kaiserhaus der Antonine und der letzte Historiker Roms* (1907). On their style, see C. Paucker, *De Latinitate Scriptorum Historiae Augustae* (1870); special lexicon by C. Lessing (1901–1906). An English translation is included in *The Lives of the Roman Emperors*, by John Bernard (1698). See further ROME: *History* (anc. *ad fin.*), section "Authorities"; M. Schanz, *Geschichte der römischen Litteratur*, iii. p. 69 (for Marius Maximus and Junius Cordus), iv. p. 47; Teuffel-Schwabe, *Hist. of Roman Literature* (Eng. tr.), § 392; H. Peter, bibliography from 1893 to 1905 in Bursian's *Jahresbericht*, cxxix. (1907).

AUGUSTA PRAETORIA SALASSORUM (mod. *Aosta*, *q.v.*), an ancient town of Italy in the district of the Salassi, founded by Augustus about 24 B.C. on the site of the camp of Varro Murena, who subdued this tribe in 25 B.C., and settled with 3000 praetorians. Pliny calls it the last town of Italy on the north-west, and its position at the confluence of two rivers, at the end of the Great and Little St Bernard, gave it considerable military importance, which is vouched for by considerable remains of Roman buildings. The ancient town walls, enclosing a rectangle 793 by 624 yds., are still preserved almost in their entire extent. The walls are 21 ft. high. They are built of concrete faced with small blocks of stone, and at the bottom are nearly 9 ft. thick, and at the top 6 ft. There are towers at the angles of the *enceinte*, and others at intervals, and two at each of the four gates, making a total of twenty towers altogether. They are roughly 32 ft. square, and project 14 ft. from the wall. The Torre del Pailleron on the south and the Torre del Leproso in the west are especially well preserved. The east and south gates exist (the latter, a double gate with three arches flanked by two towers, is the Porta Praetoria, and is especially fine), while the rectangular arrangement of the streets perpetuates the Roman plan, dividing the town into 16 blocks (*insulae*). The main road, 32 ft. wide, divides the city into two equal halves, running from east to west, an arrangement which makes it clear that the guarding of the road was the main *raison d'être* of the city. Some arcades of the amphitheatre (the diameters of which are 282 ft. and 239 ft.), and the south wall of the theatre are also preserved, the latter to a height of over 70 ft., and a market-place some 300 ft. square, surrounded by storehouses on three sides with a temple in the centre, and two on the open (south) side, and the *thermae*, have been discovered. Outside the town is a handsome triumphal arch in honour of Augustus. About 5 m. to the west is a single-arched Roman bridge, the Pondel, which has a closed passage lighted by windows for foot passengers in winter, and above it an open footpath, both being about 3½ ft. in width. There are considerable remains of the ancient road from Eporedia (mod. *Ivrea*) to Augusta Praetoria, up the Valle d' Aosta, which the modern railway follows, notably the Pont St Martin, with a single arch with a span of 116 ft. and a roadway 15 ft. wide, the cutting of Donnaz, and the Roman bridges of Châtillon (Pont St Vincent) and Aosta (Pont de Pierre), &c.

See C. Promis, *Le antichità di Aosta* (Turin, 1862); E. Bérard in *Atti della Società di Archeologia di Torino*, iii. 119 seq.; *Notizie degli Scavi*, passim; A. d'Andrade, *Relazione dell' Ufficio Regionale per la conservazione dei Monumenti del Piemonte e della Liguria* (Turin, 1899), 46 seq. (T. As.)

AUGUSTI, JOHANN CHRISTIAN WILHELM (1772–1841), German theologian, born at Eschenberga, near Gotha, was of Jewish descent, his grandfather having been a converted rabbi. He was educated at the gymnasium at Gotha and the university of Jena. At Jena he studied oriental languages, of which he became professor there in 1803. Subsequently he became ordinary professor of theology (1812), and for a time rector, at Breslau. In 1819 he was transferred to the university of Bonn, where he was made professor primarius. In 1828 he was appointed chief member of the consistorial council at Coblenz. Here he was afterwards made director of the consistory. He died at Coblenz in 1841. Augusti had little sympathy with the modern philosophical interpretations of dogma, and although

he took up a position of free criticism with regard to the Biblical narratives, he held fast to the traditional faith. His works on theology (*Dogmengeschichte*, 1805; 4th ed., 1835) are simple statements of fact; they do not attempt a speculative treatment of their subjects. In 1809 he published in conjunction with W. M. L. de Wette a new translation of the Old Testament. Mention should also be made of his *Grundriss einer historisch-kritischen Einleitung ins Alte Testament* (1806), his *Exegetisches Handbuch des Alten Testaments* (1797–1800), and his edition of *Die Apokryphen des A. T.* (1804). In addition to these, his most important writings are the *Denkwürdigkeiten aus der Christlichen Archäologie*, 12 vols. (1817–1831), a partially digested mass of materials, and the *Handbuch der Christ. Archäologie*, 3 vols. (1836–1837), which gives the substance of the larger work in a more compact and systematic form.

AUGUSTINE, SAINT (354–430), one of the four great fathers of the Latin Church. Augustinus—the *praenomen* Aurelius is used indeed by his disciples Orosius and Prosper, and is found in the oldest Augustine MSS., but is not used by himself, nor in the letters addressed to him—was born at Tagaste, a town of Numidia, now Suk Ahras in Constantine, on the 13th of November 354. His father, Patricius, was a burgess of Tagaste and still a pagan at the time of his son's birth. His mother, Monica, was not only a Christian, but a woman of the most tender and devoted piety, whose beautiful faith and enthusiasm and patient prayer for both her husband and son (at length crowned with success in both cases) have made her a type of womanly saintliness for all ages. She early instructed her son in the faith and love of Jesus Christ, and for a time he seems to have been impressed by her teaching. Falling ill, he wished to be baptized; but when the danger was past, the rite was deferred and, in spite of his mother's admonitions and prayers, Augustine grew up without any profession of Christian piety or any devotion to Christian principles.

Inheriting from his father a passionate nature, he formed while still a mere youth an irregular union with a girl, by whom he became the father of a son, whom in a fit of pious emotion he named Adeodatus ("by God given"), and to whom he was passionately attached. In his *Confessions* he afterwards described this period of his life in the blackest colours; for in the light of his conversion he saw behind him only shadows. Yet, whatever his youthful aberrations, Augustine was from the first an earnest student. His father, noticing his early promise, destined him for the brilliant and lucrative career of a rhetorician, for which he spared no expense in training him. Augustine studied at his native town and afterwards at Madaura and Carthage, especially devoting himself to the works of the Latin poets, many traces of his love for which are to be found in his writings. His acquaintance with Greek literature was much more limited, and, indeed, it has been doubted, though without sufficient reason, whether he could use the Greek scriptures in the original. Cicero's *Hortensius*, which he read in his nineteenth year, first awakened in his mind the spirit of speculation and the impulse towards the knowledge of the truth. But he passed from one phase of thought to another, unable to find satisfaction in any. Manichaeism, that mixed product of Zoroastrian and Christian-gnostic elements, first enthralled him. He became a fervent member of the sect, and was admitted into the class of *auditors* or "hearers." Manichaeism seemed to him to solve the mysteries of the world, and of his own experiences by which he was perplexed. His insatiable imagination drew congenial food from the fanciful religious world of the Manichaeans, decked out as this was with the luxuriant wealth of Oriental myth. His strongly developed sense of a need of salvation sought satisfaction in the contest of the two principles of Good and Evil, and found peace, at least for the moment, in the conviction that the portions of light present in him would be freed from the darkness in which they were immersed. The ideal of chastity and self-restraint, which promised a foretaste of union with God, amazed him, bound as he was in the fetters of sensuality and for ever shaking at these fetters. But while his moral force was not sufficient for the attainment of this ideal, gradually everything else which Manichaeism seemed to offer him dissolved before his criticism. Increasingly occupied with the exact sciences, he learnt the incompatibility of the Manichaean astrology with the facts. More and more absorbed in the problems of psychology, he realized the insufficiency of dualism, which did not solve the ultimate questions but merely set them back. The Manichaean propaganda seemed to him invertebrate and lacking in force, and a discussion which he had with Faustus, a distinguished Manichaean bishop and controversialist, left him greatly disappointed.

Meanwhile nine years had passed. Augustine, after finishing his studies, had returned to Tagaste, where he became a teacher of grammar. He must have been an excellent master, who knew how to influence the whole personality of his pupils. It was then that Alypius, who in the later stages of Augustine's life proved a true friend and companion, attached himself to him. He remained in his native town little more than a year, during which time he lived with his mother, who was comforted by the bishop for the estrangement of her son from the Catholic faith ("a son of so many tears cannot be lost": *Confess.* III. xii. § 21), comforted also, and above all, by the famous vision, which Augustine thus describes: "She saw herself standing on a certain wooden rule, and a shining youth coming towards her, cheerful and smiling upon her the while she grieved, and was consumed with grief: and when he had inquired of her the causes of her grief and daily tears (for the sake, as is their wont, of teaching, not of learning) and she had made answer that she was bewailing my perdition, he bade her be at ease, and advised her to look and observe, 'That where she was, there was I also.' And when she looked there, she saw me standing by her on the same rule" (*Confess.* III. xi.). Augustine now returned for a second time to Carthage, where he devoted himself zealously to work. Thence, probably in the spring of 383, he migrated to Rome. His Manichaean friends urged him to take this step, which was rendered easier by the licentious lives of the students at Carthage. His stay at Rome may have lasted about a year, no agreeable time for Augustine, since his patrons and friends belonged to just those Manichaean circles with which he had in the meantime entirely lost all intellectual touch. He, therefore, accepted an invitation from Milan, where the people were in search of a teacher of rhetoric.

At Milan the conflict within his mind in search of truth still continued. It was now that he separated himself openly from the Manichaean sect. As a thinker he came entirely under the influence of the New Academy; he professed the Sceptic philosophy, without being able to find in it the final conclusion of wisdom. He was, however, not far from the decision. Two things determined his further development. He became acquainted with the Neo-Platonic philosophy; its monism replaced the dualism, its intellectualized world of ideas the materialism of Manichaeism. Here he found the admonition to seek for truth outside the material world, and from created things he learnt to recognize the invisible God; he attained the certainty that this God is, and is eternal, always the same, subject to change neither in his parts nor in his motions. And while thus Augustine's metaphysical convictions were being slowly remodelled, he met, in Ambrose, bishop of Milan, a man in whom complete worldly culture and the nobility of a ripe Christian personality were wonderfully united. He heard him preach; but at first it was the orator and not the contents of the sermons that enchained him. He sought an opportunity of conversation with him, but this was not easily found. Ambrose had no leisure for philosophic discussion. He was accessible to all who sought him, but never for a moment free from study or the cares of duty. Augustine, as he himself tells us, used to enter without being announced, as all persons might; but after staying for a while, afraid of interrupting him, he would depart again. He continued, however, to hear Ambrose preach, and gradually the gospel of divine truth and grace was received into his heart. He was busy with his friend Alypius in studying the Pauline epistles; certain words were driven home with irresistible force to his conscience. His struggle of mind became more and more intolerable, the thought of divine purity fighting in his heart

with the love of the world and the flesh. That sensuality was his worst enemy he had long known. The mother of his child had accompanied him to Milan. When he became betrothed he dismissed her; but neither the pain of this parting nor consideration for his not yet marriageable bride prevented him from forming a fresh connexion of the same kind. Meanwhile, the determination to renounce the old life with its pleasures of sense, was ever being forced upon him with more and more distinctness. He then received a visit from a Christian compatriot named Pontitian, who told him about St Anthony and the monachism in Egypt, and also of a monastery near Milan. He was shaken to the depths when he learnt from Pontitian that two young officials, like himself betrothed, had suddenly formed a determination to turn their backs upon the life of the world. He could no longer bear to be inside the house; in terrible excitement he rushed into the garden; and now followed that scene which he himself in the *Confessions* has described to us with such graphic realism. He flung himself under a fig tree, burst into a passion of weeping, and poured out his heart to God. Suddenly he seemed to hear a voice bidding him consult the divine oracle: "Take up and read, take up and read." He left off weeping, rose up, sought the volume where Alypius was sitting, and opening it read in silence the following passage from the Epistle to the Romans (xiii. 13, 14): "Not in rioting and drunkenness, not in chambering and wantonness, not in strife and envying. But put ye on the Lord Jesus Christ, and make not provision for the flesh to fulfil the lusts thereof." He adds: "I had neither desire nor need to read further. As I finished the sentence, as though the light of peace had been poured into the heart, all the shadows of doubt dispersed. Thus hast Thou converted me to Thee, so as no longer to seek either for wife or other hope of the world, standing fast in that rule of faith in which Thou so many years before hadst revealed me to my mother" (*in qua* me *ante tot annos ei revelaveras*: *Confess.* VIII. xii. § 30).[1]

The conversion of Augustine, as we have been accustomed to call this event, took place in the late summer of 386, a few weeks before the beginning of the vacation. The determination to give up his post was rendered easier by a chest-trouble which was not without danger, and which for months made him incapable of work. He withdrew with several companions to the country estate of Cassisiacum near Milan, which had been lent him by a friend, and announced himself to the bishop as a candidate for baptism. His religious opinions were still to some extent unformed, and even his habits by no means altogether such as his great change demanded. He mentions, for example, that during this time he broke himself of a habit of profane swearing, and in other ways sought to discipline his character and conduct for the reception of the sacred rite. He received baptism the Easter following, in his thirty-third year, and along with him his son Adeodatus and his friend Alypius were admitted to the Church. Monica, his mother, had rejoined him, and at length rejoiced in the fulfilment of her prayers. She died at Ostia, just as they were about to embark for Africa, her last hours being gladdened by his Christian sympathy. In the account of the conversation which he had with his mother before her end, in the narrative of her death and burial (*Confess.* IX. x.-xi., §§ 23-28), Augustine's literary power is displayed at its highest.

The plan of returning home remained for the present unaccomplished. Augustine stayed for a year in Rome, occupied in literary work, particularly in controversy with Manichaeism. It was not until the autumn of 388 that he returned to Tagaste, probably still accompanied by his son, who, however, must have died shortly afterwards. With some friends, who joined him in devotion, he formed a small religious community, which looked to him as its head. Their mode of life was not formally monastic according to any special rule, but the experience of this time of seclusion was, no doubt, the basis of that monastic system which Augustine afterwards sketched and which derived its name from him (see AUGUSTINIANS). As may be imagined, the fame of such a convert in such a position soon spread, and invitations to a more active ecclesiastical life came to him from many quarters. He shrank from the responsibility, but his destiny was not to be avoided. After two and a half years spent in retirement he went to Hippo, to see a Christian friend, who desired to converse with him as to his design of quitting the world and devoting himself to a religious life. The Christian community there being in want of a presbyter and Augustine being present at the meeting, the people unanimously chose him and he was ordained to the presbyterate. A few years afterwards, 395 or 396, he was made coadjutor to the bishop, and finally became bishop of the see.

Henceforth Augustine's life is filled up with his ecclesiastical labours, and is more marked by the series of his numerous writings and the great controversies in which they engaged him than by anything else. His life was spent in a perpetual strife. During the first half this had been against himself; but even when others stepped into his place, it always seems as though a part of Augustine himself were incarnate in them. Augustine had early distinguished himself as an author. He had written several philosophical treatises, and, as teacher of rhetoric at Carthage, he had composed a work *De pulchro et apto*, which is no longer extant. Whenat Cassisiacum he had combated the scepticism of the New Academy (*Contra Academicos*), had treated of the "blessed life" (*De Vita beata*), of the significance of evil in the order of the world (*De ordine*), of the means for the elucidation of spiritual truths (*Soliloquia*). Shortly before the time of his baptism, he was occupied with the question of the immortality of the soul (*De immortalitate animae*), and in Rome and at Tagaste he was still engaged with philosophical problems, as is evidenced by the writings *De quantitate animae* and *De magistro*. In all these treatises is apparent the influence of the Neo-Platonic method of thought, which for him, as for so many others, had become the bridge to the Christian. While still in Rome, he began to come to a reckoning with the Manichaeans, and wrote two books on the morals of the Catholic Church and of the Manichaeans (*De moribus ecclesiae Catholicae et de moribus Manichaeorum libri duo*). For many years he pursued this controversy in a long series of writings, of which the most conspicuous is the elaborate reply to his old associate and disputant, Faustus of Mileve (*Contra Faustum Manichaeum*, A.D. 400). It was natural that the Manichaean heresy, which had so long enslaved his own mind, should have first exercised Augustine's great powers as a theological thinker and controversialist. He was able from his own experience to give force to his arguments for the unity of creation and of the spiritual life, and to strengthen the mind of the Christian Church in its last struggle with that dualistic spirit which had animated and moulded in succession so many formsof thought at variance with Christianity.

But the time was one of almost universal ecclesiastical and intellectual excitement; and so powerful a mental activity as his was naturally drawn forth in all directions. Following his writings against the Manichaeans came those against the Donatists. The controversy was one which strongly interested him, involving as it did the whole question of the constitution of the Church and the idea of catholic order, to which the circumstances of the age gave special prominence. The Donatist controversy sprang out of the Diocletian persecution in the beginning of the century. A party in the Church of Carthage, fired with fanatic zeal on behalf of those who had courted martyrdom by resistance to the imperial mandates, resented deeply the appointment of a bishop of moderate opinions, whose consecration had been performed, they alleged, by a *traditor*, viz. a bishop who had "delivered" the holy scriptures to the magistrates. They set up, in consequence, a bishop of their own, of the name of Majorinus, succeeded in 315 by Donatus. The party made great pretensions to purity of discipline, and rapidly rose in popular favour, notwithstanding a decision given against them both by the bishop of Rome and by the emperor Constantine. Augustine was strongly moved by the lawlessness of the party and launched forth a series of writings against them, the most important of which survive. Amongst these are "Seven Books on Baptism" (*De baptismo contra Donatistas*, *c.* A.D. 400) and a lengthy answer, in three books, to Petilian, bishop of Cirta, who was the most eminent theologian amongst the Donatist divines. At a later period, about 417, Augustine wrote a treatise concerning

[1] The reference is to the vision described above.

the correction of the Donatists (*De correctione Donatistarum*) "for the sake of those," he says in his *Retractations*," who were not willing that the Donatists should be subjected to the correction of the imperial laws." In these writings, while vigorously maintaining the validity of the Church as it then stood in the Roman world, and the necessity for moderation in the exercise of church discipline, Augustine yet gave currency, in his zeal against the Donatists, to certain maxims as to the duty of the civil power to control schism, which were of evil omen, and have been productive of much disaster in the history of Christianity.

The third controversy in which Augustine engaged was the most important, and the most intimately associated with his distinctive greatness as a theologian. As may be supposed, owing to the conflicts through which he had passed, the bishop of Hippo was intensely interested in what may be called the anthropological aspect of the great Christian idea of redemption. He had himself been brought out of darkness into "marvellous light," only by entering into the depths of his own soul, and finding, after many struggles, that there was no power but divine grace, as revealed in the life and death of the Son of God, which could bring rest to human weariness, or pardon and peace for human guilt. He had found human nature in his own case too weak and sinful to find any good for itself. In God alone he had found good. This deep sense of human sinfulness coloured all his theology, and gave to it at once its depth—its profound and sympathetic adaptation to all who feel the reality of sin—and that tinge of darkness and exaggeration which has as surely repelled others. When the expression "Augustinism" is used, it points especially to those opinions of the great teacher which were evoked in the Pelagian controversy, to which he devoted the most mature and powerful period of his life. His opponents in this controversy were Pelagius, from whom it derives its name, and Coelestius and Julianus, pupils of the former. Nothing is certainly known as to the home of Pelagius. Augustine calls him Brito, and so do Marius Mercator and Orosius. Jerome points to his Scottish descent, in such terms, however, as to leave it uncertain whether he was a native of Scotland or of Ireland. He was a man of blameless character, devoted to the reformation of society, full of that confidence in the natural impulses of humanity which often accompanies philanthropic enthusiasm. About the year 400 he came, no longer a young man, to Rome, where he lived for more than a decade, and soon made himself conspicuous by his activity and by his opinions. His pupil Coelestius, a lawyer of unknown origin, developed the views of his master with a more outspoken logic, and, while travelling with Pelagius in Africa, in the year 411, was at length arraigned before the bishop of Carthage for the following, amongst other heretical opinions:— (1) that Adam's sin was purely personal, and affected none but himself; (2) that each man, consequently, is born with powers as incorrupt as those of Adam, and only falls into sin under the force of temptation and evil example; (3) that children who die in infancy, being untainted by sin, are saved without baptism. Views such as these were obviously in conflict with the whole course of Augustine's experience, as well as with his interpretation of the catholic doctrine of the Church. And when his attention was drawn to them by the trial and excommunication of Coelestius, he undertook their refutation, first of all in three books on the punishment and forgiveness of sins and the baptism of infants (*De peccatorum meritis et remissione et de baptismo parvulorum*), addressed to his friend Marcellinus, in which he vindicated the necessity of baptism of infants because of original sin and the grace of God by which we are justified (*Retract.* ii. 23). This was in 412. In the same year he addressed a further treatise to the same Marcellinus on *The Spirit and the Letter* (*De spiritu et littera*). Three years later he composed the treatises on *Nature and Grace* (*De natura et gratia*) and the relation of the human to the divine righteousness (*De perfectione iustitiae hominis*). The controversy was continued during many years in no fewer than fifteen treatises. Upon no subject did Augustine bestow more of his intellectual strength, and in relation to no other have his views so deeply and permanently affected the course of Christian thought. Even those who most usually agree with his theological standpoint will hardly deny that, while he did much in these writings to vindicate divine truth and to expound the true relations of the divine and human, he also, here as elsewhere, was hurried into extreme expressions as to the absoluteness of divine grace and the extent of human corruption. Like his great disciple in a later age—Luther—Augustine was prone to emphasize the side of truth which he had most realized in his own experience, and, in contradistinction to the Pelagian exaltation of human nature, to depreciate its capabilities beyond measure.

In addition to these controversial writings, which mark the great epochs of Augustine's life and ecclesiastical activity after his settlement as a bishop at Hippo, he was the author of other works, some of them better known and even more important. His great work, the most elaborate, and in some respects the most significant, that came from his pen, is *The City of God* (*De civitate Dei*). It is designed as a great apologetic treatise in vindication of Christianity and the Christian Church,— the latter conceived as rising in the form of a new civic order on the crumbling ruins of the Roman empire,—but it is also, perhaps, the earliest contribution to the philosophy of history, as it is a repertory throughout of his cherished theological opinions. This work and his *Confessions* are, probably, those by which he is best known, the one as the highest expression of his thought, and the other as the best monument of his living piety and Christian experience. *The City of God* was begun in 413, and continued to be issued in its several portions for a period of thirteen years, or till 426. The *Confessions* were written shortly after he became a bishop, about 397, and give a vivid sketch of his early career. To the devout utterances and aspirations of a great soul they add the charm of personal disclosure, and have never ceased to excite admiration in all spirits of kindred piety. Something of this charm also belongs to the *Retractations*, that remarkable work in which Augustine, in 427, towards the end of his life, held as it were a review of his literary activity, in order to improve what was erroneous and to make clear what was doubtful in it. His systematic treatise on *The Trinity* (*De Trinitate*) which extends to fifteen books and occupied him for nearly thirty years, must not be passed over. This important work, unlike most of his dogmatic writings, was not provoked by any special controversial emergency, but grew up silently during this long period in the author's mind. This has given it something more of completeness and organic arrangement than is usual with Augustine, if it has also led him into the prolonged discussion of various analogies, more curious than apt in their bearing on the doctrine which he expounds. Brief and concise is the presentation of the Catholic doctrine in the compendium, which, about 421, he wrote at the request of a Roman layman named Laurentius (*Encheiridion, sive de fide spe et caritate*). In spite of its title, the compendious work on Christian doctrine (*De doctrina christiana*), begun as early as 393, but only finished in 426, does not belong to the dogmatic writings. It is a sort of Biblical hermeneutic, in which homiletic questions are also dealt with. His catechetical principles Augustine developed in the charming writing *De catechizandis rudibus* (*c.* 400). A large number of tractates are devoted to moral and theological problems (*Contra mendacium*, *c.* 420; *De bono conjugali*, 401, &c.). A widespread influence was exercised by the treatise *De opere monachorum* (*c.*400), in which, on the ground of Holy Scripture, manual work was demanded of monks. Of less importance than the remaining works are the numerous exegetical writings, among which the commentary on the Gospel of St John deserves a special mention. These have a value owing to Augustine's appreciation of the deeper spiritual meaning of scripture, but hardly for their exegetical qualities. His *Letters* are full of interest owing to the light they throw on many questions in the ecclesiastical history of the time, and owing to his relations with such contemporary theologians as Jerome. They have, however, neither the liveliness nor the varied interest of the letters of Jerome himself. As a preacher Augustine was

of great importance. We still possess almost four hundred sermons which may be ascribed to him with certainty. Many others only pass under his celebrated name.

The closing years of the great bishop were full of sorrow. The Vandals, who had been gradually enclosing the Roman empire, appeared before the gates of Hippo, and laid siege to it. Augustine was ill with his last illness, and could only pray for his fellow-citizens. He passed away during the siege, on the 28th of August 430, at the age of seventy-five, and thus was spared the indignity of seeing the city in the hands of the enemy.

The character of Augustine, both as a man and as a theologian, has been briefly indicated in the course of our sketch. None can deny the greatness of Augustine's soul—his enthusiasm, his unceasing search after truth, his affectionate disposition, his ardour, his self-devotion. And even those who may doubt the soundness of his dogmatic conclusions, cannot but acknowledge the depth of his spiritual convictions, and the logical force and penetration with which he handled the most difficult questions, thus weaving all the elements of his experience and of his profound scriptural knowledge into a great system of Christian thought. Of the four great Fathers of the Church he was admittedly the greatest—more profound than Ambrose, his spiritual father, more original and systematic than Jerome, his correspondent, and intellectually far more distinguished than Gregory the Great, his pupil on the papal throne. The theological position and influence of Augustine may be said to be unrivalled. No single name has ever exercised such power over the Christian Church, and no one mind ever made so deep an impression upon Christian thought. In him scholastics and mystics, popes and the opponents of the papal supremacy, have seen their champion. He was the fulcrum on which Luther rested the thoughts by which he sought to lift the past of the Church out of the rut; yet the judgment of Catholics still proclaims the ideas of Augustine as the only sound basis of philosophy.

The best complete edition of Augustine's works is that of the Maurines, in 11 vols. fol. published at Paris, 1679–1700, and reprinted in Migne's *Patrologie* (Paris, 1841–1842). Of the new critical edition in the *Corpus Scriptorum Ecclesiasticorum Latinorum*, issued by the Vienna Academy, thirteen volumes had been published in 1908, including the *Confessions*, the *Retractations*, *De civitate Dei*, and a number of exegetical and of dogmatic polemical works, together with a portion of the *Letters*. An English translation of nearly the whole of Augustine's writings will be found in the *Select Library of the Nicene and post-Nicene Fathers of the Christian Church* (series 1, Buffalo, 1886, &c.). Tillemont, in his *Mémoires pour servir à l'histoire ecclésiastique des VI premiers siècles*, has devoted a quarto volume (vol. xiii.) to Augustine's life and writings. The most complete monographs are those on the Catholic side by Kloth (Aix-la-Chapelle, 1839–1840, 3 vols.) and J. J. F. Poujoulat (7th ed., Paris, 1886, 2 vols.), and on the Protestant side by Bindemann (Berlin, Leipzig, Greifswald, 1844–1869, 3 vols.). There are interesting sketches, from quite different points of view, by von Hertling, *Augustinus* (2nd ed., Mainz, 1904), and Joseph McCabe, *St Augustine and His Age* (London, 1902). See also Nourrisson, *La Philosophie de St Augustin* (2nd ed., Paris, 1866, 2 vols.); H. A. Naville, *St Augustin, étude sur la développement de sa pensée jusqu'à l'époque de son ordination* (Geneva, 1872); Dorner, *Augustinus* (Berlin, 1873); Reuter, *Augustinische Studien* (Gotha, 1886); F. Scheel, *Die Anschauung Augustins über Christi Person und Werk* (Tübingen, 1901); A. Hatzfeld, *Saint Augustin* (6th ed., Paris, 1902); G. von Hertling, *Augustin* (Mainz, 1902); A. Egger, *Der heilige Augustinus* (Kempten, 1904); J. N. Espenberger, *Die Elemente der Erbsünde nach Augustin und der Frühscholastik* (Mainz, 1905); S. Angus, *The Sources of the First Ten Books of Augustine's De Civitate Dei* (Princeton, 1906); and the more modern text-books of the history of dogma, especially Harnack. (G. K.)

AUGUSTINE, SAINT (d. *c.*613), first archbishop of Canterbury, occupied a position of authority in the monastery of St Andrew at Rome, when Gregory I. summoned him to lead a mission to England in A.D. 596. The apprehensions of Augustine's followers caused him to return to Rome, but the pope furnished him with letters of commendation and encouraged him to proceed. He landed in Thanet in A.D. 597, and was favourably received by Æthelberht, king of Kent, who granted a dwelling-place for the monks in Canterbury, and allowed them liberty to preach. Augustine first made use of the ancient church of St Martin at Canterbury, which before his arrival had been the oratory of the Queen Berhta and her confessor Liudhard. Æthelberht upon his conversion employed all his influence in support of the mission. In 601 Augustine received the pallium from Gregory and was given authority over the Celtic churches in Britain, as well as all future bishops consecrated in English territory, including York. Authority over the see of York was not, however, to descend to Augustine's successors. In 603 he consecrated Christ Church, Canterbury, and built the monastery of SS. Peter and Paul, afterwards known as St Augustine's. At the conference of Augustine's Oak he endeavoured in vain to bring over the Celtic church to the observance of the Roman Easter. He afterwards consecrated Mellitus and Justus to the sees of London and Rochester respectively. The date of his death is not recorded by Bede, but MS. F of the Saxon Chronicle puts it in 614, and the *Annales Monasterienses* in 612.

See Bede, *Eccl. Hist.* (ed. by Plummer), i. 23–ii. 3.

AUGUSTINIAN CANONS, a religious order in the Roman Catholic Church, called also Austin Canons, Canons Regular, and in England Black Canons, because their cassock and mantle were black, though they wore a white surplice: elsewhere the colour of the habit varied considerably.

The canons regular (see CANON) grew out of the earlier institute of canonical life, in consequence of the urgent exhortations of the Lateran Synod of 1059. The clergy of some cathedrals (in England, Carlisle), and of a great number of collegiate churches all over western Europe, responded to the appeal; and the need of a rule of life suited to the new régime produced, towards the end of the 11th century, the so-called Rule of St Augustine (see AUGUSTINIANS). This Rule was widely adopted by the canons regular, who also began to bind themselves by the vows of poverty, obedience and chastity. In the 12th century this discipline became universal among them; and so arose the order of Augustinian canons as a religious order in the strict sense of the word. They resembled the monks in so far as they lived in community and took religious vows; but their state of life remained essentially clerical, and as clerics their duty was to undertake the pastoral care and serve the parish churches in their patronage. They were bound to the choral celebration of the divine office, and in its general tenor their manner of life differed little from that of monks.

Their houses, at first without bonds between them, soon tended to draw together and coalesce into congregations with corporate organization and codes of constitutions supplementary to the Rule. The popes encouraged these centralizing tendencies; and in 1339 Benedict XII. organized the Augustinian canons on the same general lines as those laid down for the Benedictines, by a system of provincial chapters and visitations.

Some thirty congregations of canons regular of St Augustine are numbered. The most important were: (1) the Lateran canons, formed soon after the synod of 1059, by the clergy of the Lateran Basilica; (2) Congregation of St Victor in Paris, *c.* 1100, remarkable for the theological and mystical school of Hugh, Richard and Adam of St Victor; (3) Gilbertines (see GILBERT OF SEMPRINGHAM, ST); (4) Windesheim Congregation, *c.* 1400, in the Netherlands and over north and central Germany (see GROOT, GERHARD), to which belonged Thomas à Kempis; (5) Congregation of Ste Geneviève in Paris, a reform *c.* 1630. During the later middle ages the houses of these various congregations of canons regular spread all over Europe and became extraordinarily numerous. They underwent the natural and inevitable vicissitudes of all orders, having their periods of depression and degeneracy, and again of revival and reform. The book of Johann Busch, himself a canon of Windesheim, *De Reformatione monasteriorum*, shows that in the 15th century grave relaxation had crept into many monasteries of Augustinian canons in north Germany, and the efforts at reform were only partially successful. The Reformation, the religious wars and the Revolution have swept away nearly all the canons regular, but some of their houses in Austria still exist in their medieval splendour. In England there were as many as 200 houses of Augustinian canons, and 60 of them were among the "greater monasteries" suppressed in 1538–1540 (for list see Tables in

F. A. Gasquet's *English Monastic Life*). The first foundation was Holy Trinity, Aldgate, by Queen Maud, in 1108; Carlisle was an English cathedral of Augustinian canons. In Ireland the order was even more numerous, Christ Church, Dublin, being one of their houses. Three houses of the Lateran canons were established in England towards the close of the 19th century. Most of the congregations of Augustinian canons had convents of nuns, called canonesses; many such exist to this day.

See the works of Amort and Du Molinet, mentioned under CANON. Vol. ii. of Helyot's *Hist. des ordres religieux* (1792) is devoted to canons regular of all kinds. The information is epitomized by Max Heimbucher, *Orden und Kongregationen*, i. (1896), §§ 54-60, where copious references to the literature of the subject are supplied. See also Otto Zöckler, *Askese und Mönchtum*, ii. (1897), p. 422; and Wetzer und Welte, *Kirchenlexicon* (2nd ed.), art. "Canonici Regulares" and "Canonissae." For England see J. W. Clark, *Observances in use at the Augustinian Priory at Barnwell* (1897); and an article in *Journal of Theological Studies* (v.) by Scott Holmes. (E. C. B.)

AUGUSTINIAN HERMITS, or FRIARS, a religious order in the Roman Catholic Church, sometimes called (but improperly) Black Friars (see FRIARS). In the first half of the 13th century there were in central Italy various small congregations of hermits living according to different rules. The need of co-ordinating and organizing these hermits induced the popes towards 1250 to unite into one body a number of these congregations, so as to form a single religious order, living according to the Rule of St Augustine, and called the Order of Augustinian Hermits, or simply the Augustinian Order. Special constitutions were drawn up for its government, on the same lines as the Dominicans and other mendicants—a general elected by chapter, provincials to rule in the different countries, with assistants, definitors and visitors. For this reason, and because almost from the beginning the term "hermits" became a misnomer (for they abandoned the deserts and lived conventually in towns), they ranked among the friars, and became the fourth of the mendicant orders. The observance and manner of life was, relatively to those times, mild, meat being allowed four days in the week. The habit is black. The institute spread rapidly all over western Europe, so that it eventually came to have forty provinces and 2000 friaries with some 30,000 members. In England there were not more than about 30 houses (see Tables in F. A. Gasquet's *English Monastic Life*). The reaction against the inevitable tendencies towards mitigation and relaxation led to a number of reforms that produced upwards of twenty different congregations within the order, each governed by a vicar-general, who was subject to the general of the order. Some of these congregations went in the matter of austerity beyond the original idea of the institute; and so in the 16th century there arose in Spain, Italy and France, Discalced or Barefooted Hermits of St Augustine, who provided in each province one house wherein a strictly eremitical life might be led by such as desired it.

About 1500 a great attempt at a reform of this kind was set on foot among the Augustinian Hermits of northern Germany, and they were formed into a separate congregation independent of the general. It was from this congregation that Luther went forth, and great numbers of the German Augustinian Hermits, among them Wenceslaus Link the provincial, followed him and embraced the Reformation, so that the congregation was dissolved in 1526.

The Reformation and later revolutions have destroyed most of the houses of Augustinian Hermits, so that now only about a hundred exist in various parts of Europe and America; in Ireland they are relatively numerous, having survived the penal times. The Augustinian school of theology (Noris, Berti) was formed among the Hermits. There have been many convents of Augustinian Hermitesses, chiefly in the Barefooted congregations; such convents exist still in Europe and North America, devoted to education and hospital work. There have also been numerous congregations of Augustinian Tertiaries, both men and women, connected with the order and engaged on charitable works of every kind (see TERTIARIES).

See Helyot, *Hist. des ordres religieux* (1792), iii.; Max Heimbucher, *Orden und Kongregationen*, i. (1896), § 61-65; Wetzer und Welte, *Kirchenlexicon* (2nd ed.), art "Augustiner"; Herzog, *Realencyklopädie* (3rd ed.), art. "Augustiner." The chief book on the subject is Th. Kolde, *Die deutschen Augustiner-Kongregationen* (1879). (E. C. B.)

AUGUSTINIANS, in the Roman Catholic Church, a generic name for religious orders that follow the so-called "Rule of St Augustine." The chief of these orders are:—Augustinian Canons (*q.v.*), Augustinian Hermits (*q.v.*) or Friars, Premonstratensians (*q.v.*), Trinitarians (*q.v.*), Gilbertines (see GILBERT OF SEMPRINGHAM, ST). The following orders, though not called Augustinians, also have St Augustine's Rule as the basis of their life: Dominicans, Servites, Our Lady of Ransom, Hieronymites, Assumptionists and many others; also orders of women: Brigittines, Ursulines, Visitation nuns and a vast number of congregations of women, spread over the Old and New Worlds, devoted to education and charitable works of all kinds.

See Helyot, *Ordres religieux* (1792), vols. ii., iii., iv.; Max Heimbucher, *Orden und Kongregationen*, i. (1896), § 66-85; Wetzer und Welte, *Kirchenlexicon*, i., 1665–1667.

St Augustine never wrote a Rule, properly so called; but *Ep.* 211 (*al.* 109) is a long letter of practical advice to a community of nuns, on their daily life; and *Serm.* 355, 356 describe the common life he led along with his clerics in Hippo. When in the second half of the 11th century the clergy of a great number of collegiate churches were undertaking to live a substantially monastic form of life (see CANON), it was natural that they should look back to this classical model for clerics living in community. And so attention was directed to St Augustine's writings on community life; and out of them, and spurious writings attributed to him, were compiled towards the close of the 11th century three Rules, the "First" and "Second" being mere fragments, but the "Third" a substantive rule of life in 45 sections, often grouped in twelve chapters. This Third Rule is the one known as "the Rule of St Augustine." Being confined to fundamental principles without entering into details, it has proved itself admirably suited to form the foundation of the religious life of the most varied orders and congregations, and since the 12th century it has proved more prolific than the Benedictine Rule. In an uncritical age it was attributed to St Augustine himself, and Augustinians, especially the canons, put forward fantastic claims to antiquity, asserting unbroken continuity, not merely from St Augustine, but from Christ and the Apostles.

The three Rules are printed in Dugdale, *Monasticon* (ed. 1846), vi. 42; and in Holsten-Brockie, *Codex Regularum*, ii. 121. For the literature see Otto Zöckler, *Askese und Mönchtum* (1897), pp. 347, 354. (E. C. B.)

AUGUSTOWO, a city of Russian Poland, in the government of Suwalki, 20 m. S. of the town of that name, on a canal (65 m.) connecting the Vistula with the Niemen. It was founded in 1557 by Sigismund II. (Augustus), and is laid out in a very regular manner, with a spacious market-place. It carries on a large trade in cattle and horses, and manufactures linen and huckaback. Pop. (1897) 12,746.

AUGUSTUS (a name[1] derived from Lat. *augeo*, increase, *i.e.* venerable, majestic, Gr. Σεβαστός), the title given by the Roman senate, on the 17th of January 27 B.C., to Gaius Julius Caesar Octavianus (63 B.C.–A.D. 14), or as he was originally designated, Gaius Octavius, in recognition of his eminent services to the state (*Mon. Anc.* 34), and borne by him as the first of the Roman emperors. The title was adopted by all the succeeding Caesars or emperors of Rome long after they had ceased to be connected by blood with the first Augustus.

Gaius Octavius was born in Rome on the 23rd of September 63 B.C., the year of Cicero's consulship and of Catiline's conspiracy. He came of a family of good standing, long settled at Velitrae (Velletri), but his father was the first of the family to obtain a curule magistracy at Rome and senatorial dignity. His mother, however, was Atia, daughter of Julia, the wife of M. Atius Balbus, and sister of Julius Caesar, and it was this connexion with the great dictator which determined his career. In his fifth year (58 B.C.) his father died; about a year later his mother

[1] On the name see Neumann, in Pauly-Wissowa's *Realencyclopädie f. cl. alterth.*, s.v., 2374.

remarried, and the young Octavius passed under her care to that of his stepfather, L. Marcius Philippus. At the age of twelve (51 B.C.) he delivered the customary funeral panegyric on his grandmother Julia, his first public appearance. On the 18th of October 48 (or ? 47) B.C. he assumed the "toga virilis" and was elected into the pontifical college, an exceptional honour which he no doubt owed to his great-uncle, now dictator and master of Rome. In 46 B.C. he shared in the glory of Caesar's African triumph, and in 45 he was made a patrician by the senate, and designated as one of Caesar's "masters of the horse" for the next year. In the autumn of 45, Caesar, who was planning his Parthian campaign, sent his nephew to study quietly at the Greek colony of Apollonia, in Illyria. Here the news of Caesar's murder reached him and he crossed to Italy. On landing he learnt that Caesar had made him his heir and adopted him into the Julian gens, whereby he acquired the designation of Gaius Julius Caesar Octavianus. The inheritance was a perilous one; his mother and others would have dissuaded him from accepting it, but he, confident in his abilities, declared at once that he would undertake its obligations, and discharge the sums bequeathed by the dictator to the Roman people. Mark Antony had possessed himself of Caesar's papers and effects, and made light of his young nephew's pretensions. Brutus and Cassius paid him little regard, and dispersed to their respective provinces. Cicero, much charmed at the attitude of Antonius, hoped to make use of him, and flattered him to the utmost, with the expectation, however, of getting rid of him as soon as he had served his purpose. Octavianus conducted himself with consummate adroitness, making use of all competitors for power, but assisting none. Considerable forces attached themselves to him. The senate, when it armed the consuls against Antonius, called upon him for assistance; and he took part in the campaign in which Antonius was defeated at Mutina (43 B.C.). The soldiers of Octavianus demanded the consulship for him, and the senate, though now much alarmed, could not prevent his election. He now effected a coalition with Antonius and Lepidus, and on the 27th of November 43 B.C. the three were formally appointed a triumvirate for the reconstitution of the commonwealth for five years. They divided the western provinces among them, the east being held for the republic by Brutus and Cassius. They drew up a list of proscribed citizens, and caused the assassination of three hundred senators and two thousand knights. They further confiscated the territories of many cities throughout Italy, and divided them among their soldiers. Cicero was murdered at the demand of Antonius. The remnant of the republican party took refuge either with Brutus and Cassius in the East, or with Sextus Pompeius, who had made himself master of the seas.

Octavianus and Antonius crossed the Adriatic in 42 B.C. to reduce the last defenders of the republic. Brutus and Cassius were defeated, and fell at the battle of Philippi. War soon broke out between the victors, the chief incident of which was the siege and capture by famine of Perusia, and the alleged sacrifice of three hundred of its defenders by the young Caesar at the altar of his uncle. But peace was again made between them (40 B.C.). Antonius married Octavia, his rival's sister, and took for himself the eastern half of the empire, leaving the west to Caesar. Lepidus was reduced to the single province of Africa. Meanwhile Sextus Pompeius made himself formidable by cutting off the supplies of grain from Rome. The triumvirs were obliged to concede to him the islands in the western Mediterranean. But Octavianus could not allow the capital to be kept in alarm for its daily sustenance. He picked a quarrel with Sextus, and when his colleagues failed to support him, undertook to attack him alone. Antonius, indeed, came at last to his aid, in return for military assistance in the campaign he meditated in the East. But Octavianus was well served by the commander of his fleet, M. Vipsanius Agrippa. Sextus was completely routed, and driven into Asia, where he perished soon afterwards (36 B.C.). Lepidus was an object of contempt to all parties, and Octavianus and Antonius remained to fight for supreme power.

The five years (36–31 B.C.) which preceded the decisive encounter between the two rivals were wasted by Antony in fruitless campaigns, and in a dalliance with Cleopatra which shocked Roman sentiment. By Octavian they were employed in strengthening his hold on the West, and his claim to be regarded as the one possible saviour of Rome and Roman civilization. His marriage with Livia (38 B.C.) placed by his side a sagacious counsellor and a loyal ally, whose services were probably as great as even those of his trusted friend Marcus Agrippa. With their help he set himself to win the confidence of a public still inclined to distrust the author of the proscriptions of 43 B.C. Brigandage was suppressed in Italy, and the safety of the Italian frontiers secured against the raids of Alpine tribes on the north-west and of Illyrians on the east, while Rome was purified and beautified, largely with the help of Agrippa (aedile in 33 B.C.). Meanwhile, indignation at Antony's un-Roman excesses, and alarm at Cleopatra's rumoured schemes of founding a Greco-Oriental empire, were rapidly increasing. In 32 B.C. Antony's repudiation of his wife Octavia, sister of Octavian, and the discovery of his will, with its clear proofs of Cleopatra's dangerous ascendancy, brought matters to a climax, and war was declared, not indeed against Antony, but against Cleopatra.

The decisive battle was fought on the 2nd of September 31 B.C. at Actium on the Epirot coast, and resulted in the almost total destruction of Antony's fleet and the surrender of his land forces. Not quite a year later (Aug. 1, 30 B.C.) followed the capture of Alexandria and the deaths by their own hands of Antony and Cleopatra. On the 11th of January 29 B.C. the restoration of peace was marked by the closing of the temple of Janus for the first time for 200 years. In the summer Octavian returned to Italy, and in August celebrated a three days' triumph. He was welcomed, not as a successful combatant in a civil war, but as the man who had vindicated the sovereignty of Rome against its assailants, as the saviour of the republic and of his fellow-citizens, above all as the restorer of peace.

He was now, to quote his own words, "master of all things," and the Roman world looked to him for some permanent settlement of the distracted empire. His first task was the re-establishment of a regular and constitutional government, such as had not existed since Julius Caesar crossed the Rubicon twenty years before. To this task he devoted the next eighteen months (Aug. 29–Jan. 27 B.C.). In the article on ROME: *History* (*q.v.*), his achievements are described in detail, and only a brief summary need be given here. The "principate," to give the new form of government its most appropriate name, was a compromise thoroughly characteristic of the combination of tenacity of purpose with cautious respect for forms and conventions which distinguished its author. The republic was restored; senate, magistrates and assembly resumed their ancient functions; and the public life of Rome began to run once more in the familiar grooves. The triumvirate with its irregularities and excesses was at an end. The controlling authority, which Octavian himself wielded, could not indeed be safely dispensed with. But henceforward he was to exercise it under constitutional forms and limitations, and with the express sanction of the senate and people. Octavian was legally invested for a period of ten years with the government of the important frontier provinces, with the sole command of the military and naval forces of the state, and the exclusive control of its foreign relations. At home it was understood that he would year by year be elected consul, and enjoy the powers and pre-eminence attached to the chief magistracy of the Roman state. Thus the republic was restored under the presidency and patronage of its "first citizen" (*princeps civitatis*).

In acknowledgment of this happy settlement and of his other services further honours were conferred upon Octavian. On the 13th of January 27 B.C., the birthday of the restored republic, he was awarded the civic crown to be placed over the door of his house, in token that he had saved his fellow-citizens and restored the Republic. Four days later (Jan. 17) the senate conferred upon him the cognomen of Augustus.

But it was not only the machinery of government in Rome that needed repair. Twenty years of civil war and confusion had disorganized the empire, and the strong hand of Augustus,

as he must now be called, could alone restore confidence and order. Towards the end of 27 B.C. he left Rome for Gaul, and from that date until October 19 B.C. he was mainly occupied with the reorganization of the provinces and of the provincial administration, first of all in the West and then in the East. It was during his stay in Asia (20 B.C.) that the Parthian king Phraates voluntarily restored the Roman prisoners and standards taken at Carrhae (53 B.C.), a welcome tribute to the respect inspired by Augustus, and a happy augury for the future. In October 19 B.C. he returned to Rome, and the senate ordered that the day of his return (Oct. 12) should thenceforward be observed as a public holiday. The period of ten years for which his *imperium* had been granted him was nearly ended, and though much remained to be done, very much had been accomplished. The pacification of northern Spain by the subjugation of the Astures and Cantabri, the settlement of the wide territories added to the empire by Julius Caesar in Gaul—the "New Gaul," or the "long-haired Gaul" (Gallia Comata) as it was called by way of distinction from the old province of Gallia Narbonensis (see GAUL)—and the re-establishment of Roman authority over the kings and princes of the Near East, were achievements which fully justified the acclamations of senate and people.

In 18 B.C. Augustus's *imperium* was renewed for five years, and his tried friend Marcus Agrippa, now his son-in-law, was associated with him as a colleague. From October of 19 B.C. till the middle of 16 B.C. Augustus's main attention was given to Rome and to domestic reform, and to this period belong such measures as the Julian law "as to the marriage of the orders." In June of 17 B.C. the opening of the new and better age, which he had worked to bring about, was marked by the celebration in Rome of the Secular games. The chief actors in the ceremony were Augustus himself and his colleague Agrippa, —while, as the extant record tells us, the processional hymn, chanted by youths and maidens first before the new temple of Apollo on the Palatine and then before the temple of Jupiter on the Capitol, was composed by Horace. The hymn, the well-known *Carmen Saeculare*, gives fervent expression to the prevalent emotions of joy and gratitude.

In the next year (16 B.C.), however, Augustus was suddenly called away from Rome to deal with a problem which engrossed much of his attention for the next twenty-five years. The defeat of Marcus Lollius, the legate commanding on the Rhine, by a horde of German invaders, seems to have determined Augustus to take in hand the whole question of the frontiers of the empire towards the north, and the effective protection of Gaul and Italy. The work was entrusted to Augustus's step-sons Tiberius and Drusus. The first step was the annexation of Noricum and Raetia (16–15 B.C.), which brought under Roman control the mountainous district through which the direct routes lay from North Italy to the upper waters of the Rhine and the Danube. East of Noricum Tiberius reduced to order for the time the restless tribes of Pannonia, and probably established a military post at Carnuntum on the Danube. To Drusus fell the more ambitious task of advancing the Roman frontier line from the Rhine to the Elbe, a work which occupied him until his death in Germany in 9 B.C. In 13 B.C. Augustus had returned to Rome; his return, and the conclusion of his second period of rule, were commemorated by the erection of one of the most beautiful monuments of the Augustan age, the Ara Pacis Augustae (see ROMAN ART, Pl. II, III). His *imperium* was renewed, again for five years, and in 12 B.C., on the death of his former fellow-triumvir Lepidus, he was elected Pontifex Maximus. But this third period of his *imperium* brought with it losses which Augustus must have keenly felt. Only a few months after his reappointment as Augustus's colleague, Marcus Agrippa, his trusted friend since boyhood, died. As was fully his due, his funeral oration was pronounced by Augustus, and he was buried in the mausoleum near the Tiber built by Augustus for himself and his family. Three years later his brilliant step-son Drusus died on his way back from a campaign in Germany, in which he had reached the Elbe. Finally in 8 B.C. he lost the comrade who next to Agrippa had been the most intimate friend and counsellor of his early manhood, Gaius Cilnius Maecenas, the patron of Virgil and Horace.

For the moment Augustus turned, almost of necessity, to his surviving step-son. Tiberius was associated with him as Agrippa had been in the tribunician power, was married against his will to Julia, and sent to complete his brother Drusus's work in Germany (7–6 B.C.). But Tiberius was only his step-son, and, with all his great qualities, was never a very lovable man. On the other hand, the two sons of Agrippa and Julia, Gaius and Lucius, were of his own blood and evidently dear to him. Both had been adopted by Augustus (17 B.C.). In 6 B.C. Tiberius, who had just received the tribunician power, was transferred from Germany to the East, where the situation in Armenia demanded attention. His sudden withdrawal to Rhodes has been variously explained, but, in part at least, it was probably due to the plain indications which Augustus now gave of his wish that the young Caesars should be regarded as his heirs. The elder, Gaius, now fifteen years old (5 B.C.), was formally introduced to the people as consul-designate by Augustus himself, who for this purpose resumed the consulship (12th) which he had dropped since 23 B.C., and was authorized to take part in the deliberations of the senate. Three years later (2 B.C.) Augustus, now consul for the 13th and last time, paid a similar compliment to the younger brother Lucius. In 1 B.C. Gaius was given proconsular imperium, and sent to re-establish order in Armenia, and a few years afterwards (A.D. 2) Lucius was sent to Spain, apparently to take command of the legions there. But the fates were unkind; Lucius fell sick and died at Marseilles on his way out, and in the next year (A.D. 3) Gaius, wounded by an obscure hand in Armenia, started reluctantly for home, only to die in Lycia. Tiberius alone was left, and Augustus, at once accepting facts, formally and finally declared him to be his colleague and destined successor (A.D. 4) and adopted him as his son.

The interest of the last ten years of Augustus's life centres in the events occurring on the northern frontier. The difficult task of bringing the German tribes between the Rhine and the Elbe under Roman rule, commenced by Drusus in 13 B.C., had on his death been continued by Tiberius (9–6 B.C.). During Tiberius's retirement in Rhodes no decisive progress was made, but in A.D. 4 operations on a large scale were resumed. From Velleius Paterculus, who himself served in the war, we learn that in the first campaign Roman authority was restored over the tribes between the Rhine and the Weser, and that the Roman forces, instead of returning as usual to their headquarters on the Rhine, went into winter-quarters near the source of the Lippe. In the next year (A.D. 5) the Elbe was reached by the troops, while the fleet, after a hazardous voyage, arrived at the mouth of the same river and sailed some way up it. Both feats are deservedly commemorated by Augustus himself in the Ancyran monument. To complete the conquest of Germany and to connect the frontier with the line of the Danube, it seemed that only one thing remained to be done, to break the power of the Marcomanni and their king Maroboduus. In the spring of A.D. 6 preparations were made for this final achievement; the territory of the Marcomanni (now Bohemia) was to be invaded simultaneously by two columns. One, starting apparently from the headquarters of the army of Upper Germany at Mainz, was to advance by way of the Black Forest and attack Maroboduus on the west; the other, led by Tiberius himself, was to start from the new military base at Carnuntum on the Danube and operate from the south-east.

But the attack was never delivered, for at this moment, in the rear of Tiberius, the whole of Pannonia and Dalmatia burst into a blaze of insurrection. The crisis is pronounced by Suetonius to have been more serious than any which had confronted Rome since the Hannibalic war, for it was not merely the loss of a province but the invasion of Italy that was threatened, and Augustus openly declared in the senate that the insurgents might be before Rome in ten days. He himself moved to Ariminum to be nearer the seat of war, recruiting was vigorously carried on in Rome and Italy, and legions were summoned from

Moesia and even from Asia. In the end, and not including the Thracian cavalry of King Rhoemetalces, a force of 15 legions with an equal number of auxiliaries was employed. Even so the task of putting down the insurrection was difficult enough, and it was not until late in the summer of A.D. 9, after three years of fighting, that Germanicus, who had been sent to assist Tiberius, ended the war by the capture of Andetrium in Dalmatia.

Five days later the news reached Rome of the disaster to Varus and his legions, in the heart of what was to have been the new province of Germany beyond the Rhine. The disaster was avowedly due entirely to Varus's incapacity and vanity, and might no doubt have been repaired by leaders of the calibre of Tiberius and Germanicus. Augustus, however, was now seventy-two, the Dalmatian outbreak had severely tried his nerve, and now for the second time in three years the fates seemed to pronounce clearly against a further prosecution of his long-cherished scheme of a Roman Germany reaching to the Elbe.

All that was immediately necessary was done. Recruiting was pressed forward in Rome, and first Tiberius and then Germanicus were despatched to the Rhine. But the German leaders were too prudent to risk defeat, and the Roman generals devoted their attention mainly to strengthening the line of the Rhine.

The defeat of Varus, and the tacit abandonment of the plans of expansion begun twenty-five years before, are almost the last events of importance in the long principate of Augustus. The last five years of his life (A.D. 10–14) were untroubled by war or disaster. Augustus was ageing fast, and was more and more disinclined to appear personally in the senate or in public. Yet in A.D. 13 he consented, reluctantly we are told, to yet one more renewal of his *imperium* for ten years, stipulating, however, that his step-son Tiberius, himself now over fifty, should be associated with himself on equal terms in the administration of the empire. Early in the same year (January 16, A.D. 13) the last triumph of his principate was celebrated. Tiberius was now in Rome, the command on the Rhine having been given to Germanicus, who went out to it immediately after his consulship (A.D. 12), and the time had come to celebrate the Dalmatian and Pannonian triumph, which the defeat of Varus had postponed. Augustus witnessed the triumphal procession, and Tiberius, as it turned from the Forum to ascend the Capitol, halted, descended from his triumphal car, and did reverence to his adopted father.

One last public appearance Augustus made in Rome. During A.D. 13 he and Tiberius conducted a census of Roman citizens, the third taken by his orders; the first having been in 28 B.C. at the very outset of his rule. The business of the census lasted over into the next year, but on the 11th of May, A.D. 14, before a great crowd in the Campus Martius, Augustus took part in the solemn concluding ceremony of burying away out of sight the old age and inaugurating the new. The ceremony had been full of significance in 28 B.C., and now more than forty years later it was given a pathetic interest by Augustus himself. When the tablets containing the vows to be offered for the welfare of the state during the next lustrum were handed to him, he left the duty of reciting them to Tiberius, saying that he would not take vows which he was never destined to perform.

It was apparently at the end of June or early in July that Augustus left Rome on his last journey. Travelling by road to Astura (Torre Astura) at the southern point of the little bay of Antium, he sailed thence to Capri and to Naples. On his way at Puteoli, the passengers and crew of a ship just come from Alexandria cheered the old man by their spontaneous homage, declaring, as they poured libations, that to him they owed life, safe passage on the seas, freedom and fortune.

At Naples, in spite of increasing disease, he bravely sat out a gymnastic contest held in his honour, and then accompanied Tiberius as far as Beneventum on his way to Brundusium and Illyricum. On his return he was forced by illness to stop at Nola, his father's old home. Tiberius was hastily recalled and had a last confidential talk on affairs of state. Thenceforward, says Suetonius, he gave no more thought to such great affairs. He bade farewell to his friends, inquired after the health of Drusus's daughter who was ill, and then quietly expired in the arms of the wife who for more than fifty years had been his most intimate and trusted guide and counsellor, and to whom his last words were an exhortation to "live mindful of our wedded life." He died on the 19th of August, A.D. 14, in the same room in which his father had died before him, and on the anniversary of his entrance upon his first consulship fifty-seven years before (43 B.C.). The corpse was carried to Rome in slow procession along the Appian Way. On the day of the funeral it was borne to the Campus Martius on the shoulders of senators and there burnt. The ashes were reverently collected by Livia, and placed in the mausoleum by the Tiber which her husband had built for himself and his family. The last act was the formal decree of the senate by which Augustus, like his father Julius before him, was added to the number of the gods recognized by the Roman state.

If we except writers like Voltaire who could see in Augustus only the man who had destroyed the old republic and extinguished political liberty, the verdict of posterity on Augustus has varied just in proportion as his critics have fixed their attention, mainly, on the means by which he rose to power, or the use which he made of the power when acquired. The lines of argument followed respectively by friendly and hostile contemporaries immediately after his death (Tac. *Ann.* i. 9, 10) have been followed by later writers with little change. But of late years, our increasing mistrust of the current gossip about him, and our increased knowledge of the magnitude of what he actually accomplished, have conspicuously influenced the judgments passed upon him. We allow the faults and crimes of his early manhood, his cruelties and deceptions, his readiness to sacrifice everything that came between him and the end he had in view. On the other hand, a careful study of what he achieved between the years 38 B.C., when he married Livia, and his death in A.D. 14, is now held to give him a claim to rank, not merely as an astute and successful intriguer, or an accomplished political actor, but as one of the world's great men, a statesman who conceived and carried through a scheme of political reconstruction which kept the empire together, secured peace and tranquillity, and preserved civilization for more than two centuries.

BIBLIOGRAPHY.—The most comprehensive work on Augustus and his age is that of V. Gardthausen, *Augustus und seine Zeit* (2 vols., Leipzig, 1891–1904), which deals with all aspects of Augustus's life, vol. ii. consisting of elaborate critical and bibliographical notes. See also histories of Rome generally, and among special works:—E. S. Shuckburgh, *Augustus* (London, 1903; reviewed by F. T. Richards in *Class. Rev.* vol. xviii.), containing the text of the *Monumentum Ancyranum* (see also Gardthausen, book xiii.); J. B. Firth, *Augustus Caesar* (London, 1903), in "Heroes of the Nations" series; O. Seeck, "Kaiser Augustus" (*Monographien zur Weltgeschichte*, xvii., 1902), nine essays on special problems, *e.g.* the campaigns of Mutina, Perusia and against Sextus Pompeius, "das Augustische Zeitalter"; A. Duméril, "Auguste et la fondation de l'empire romain," in the *Annales de la Fac. des lett. de Bordeaux* (1890); a suggestive monograph on the reforms of Augustus in relation to the decrease of population is Jules Ferlet's *L'Abaissement de la natalité à Rome* (Paris, 1902). (H. F. P.)

AUGUSTUS I. (1526–1586), elector of Saxony, was the younger son of Henry, duke of Saxony, and consequently belonged to the Albertine branch of the Wettin family. Born at Freiberg on the 31st of July 1526, and brought up as a Lutheran, he received a good education and studied at the university of Leipzig. When Duke Henry died in 1541 he decreed that his lands should be divided equally between his two sons, but as his bequest was contrary to law, it was not carried out, and the dukedom passed almost intact to his elder son, Maurice. Augustus, however, remained on friendly terms with his brother, and to further his policy spent some time at the court of the German king, Ferdinand I., in Vienna. In 1544 Maurice secured the appointment of his brother as administrator of the bishopric of Merseburg; but Augustus was very extravagant and was soon compelled to return to the Saxon court at Dresden. Augustus supported his brother during the war of the league of Schmalkalden, and in the policy which culminated in the transfer of the Saxon electorate from John Frederick I., the head of the Ernestine branch of the Wettin

family, to Maurice. On the 7th of October 1548 Augustus was married at Torgau to Anna, daughter of Christian III., king of Denmark, and took up his residence at Weissenfels. But he soon desired a more imposing establishment. The result was that Maurice made more generous provision for his brother, who acted as regent of Saxony in 1552 during the absence of the elector. Augustus was on a visit to Denmark when by Maurice's death in July 1553 he became elector of Saxony.

The first care of the new elector was to come to terms with John Frederick, and to strengthen his own hold upon the electoral position. This object was secured by a treaty made at Naumburg in February 1554, when, in return for the grant of Altenburg and other lands, John Frederick recognized Augustus as elector of Saxony. The elector, however, was continually haunted by the fear that the Ernestines would attempt to deprive him of the coveted dignity, and his policy both in Saxony and in Germany was coloured by this fear. In imperial politics Augustus acted upon two main principles: to cultivate the friendship of the Habsburgs, and to maintain peace between the contending religious parties. To this policy may be traced his share in bringing about the religious peace of Augsburg in 1555, his tortuous conduct at the diet of Augsburg eleven years later, and his reluctance to break entirely with the Calvinists. On one occasion only did he waver in his allegiance to the Habsburgs. In 1568 a marriage was arranged between John Casimir, son of the elector palatine, Frederick III., and Elizabeth, a daughter of Augustus, and for a time it seemed possible that the Saxon elector would support his son-in-law in his attempts to aid the revolting inhabitants of the Netherlands. Augustus also entered into communication with the Huguenots; but his aversion to foreign complications prevailed, and the incipient friendship with the elector palatine soon gave way to serious dislike. Although a sturdy Lutheran the elector hoped at one time to unite the Protestants, on whom he continually urged the necessity of giving no cause of offence to their opponents, and he favoured the movement to get rid of the clause in the peace of Augsburg concerning ecclesiastical reservation, which was offensive to many Protestants. His moderation, however, prevented him from joining those who were prepared to take strong measures to attain this end, and he refused to jeopardize the concessions already won.

The hostility between the Albertines and the Ernestines gave serious trouble to Augustus. A preacher named Matthias Flacius held an influential position in ducal Saxony, and taught a form of Lutheranism different from that taught in electoral Saxony. This breach was widened when Flacius began to make personal attacks on Augustus, to prophesy his speedy downfall, and to incite Duke John Frederick to make an effort to recover his rightful position. Associated with Flacius was a knight, William of Grumbach, who, not satisfied with words only, made inroads into electoral Saxony and sought the aid of foreign powers in his plan to depose Augustus. After some delay Grumbach and his protector, John Frederick, were placed under the imperial ban, and Augustus was entrusted with its execution. His campaign in 1567 was short and successful. John Frederick surrendered, and passed his time in prison until his death in 1595; Grumbach was taken and executed; and the position of the elector was made quite secure.

The form of Lutheranism taught in electoral Saxony was that of Melanchthon, and many of its teachers and adherents, who were afterwards called Crypto-Calvinists, were favoured by the elector. When Augustus, freed from the fear of an attack by the Ernestines, became gradually estranged from the elector palatine and the Calvinists, he seemed to have looked with suspicion upon the Crypto-Calvinists, who did not preach the pure doctrines of Luther. Spurred on by his wife the matter reached a climax in 1574, when letters were discovered, which, while revealing a hope to bring over Augustus to Calvinism, cast some aspersions upon the elector and his wife. Augustus ordered the leaders of the Crypto-Calvinists to be seized, and they were tortured and imprisoned. A strict form of Lutheranism was declared binding upon all the inhabitants of Saxony, and many persons were banished from the country. In 1576 he made a serious but unsuccessful attempt to unite the Protestants upon the basis of some articles drawn up at Torgau, which inculcated a strict form of Lutheranism. The change in Saxony, however, made no difference to the attitude of Augustus on imperial questions. In 1576 he opposed the proposal of the Protestant princes to make a grant for the Turkish War conditional upon the abolition of the clause concerning ecclesiastical reservation, and he continued to support the Habsburgs.

Much of the elector's time was devoted to extending his territories. In 1573 he became guardian to the two sons of John William, duke of Saxe-Weimar, and in this capacity was able to add part of the county of Henneberg to electoral Saxony. His command of money enabled him to take advantage of the poverty of his neighbours, and in this way he secured Vogtland and the county of Mansfeld. In 1555 he had appointed one of his nominees to the bishopric of Meissen, in 1561 he had secured the election of his son Alexander as bishop of Merseburg, and three years later as bishop of Naumburg; and when this prince died in 1565 these bishoprics came under the direct rule of Augustus.

As a ruler of Saxony Augustus was economical and enlightened. He favoured trade by encouraging Flemish emigrants to settle in the country, by improving the roads, regulating the coinage and establishing the first posts. He was specially interested in benefiting agriculture, and added several fine buildings to the city of Dresden. His laws were numerous and comprehensive. The constitution of 1572 was his work, and by these laws the church, the universities and the police were regulated, the administration of justice was improved, and the raising of taxes placed upon a better footing (see SAXONY).

In October 1585 the electress Anna died, and a few weeks later Augustus married Agnes Hedwig, a daughter of Joachim Ernest, prince of Anhalt. His own death took place at Dresden on the 21st of January 1586, and he was buried at Freiberg. By his first wife he had fifteen children, but only four of these survived him, among whom was his successor, the elector Christian I. (1560–1591). Augustus was a covetous, cruel and superstitious man, but these qualities were redeemed by his political caution and his wise methods of government. He wrote a small work on agriculture entitled *Künstlich Obst- und Gartenbüchlein*.

See C. W. Böttiger and T. Flathe, *Geschichte Sachsens*, Band ii. (Gotha, 1870); M. Ritter, *Deutsche Geschichte im Zeitalter der Gegenreformation*, Band i. (Stuttgart, 1890); R. Calinich, *Kampf und Untergang des Melanchthonismus in Kursachsen* (Leipzig, 1866); J. Falke, *Geschichte des Kurfürsten August in volkswirtschaftlicher Beziehung* (Leipzig, 1868); J. Janssen, *Geschichte des Deutschen Volks seit dem Ausgang des Mittelalters* (Freiburg, 1885–1894); W. Wenck, *Kurfürst Moritz und Herzog August* (Leipzig, 1874).

AUGUSTUS II., king of Poland, and, as FREDERICK AUGUSTUS I., elector of Saxony (1670–1733), second son of John George III., elector of Saxony, was born at Dresden on the 12th of May 1670. He was well educated, spent some years in travel and in fighting against France, and on account of his immense strength was known as "the Strong." On the death of his brother, John George IV., in 1694, he became elector of Saxony, and in 1695 and 1696 led the imperial troops against the Turks, but without very much success. When John Sobieski died in 1696, Augustus was a candidate for the Polish throne, and in order to further his chances became a Roman Catholic, a step which was strongly resented in Saxony. By a lavish expenditure of money, and by his promptness in entering the country, he secured his election and coronation in September 1697, and his principal rival F. L. de Bourbon, prince of Conti, abandoned the contest and returned to France. Augustus continued the war against the Turks for a time, and being anxious to extend his influence and to find a pretext for retaining the Saxon troops in Poland, made an alliance in 1699 with Russia and Denmark against Charles XII. of Sweden. The Poles would not assist, and at the head of the Saxons Augustus invaded Livonia, but for various causes the campaign was not a success, and in July 1702 he was defeated by Charles at Klissow. Augustus was then deposed in Poland,

and after holding Warsaw for a short time he fled to Saxony. The alliance with Russia was renewed and in reply Charles invaded Saxony in 1706, and compelled the elector to sign the treaty of Altranstädt in September of that year, to recognize Stanislaus Leszczynski as his successor in Poland, and to abandon the Russian alliance. During the War of the Spanish Succession, Augustus fought with the imperialists in the Netherlands, but after the defeat of Charles XII. at Poltawa in July 1709, he turned his attention to the recovery of Poland. Declaring the treaty of Altranstädt void and renewing his alliance with Russia and Denmark, he quickly recovered the Polish crown. He then attacked Swedish Pomerania. He was handicapped by the mutual jealousy of the Saxons and the Poles, and a struggle broke out in Poland which was only ended when the king promised to limit the number of his army in that country to 18,000 men. Peace was made with Sweden in December 1719 at Stockholm after the death of Charles XII., and Augustus was recognized as king of Poland. His remaining years were spent in futile plans to make Poland a hereditary monarchy, to weaken the power of the Saxon nobles, and to gain territory for his sons in various parts of Europe. He was a man of extravagant and luxurious tastes, and, although he greatly improved the city of Dresden, he cannot be called a good ruler. He sought to govern Saxony in an absolute fashion, and, in spite of his declaration that his conversion to Roman Catholicism was personal only, assisted the spread of the teachings of Rome. His wife was Christine Eberhardine, a member of the Hohenzollern family, who left him when he became a Roman Catholic, and died in 1727. Augustus died at Warsaw on the 1st of February 1733, leaving a son Frederick Augustus, who succeeded him in Poland and Saxony, and many illegitimate children, among whom was the famous general, Maurice of Saxony, known as Marshal Saxe (*q.v.*).

See Otwikowski, *History of Poland under Augustus II.* (Cracow, 1849); F. Förster, *Die Höfe und Kabinette Europas im achtzehnten Jahrhundert* (Potsdam, 1839); Jarochowski, *History of Augustus II.* (Posen, 1856–1874); C. W. Böttiger and T. Flathe, *Geschichte des Kurstaates und Königreichs Sachsen* (Gotha, 1867–1873).

AUGUSTUS III., king of Poland, and, as FREDERICK AUGUSTUS II., elector of Saxony (1696–1763), the only legitimate son of Augustus II. (" the Strong "), was born at Dresden on the 17th of October 1696. Educated as a Protestant, he followed his father's example by joining the Roman Catholic Church in 1712, although his conversion was not made public until 1717. In August 1719 he married Maria Josepha, daughter of the emperor Joseph I., and seems to have taken very little part in public affairs until he became elector of Saxony on his father's death in February 1733. He was then a candidate for the Polish crown; and having purchased the support of the emperor Charles VI. by assenting to the Pragmatic Sanction, and that of the czarina Anne by recognizing the claim of Russia to Courland, he was elected king of Poland in October 1733. Aided by the Russians, his troops drove Stanislaus Leszczynski from Poland; Augustus was crowned at Cracow in January 1734, and was generally recognized as king at Warsaw in June 1736. On the death of Charles VI. in October 1740, Augustus was among the enemies of his daughter Maria Theresa, and, as a son-in-law of the emperor Joseph I., claimed a portion of the Habsburg territories. In 1742, however, he was induced to transfer his support to Maria Theresa, and his troops took part in the struggle against Frederick the Great during the Silesian wars, and again when the Seven Years' War began in 1756. Saxony was in that year attacked by the Prussians, and with so much success that not only was the Saxon army forced to capitulate at Pirna in October, but the elector, who fled to Warsaw, made no attempt to recover Saxony, which remained under the dominion of Frederick. When the treaty of Hubertsburg was concluded in February 1763, he returned to Saxony, where he died on the 5th of October 1763. He left five sons, the eldest of whom was his successor in Saxony, Frederick Christian; and five daughters, one of whom was the wife of Louis, the dauphin of France, and mother of Louis XVI. Another daughter was the wife of Charles III., king of Spain, but she predeceased her father. Augustus, who showed neither talent nor inclination for government, was content to leave Poland under the influence of Russia, and Saxony to the rule of his ministers. He took great interest in music and painting, and added to the collection of art treasures at Dresden.

See C. W. Böttiger and T. Flathe, *Geschichte des Kurstaates und Königreichs Sachsen* (Gotha, 1867–1873); R. Röpell, *Polen um die Mitte des 18. Jahrhunderts* (Gotha, 1876).

AUGUSTUSBAD, a watering-place of Germany, in the kingdom of Saxony, 10 m. E. from Dresden, close to Radeberg, in a pleasant valley. Pop. 900. It has five saline chalybeate springs, used both for drinking and bathing, and specific in feminine disorders, rheumatism, paralysis and neuralgia. The spa is largely frequented in summer and has agreeable public rooms and gardens.

AUK, a name commonly given to several species of sea-fowl. A special interest attaches to the great auk (*Alca impennis*), owing to its recent extinction and the value of its eggs to collectors. (See GAREFOWL; also GUILLEMOT, PUFFIN, RAZORBILL.)

AULARD, FRANÇOIS VICTOR ALPHONSE (1849–), French historian, was born at Montbron in Charente in 1849. Having obtained the degree of doctor of letters in 1877 with a Latin thesis upon C. Asinius Pollion and a French one upon Giacomo Leopardi (whose works he subsequently translated into French), he made a study of parliamentary oratory during the French Revolution, and published two volumes upon *Les Orateurs de la constituante* (1882) and upon *Les Orateurs de la législative et de la convention* (1885). With these works, which were reprinted in 1905, he entered a fresh field, where he soon became an acknowledged master. Applying to the study of the French Revolution the rules of historical criticism which had produced such rich results in the study of ancient and medieval history, he devoted himself to profound research in the archives, and to the publication of numerous most important contributions to the political, administrative and moral history of that marvellous period. Appointed professor of the history of the French Revolution at the Sorbonne, he formed the minds of students who in their turn have done valuable work. To him we owe the *Recueil des actes du comité de salut public* (vol. i., 1889; vol. xvi., 1904); *La Société des Jacobins; recueil de documents pour l'histoire du club des Jacobins de Paris* (6 vols., 1889–1897); and *Paris pendant la réaction thermidorienne et sous le directoire, recueil de documents pour l'histoire de l'esprit public à Paris* (5 vols., 1898–1902), which was followed by an analogous collection for *Paris sous le consulat* (2 vols., 1903–1904). For the Société de l'Histoire de la Révolution Française, which brought out under his supervision an important periodical publication called *La Révolution française*, he produced the *Registre des délibérations du consulat provisoire* (1894), and *L'État de la France en l'an VIII et en l'an IX*, with the reports of the prefects (1897), besides editing various works or memoirs written by men of the Revolution, such as J. C. Bailleul, Chaumette, Fournier (called the American), Hérault de Séchelles, and Louvet de Couvrai. But these large collections of documents are not his entire output. Besides a little pamphlet upon Danton, he has written a *Histoire politique de la Révolution française* (1901), and a number of articles which have been collected in volumes under the title *Études et leçons sur la Révolution française* (5 vols., 1893–1908). In a volume entitled *Taine, historien de la Révolution française* (1908), Aulard has submitted the method of the eminent philosopher to a criticism, severe, perhaps even unjust, but certainly well-informed. This is, as it were, the " manifesto " of the new school of criticism applied to the political and social history of the Revolution (see *Les Annales Révolutionnaires*, June 1908).

See A. Mathiez, " M. Aulard, historien et professeur," in the *Revue de la Révolution française* (July 1908). (C. B.*)

AULIC COUNCIL (*Reichshofrat*), an organ of the Holy Roman Empire, originally intended for executive work, but acting chiefly as a judicature, which worked from 1497 to 1806. In the

early middle ages the emperor had already his *consiliarii*; but his council was a fluctuating body of personal advisers. In the 14th century there first arose an official council, with permanent and paid members, many of whom were legists. Its business was largely executive, and it formed something of a ministry; but it had also to deal with petitions addressed to the king, and accordingly it acted as a supreme court of judicature. It was thus parallel to the king's council, or *concilium continuum*, of medieval England; while by its side, during the 15th century, stood the *Kammergericht*, composed of the legal members of the council, in much the same way as the Star Chamber stood beside the English council. But the real history of the Aulic Council, as that term was understood in the later days of the Empire, begins with Maximilian I. in 1497–1498. In these years Maximilian created three organs (apparently following the precedent set by his Burgundian ancestors in the Netherlands)—a *Hofrat*, a *Hofkammer* for finance, and a *Hofkanzlei*. Primarily intended for the hereditary dominions of Maximilian, these bodies were also intended for the whole Empire; and the *Hofrat* was to deal with "all and every business which may flow in from the Empire, Christendom at large, or the king's hereditary principalities." It was thus to be the supreme executive and judicial organ, discharging all business except that of finance and the drafting of documents; and it was intended to serve Maximilian as a *point d'appui* for the monarchy against the system of oligarchical committees, instituted by Berthold, archbishop of Mainz. But it was difficult to work such a body both for the Empire and for the hereditary principalities; and under Ferdinand I. it became an organ for the Empire alone (*circ.* 1558), the hereditary principalities being removed from its cognizance. As such an imperial organ, its composition and powers were fixed by the treaty of Westphalia of 1648. (1) It consisted of about 20 members—a president, a vice-president, the vice-chancellor of the Empire, and some 18 other members. These came partly from the Empire at large, partly (and in greater numbers) from the hereditary lands of the emperor. There were two benches, one of the nobles, one of doctors of civil law; six of the members must be Protestants. The council followed the person of the emperor, and was therefore stationed at Vienna; it was paid by the emperor, and he nominated its members, whose office terminated with his life—an arrangement which made the council more dependent than it should have been on the emperor's will. (2) Its powers were nominally both executive and judicial. (*a*) Its executive powers were small: it gradually lost everything except the formal business of investiture with imperial fiefs and the confirmation of charters, its other powers being taken over by the *Geheimräte*. These *Geheimräte*, a narrow body of secret counsellors, had already become a determinate *concilium* by 1527; and though at first only concerned with foreign affairs, they acquired, from the middle of the 16th century onwards, the power of dealing with imperial affairs in lieu of the Aulic Council. (*b*) In its judicial aspect, the Aulic Council, exercising the emperor's judicial powers on his behalf, and thus succeeding, as it were, to the old *Kammergericht*, had exclusive cognizance of matters relating to imperial fiefs, criminal charges against immediate vassals of the Empire, imperial charters, Italian affairs, and cases "reserved" for the emperor. In all other matters, the Aulic Council was a competitor for judicial work with the Imperial Chamber[1] (*Reichskammergericht*, a tribunal dating from the great diet of Worms of 1495: see under IMPERIAL CHAMBER). It was determined in 1648 that the one of these two judicial authorities which first dealt with a case should alone have competence to pursue it. An appeal lay from the decision of the council to the emperor, and judgment on appeal was given by those members of the council who had not joined in the original decision, though in important cases they might be afforced by members of the diet. Neither the council nor the chamber could deal with cases of outlawry, except to prepare such cases for the decision of the diet. To-day the archives of the Aulic Council are in Vienna, though parts of its records have been given to the German states which they concern.

[1] The Aulic Council is the private court of the emperor, with its members nominated by him; the Imperial Chamber is the public court of the Empire, with its members nominated by the estates of the Empire.

AUTHORITIES.—R. Schröder, *Lehrbuch der deutschen Rechtsgeschichte* (Leipzig, 1904), gives the main facts; S. Adler, *Die Organisation der Centralverwaltung unter Maximilian I.* (Leipzig, 1886), deals with Maximilian's reorganization of the Council; and J. St. Pütter, *Historische Entwickelung der heutigen Staatsverfassung des Teutschen Reichs* (Göttingen, 1798–1799), may be consulted for its development and later form. (E. Ba.)

AULIE-ATA, a town and fort of Russian Turkestan, province of Syr-darya, 152 m. N.E. of Tashkent, on the Talas river, at the western end of the Alexander range, its altitude being 5700 ft. The inhabitants are mostly Sarts and Tajiks, trading in cattle, horses and hides. Pop. (1897) 12,006.

AULIS, an ancient Boeotian town on the Euripus, situated on a rocky peninsula between two bays, near the modern village of Vathy, about 3 m. S. of Chalcis. Its fame was due to the tradition that it was the starting-place of the Greek fleet before the Trojan War, the scene of the sacrifice of Iphigenia. The temple of Artemis was still to be seen in the time of Pausanias.

AULNOY (or AUNOY), **MARIE CATHERINE LE JUMEL DE BARNEVILLE DE LA MOTTE,** BARONNE D' (*c.* 1650–1705), French author, was born about 1650 at Barneville near Bourg-Achard (Eure). She was the niece of Marie Bruneau des Loges, the friend of Malherbe and of J. G. de Balzac, who was called the "tenth Muse." She married on the 8th of March 1666 François de la Motte, a gentleman in the service of César, duc de Vendôme, who became Baron d'Aulnoy in 1654. With her mother, who by a second marriage had become marquise de Gudaigne, she instigated a prosecution for high treason against her husband. The conspiracy was exposed, and the two women saved themselves by a hasty flight to England. Thence they went (February 1679) to Spain, but were eventually allowed to return to France in reward for secret services rendered to the government. Mme. d'Aulnoy died in Paris on the 14th of January 1705. She wrote fairy tales, *Contes nouvelles ou les Fées à la mode* (3 vols., 1698), in the manner of Charles Perrault. This collection (24 tales) included *L'Oiseau bleu*, *Finette Cendron*, *La Chatte blanche* and others. The originals of most of her admirable tales are to be found in the *Pentamerone* (1637) of Giovanni Battista Basile. Other works are: *L'Histoire d'Hippolyte, comte de Duglas* (1690), a romance in the style of Madame de la Fayette, though much inferior to its model; *Mémoires de la cour d'Espagne* (1679–1681); and a *Relation du voyage d'Espagne* (1690 or 1691) in the form of letters, edited in 1874–1876 as *La Cour et la ville de Madrid* by Mme. B. Carey; *Histoire de Jean de Bourbon* (1692); *Mémoires sur la cour de France* (1692); *Mémoires de la cour d'Angleterre* (1695). Her historical writings are partly borrowed from existing records, to which she adds much that must be regarded as fiction, and some vivid descriptions of contemporary manners.

The *Diverting Works of the Countess d'Anois*, including some extremely untrustworthy "Memoirs of her own life," were printed in London in 1707. *The Fairy Tales of Madame d'Aulnoy*, with an introduction by Lady Thackeray Ritchie, appeared in 1892. For biographical particulars see M. de Lescure's introduction to the *Contes des Fées* (1881).

AULOS (Gr. αὐλός; Lat. *tibia*; Egyptian hieroglyphic, *Ma-it*; medieval equivalents, *shalm*, *chalumeau*, *schalmei*, *hautbois*), in Greek antiquities, a class of wood-wind instruments with single or with double reed mouthpiece and either cylindrical or conical bore, thus corresponding to both oboe and clarinet. In its widest acceptation the *aulos* was a generic term for instruments consisting of a tube in which the air column was set in vibration either directly by the lips of the performer, or through the medium of a mouthpiece containing a single or a double reed. Even the pipes of the pan-pipes (*syrinx polycalamus*,[1] σῦριγξ πολυκάλαμος) were sometimes called *auloi* (αὐλοί). The aulos is also the earliest prototype of the organ, which, by gradual assimilation of the principles of syrinx and bag-pipe, reached

[1] See Pollux, *Onom.* iv. 69.

the stage at which it became known as the *Tyrrhenian aulos* (Pollux iv. 70) or the *hydraulos*, according to the method of compressing the wind supply (see ORGAN: *Early History*; and SYRINX). The aulos in its earliest form, the reed pipe, during the best classical period had a cylindrical bore (κοιλία) like that of the modern clarinet, and therefore had the acoustic properties of the stopped pipe, whether the air column was set in vibration by means of a single or of a double reed, for the mouthpiece does not affect the harmonic series.[1] To the acoustic properties of open or stopped pipes are due those essential differences which underlie the classification of modern wind instruments. A stopped pipe produces its fundamental tone one octave lower than the tone of an open pipe of corresponding length, and overblows the harmonics of the twelfth, and of the third above the second octave of the fundamental tone, *i.e.* the odd numbers of the series; whereas the open pipe gives the whole series of harmonics, the octave, the twelfth, the double octave, and the third above it, &c.

To produce the diatonic scale throughout the octaves of its compass, the stopped pipe requires eleven lateral holes in the side of the pipe, at appropriate distances from each other, and from the end of the pipe, whereas the open pipe requires but six. The acoustic properties of the open pipe can only be secured in combination with a reed mouthpiece by making the bore conical. The late Romans (and therefore we may perhaps assume the Greeks also, since the Romans acknowledge their indebtedness to the Greeks in matters relating to musical instruments, and more especially to the cithara and aulos) understood the acoustic principle utilized to-day in making wind instruments, that a hole of small diameter nearer the mouthpiece may be substituted for one of greater diameter in the theoretically correct position. This is demonstrated by the 4th-century grammarian Macrobius, who says (*Comm. in Somn. Scip.* ii. 4, 5): "Nec secus probamus in tibiis, de quarum foraminibus vicinis inflantis ori sonus acutus emittitur, de longinquis autem et termino proximis gravior; item acutior per patentiora foramina, gravior per angusta" (see BASSOON). Aristotle gives directions for boring holes in the aulos, which would apply only to a pipe of cylindrical bore (*Probl.* xix. 23). At first the aulos had but three or four holes; to Diodorus of Thebes is due the credit of having increased this number (Pollux iv. 80). Pronomus, the musician, and teacher of Alcibiades (5th century B.C.), further improved the aulos by making it possible to play on one pair of instruments the three musical scales in use at his time, the Dorian, the Phrygian, and the Lydian, whereas previously a separate pair of pipes had been used for each scale (Pausanias ix. 12. 5; Athenaeus xiv. 31). These three modes would require a compass of a tenth in order to produce the fundamental octave in each.

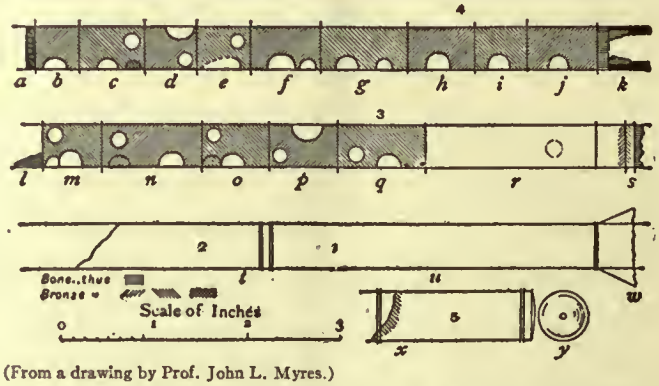
There are two ways in which this increased compass might have been obtained: (1) by increasing the number of holes and covering up those not required, (2) by means of contrivances for lowering the pitch of individual notes as required. We have evidence that both means were known to the Greeks and Romans. The simplest device for closing holes not in use was a band of metal left free to slide round the pipe, and having a hole bored through it corresponding in diameter with the hole in the pipe. Each hole was provided with a band, which was in some cases prevented from slipping down the pipe by narrow fixed rings of metal. The line on fig. 1 between *r* and *s* is thought to have been one of these rings.

Some pipes had two holes pierced through the bands and the bone, in such a manner that only one could be exposed at a time. This is clearly shown in the diagram (fig. 1) of fragments of an aulos from the museum at Candia, for which the writer is greatly indebted to Professor John L. Myres, by whom measured drawings were made from the instrument in 1893. These highly interesting remains, judging from the closed end (5), seem to belong to a side-blown reed-pipe similar to the Maenad pipes in the Castellani collection at the British Museum, illustrated below; they are constructed like modern flutes, but played by means of a reed inserted into the lateral embouchure.

In the Candia pipe, it seems likely that Nos. 1 and 2 represented the bell end, slightly expanded, No. 3 joining the broken end of No. 2 at *l*; there being a possible fit at the other end at *s* with *a* in No. 4 (the drawings must in this case be imagined as reversed for parts 3 and 4), and No. 5 joining on to No. 4 at *k*.

According to Professor Myres there are fragments of a pair of pipes in the Cyprus Museum of precisely the same construction as the one in Candia. In the drawing, the shape and relative position of the holes *on the circumference* is approximate only, but their position lengthways is measured.

Bands of silver were found on the ivory pipes from Pompeii[2] (fig. 2), as well as on two pipes belonging to the Castellani collection (fig. 4) and on one from Halicarnassus, in the British Museum. In order to enable the performer to use these bands



(From a drawing by Prof. John L. Myres.)

FIG. 1.—Diagram of the Fragments of an *Aulos* (Candia Mus.).

a, Triple wrapping of bronze as well as slide.
b, Slide with hole.
c, Slides with two holes not uncovered together.
d, Slides with two holes not uncovered together, one hole at back.
e, Slide.
f, Slide missing. [holes.
g, Slide missing, scars of slide
h, Slide.
i and *j*, Slide.
k, Socket.
l, Male half of joint.
m, *n* *o*, Slides, the top hole being in the slide only.
p and *q*, Slides, with two holes; the small hole shown is in the pipe, there being a corresponding hole in the slide at the back.
r, Bronze covering (and slide?).
s, Male joint.
t, The wavy line shows the extreme length of fragment.
u, 13 mm. inside diameter, 14 mm. outside diameter.
w, Engraved lines and conical form of bronze covering.
x, Wavy line shows extreme length of fragment.
y, Stopped end of pipe with engraved lines.

The line between *r* and *s* is either a turned ring or part of bronze cover. The double lines to the right of *t* are engraved lines.

conveniently, a contrivance such as a little ring, a horn or a hook termed *keras* (κέρας) was attached to the band.[3]

Thirteen of the bands on the Pompeian pipes still have sockets which probably originally contained *kerata*. Pollux (iv. 80) mentions that Diodorus of Thebes, in order to increase the range of the aulos, made lateral channels for the air (πλάγιαι ὁδοί). These consisted of tubes inserted into the holes in the bands for the purpose of lengthening the column of air, and lowering individual notes at will, the sound being then produced at the extremity of the tube, instead of at the surface of the pipe. It is possible that some of the double holes in the slides of the Candia pipe were intended for the reception of these tubes. These lateral tubes form the archetype of the modern crook or piston.[4] The mouthpiece of the aulos was called *zeugos*

[1] See Friedrich Zamminer, *Die Musik und die musikalischen Instrumente in ihrer Beziehung zu den Gesetzen der Akustik* (Giessen, 1855), p. 305.

[2] These pipes were discovered during the excavations in 1867, and are now in the museum at Naples. Excellent reproductions and descriptions of them are given in "The Aulos or Tibia," by Albert A. Howard, *Harvard Studies*, vol. iv. (Boston, 1893), pl. ii. and pp. 48-55.

[3] For illustrations of *auloi* provided with these contrivances, see illustration (fig. 2) of an aulos from Pompeii; a relief in Vatican, No. 535; Helbig's *Wandgemälde*, Nos. 56, 69, 730, 765, &c.

[4] For illustrations of ὁδοί showing the holes at the ends of the tubes, see *Description des marbres antiques du Musée Campana*, by H. d'Escamps, pl. 25; Wilhelm Froehner's *Catalogue of the Louvre*,

(ζεῦγος),[1] the reed tongue *glossa*[2] or *glotta* (γλῶσσα or γλῶττα), and the socket into which the reed was fixed *glottis*[3] (γλωττίς).

The double reed was probably used at first, being the simplest form of mouthpiece; the word *zeugos*, moreover, signifies a pair of like things. There is, however, no difficulty in accepting the probability that a single beating reed or clarinet mouthpiece was used by the Greeks, since the ancient Egyptians used it with the as-it or arghoul (*q.v.*).

The beak-shaped mouthpiece of a pipe found at Pompeii (fig. 3) has all the appearance of the beak of the clarinet, having, on the side not shown, the lay on which to fix a single or beating reed.[4] It may, however, have been the cap of a covered reed, or even a whistle mouthpiece in which the lip does not show in the photograph. It is difficult to form a conclusion without seeing the real instrument. On a mosaic of Monnus in Trèves[5] is represented an aulos which also appears to have a beak-shaped mouthpiece.

(Drawn from a photo by Brogi.)

FIG. 2.—Roman Ivory Aulos found at Pompeii (Naples Mus.), showing slides and rings.

The upper part of the aulos, as in the Pompeian pipes, frequently had the form of a flaring cup supported on a pear-shaped bulb, respectively identified as the *holmos* (ὅλμος) and the *hypholmion* (ὑφόλμιον), the support of the *holmos*. An explanation of the original nature and construction of the bulb and flaring cup, so familiar in the various representations of the aulos, and in the real instruments found in Pompeii, is provided by an ancient Egyptian flute belonging to the collection of G. Maspero, illustrated and described by Victor Loret.[6] Loret calls the double bulb the beak mouthpiece of the instrument, and describes its construction; it consists of a piece of reed of larger diameter than that of the flute, and eight centimetres long; this reed has been forcibly compressed a little more than half way down by means of a ligature of twine, thus reducing the diameter from 6 mm. to 4 mm. The end of the pipe, covered by rows of waxed thread, fits into the end of the smaller bulb, to which it was also bound by waxed thread exactly as in the Elgin pipe at the British Museum, described below. There is no indication of the manner in which the pipe was sounded, and Loret assumes that there was once a whistle or flageolet mouthpiece. To the present writer, however, it seems probable that the constricted diameter between the two bulbs formed a socket into which the double reed or straw was inserted, and that, in this case at least, the reed was not taken into the mouth, but vibrated in the upper bulb or air-chamber. This simple contrivance was probably also employed in the earliest Greek pipes, and was later copied and elaborated in wood, bone or metal, the upper bulb being made shorter and developing into the flaring cup, in order that the reeds might be taken directly into the mouth. During the best period of Greek music the reeds were taken directly into the mouth[7] and not enclosed in an air-chamber.

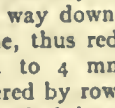
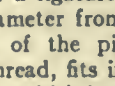
The two pipes were kept in position while the fingers stopped the holes and turned the bands by means of the *φορβεία* (Lat. *capistrum*), a bandage encircling mouth and cheeks, and having holes through which the reed-mouthpiece passed into the mouth of the performer; the *phorbeia* also relieved the pressure of the breath on the cheeks and lips,[8] which is felt more especially by performers on oboe and bassoon at the present day.

In the pair of wooden pipes belonging to the Elgin collection at the British Museum, one of the bulbs, partly broken, but preserved in the same case as the pipes, was fastened to the pipes by means of waxed thread, the indented lines being still visible on the rim of the bulb. The aulos was kept in a case called *sybene*[9] (*συβήνη*) or *aulotheke*[10] (*αὐλοθήκη*), and the little bag or case in which the delicate reeds were carried was known by the name of *glottokomeion*[10] (*γλωττοκομεῖον*).[11] Two Egyptian flute cases are extant, one in the Louvre,[12] and the other in the museum at Leiden. The latter case is of sycamore wood, cylindrical in shape, with a stopper of the same wood; there is no legend or design upon it. The case contained seven pipes, five pieces of reed without bore or holes, and three pieces of straw suitable for making double-reed mouthpieces.[13]

(From a photo by Brogi.)

FIG. 3.—Beak mouthpiece. Found at Pompeii (Naples Mus.).

Aristoxenus gives the full compass of a single pipe or pair of pipes as over three octaves:—"For doubtless we should find an interval greater than the above mentioned three octaves between the highest note of the soprano clarinet (aulos) and the lowest note of the bass-clarinet (aulos); and again between the highest note of a clarinet player performing with the speaker open, and the lowest note of a clarinet player performing with the speaker closed."[14]

This, according to the tables of Alypius, would correspond to the full range of the Greek scales, a little over three octaves from  to  . It is evident that the ancient Greeks obtained this full compass on the aulos by means of the harmonics. Proclus (*Comm. in Alcibiad.* chap. 68) states that from each hole of the pipe at least three tones could be produced. Moreover, classic writers maintain that if the performer press the *zeugos* or the *glottai* of the pipes, a sharper tone is produced.[15] This is exactly how a performer on a modern clarinet or oboe produces the higher harmonics of the instrument.[16] The small bore of the aulos in comparison to its length facilitated the production of the harmonics (cf. Zamminer p. 218), as does also the use of a small hole near the mouthpiece, called in Greek *syrinx* (*σῦριγξ*) and in the modern clarinet the "speaker," which when open enables the performer to overblow with case the first harmonic of the lowest fundamental

No. 378; Glyptothek Museum at Munich, No. 188; Albert A. Howard, "The Aulos or Tibia," *Harvard Studies*, iv. (Boston, 1893), pl. 1, No. 1.

[1] For a description of the reed calamus from which pipe and mouthpiece were made see Theophrastus, *Hist. Plant.* iv. 11.

[2] Aeschines 86. 29; Aristotle, *H.A.* 6, 10, 9, &c.

[3] Lucian, *Harm.* 1.

[4] Cf. article MOUTHPIECE.

[5] See *Antike Denkmäler*, Deutsches archäol. Inst., Berlin, 1891, vol. i. pl. 49.

[6] See "Les Flûtes égyptiennes antiques," *Journal asiatique*, 8th ser. vol. xiv. (Paris, 1889), pp. 212-215.

[7] See Aristotle, *De Audib.* p. 802 b, 18, and p. 804 a; Festus, ed. Mueller, p. 116.

[8] See Albert A. Howard, *op. cit.* p. 29, and Dr Hugo Riemann, *Gesch. d. Musik*, Bd. i. T. 1, p. 111 (Leipzig, 1904).

[9] Pollux, *Onomasticon*, vii. 153.

[10] Hesychius.

[11] Pollux ii. 108, vii. 153, x. 153-154; A. A. Howard, *op. cit.* pp. 26-27. An illustration of the little bag is given in *Denkmäler des klassischen Altertums*, by August Baumeister, vol. i. p. 554, fig. 591.

[12] Two Egyptian pipes now in the Louvre were found in a case ornamented with a painting of a female musician playing a double pipe. See E. de Rougé, *Notice sommaire des monuments égyptiens exposés dans les galeries du Louvre*, p. 87.

[13] See Victor Loret, "Les Flûtes égyptiennes antiques," in *Journal asiatique*, vol. xiv. (Paris, 1889), pp. 199, 200 and 201 (note), pp. 207, 211 and 217, and Conrad Leemans, *Description raisonnée des monuments égyptiens du Musée d'Antiquités de Leyde*, p. 132, No. 489; contents of case Nos. 474-488.

[14] Aristoxenus, *Harm.* bk. i. 20 and 21, H. S. Macran's edition with translation (Oxford, 1902), p. 179.

[15] Aristotle, *De audib.* p. 804 a; Porphyry, ed. Wallis, p. 249; *ibid.* p. 252.

[16] Zamminer, *op. cit.* p. 301.

tones. To Mr Albert A. Howard of Harvard University is due the credit of having identified the *syrinx* of the aulos with the speaker of the clarinet.[1] This assumption is doubtless correct, and is supported by classical grammarians,[2] who state that the *syrinx* was one of the holes of the aulos. It renders quite clear certain passages in Aristoxenus, Aristotle and Plutarch, and a scholion to Pindar's 12th *Pythian*, which before were difficult to understand (see SYRINX).

The aulos or tibia existed in a great number of varieties enumerated by Pollux (*Onomast.* iv. 74 et seq.) and Athenaeus

FIG. 4.—The Plagiaulos. Castellani Collection (Maenad Pipes), British Museum.

(iv. 76 et seq.). They fall into two distinct classes, the single and the double pipes. There were three principal single pipes, the *monaulos*, the *plagiaulos* and the *syrinx monocalamos*. The double pipes were used by the great musicians of ancient Greece, and notably at the musical contests at Delphi, and what has been said above concerning the construction of the aulos refers mainly to the double pipes. The *monaulos*, a single pipe of Egyptian origin, which, by inference, we assume to have been played from the end by means of a reed, may have been the archetype of the oboe or clarinet. The *plagiaulos photinx* or *tibia obliqua*, invented by the Libyans (Pollux iv. 74), or, according to Pliny (vii. 204), by Midas of Phrygia, was held like the modern flute, but was played by means of a mouthpiece containing a reed. Three of the existing pipes at the British Museum (the two in the Castellani collection, and the pipe from Halicarnassus) belong to this type. The mouthpiece projects from the side of the pipe and communicates with the main bore by means of a slanting passage; the end nearest the mouthpiece is stopped as in the modern flute; in the latter, however, the embouchure is not closed by the lips when playing, and therefore the flute has the acoustic properties of the open pipe, whereas the *plagiaulos* having a reed mouthpiece gave the harmonics of a closed pipe. The double pipes existed in five sizes according to pitch, in the days of Aristoxenus, who, in a treatise on the construction of the auloi (Περὶ αὐλῶν τρήσεως), unfortunately not extant,[3] divides them thus:—

FIG. 5.—Ancient Greek Double Pipes. Elgin Collection, British Museum.

(1) *Parthenioi auloi* (παρθένιοι αὐλοί), the maiden's *auloi*, corresponding to the soprano compass.

(2) *Paidikoi auloi* (παιδικοὶ αὐλοί), the boy's pipes or alto *auloi*, used to accompany boys' songs and also in double pairs at feasts.

(3) *Kitharisterioi auloi* (κιθαριστήριοι αὐλοί), used to accompany the cithara.

(4) *Teleioi auloi*, the perfect aulos, or tenor's pipes; also known as the *pythic auloi* (πυθικοὶ αὐλοί); used for the paeans and for solos at the Pythean games (without chorus). It was the *pythic auloi* and the *kitharisterioi auloi* more especially which were provided with the speaker (syrinx) in order to improve the harmonic notes (see SYRINX).

[1] *Op. cit.* p. 32-35.
[2] See *Etymologicum magnum* (Augsburg, 1848), *s.v.* "Syrinx."
[3] See Athenaeus xiv. 634, who quotes from Didymus.

(5) *Hyperteleioi auloi* (ὑπερτέλειοι αὐλοί) or *andreioi auloi* (ἀνδρεῖοι αὐλοί) (see Athenaeus iv. 79), the bass-auloi.

The Phrygian pipes or *auloi Elymoi*[4] were made of box-wood and were tipped with horn; they were double pipes, but differed from all others in that the two pipes were unequal in length and in the diameter of their bores[5]; sometimes one of the pipes was curved upwards and terminated in a horn bell[6]; they seem to have had a conical bore, if representations on monuments are to be trusted. We may conclude that the archetype of the oboe with conical bore was not unknown to the Greeks; it was frequently used by the Etruscans and Romans, and appears on many bas-reliefs, mural paintings and other monuments. For illustrations see Wilhelm Froehner, *Les Musées de France*, pl. iii., "Marsyas playing the double pipes." There the bore is decidedly conical in the ratio of at least 1 : 4 between the mouthpiece and the end of the instrument; the vase is Roman, from the south of France. See also *Bulletino della Commissione Archeologica Comunale di Roma*, Rome, 1879, vol. vii., 2nd series, pl. vii. and p. 119 et seq., "Le Nozze di Elena e Paride," from a bas-relief in the monastery of S.Antonio on the Esquiline; Wilhelm Zahn, *Die schönsten Ornamente und die merkwürdigsten Gemälde aus Pompeji, Herkulaneum und Stabiae* (German and French), vol. iii., pl. 43 and 51 (Berlin, 1828–1859).

For further information on the aulos, consult Albert A. Howard, "The Aulos or Tibia," *Harvard Studies*, iv., 1893; François A. Gevaert, *Histoire de la musique dans l'antiquité*, vol. ii. p. 273 et seq.; Carl von Jan's article "Flöte" in August Baumeister's *Denkmäler des klassischen Altertums* (Munich, 1884–1888), vol. i.; Dr Hugo Riemann, *Handbuch der Musikgeschichte*, Bd. I. T. 1, pp. 93-112 (Leipzig, 1904); Caspar Bartholinus, *De Tibiis Veterum* (Amsterdam, 1779). (K. S.)

AUMALE, HENRI EUGÈNE PHILIPPE LOUIS D'ORLÉANS, DUC D' (1822–1897), French prince and statesman, fifth son of Louis Philippe, duke of Orleans, afterwards king of the French, and of Marie Amélie, princess of the Two Sicilies, was born at Paris on the 16th of January 1822. While still young he inherited a large fortune from the prince de Condé. Brought up by his parents with great simplicity, he was educated at the college of Henri IV., on leaving which at the age of seventeen he entered the army with the rank of a captain of infantry. He distinguished himself during the conquest of Algeria, and was appointed governor of that colony, in which capacity he received the submission of the amir Abd-el-Kader. After the revolution of 1848 he retired to England and busied himself with historical and military studies, replying in 1861 by a *Letter upon the History of France* to Prince Napoleon's violent attacks upon the house of Orleans. On the outbreak of the Franco-Prussian War he volunteered for service in the French army, but his offer was declined. Elected deputy for the Oise department, he returned to France, and succeeded to the *fauteuil* of the comte de Montalembert in the French Academy. In March 1872 he resumed his place in the army as general of division; and in 1873 he presided over the court-martial which condemned Marshal Bazaine to death. About this period, being appointed commandant of the VII. army corps at Besançon, he retired from political life, and in 1879 became inspector-general of the army. By the act of exception passed in 1883 all members of families that had reigned in France serving in the army were deprived of their military positions; consequently the duc d'Aumale was placed on the unemployed supernumerary list. Subsequently, in 1886, another law was promulgated which expelled from French territory the heads of former reigning families, and provided that henceforward all members of those families should be disqualified for any public position or function, and for election to any public body. The duc d'Aumale protested energetically, and was himself expelled. By his will of the 3rd of June 1884, however, he had bequeathed to the Institute of France his Chantilly estate, with all the art-collection he had gathered there. This generosity led the government to withdraw the decree of exile, and the duke returned to France in 1889.

[4] Pollux iv. 74.
[5] Servius *ad Aen.* ix. 615.
[6] Tibullus ii. 85; Virg. *Aen.* xi. 735; Ovid, *Met.* iii. 533, *Ex Ponto* i. 1. 39.

He died at Zucco in Sicily on the 7th of May 1897. Of his marriage, contracted in 1844 with his first cousin, Caroline de Bourbon, daughter of the prince of Salerno, were born two sons: the prince de Condé (d. 1866), and the duc de Guise (d. 1872). The duc d'Aumale's principal literary work was an *Histoire des princes de Condé*, which he left unfinished.

See Georges Picot, *M. le duc d'Aumale* (Paris, 1898); Ernest Daudet, *Le duc d'Aumale* (Paris, 1898). (M. P.*)

AUMALE, a town of northern France, in the department of Seine-Inférieure, on the left bank of the Bresle, 47 m. N.E. of Rouen on the Northern railway. Pop. (1906) 1999. The church is an interesting building of the 16th and 17th centuries, and has a portal attributed to Jean Goujon. The town has glass and steel works.

The territory of Aumale (Albemarle, Aubemale, Aumerle; Lat. *Alba Marla*) in Normandy, a dependency of the archbishopric of Rouen, was granted to Odo of Champagne, brother-in-law of William the Conqueror, who founded the first line of counts of Aumale. Hawise (Hadwide, Havoise or Avoie), countess of Aumale, after the death of her first husband William de Mandeville, earl of Essex (d. 1189), married William des Forts (de Fors, or de Fortz; Lat. de Fortibus), a military adventurer who had been one of the commanders of the fleet under Richard I. during his first crusade. He died in 1195, and his widow married Baldwin de Betun, who became count of Aumale in her right. He died in 1213, and in 1214 William de Fortibus, son of Hawise by her second husband, was confirmed by King John in all his mother's lands. Meanwhile, however, the territory of Aumale shared the fate of the rest of Normandy, and was annexed to the French crown by King Philip Augustus; but the title of earl of Albemarle, derived from it, continued to be borne in England by William de Fortibus, and was passed on to his heirs (see ALBEMARLE). Aumale itself was conferred by Philip Augustus as an appanage on his son Philip. It was subsequently granted by Louis VIII. to Simon, count of Dammartin, whose daughter, Jeanne, countess of Dammartin, transferred it, together with the countship of Ponthieu, to the house of Castile, by her marriage with Ferdinand III., king of Castile, called the Saint (1238). It then remained in the possession of a branch of her descendants bearing the name of Ponthieu, until it passed to the house of Harcourt on the marriage of Blanche of Ponthieu with John, count of Harcourt (1340). Marie d'Harcourt (d. 1476), heiress of Aumale, married Anthony of Lorraine, count of Vaudémont, and Aumale was created a duchy in the peerage of France for Claude and Francis of Lorraine in 1547. By the marriage of Anne of Lorraine with the duke of Nemours in 1618 the duchy of Aumale passed to the house of Savoy-Nemours. In 1686 Marie Jeanne Baptiste, duchess of Nemours and of Aumale, and wife of Charles Emmanuel II., duke of Savoy, sold Aumale to Louis XIV., who gave it to his natural son, the duke of Maine. After the death of that prince, the dukedom devolved upon his brother, the count of Toulouse, subsequently passing to the latter's son, the duke of Penthièvre, whose daughter married the duke of Orleans. Since the reign of Louis Philippe, king of the French, the title of duke of Aumale has been borne by a son of the duke of Orleans.

AUMONT, the name of a family which played an important part in French history. The origin of the name is uncertain, but it has usually been derived from Aumont, now a small commune in the department of the Somme. The family was of great antiquity, a Jean, sire d'Aumont, having accompanied Louis IX. on crusade. It was already powerful in the 14th century, and during the English wars of that period its members fought in the armies of the kings of France. Towards the end of the century, the family took the part of the dukes of Burgundy, but returned to the side of France on the death of Charles the Bold. Jean d'Aumont, lieutenant-general to the king of France in the government of Burgundy, rendered important services to Louis XII. and Francis I. Another Jean d'Aumont (d. 1595), a marshal of France and knight of the order of the Holy Ghost since its institution in 1578, fought against the Huguenots under the last of the Valois kings; but he was among the first to recognize Henry IV., and was appointed governor of Champagne and of Brittany, where he had to fight against the League. His grandson Antoine (1601–1669) was also a marshal of France (1651), governor of Paris (1662), duke and peer (1665). Louis Marie Augustin, duc d'Aumont (1709–1782), was a celebrated collector of works of art. Louis Marie Céleste d'Aumont, duc de Piennes, afterwards duc d'Aumont (1762–1831), emigrated during the Revolution and served in the army of the royalists, as also in the Swedish army. During the Hundred Days he effected a descent upon Normandy in the Bourbon interest, and succeeded in capturing Bayeux and Caen.

AUNCEL (from the Anglo-Fr. *auncelle*, a confused derivation from *l'auncelle*, Ital. *lancella*, a little balance), a balance formerly used in England; now, in dialectical use, a term for the weighing of meat by hand instead of by scales.

AUNDH, a native state of India, in the Deccan division of Bombay, ranking as one of the Satara Jagirs. Its area is 447 sq. m.; its population was 63,921 in 1901, showing a decrease of 2% in the decade. Estimated revenue £9422. The chief, whose title is Pant Pratinidhi, is a Brahman by caste. The state has suffered severely from plague. The town of Aundh is situated 26 m. S.E. of Satara. Pop. about 3500.

AUNGERVYLE, RICHARD (1287–1345), commonly known as RICHARD DE BURY, English bibliophile, writer and bishop, was born near Bury St Edmunds, Suffolk, on the 24th of January 1287. He was the son of Sir Richard Aungervyle, who was descended from one of William the Conqueror's soldiers, settled in Leicestershire, where the family came into possession of the manor of Willoughby. His education was undertaken by his uncle, John de Willoughby, and after leaving the grammar school of his native place he was sent to Oxford, where he is said to have distinguished himself in philosophy and theology. John Pits[1] says, but apparently without authority, that he became a Benedictine monk. He was made tutor to Prince Edward of Windsor (afterwards Edward III.), and, according to Dibdin, inspired him with some of his own love of books. He was mixed up with the sordid intrigues which preceded the deposition of Edward II., and supplied Queen Isabella and Mortimer in Paris with money in 1325 from the revenues of Guienne, of which province he was treasurer. For some time he had to hide in Paris from the officers sent by Edward II. to apprehend him. On the accession of Edward III. his services were rewarded by rapid promotion. He was cofferer to the king, treasurer of the wardrobe and afterwards clerk of the privy seal. The king, moreover, repeatedly recommended him to the pope, and twice sent him, in 1330 and 1333, as ambassador to the papal court, then in exile at Avignon. On the first of these visits he made the acquaintance of a fellow bibliophile in Petrarch, who records his impression (*Epist. Famil.* lib. iii. Ep. 1) of the Englishman as "not ignorant of literature and . . . from his youth up curious beyond belief of hidden things." He asked him for information about Thule, but Aungervyle, who promised information when he should once more be at home among his books, never sent any answer, in spite of repeated enquiries. The pope, John XXII., made him his principal chaplain, and presented him with a rochet in earnest of the first vacant bishopric in England.

During his absence from England he was made (1333) dean of Wells. In September of the same year the see of Durham fell vacant, and the king overruled the choice of the monks, who had elected and actually installed their sub-prior, Robert de Graystanes, in favour of Aungervyle. In February 1334 he was made lord treasurer, an appointment he exchanged later in the year for that of lord chancellor. This charge he resigned in the next year, and, after making arrangements for the protection of his northern diocese from an expected inroad of the Scots, he proceeded in July 1336 to France to attempt a settlement of the claims in dispute between Edward and Philip. In the next year he served on three commissions for the defence of the northern counties. In June 1338 he was once more sent abroad to secure peace, but within a month of his appointment

[1] *De Ill. Angl. Script.* (1619, p. 467).

Edward himself landed in Flanders to procure allies for his approaching campaign. Aungervyle accompanied him to Coblenz to his meeting with the emperor Louis IV., and in the next year was sent to England to raise money. This seems to have been his last visit to the continent. In 1340 and 1342 he was again engaged in trying to negotiate peace with the Scots, but from this time his life appears to have passed quietly in the care of his diocese and in the accumulation of a library.

He sent far and wide in search of manuscripts, rescuing many treasures from the charge of ignorant and neglectful monks. "No dearness of price," he says, "ought to hinder a man from the buying of books, if he has the money demanded for them, unless it be to withstand the malice of the seller or to await a more favourable opportunity of buying." It is to be supposed that Richard de Bury sometimes brought undue pressure to bear on the owners, for it is recorded that an abbot of St Albans bribed him to secure his influence for the house by four valuable books, and that de Bury, who procured certain coveted privileges for the monastery, bought from him thirty-two other books, for fifty pieces of silver, far less than their normal price. The record of his passion for books, his *Philobiblon*, was completed on his fifty-eighth birthday, the 24th of January 1345, and he died on the 14th of April (May, according to Adam Murimuth) of that year. He gives an account (chapter viii.) of the unwearied efforts made by himself and his agents to collect books. In the eighteenth chapter he records his intention of founding a hall at Oxford, and in connexion with it a library of which his books were to form the nucleus. He even details the rules to be observed for the lending and care of the books, and he had already taken the preliminary steps for the foundation. The bishop died, however, in great poverty, and it seems likely that his collection was dispersed immediately after his death. But the traditional account is that the books were sent to the Durham Benedictines at Oxford, and that on the dissolution of the foundation by Henry VIII. they were divided between Duke Humphrey of Gloucester's library, Balliol College and Dr George Owen. Only two of the volumes are known to be in existence; one is a copy of John of Salisbury's works in the British Museum, and the other some theological treatises by Anselm and others in the Bodleian.

The chief authority for the bishop's life is William de Chambre (printed in Wharton's *Anglia Sacra*, 1691, and in *Historiae Dunelmensis scriptores tres*, Surtees Soc. 1839), who describes him as an amiable and excellent man, charitable in his diocese, and the liberal patron of many learned men, among these being Thomas Bradwardine, afterwards archbishop of Canterbury, Richard Fitzralph, afterwards archbishop of Armagh, the enemy of the mendicant orders, Walter Burley, who translated Aristotle, John Mauduit the astronomer, Robert Holkot and Richard de Kilvington. John Bale[1] and Pits[2] mention other works of his, *Epistolae Familiares* and *Orationes ad Principes*. The opening words of the *Philobiblon* and the *Epistolae* as given by Bale represent those of the *Philobiblon* and its prologue, so that he apparently made two books out of one treatise. It is possible that the *Orationes* may represent a letter book of Richard de Bury's, entitled *Liber Epistolaris quondam domini Ricardi de Bury, Episcopi Dunelmensis*, now in the possession of Lord Harlech. This MS., the contents of which are fully catalogued in the Fourth Report (1874) of the Historical MSS. Commission (Appendix, pp. 379-397), contains numerous letters from various popes, from the king, a correspondence dealing with the affairs of the university of Oxford, another with the province of Gascony, beside some harangues and letters evidently kept as models to be used on various occasions.

It has often been asserted that the *Philobiblon* itself was not written by Richard de Bury at all, but by Robert Holkot. This assertion is supported by the fact that in seven of the extant MSS. of *Philobiblon* it is ascribed to Holkot in an introductory note, in these or slightly varying terms: *Incipit prologus in philobiblon ricardi dunelmensis episcopi quē librū composuit Robertus holcote de ordine predicatorum sub nomine dicti episcopi.* The Paris MS. has simply *Philobiblon olchoti anglici*, and does not contain the usual concluding note of the date when the book was completed by Richard. As a great part of the charm of the book lies in the unconscious record of the collector's own character, the establishment of Holkot's authorship would materially alter its value. A notice of Richard de Bury by his contemporary Adam Murimuth (*Continuatio Chronicarum*, Rolls Series, 1889, p. 171) gives a less favourable account of him than does William de Chambre, asserting that he was only moderately learned, but desired to be regarded as a great scholar.

The original Latin text was printed at Cologne (1473), Spires (1483), Paris (1500), Oxford (1598 and 1599), &c. It was first translated into English by J. B. Inglis in 1832, and into French by Hippolyte Cocheris in 1856. The best translation is that by Mr E. C. Thomas, accompanying the Latin text, with full biographical and bibliographical introductions (1888). Other editions are in the *King's Classics* (1902) and for the Grolier Club (New York, 1889, ed. A. W. West).

AUNT SALLY, the English name for a game popular at fairs, race-courses and summer resorts. It consists in throwing hard balls, of wood or leather-covered yarn, at puppets dressed to represent different characters, originally a grotesque female figure called "Aunt Sally," with the object of smashing a clay pipe which is inserted either in the mouth or forehead of the puppet. In France the game is popular under the name *jeu de massacre*. In a variation of the pastime the mark consists of a living person's head thrust through a hole in a sheet of canvas. In case of a hit a second shy is allowed, or a small prize is given.

AURA (from the Gr. for "breath" or "breeze"), a term used in old days to denote a supposed ethereal emanation from a volatile substance; applied later to the "electrical aura," or air-current caused by electrical discharge; in epilepsy (*q.v.*) to one of its premonitory symptoms; and in spiritualism to a mysterious light associated with the presence of spirit-forms. See also AUREOLA.

AURANGABAD, or AURUNGABAD, a city of India, in the dominions of the nizam of Hyderabad, north-west division, situated 138 m. from Poona, 207 from Bombay via Poona, and 270 from Hyderabad on the river Kaum. It gives its name to a district. It was founded in 1610, under the name of Fatchnagar, by Malik Ambar, an Abyssinian, who had risen from the condition of a slave to great influence. Subsequently it became the capital of the Mogul conquests in the south of India. Aurangzeb, who erected here a mausoleum to his wife which has been compared to the Taj at Agra, made the city the seat of his government during his viceroyalty of the Deccan, and gave it the name of Aurangabad. It thus grew into the principal city of an extensive province of the same name, stretching westward to the sea, and comprehending nearly the whole of the territory now comprised within the northern division of the presidency of Bombay. Aurangabad long continued to be the capital of the succession of potentates bearing the modern title of nizam, after those chiefs became independent of Delhi. They abandoned it subsequently, and transferred their capital to Hyderabad, when the town at once began to decline. Aurangabad is a railway station on the Hyderabad-Godavari line, 435 m. from Bombay. In 1901 the population, with military cantonments, was 36,837, showing an increase of 8 % in the decade. It has a cotton mill.

The district of Aurangabad has an area of 6172 sq. m. The population in 1901 was 721,407. It contains the famous caves of Ajanta, and also the battlefield of Assaye.

AURANGZEB (1618–1707), one of the greatest of the Mogul emperors of Hindustan, was the third son of Shah Jahan, and was born in November 1618. His original name, Mahommed, was changed by his father, with whom he was a favourite, into Aurangzeb, meaning ornament of the throne, and at a later time he assumed the additional titles of Mohi-eddin, reviver of religion, and Alam-gir, conqueror of the world. At a very early age, and throughout his whole life, he manifested profound religious feeling, perhaps instilled into him in the course of his education under some of the strictest Mahommedan doctors.

[1] *Script. Ill. Maj. Brit.* cent. v. No. 69.
[2] *De Ill. Angl. Script.* (1619, p. 468).

He was employed, while very young, in some of his father's expeditions into the country beyond the Indus, gave promise of considerable military talents, and was appointed to the command of an army directed against the Uzbegs. In this campaign he was not completely successful, and soon after was transferred to the army engaged in the Deccan. Here he gained several victories, and in conjunction with the famous general, Mir Jumla, who had deserted from the king of Golconda, he seized and plundered the town of Hyderabad, which belonged to that monarch. His father's express orders prevented Aurangzeb from following up this success, and, not long after, the sudden and alarming illness of Shah Jahan turned his thoughts in another direction. Of Shah Jahan's four sons, the eldest, Dara, a brave and honourable prince, but disliked by the Mussulmans on account of his liberality of thought, had a natural right to the throne. Accordingly, on the illness of his father, he at once seized the reins of government and established himself at Delhi. The second son, Shuja, governor of Bengal, a dissolute and sensual prince, was dissatisfied, and raised an army to dispute the throne with Dara. The keen eye of Aurangzeb saw in this conjuncture of events a favourable opportunity for realising his own ambitious schemes. His religious exercises and temperate habits gave him, in popular estimation, a great superiority over his brothers, but he was too politic to put forward his claims openly. He made overtures to his younger brother Murad, governor of Gujarat, representing that neither of their elder brothers was worthy of the kingdom, that he himself had no temporal ambition, and desired only to place a fit monarch on the throne, and then to devote himself to religious exercises and make the pilgrimage to Mecca. He therefore proposed to unite his forces to those of Murad, who would thus have no difficulty in making himself master of the empire while the two elder brothers were divided by their own strife. Murad was completely deceived by these crafty representations, and at once accepted the offer. Their united armies then moved northward. Meanwhile Shah Jahan had recovered, and though Dara resigned the crown he had seized, the other brothers professed not to believe in their father's recovery, and still pressed on. Shuja was defeated by Dara's son, but the imperial forces under Jaswant Singh were completely routed by the united armies of Aurangzeb and Murad. Dara in person took the field against his brothers, but was defeated and compelled to fly. Aurangzeb then, by a clever stroke of policy, seized the person of his father, and threw him into confinement, in which he was kept for the remaining eight years of his life. Murad was soon removed by assassination, and the way being thus cleared, Aurangzeb, with affected reluctance, ascended the throne in August 1658. He quickly freed himself from all other competitors for the imperial power. Dara, who again invaded Gujarat, was defeated and closely pursued, and was given up by the native chief with whom he had taken refuge. He was brought up to Delhi, exhibited to the people, and assassinated. Shuja, who had been a second time defeated near Allahabad, was attacked by the imperial forces under Mir Jumla and Mahommed, Aurangzeb's eldest son, who, however, deserted and joined his uncle. Shuja was defeated and fled to Arakan, where he perished; Mahommed was captured, thrown into the fortress of Gwalior, and died after seven years' confinement. No similar contest disturbed Aurangzeb's long reign of forty-six years, which has been celebrated, though with doubtful justice, as the most brilliant period of the history of Hindustan. The empire certainly was wealthy and of enormous extent, for there were successively added to it the rich kingdoms of Bijapur and Golconda, but it was internally decaying and ready to crumble away before the first vigorous assault. Two causes principally had tended to weaken the Mogul power. The one was the intense bigotry and intolerant policy of Aurangzeb, which had alienated the Hindus and roused the fierce animosity of the haughty Rajputs. The other was the rise and rapid growth of the Mahratta power. Under their able leader, Sivaji, these daring freebooters plundered in every direction, nor could all Aurangzeb's efforts avail to subdue them. For the last twenty-six years of his life Aurangzeb was engaged in wars in the Deccan, and never set foot in his own capital. At the close of the long contest the Mogul power was weaker, the Mahratta stronger than at first. Still the personal ability and influence of the emperor were sufficient to keep his realms intact during his own life. His last years were embittered by remorse, by gloomy forebodings, and by constant suspicion, for he had always been in the habit of employing a system of espionage, and only then experienced its evil effects. He died on the 3rd of March 1707 at Ahmadnagar, while engaged on an extensive but unfortunate expedition against the Mahrattas.

See Lane-Poole, *Aurangzib*, "Rulers of India" series (1893).

AURAY, a town of France near the mouth of the Auray river, in the department of Morbihan, 12 m. W. of Vannes on the railway between that town and Lorient. Pop. (1906) 5241. Its port, which is formed by the channel of the river and divides the town into two parts, is frequented by coasting and fishing vessels. The principal buildings are the church of St Esprit (13th century) now secularized; the Renaissance church of St Gildas; the town-hall (18th century); and, at a short distance from the town, the Carthusian monastery, now a deaf and dumb institute, on the site of the battle of 1364, at which Charles of Blois was defeated by John of Montfort (see BRITTANY: *History*). Adjoining the Chartreuse is a small chapel in which are preserved the bones of the Royalists captured by the Republicans in a battle fought near the spot in 1795. In the neighbourhood is the church of Sainte Anne d'Auray, one of the principal places of pilgrimage in Brittany. Auray is one of the chief centres in France for oyster-breeding, and carries on boat-building and sardine-fishing.

AURELIA, VIA, an ancient highroad of Italy, the date of the construction of which is unknown. It ran from Rome to Alsium, where it reached the sea, and thence along the south-west coast of Italy, perhaps originally only as far as Cosa, and was later extended to Vada Volaterrana, and in 109 B.C. to Genua and Dertona by means of the Via Aemilia, though a coast road as far as Genua at least must have existed long before. The name is applied in the Antonine Itinerary to these extensions, and even to the prolongation to Arles. Its line is in the main closely followed by the modern coast highroad; cf., however, for the section between Cosa and Populonia, O. Cuntz in *Jahreshefte des Österr. arch. Instituts*, vii. (1904), 54. (T. As.)

AURELIAN [LUCIUS DOMITIUS AURELIANUS], one of the greatest of the Roman soldier emperors, was born at Sirmium in Pannonia between A.D. 212–214. He was of humble origin, but nothing definite is known of his family. He had always shown great enthusiasm for a military career, and so distinguished himself in the campaigns in which he took part that on one occasion he received a public vote of thanks. At the same time he was proclaimed consul elect, and adopted by Ulpius Crinitus, military governor of Illyria and Thrace. On the death of the emperor Claudius II. Gothicus (270), Aurelian was proclaimed his successor with the universal approval of the soldiers. His first task was to continue the war which had been begun by Claudius against the Goths. He drove them out of Moesia across the Danube, where he left them in possession of Dacia, which he did not think himself able to retain; the name was transferred to Moesia, which was then called Dacia Aureliani. The chronology, however, of Aurelian's reign is very confused, and the abandonment of Dacia is placed by some authorities towards its close. He next entered upon campaigns against the Juthungi, Alamanni, and other Germanic tribes, over whom, after a severe defeat which was said to have imperilled the very existence of the empire, he at length obtained a complete victory. Having thus secured the Rhine and Danube frontiers, he turned his energies towards the east, and in 271 set out on his expedition against Zenobia, queen of Palmyra (*q.v.*). At the same time he crushed two pretenders to the throne—Firmus and Tetricus. Firmus, a wealthy merchant of Seleucia, had proclaimed himself emperor of Egypt. Aurelian, who was at the time in Mesopotamia, hastened thither, and ordered him to be seized and put to death. Tetricus, who had been proclaimed emperor in the west after the death of Gallienus, and left undisturbed by Claudius II., still ruled over Gaul, Spain and Britain. A decisive battle was fought

near the modern Châlons, in which Tetricus was defeated. The restoration of the unity of the empire was thus complete. In 274 a brilliant triumph, adorned by the persons of Zenobia and Tetricus, was celebrated at Rome.

Aurelian now turned his attention to the internal affairs of the empire. He introduced sumptuary laws; relieved the poor by distributions of bread and meat, proceeded with great severity against informers and embezzlers; began the construction of various public works and buildings; and proclaimed a general amnesty for political crimes. The restoration and enlargement of the walls of Rome, commenced by him, was not completed till the reign of Probus. An attempt to restore the standard of the coinage is said to have caused a revolt of the workmen and officials connected with the mint, which was only put down with the loss of 7000 soldiers. It has been suggested that this was really an attempt at revolution incited by the senate and praetorian guards, the opportunity being found in disturbances resulting from opposition to the attempted reform, which by themselves could hardly have assumed such serious proportions. Aurelian's restless spirit was not long able to endure a life of inaction in the city. Towards the end of 274, he started on an expedition against the Persians, halting in Thrace by the way. While on the march between Heracleia and Byzantium, at the beginning of the following year, he was assassinated through the treachery of his secretary Eros, who, in order to escape the discovery of his own irregularities, incited certain officers against the emperor by showing them a forged list, on which their names appeared as marked out for death.

Aurelian well deserved the title of restorer of the empire, and it must be remembered that he lived in an age when severity was absolutely necessary. He was a great soldier and a rigid but just disciplinarian. In more favourable circumstances he would have been a great administrator. He displayed a fondness for pomp and show on public occasions; he was the first Roman emperor to wear the diadem, and assumed the title of Lord and God on medals.

The chief authority for the events of Aurelian's reign is his life by Vopiscus, one of the writers of the "Augustan History"; it is founded on Greek memoirs and certain journals deposited in the Ulpian library at Rome. See L. Homo, *Le Règne de l'empereur Aurélien* (1904), and Groag's art. in Pauly-Wissowa, *Realencyclopädie*, v. 1347 foll.

AURELIANUS, CAELIUS, a physician of Sicca in Numidia, who probably flourished in the 5th century A.D., although some place him two or even three centuries earlier. In favour of the later date is the nature of his Latin, which shows a strong tendency to the Romance, and the similarity of his language to that of Cassius Felix, also an African medical writer, who about 450 wrote a short treatise, chiefly based on Galen. We possess a translation by Aurelianus of two works of Soranus of Ephesus (2nd century), the chief of the "methodist" school of medicine, on chronic and acute maladies—*Tardae* or *Chronicae Passiones*, in five, and *Celeres* or *Acutae Passiones* in three books. The translation, which is especially valuable since the original has been lost, shows that Soranus possessed considerable practical skill in the diagnosis of ordinary and even of exceptional diseases. It is also important as containing numerous references to the methods of earlier medical authorities. We also possess considerable fragments of his *Medicinales Responsiones*, also adapted from Soranus, a general treatise on medicine in the form of question and answer; it deals with rules of health (*salutaria praecepta*) and the pathology of internal diseases (ed. Rose, *Anecdota Graeca et Latina*, ii., 1870). Where it is possible to compare Aurelianus's translation with the original—as in a fragment of his Gynaecia with Soranus's Περὶ γυναικείων Παθῶν—it is found that it is literal, but abridged. There is apparently no MS. of the treatises in existence. (Editions: Amman, 1709; Haller, 1774.)

AURELLE DE PALADINES, LOUIS JEAN BAPTISTE D' (1804–1877), French general, was born at Malzieu, Lozère, on the 9th of January 1804. He was educated at St Cyr, and entered the army as sub-lieutenant of foot in 1824. He served with distinction in Algeria between 1841 and 1848, becoming lieut.-colonel and an officer of the Legion of Honour; took part in the Roman campaigns of 1848 and 1849, and was made colonel. He served as general of brigade throughout the Crimean War of 1854–56, being promoted general of division and commander of the Legion of Honour. During the campaign in Lombardy in 1859 he commanded at Marseilles, and superintended the despatch of men and stores to the seat of war, and for his services he was made a grand officer of the Legion of Honour. Placed on the reserve list in 1869, he was recalled to the Marseilles command on the outbreak of the Franco-German War of 1870–71. After the first capture of Orleans by the Germans, he was appointed by the Government of National Defence, in November 1870, to the command of the Army of the Loire. He was at first very successful against von der Tann-Rathsamhausen, winning the battle of Coulmiers and compelling the Germans to evacuate Orleans, but the capitulation of Metz had set free additional German troops to oppose him, and, after his defeat at Beaune la Rolande and subsequent unsuccessful fighting near Orleans, resulting in its recapture by the Germans in December, Aurelle retreated into the Sologne and was superseded. After the armistice he was elected to the National Assembly by the departments both of Allier and Gironde. He sat for Allier and was one of the fifteen officers chosen to assist in the peace negotiations. He was decorated with the grand cross of the Legion of Honour, and was given the command at Bordeaux, but retired in 1872. Elected a life senator in 1875, he supported the monarchical majority of 1876. He died at Versailles on the 17th of December 1877. He was the author of *La Première Armée de la Loire*, published in 1872.

AUREOLA, AUREOLE (diminutive of Lat. *aura*, air), the radiance of luminous cloud which, in paintings of sacred personages, is represented as surrounding the whole figure. In the earliest periods of Christian art this splendour was confined to the figures of the persons of the Godhead, but it was afterwards extended to the Virgin Mary and to several of the saints. The aureola, when enveloping the whole body, is generally oval or elliptical in form, but is occasionally circular or quatrefoil. When it is merely a luminous disk round the head, it is called specifically a *nimbus*, while the combination of nimbus and aureole is called a *glory*. The strict distinction between nimbus and aureole is not commonly maintained, and the latter term is most frequently used to denote the radiance round the heads of saints, angels or persons of the Godhead. The *nimbus* in Christian art appeared first in the 5th century, but practically the same device was known still earlier, though its history is obscure, in non-Christian art. Thus (though earlier Indian and Bactrian coins do not show it) it is found with the gods on some of the coins of the Indian kings Kanishka, Huvishka and Vasudeva, 58 B.C. to A.D. 41 (Gardner's *Cat. of Coins of Greek and Scythic Kings of Bactria and India*, Brit. Mus. 1886, plates 26-29). And its use has been traced through the Egyptians to the Greeks and Romans, representations of Trajan (arch of Constantine) and Antoninus Pius (reverse of a medal) being found with it. In the circular form it constitutes a natural and even primitive use of the idea of a crown, modified by an equally simple idea of the emanation of light from the head of a superior being, or by the meteorological phenomenon of a halo. The probability is that all later associations with the symbol refer back to an early astrological origin (cf. MITHRAS), the person so glorified being identified with the sun and represented in the sun's image; so the aureole is the *Hvarenō* of Mazdaism. From this early astrological use the form of "glory" or "nimbus" has been adapted or inherited under new beliefs.

AURICH, a town of Germany, in the Prussian province of Hanover, chief town of the district of East Friesland, on the Ems-Jade canal, 18 m. N.W. from Emden by rail. Pop. (1900) 6013. It is built in the Dutch style, and lies in a sandy but fertile plain, surrounded by pleasant promenades which have taken the place of the old fortifications. It has a palace, formerly the residence of the counts of East Friesland and now used as government offices, a Roman Catholic and two Protestant churches, a gymnasium, and four libraries. There are breweries

and small manufactories of paper and tobacco. Close by is the *Upstallsboom*, the hill of oath and liberty, where every year at Whitsuntide representatives of the seven Frisian coast lands assembled to deliberate.

See Wiarda, *Bruchstücke zur Geschichte der Stadt Aurich* (Emden, 1835).

AURICLE (from Lat. diminutive of *auris*, ear), the external ear in animals, or an analogous part in plants, &c. From a supposed resemblance to the ear of a dog, the term was applied to the upper cavities of the heart. The adjective "auricular" is more specially used in the phrase "auricular confession" (see CONFESSION), i.e. private.

AURICULA (*Primula auricula*), an Alpine plant, which has been an inmate of British gardens for about three hundred years, and is still prized by florists as a favourite spring flower. It loves a cool soil and shady situation. The florists' varieties are grown in rich composts, for the preparation of which numberless receipts have been given; but many of the old nostrums are now exploded, and a more rational treatment has taken their place. Thus Mr Douglas writes (*Hardy Florists' Flowers*):—

"There is no mystery, as some suppose, about the potting, any more than there is about the potting material. The compost should consist of turfy loam four parts, leaf-mould one part, sharp river or silver sand one part, and a few bits of broken charcoal mixed with it. The pots to be used should be from 3 to 4½ in. in diameter, inside measure; about 1 in. of potsherds should be placed in the bottom of each pot, and over this some fibrous turf, from which the fine particles of earth have been removed. The old soil should be shaken from the roots of the plants to be potted; and before potting cut off, if necessary, a portion of the main root. In potting press the soil rather firmly around the roots."

Auriculas are best grown in a cold frame mounted on legs about 2 ft. from the ground, and provided with hinged sashes. A graduated stage formed of wood battens 6 in. broad, with a rise of 2 in., should be fixed so as to take each one row of pots, with the plants standing at about 15 in. from the glass; the spaces between the shelves should be closed, while the top board of the back and the front should be hinged so as to be let down when desired for ventilation, the sashes, too, being movable for the same purpose, and also to afford facilities for examining and attending to the plants. This frame should face the north from May to October, and south in winter. No protection will be needed except in very severe frosts, when two or three thicknesses of garden mats may be thrown over the glass, and allowed to remain on until the soil is thawed, should it become frozen.

Auriculas may be propagated from seed, which is to be sown as soon as ripe, in July or August, in boxes, kept under cover, and exposed only to the rays of the morning sun. When seed has been saved from the finer sorts, the operation is one of considerable nicety, as it not unfrequently happens that the best seedlings are at first exceedingly weak. They generally flower in the second or third year, a few good sorts being all that can be expected from a large sowing. The established varieties are increased by taking off the offshoots, an operation performed at the time of potting in July or the beginning of August. But some varieties are very shy in producing offsets.

The original of the auricula is a hardy perennial herb, of dwarf habit, bearing dull yellowish blossoms. This and the commoner forms raised from seed, as well as one or two double forms, are interesting hardy border flowers. The choice florists' varieties are divided into five classes:—the *green-edged*, with the margins of the flowers green; the *grey-edged*, with the green margins powdered with meal so as to appear to be coloured grey; the *white-edged*, with the mealy powder so dense as to cover the green; the *selfs*, which have none of the green variegation of margin seen in the foregoing, but are of some distinct colour, as purple, maroon, &c., but have, like the preceding, a white paste surrounding the eye; and the *alpines*, which resemble the selfs in not having any green marginal variegation, but differ in having a yellow centre more or less dense. The individual flowers of the first three groups of florists' auriculas show four distinct circles:—first the eye or tube, which should have the stamens lying in it, but sometimes has the pin-headed stigma instead, which is a defect; second, the paste or circle of pure white surrounding the eye; third, the body colour, a circle of some dark tint, as maroon or violet, which feathers out more or less towards the edge, but is the more perfect the less it is so feathered, and is quite faulty if it breaks through to the outer circle; fourth, the margin, which is green or grey or white. These circles should be about equal in width and clearly defined, and the nearer they are to this standard the more perfect is the flower. In the group of selfs the conditions are the same, except that there is no margin, and consequently the body colour, which should be uniform in tone, extends to the edge. In the alpines there should be no paste or white surrounding the eye, but this space should be either golden-yellow or creamy-yellow, which makes two subdivisions in this group; and the body colour is more or less distinctly shaded, the edges being of a paler hue. There is besides a group of laced alpines, in which a distinct and regular border of colour surrounds each of the marginal lobes.

The following is a selection of the best varieties cultivated in 1909:—

Green-edged.—Abbé Liszt, Abraham Barker, Shirley Hibberd, Prince Charming, Mrs Henwood.

Grey-edged.—Amy Robsart, George Lightbody, Marmion, Olympus, George Rudd, Richard Headly.

White-edged.—Acme, Conservative, Heather Bell, Mrs Dodson, Rachel, Smiling Beauty.

Selfs.—Andrew Miller, Gerald, Mikado, Mrs Phillips, Mrs Potts, Harrison Weir.

Alpines.—Argus, Dean Hole, Duke of York, Firefly, Flora McIvor, Mrs Douglas, Mrs Markham, Perfection, Phyllis, Rosy Morn, The Bride, Teviotdale.

AURIFABER (the latinized form of Goldschmidt), a surname borne by three prominent men of the Reformation period in Germany.

1. ANDREAS (1514–1559) was a physician of some repute, but through his influence with Albert of Brandenburg, last grand-master of the Teutonic order, and first Protestant duke of Prussia, became an outstanding figure in the controversy associated with Andreas Osiander (*q.v.*) whose daughter he had married.

2. JOANNES (Vratislaviensis; 1517–1568), the younger brother of Andreas, was born at Breslau on the 30th of January 1517, and educated at Wittenberg, where he formed a close and lasting friendship with Melanchthon. After graduating in 1538 he spent twelve years as *docent* at the university, and having then received his doctorate of divinity, was appointed professor of divinity and pastor of the church of St Nicholas at Rostock. He distinguished himself by his conciliatory disposition, earned the special confidence of Duke John Albert of Mecklenburg, and took a leading part in 1552 in drawing up the constitution of the Mecklenburg church. He also settled some religious disputes in the town of Lübeck. In 1553 Duke Albert of Prussia, anxious to heal the differences in the Prussian church caused by the discussion of Osiander's doctrines, invited him to Königsberg, and in the following year appointed him professor of divinity and president of the Samland diocese. Joannes, however, found it impossible to conciliate all parties, and in 1565 returned to Breslau, where, in 1567, he became pastor in the church of St Elizabeth and inspector of the Lutheran churches and schools. He died on the 19th of October 1568.

3. JOANNES (Vinariensis; 1519–1575), was born in the county of Mansfeldt in 1519. He studied at Wittenberg where he heard the lectures of Luther, and afterwards became tutor to Count Mansfeldt. In the war of 1544–45 he accompanied the army as field-preacher, and then lived with Luther as his *famulus* or private secretary, being present at his death in 1546. In the following year he spent six months in prison with John Frederick, elector of Saxony, who had been captured by the emperor, Charles V. He held for some years the office of court-preacher at Weimar, but owing to theological disputes was compelled to resign this office in 1561. In 1566 he was appointed to the Lutheran church at Erfurt, and there remained till his death

in November 1575. Besides taking a share in the first collected or Jena edition of Luther's works (1556), Aurifaber sought out and published at Eisleben in 1564–1565 several writings not included in that edition. He also published Luther's *Letters* (1556, 1565), and *Table Talk* (1566). This popular work, which has given him most of his fame, is unfortunately but a second or third hand compilation.

See G. Kawerau's art. in Herzog-Hauck's *Realencyk. für prot. Theologie*, and the literature there cited.

AURIGA (the " charioteer " or " waggoner "), in astronomy, a constellation of the northern hemisphere, found in the catalogues of Eudoxus (4th century B.C.) and Aratus (3rd century B.C.). It was symbolized by the Greeks as an old man in a more or less sitting posture, with a goat and her kids in his left hand, and a bridle in his right. The ancient Greeks associated this constellation with many myths. Some assume it to be Erichthonius, son of Athena and Hephaestus, who was translated to the skies by Zeus on account of his invention of chariots or coaches. Others assume it to be Myrtilus, a son of Hermes and Clytie, and charioteer to Oenomaus, who was placed in the heavens by Hermes. Another myth has it to be Olenus, a son of Hephaestus, and father of Aega and Helice, two nymphs who nursed Zeus. Ptolemy catalogued fourteen stars, Tycho Brahe twenty-seven, and Hevelius forty in this constellation. Interesting stars are: α *Aurigae* or *Capella* (the goat), one of the brightest stars in the heavens, determined by Newall and Campbell to be a spectroscopic binary; β *Aurigae*, a star of the second magnitude also a spectroscopic binary; ϵ *Aurigae*, an irregularly variable star; and *Nova Aurigae*, a " new " star discovered by Anderson in 1892, and afterwards found on a photographic plate exposed at Harvard in December 1891. Several fine star clusters also appear in this constellation.

AURILLAC, a town of central France, capital of the department of Cantal, 140 m. N.N.E. of Toulouse, on the Orléans railway between Figeac and Murat. Pop. (1906) 14,097. Aurillac stands on the right bank of the Jordanne, and is dominated from the north-west by the Roc Castanet, crowned by the castle of St Etienne, the keep of which dates from the 11th century. Its streets are narrow and uninteresting, with the exception of one which contains, among other old houses, that known as the Maison des Consuls, a Gothic building of the 16th century, decorated with sculptured stone-work. Aurillac owes its origin to an abbey founded in the 9th century by St Géraud, and the abbey-church, rebuilt in the 17th century in the Gothic style, is the chief building in the town. The former college, which dates from the 17th century, is now occupied by a museum and a library. There is a statue of Pope Silvester II., born near Aurillac in 930 and educated in the abbey, which soon afterwards became one of the most famous schools of France. Aurillac is the seat of a prefect, and its public institutions include tribunals of first instance and of commerce, a chamber of commerce, a lycée, training-colleges and a branch of the Bank of France. The chief manufactures are wooden shoes and umbrellas, and there is trade in cheese and in the cattle and horses reared in the neighbourhood.

AURISPA, GIOVANNI (*c.* 1370–1459), one of the learned Italians of the 15th century, who did so much to promote the revival of the study of Greek in Italy, was born at Noto in Sicily. In 1418 he visited Constantinople, where he remained for some years, perfecting his knowledge of Greek and searching for ancient MSS. His efforts were rewarded by the acquisition of some 250 MSS., with which he returned to Venice. Here he is said to have been obliged to pawn his treasures for 50 gold florins to provide for his immediate wants. Cosimo de' Medici, hearing of his embarrassment, redeemed the MSS. and summoned the owner to Florence. In 1438, at the council of Basel, Aurispa attracted the attention of Pope Eugenius IV., who made him his secretary; he held a similar position under Nicholas V., who presented him to two lucrative abbacies. He died at Ferrara. Considering his long life and reputation Aurispa produced little: Latin translations of the commentary of Hierocles on the golden verses of Pythagoras (1474) and of *Philisci Consolatoria ad Ciceronem* from Dio Cassius (not published till 1510); and, according to Gesner, a translation of the works of Archimedes. Aurispa's reputation rests upon the extensive collection of MSS. copied and distributed by him, and his persistent efforts to revive and promote the study of ancient literature.

AUROCHS (from Lat. *urus*, the wild ox, and " ox ") or URUS, the name of the extinct wild ox of Europe (*Bos taurus primigenius*), which after the disappearance of that animal became transferred to the bison. According to the German Freiherr von Herberstein (1486–1566), in his *Moscovia*, of which an Italian translation was published at Venice in 1550, the aurochs survived in Poland (and probably also in Hungary) during the latter middle ages. In this work appear woodcuts—rude but characteristic and unmistakable—of two distinct types of European wild cattle; one the aurochs, or ur, and the other the bison. As Herberstein had travelled in Poland, it is probable that he had seen both species alive, and the drawings were most likely executed under his own direction. It has indeed been suggested that the figure of the aurochs was taken from a domesticated ox, but this is a mistaken idea. Not the least important feature of the work of Herberstein is the application of the name aurochs to the wild ox, as distinct from the bison. The locality where aurochs survived in Herberstein's time was the forest of Jaktozowka, situated about 55 kilometres west-south-west of Warsaw, in the provinces of Bolemow and Sochaczew. From other evidence it appears that the last aurochs was killed in this forest in the year 1627. Herberstein describes the colour of the aurochs as black, and this is confirmed by another old picture of the animal. Gesner's figure of the aurochs, or as he calls it " thur," given in the *Icones* to his *History of Animals*, was probably adapted from Herberstein's. It may be added that an ancient gold goblet depicts the hunting and taming of the wild aurochs.

As a wild animal, then, the aurochs appears to have ceased to exist in the early part of the 17th century; but as a species it survives, for the majority of the domesticated breeds of European cattle are its descendants, all diminished in point of size, and some departing more widely from the original type than others. Aurochs' calves were in all probability captured by the early inhabitants of Britain and the continent and tamed; and from these, with perhaps an occasional blending of wild blood, are descended most European breeds of cattle.

Much misconception, however, has prevailed as to which breeds are the nearest to the ancestral wild stock. At one time this position was supposed to be occupied by the white half-wild cattle of Chillingham and other British parks. These white breeds are, however, partial albinos; and such semi-albinos are always the result of domestication and could not have arisen in the wild state. Moreover, park-cattle display evidence of their descent from dark-coloured breeds by the retention of red or black ears and brown or black muzzles. In the Chillingham cattle the ears are generally red, although sometimes black, and the muzzle is brown; while in the breed at Cadzow Chase, Lanarkshire, both ears and muzzle are black, and there are usually flecks of black on the head and forequarters. It is further significant that, in the Chillingham herd, dark-coloured calves, which are weeded out, make their appearance from time to time.

A very ancient British breed is the black Pembroke; and when this breed tends to albinism, the ears and muzzle, and more rarely the fetlocks, remain completely black, or very dark grey, although the colour elsewhere is whitish, more or less flecked and blotched with pale grey. In the shape and curvature of the horns, which at first incline outwards and forwards, and then bend somewhat upwards and inwards, this breed of cattle resembles the aurochs and the (by comparison) dwarfed park-breeds. Moreover, in both the Pembroke and the park-breeds the horns are light-coloured with black tips.

Evidence as to the affinity between these breeds is afforded by the fact that a breed of cattle very similar to that at Chillingham was found in Wales in the 10th century; these cattle being white with red ears. Individuals of this race survived till at least 1850 in Pembroke, where they were at one time kept

perfectly pure as a part of the regular farm-stock. Until a period comparatively recent, they were relatively numerous, and were driven in droves to the pasturages of the Severn and the neighbouring markets. Their whole essential characters are the same as those of the cattle at Chillingham. Their horns are white, tipped with black, and extended and turned upwards in the manner distinctive of the park-breed. The inside of the ears and the muzzle are black, and the feet are black to the fetlock joint. The skin is unctuous and of a deep-toned yellow colour. Individuals of the race were sometimes born entirely black, and then were not to be distinguished from the common Pembroke cattle of the mountains.

It is thus evident that park-cattle are an albino offshoot from the ancient Pembroke black breed, which, from their soft and well-oiled skins, are evidently natives of a humid climate, such as that of the forests in which dwelt the wild aurochs. This disposes of a theory that they are descendants of a white sacrificial breed introduced into Britain by the ancient Romans.

The Pembroke and park-cattle are, however, by no means the sole descendants of the aurochs, the black Spanish fighting-bulls claiming a similar descent. This breed shows a light-coloured line along the spine, which was characteristic of the aurochs. It has also been suggested that the Swiss Siemental cattle are nearly related to the aurochs. The latter was a gigantic animal, especially during the Pleistocene period; the skulls and limb-bones discovered in the brick-earths and gravels of the Thames valley and many other parts of England having belonged to animals that probably stood six feet at the shoulder. (R. L.*)

AURORA (perhaps through a form *ausosa* from Sansk. *ush*, to burn; the common idea of "brightness" suggests a connexion with *aurum*, gold), the Roman goddess of the dawn, corresponding to the Greek goddess Eos. According to Hesiod (*Theog.* 271) she was the daughter of the Titan Hyperion and Thea (or Euryphassa), and sister of Helios and Selene. By the Titan Astraeus, she was the mother of the winds Zephyrus, Notus and Boreas, of Hesperus and the stars. Homer represents her as rising every morning from the couch of Tithonus (by whom she was the mother of Emathion and Memnon), and drawn out of the east in a chariot by the horses Lampus and Phaëthon to carry light to gods and men (*Odyssey*, xxiii. 253); in Homer, she abandons her course when the sun is fully risen (or at the latest at mid-day, *Iliad*, ix. 66), but in later literature she accompanies the sun all day and thus becomes the goddess of the daylight. From the roseate shafts of light which herald the dawn, she bears in Homer the epithet "rosy-fingered." The conception of a dawn-goddess is common in primitive religions, especially in the Vedic mythology, where the deity Usás is closely parallel to the Greco-Roman; see Paul Regnaud, *Le Rig-Vêda* in *Annales du musée Guimet*, vol. i. c. 6 (Paris, 1892). She is also represented as the lover of the hunter Orion (*Odyssey*, v. 121), the representative of the constellation that disappears at the flush of dawn, and the youthful hunter Cephalus, by whom she was the mother of Phaëthon (Apollodorus iii. 14. 3). In works of art, Eos is represented as a young woman, fully clothed, walking fast with a youth in her arms; or rising from the sea in a chariot drawn by winged horses; sometimes, as the goddess who dispenses the dews of the morning, she has a pitcher in each hand. In the fresco-painting by Guido Reni in the Rospigliosi palace at Rome, Aurora is represented strewing flowers before the chariot of the sun. Metaphorically the word Aurora was used (*e.g.* Virg. *Aen.* viii. 686, vii. 606) for the East generally.

AURORA, a city of Kane county, Illinois, U.S.A., in the N.E. part of the state, on the Fox river, about 37 m. W. of Chicago. Pop. (1890) 19,688; (1900) 24,147, of whom 5075 were foreign-born; (1910) 29,807. Aurora is served by the Chicago, Burlington & Quincy, the Chicago & North-Western, the Elgin, Joliet & Eastern, and the Illinois, Iowa and Minnesota railways, and is connected with Chicago by an electric line. The city has a soldiers' memorial hall, erected by popular subscription, and a Carnegie library. Aurora is an important manufacturing centre; among its manufactures are railway cars—the shops of the Chicago, Burlington & Quincy railway being here—flour and cotton, carriages, hardware specialties, corsets, suspenders, stoves and silver-plate. In 1905 the city's factory products were valued at $7,329,028, an increase of 30% in 5 years. The municipality owns and operates the water-works and electric-lighting plants. The first settlement in the vicinity of Aurora was made in 1834. In 1845 the village of East Aurora was incorporated, and West Aurora was incorporated nine years later. In 1853 the two villages were united under a city charter, which was superseded by a revised charter in 1887.

AURORA, a city of Lawrence county, Missouri, U.S.A., 275 m. S.W. of St Louis, on the St Louis & San Francisco, and the St Louis, Iron Mountain & Southern railways. Pop. (1890) 3482; (1900) 6191; (1910) 4148. It is situated near a lead and zinc mining region, where surface lead was discovered in 1873 and systematic mining began in 1887; among the cities of the state it is second to Joplin in mineral importance, and has large ironworks and flour-mills; mining machinery also is manufactured. Farming and fruit-growing are carried on in the surrounding country, and Aurora is the place from which the products are shipped. Aurora was platted in 1870 and was chartered as a city in 1886.

AURORA, a village of Cayuga county, New York, U.S.A., on Cayuga Lake, 16 m. S.W. of Auburn. Pop. (1905) 623; (1910) 493. It is served by the Lehigh Valley railway. Aurora is a beautiful place and a popular summer resort, but it is best known as the seat of Wells College, a non-sectarian college for women, founded in 1868 by Henry Wells (1805–1878), of the Wells Fargo Express Company, and liberally endowed by Edwin B. Morgan (1806–1881), also connected with the same company, and by others. At Aurora are also the Somes school (a preparatory school for boys), founded in 1798 and until 1904 known as the Cayuga Lake Academy, and the Wells school (a preparatory school for girls). The village has a public library. Aurora was settled in 1789 chiefly by residents of New England, and was incorporated in 1905.

AURORA POLARIS (*Aurora Borealis* and *Australis*, Polar Light, Northern Lights), a natural phenomenon which occurs in many forms, some of great beauty.

1. *Forms.*—Various schemes of classification have been proposed, but none has met with universal acceptance; the following are at least the principal types. (1) *Arcs.* These most commonly resemble segments of circles, but are not infrequently elliptical or irregular in outline. The ends of arcs frequently extend to the horizon, but often one or both ends stop short of this. Several arcs may be visible at the same time. Usually the under or concave edge of the arc is the more clearly defined, and adjacent to it the sky often seems darker than elsewhere. It is rather a disputed point whether this dark segment—through which starlight has been seen to pass—represents a real atmospheric condition or is merely a contrast effect. (2) *Bands.* These may be nearly straight and regular in outline, as if broken portions of arcs; frequently they are ribbon-like serpentine forms showing numerous sinuosities. (3) *Rays.* Frequently an arc or band is visibly composed of innumerable short rays separated by distinctly less luminous intervals. These rays are more or less perpendicular to the arc or band; sometimes they are very approximately parallel to one another, on other occasions they converge towards a point. Longer rays often show an independent existence. Not infrequently rays extend from the upper edge of an arc towards the zenith. Combinations of rays sometimes resemble a luminous fan, or a series of fans, or part of a hollow luminous cylinder. Rays often alter suddenly in length, seeming to stretch down towards the horizon or mount towards the zenith. This accounts for the description of aurora as "Merry Dancers." (4) *Curtains or Draperies.* This form is rare except in Arctic regions, where it is sometimes fairly frequent. It is one of the most imposing forms. As a rule the higher portion is visibly made up of rays, the light tending to become more continuous towards the lower edge; the combination suggests a connected whole, like a curtain whose alternate portions are in light and shade. The curtain often shows several conspicuous folds, and the lower

edge often resembles frilled drapery. At several stations in Greenland auroral curtains have been observed when passing right overhead to narrow to a thin luminous streak, exactly as a vertical sheet of light would seem to do to one passing underneath it. (5) *Corona*. A fully developed corona is perhaps the finest form of aurora. As the name implies, there is a sort of crown of light surrounding a comparatively or wholly dark centre. Farther from the centre the ray structure is usually prominent. The rays may lie very close together, or may be widely separated from one another. (6) *Patches*. During some displays, auroral light appears in irregular areas or patches, which sometimes bear a very close resemblance to illuminated detached clouds. (7) *Diffused Aurora*. Sometimes a large part of the sky shows a diffuse illumination, which, though brighter in some parts than others, possesses no definite outlines. How far the different forms indicate real difference in the nature of the phenomenon, and how far they are determined by the position of the observer, it is difficult to say. Not infrequently several different forms are visible at the same time.

2. *Isochasms*.—Aurora is seldom observed in low latitudes. In the southern hemisphere there is comparatively little inhabited land in high latitudes and observational data are few; thus little is known as to how the frequency varies with latitude and longitude. Even in the northern hemisphere there are large areas in the Arctic about which little is known. H. Fritz (2) has, however, drawn a series of curves which are believed to give a good general idea of the relative frequency of aurora throughout

after H.Fritz. Emery Walker sc.

the northern hemisphere. Fritz' curves, shown in the illustration, are termed isochasms, from the Greek word employed by Aristotle to denote aurora. Points on the same curve are supposed to have the same average number of auroras in the year, and this average number is shown adjacent to the curve. Starting from the equator and travelling northwards we find in the extreme south of Spain an average of only one aurora in ten years. In the north of France the average rises to five a year; in the north of Ireland to thirty a year; a little to the north of the Shetlands to one hundred a year. Between the Shetlands and Iceland we cross the curve of maximum frequency, and farther north the frequency diminishes. The curve of maximum frequency forms a slightly irregular oval, whose centre, the auroral pole, is according to Fritz at about 81° N. lat., 70° W. long. Isochasms reach a good deal farther south in America than in Europe. In other words, auroras are much more numerous in the southern parts of Canada and in the United States than in the same latitudes of Europe.

3. *Annual Variation*.—Table I. shows the annual variation observed in the frequency of aurora. It has been compiled from several authorities, especially Joseph Lovering (4) and Sophus Tromholt (5). The monthly figures denote the percentages of the total number seen in the year. The stations are arranged in order of latitude. Individual places are first considered, then a few large areas.

The Godthaab data in Table I. are essentially those given by Prof. A. Paulsen (6) as observed by Kleinschmidt in the winters of 1865 to 1882, supplemented by Lovering's data for summer. Starting at the extreme north, we have a simple period with a well-marked maximum at midwinter, and no auroras during several months at midsummer. This applies to Hammerfest, Jakobshavn, Godthaab and the most northern division of Scandinavia. The next division of Scandinavia shows a transition stage. To the south of this in Europe the single maximum at mid-winter is replaced by two maxima, somewhere about the equinoxes.

4. In considering what is the real significance of the great difference apparent in Table I. between higher and middle latitudes, a primary consideration is that aurora is seldom seen until the sun is some degrees below the horizon. There is no reason to suppose that the physical causes whose effects we see as aurora are in existence only when aurora is visible. Until means are devised for detecting aurora during bright sunshine, our knowledge as to the hour at which these causes are most frequently or most powerfully in operation must remain incomplete. But it can hardly be doubted that the differences apparent in Table I. are largely due to the influence of sunlight. In high latitudes for several months in summer it is never dark, and consequently a total absence of visible aurora is practically inevitable. Some idea of this influence can be derived from figures obtained by the Swedish International Expedition of 1882–1883 at Cape Thorsden, Spitsbergen, lat. 78° 28′ N. (7). The original gives the relative frequency of aurora for each degree of depression of the sun below the horizon, assuming the effect of twilight to be nil (*i.e.* the relative frequency to be 100) when the depression is 18·5° or more. The following are a selection of the figures:—

Angle of depression . .	4·5°	7·5°	10·5°	12·5°	15·5°.
Relative frequency . .	0·3	9·3	44·9	74·5	95·9.

These figures are not wholly free from uncertainties, arising from true diurnal and annual variations in the frequency, but they give a good general idea of the influence of twilight.

If sunlight and twilight were the sole cause of the apparent annual variation, the frequency would have a simple period, with a maximum at midwinter and a minimum at midsummer. This is what is actually shown by the most northern stations and districts in Table I. When we come, however, below 65° lat. in Europe the frequency near the equinoxes rises above that at midwinter, and we have a distinct double period, with a principal minimum at midsummer and a secondary minimum at midwinter. In southern Europe—where, however, auroras are too few to give smooth results in a limited number of years—in southern Canada, and in the United States, the difference between the winter and summer months is much reduced. Whether there is any real difference between high and mean latitudes in the annual frequency of the causes rendered visible by aurora, it is difficult to say. The Scandinavian data, from the wealth of observations, are probably the most representative, and even in the most northern district of Scandinavia the smallness of the excess of the frequencies in December and January over those in March and October suggests that some influence tending to create maxima at the equinoxes has largely counterbalanced the influence of sunlight and twilight in reducing the frequency at these seasons.

5. *Fourier Analysis*.—With a view to more minute examination, the annual frequency can be expressed in Fourier series, whose terms represent waves, whose periods are 12, 6, 4, 3, &c. months. This has been done by Lovering (4) for thirty-five stations. The nature of the results will best be explained by reference to the formula given by Lovering as a mean from all the stations considered, viz.:—

$$8{\cdot}33+3{\cdot}03\sin(30t+100°52')+2{\cdot}53\sin(60t+309°5')+0{\cdot}16\sin(90t+213°31')+0{\cdot}56\sin(120t+162°45')+0{\cdot}27\sin(150t+32°38').$$

The total number of auroras in the year is taken as 100, and t denotes the time, in months, that has elapsed since the middle of January.

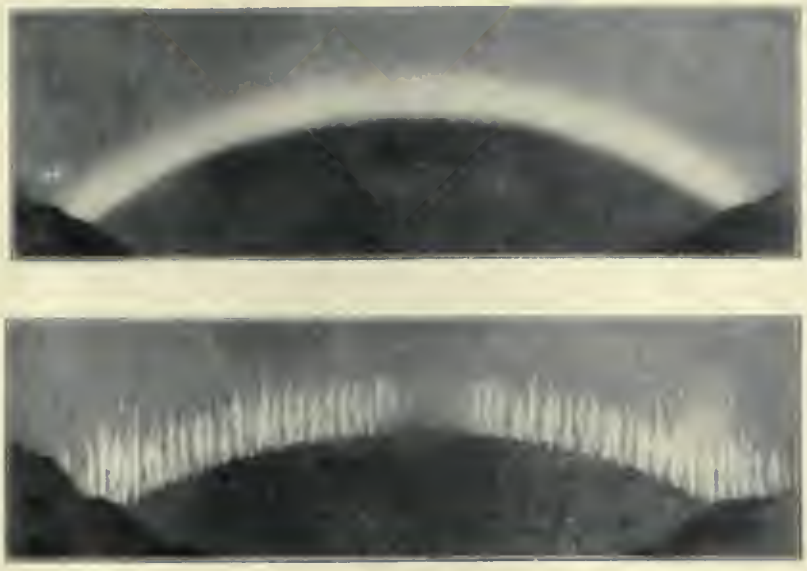


FIG. 1.—TWO TYPES OF AURORAL ARCS.

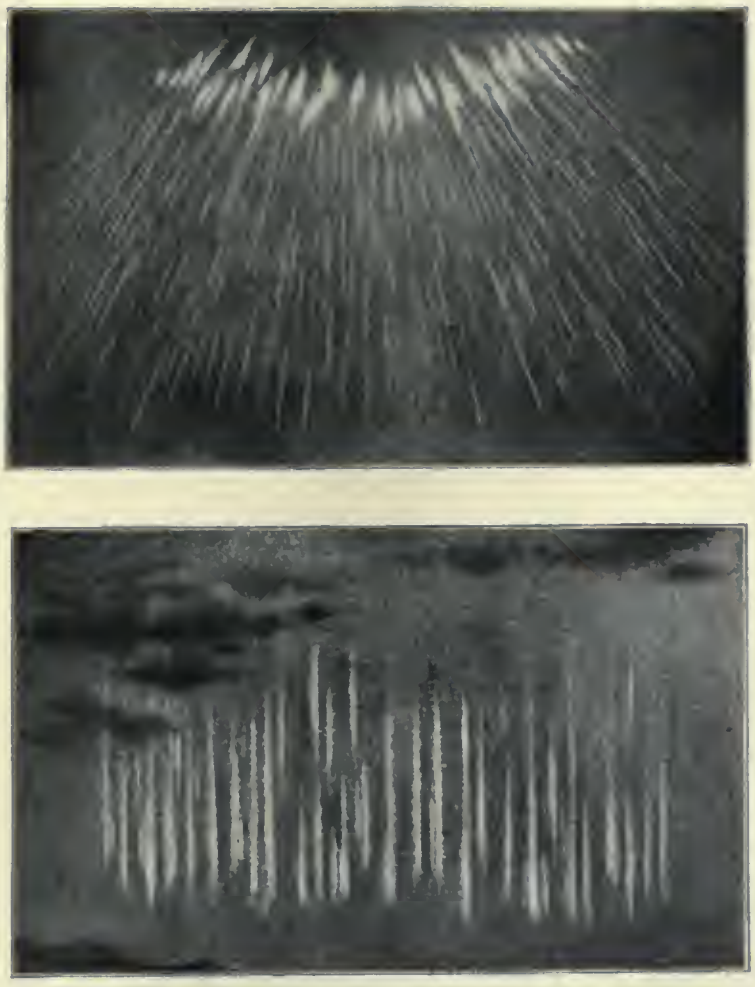


FIG. 2.—TWO TYPES OF AURORAL RAYS.

(From the *Internationale Polarforschung*, 1882–1883, by permission of the *Kaiserlichen Akademie der Wissenschaften*, Vienna.)

AURORA

FIG. 3.—AURORAL BANDS.

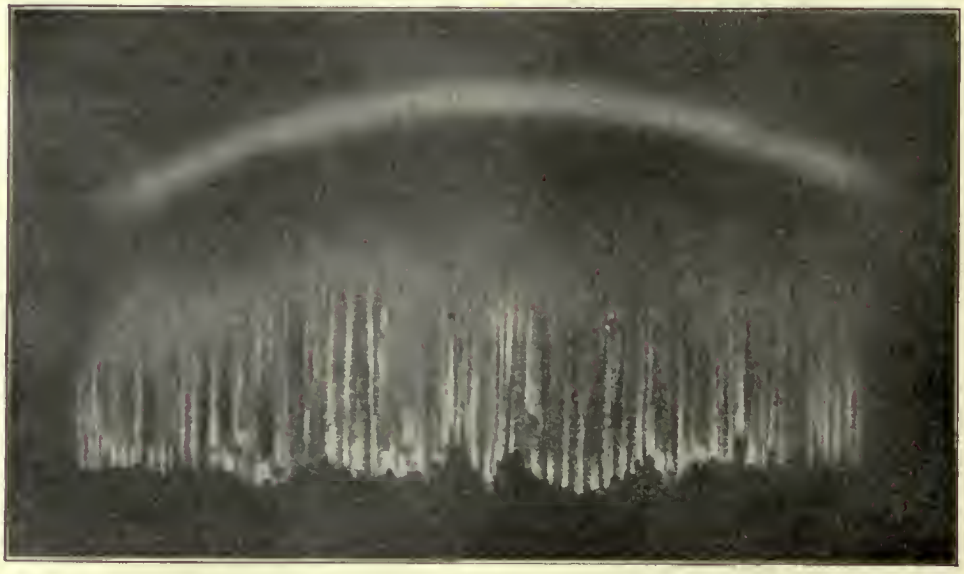


FIG. 4.—AURORAL CURTAIN BELOW AN ARC.

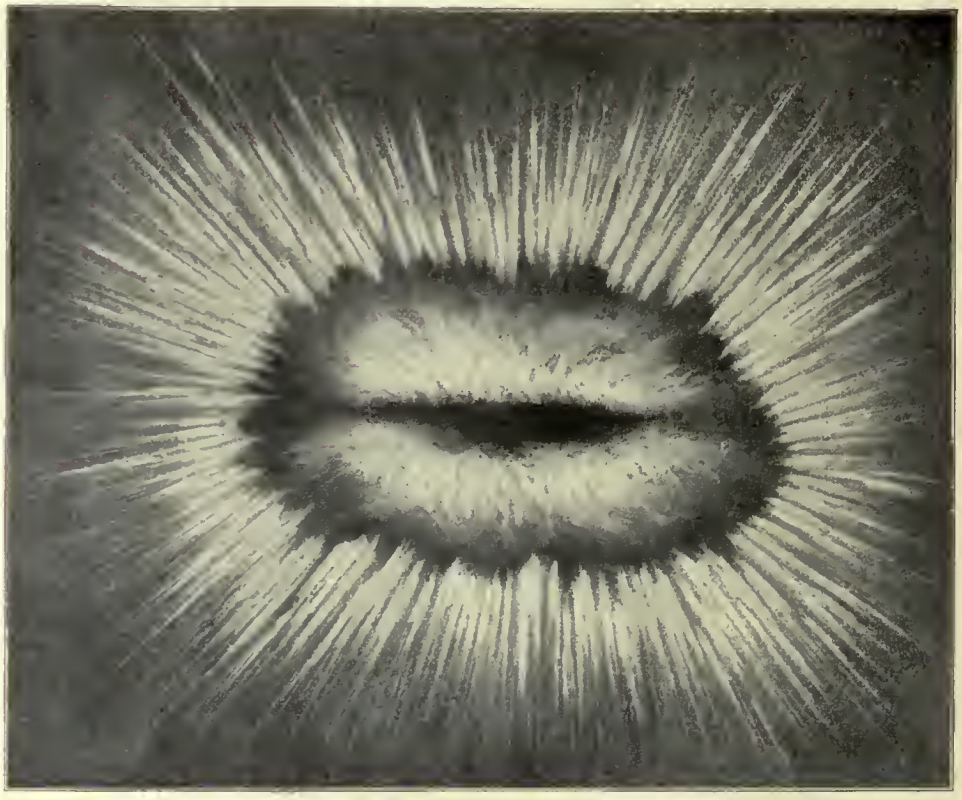


FIG. 5.—AURORAL CORONA.

TABLE I.—*Annual Frequency (Relative).*

Place.	Latitude.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	°												
Hammerfest	70½	20·9	17·6	8·8	0	0	0	0	0	4·4	9·9	17·6	20·9
Jakobshavn	69	14·6	13·0	9·2	0·5	0	0	0	0	9·2	15·1	18·4	20·0
Godthaab	64	15·5	12·4	9·7	4·9	0	0	0	1·2	8·7	13·3	17·0	17·4
St Petersburg	60	6·5	9·1	16·8	13·8	3·5	1·2	1·4	5·9	13·8	13·1	7·6	7·3
Christiania	60	8·6	11·4	14·0	11·2	0·6	0	0·2	6·5	14·6	12·2	10·3	10·3
Upsala	60	8·4	12·9	14·9	7·4	0·7	0·2	0·4	7·1	12·4	14·3	10·7	10·7
Stockholm	59	7·9	10·0	14·7	16·4	3·8	0·0	0·0	5·6	12·9	11·4	10·0	7·3
Edinburgh	56	9·5	12·6	14·0	9·5	3·4	0·0	1·7	6·0	12·6	13·5	11·8	5·2
Berlin	52½	7·0	10·8	16·4	15·5	11·4	0·6	2·9	2·9	6·5	13·2	8·5	4·1
London	51½	8·6	10·5	10·2	10·7	4·0	1·1	1·9	5·6	14·5	16·9	9·6	6·4
Quebec	47	3·6	14·8	8·3	14·2	4·1	5·9	7·7	5·9	11·2	12·4	7·7	4·1
Toronto	43½	5·4	9·5	8·7	11·8	9·0	6·2	8·0	6·4	8·5	11·1	8·7	6·7
Cambridge, Mass.	42½	5·1	8·2	11·8	10·2	6·4	5·1	10·3	8·5	13·3	9·2	6·8	5·1
New Haven, Conn.	41½	7·7	7·3	8·9	8·2	7·6	5·7	8·9	8·1	11·9	7·6	10·6	7·5
Scandinavia	N. of 68½°	16·4	13·8	14·8	1·6	0·0	0·0	0·0	0·4	7·8	15·1	14·4	15·7
,,	68½° to 65°	15·3	14·6	13·7	2·9	0·0	0·0	0·0	1·1	9·7	14·6	14·0	14·1
,,	65° to 61½°	13·2	12·3	14·5	5·4	0·2	0·0	0·0	2·8	13·1	14·2	12·8	11·5
,,	61½° to 58°	9·5	11·2	13·5	10·9	1·3	0·1	0·4	5·7	13·6	13·8	10·4	9·6
,,	S. of 58°	8·2	11·9	12·6	13·3	1·5	0·1	0·6	4·9	14·9	13·5	10·3	8·2
New York State	45° to 40½°	6·3	7·4	9·1	11·0	7·4	6·6	8·8	10·4	11·7	9·7	6·2	5·4

Putting $t = 0, 1$, &c., in succession, we get the percentages of the total number of auroras which occur in January, February, and so on. The first periodic term has a period of twelve, the second of six months, and similarly for the others. The first periodic term is largest when $t \times 30° + 100° 52' = 450°$. This makes $t = 11{\cdot}6$ months after the middle of January, otherwise the 3rd of January, approximately. The 6-month term has the earliest of its two equal maxima about the 26th of March. These two are much the most important of the periodic terms. The angles 100° 52′, 309° 5′, &c., are known as the phase angles of the respective periodic terms, while 3·03, 2·53, &c., are the corresponding amplitudes. Table II. gives a selection of Lovering's results. The stations are arranged according to latitude.

TABLE II.

Station.	Annual Term.		6-Month Term.		4-Month Term.	
	Amp.	Phase.	Amp.	Phase.	Amp.	Phase.
		°		°		°
Jakobshavn	10·40	123	1·13	206	1·41	333
Godthaab	8·21	111	1·54	316	0·64	335
St Petersburg	2·81	96	5·99	309	0·57	208
Christiania	4·83	116	4·99	317	0·76	189
Upsala	5·41	119	4·57	322	0·86	296
Stockholm	3·68	91	5·80	303	1·31	180
Makerstown (Scotland)	5·79	102	4·47	310	2·00	342
Great Britain	3·87	126	4·24	287	0·40	73
Toronto	0·18	12	2·13	260	0·52	305
Cambridge, Mass.	1·02	262	2·84	339	1·28	253
New Haven, Conn.	0·99	183	1·02	313	0·57	197
New York State.	1·34.	264	2·29	325	0·54	157

Speaking generally, the annual term diminishes in importance as we travel south. North of 55° in Europe its phase angle seems fairly constant, not differing very much from the value 110° in Lovering's general formula. The 6-month term is small, in the two most northern stations, but south of 60° N. lat. it is on the whole the most important term. Excluding Jakobshavn, the phase angles in the 6-month term vary wonderfully little, and approach the value 309° in Lovering's general formula. North of lat. 50° the 4-month term is, as a rule, comparatively unimportant, but in the American stations its relative importance is increased. The phase angle, however, varies so much as to suggest that the term mainly represents local causes or observational uncertainties. Lovering's general formula suggests that the 4-month term is really less important than the 3-month term, but he gives no data for the latter at individual stations.

6. Sunlight is not the only disturbing cause in estimates of auroral frequency. An idea of the disturbing influence of cloud may be derived from some interesting results from the Cape Thorsden (7) observations. These show how the frequency of visible auroras diminished as cloud increased from 0 (sky quite clear) to 10 (sky wholly overcast).

Grouping the results, we have:

Amount of cloud	0	1 to 3	4 to 6	7 to 9	10
Relative frequency	100	82	57	46	8

Out of a total of 1714 hours during which the sky was wholly overcast the Swedish expedition saw auroras on 17, occurring on 14 separate days, whereas 226 hours of aurora would have occurred out of an equal number of hours with the sky quite clear. The figures being based on only one season's observations are somewhat irregular. Smoothing them, Carlheim-Gyllenskold gives $f = 100' - 7{\cdot}3c$ as the most probable linear relation between c, the amount of cloud, and f, the frequency, assuming the latter to be 100 when there is no cloud.

7. *Diurnal Variation.*—The apparent daily period at most stations is largely determined by the influence of daylight on the visibility. It is only during winter and in high latitudes that we can hope to ascertain anything directly as to the real diurnal variation of the causes whose influence is visible at night as aurora. Table III. gives particulars of the number of occasions when aurora was seen at each hour of the twenty-four during three expeditions in high latitudes when a special outlook was kept.

The data under A refer to Cape Thorsden (78° 28′ N. lat., 15° 42′ E. long.); those under B to Jan Mayen (8) (71° 0′ N. lat., 8° 28′ W. long.), both for the winter of 1882–1883. The data under C are given by H. Arctowski (9) for the "Belgica" Expedition in 1898. They may be regarded as applying approximately to the mean position of the "Belgica," or 70½° S. lat., 86½° W. long. The method of counting frequencies was fairly alike, at least in the case of A and B, but in comparing the different stations the data should be regarded as relative rather than absolute. The Jan Mayen data refer really to Göttingen mean time, but this was only twenty-three minutes late on local time. In calculating the percentages of forenoon and afternoon occurrences half the entries under noon and midnight were assigned to each half of the day. Even at Cape Thorsden, the sun at midwinter is only 11° below the horizon at noon, and its effect on the visibility is thus not wholly negligible. The influence of daylight is presumably the principal cause of the difference between the phenomena during November, December and January at Cape Thorsden and Jan Mayen, for in the equinoctial months the results from these two stations are closely similar. Whilst daylight is the principal cause of the diurnal inequality, it is not the only cause, otherwise there would be as many auroras in the morning (forenoon) as in the evening (afternoon). The number seen in the evening is, however, according to Table III., considerably in excess at all seasons. Taking the whole winter, the percentage seen in the evening was the same for the "Belgica" as for Jan Mayen, *i.e.* for practically the same latitudes South and North. At Cape Thorsden from November to January there seems a distinct double period, with minima near noon and midnight. The other months at Cape Thorsden show a single maximum and minimum, the former before midnight.

The same phenomenon appears at Jan Mayen especially in November, December and January, and it is the normal state of matters in temperate latitudes, where the frequency is usually greatest between 8 and 10 P.M. An excess of evening over morning occurrences is also the rule, and it is not infrequently more pronounced than in Table III. Thus at Tasiusak (65° 37′ N. lat., 37° 33′ W. long.) the Danish Arctic Expedition (10) of 1904 found seventy-five out of every hundred occurrences to take place before midnight.

TABLE III.—*Diurnal Variation.*

Hour.	Dec.		Nov. and Jan.		Feb., March, Sept. and Oct.		Sept. to March (N. Lat.). March to Sept. (S. Lat.).		
	A	B	A	B	A	B	A	B	C
1	14	7	14	8	27	23	55	38	24
2	10	6	15	6	20	25	45	37	23
3	9	4	15	5	15	21	39	30	10
4	10	5	21	7	14	18	45	30	4
5	13	5	20	3	10	10	43	18	2
6	11	3	15	4	2	3	28	10	1
7	9	2	13	3	1	2	23	7	0
8	5	1	6	1	0	0	11	2	0
9	7	2	9	0	0	0	16	2	0
10	10	0	5	0	0	0	15	0	0
11	9	0	6	0	0	0	15	0	0
Noon	10	0	4	0	0	0	14	0	0
1	10	0	6	0	0	0	16	0	0
2	14	0	10	0	0	0	24	0	0
3	18	1	20	3	0	0	38	4	0
4	16	7	19	7	1	1	36	15	0
5	12	11	22	10	5	2	39	23	3
6	14	10	21	16	8	5	43	31	3
7	16	13	23	16	20	9	59	38	14
8	15	12	22	18	24	24	61	54	25
9	14	15	18	17	27	28	59	60	31
10	12	15	19	15	31	25	62	55	29
11	10	12	18	17	33	26	61	55	26
Midnight	9	9	13	11	28	22	50	42	26
Totals . .	277	140	354	167	266	244	897	551	221
Percentages—									
Forenoon .	42	28	42	25	39	46	41	35	35
Afternoon .	58	72	58	75	61	54	59	65	65

8. The preceding remarks relate to auroras as a whole; the different forms differ considerably in their diurnal variation. Arcs, bands and, generally speaking, the more regular and persistent forms, show their greatest frequencies earlier in the night than rays or patches. Table IV. shows the percentages of e. (evening) and m. (morning) occurrences of the principal forms as recorded by the Arctic observers at Cape Thorsden, Jan Mayen and Tasiusak.

TABLE IV.

	Arcs.		Bands.		Rays.		Patches.	
	e.	m.	e.	m.	e.	m.	e.	m.
Cape Thorsden .	76	24	66	34	52	48	51	49
Jan Mayen . .	78	22	68	32	60	40	60	40
Tasiusak . .	85	15	85	15	65	35	62	38

At Cape Thorsden diffused auroral light had percentages e. 65, m. 35, practically identical with those for bands. At Tasiusak, 8 P.M. was the hour of most frequent occurrence for arcs and bands, whereas patches had their maximum frequency at 11 P.M. and rays at midnight.

9. *Lunar and other Periods.*—The action of moonlight necessarily gives rise to a true lunar period in the visibility of aurora. The extent to which it renders aurora invisible depends, however, so much on the natural brightness of the aurora—which depends on the time and the place—and on the sharpness of the outlook kept, that it is difficult to gauge it. Ekholm and Arrhenius(11) claim to have established the existence of a true tropical lunar period of 27·32 days, and also of a 26-day period, or, as they make it, a 25·929-day period. A 26-day period has also been derived by J. Liznar (12), after an elaborate allowance for the disturbing effects of moonlight from the observations in 1882–1883 at Bossekop, Fort Rae and Jan Mayen. Neither of these periods is universally conceded. The connexion between aurora and earth magnetic disturbances renders it practically certain that if a 26-day or similar period exists in the one phenomenon it exists also in the other, and of the two terrestrial magnetism (*q.v.*) is probably the element least affected by external complications, such as the action of moonlight.

10. *Sun-spot Connexion.*—The frequency of auroral displays is much greater in some years than others. At most places the variation in the frequency has shown a general similarity to that of sun-spots. Table V. gives contemporaneous data for the frequency of sun-spots and of auroras seen in Scandinavia. The sun-spot data prior to 1902 are from A. Wolfer's table in the *Met. Zeitschrift* for 1902, p. 195; the more recent data are from his quarterly lists. All are observed frequencies, derived after Wolf's method; maxima and minima are in heavy type.

The auroral data are from Table E of Tromholt's catalogue (5), with certain modifications. In Tromholt's yearly data the year commences with July. This being inconvenient for comparison with sun-spots, use was made of his monthly values to obtain corresponding data for years commencing with January. The Tromholt-Schroeter data for Scandinavia as a whole commenced with 1761; the figures for earlier years were obtained by multiplying the data for Sweden by 1·356, the factor being derived by comparing the figures for Sweden alone and for the whole of Scandinavia from July 1761 to June 1783.

In a general way Table V. warrants the conclusion that years of many sun-spots are years of many auroras, and years of few sun-spots years of few auroras; but it does not disclose any very definite relationship between the two frequencies. The maxima and minima in the two phenomena in a good many cases are not found in the same years. On the other hand, there is absolute coincidence in a number of cases, some of them very striking, as for instance the remarkably low minima of 1810 and 1823.

11. During the period 1764 to 1872 there have been ten years of maximum, and ten of minimum, in sun-spot frequency. Taking the three years of greatest frequency at each maximum, and the three years of least frequency at each minimum, we get thirty years of many and thirty of few sun-spots. Also we can split the period into an earlier half, 1764 to 1817, and a later half, 1818 to 1872, containing respectively the earlier five and the later five of the above groups of sun-spot maximum and minimum years. The annual means derived from the whole group, and the two sub-groups, of years of many and few sun-spots are as follows:—

Years of	1764–1872.		1764–1817.		1818–1872.	
	Spots.	Auroras.	Spots.	Auroras.	Spots.	Auroras.
Many sun-spots. .	93·4	99·9	86·7	70·7	100·1	129·1
Few „ .	13·4	61·5	13·6	51·6	13·1	71·3

In each case the excess of auroras in the group of years of many sun-spots is decided, but the results from the two sub-periods do not harmonize closely. The mean sun-spot frequency for the group of years of few sun-spots is almost exactly the same for the two sub-periods, but the auroral frequency for the later group is nearly 40 % in excess of that for the earlier, and even exceeds the auroral

frequency in the years of many sun-spots in the earlier sub-period. This inconsistency, though startling at first sight, is probably more apparent than real. It is almost certainly due in large measure to a progressive change in one or both of the units of frequency. In the case of sun-spots, A. Schuster (13) has compared J. R. Wolf and A. Wolfer's frequencies with data obtained by other observers for areas of sun-spots, and his figures show unquestionably that the unit in one or other set of data must have varied appreciably from time to time. Wolf and Wolfer have, however, aimed persistently at securing a definite standard, and there are several reasons for believing that the change of unit has been in the auroral rather than the sun-spot frequency. R. Rubenson (14), from whom Tromholt derives his data for Sweden, seems to accept this view, assigning the apparent increase in auroral frequency since 1860 to the institution by the state of meteorological stations in 1859, and to the increased interest taken in the subject since 1865 by the university of Upsala. The figures themselves in Table V. certainly point to this conclusion, unless we are prepared to believe that auroras have increased enormously in number. If, for instance, we compare the first and the last three 11-year cycles for which Table V. gives complete data, we obtain as yearly means:—

1749–1781 . .	Sun-spots 56·4	Auroras	77·5
1844–1876 . .	,, 55·8	,,	112·2

The mean sun-spot frequencies in the two periods differ by only 1 %, but the auroral frequency in the later period is 45 % in excess of that in the earlier.

The above figures would be almost conclusive if it were not for the conspicuous differences that exist between the mean sun-spot frequencies for different 11-year periods. Schuster, who has considered the matter very fully, has found evidence of the existence of other periods—notably 8·4 and 4·8 years—in addition to the recognized period of 11·125 years, and he regards the difference between the maxima in successive 11-year periods as due at least partly to an overlapping of maxima from the several periodic terms. This cannot, however, account for all the fluctuations observed in sun-spot frequencies, unless other considerably longer periods exist. There has been at least one 33-year period during which the mean value of sun-spot frequency has been exceptionally low, and, as we shall see, there was a corresponding remarkable scarcity of auroras. The period in question may be regarded as extending from 1794 to 1826 inclusive. Comparing it with the two adjacent periods of thirty-three years, we obtain the following for the mean annual frequencies:—

33-Year Period.	Sun-spots.	Auroras.
1761–1793	65·6	76·1
1794–1826	20·3	39·5
1827–1859	56·1	84·4

12. The association of high auroral and sun-spot frequencies shown in Table V. is not peculiar to Scandinavia. It is shown, for instance, in Loomis's auroral data, which are based on observations at a variety of European and American stations (*Ency. Brit.* 9th ed. art. METEOROLOGY, Table XXVIII.). It does not seem, however, to apply universally. Thus at Godthaab we have, according to Adam Paulsen (15), comparing 3-year periods of few and many sun-spots:—

3-Year Period.	Total Sun-spot Frequency.	Total Nights of Aurora.
1865–1868	48	274
1869–1872	339	138
1876–1879	23	273

The years start in the autumn, and 1865–1868 includes the three winters of 1865 to '66, '66 to '67, and '67 to '68. Paulsen also gives data from two other stations in Greenland, viz. Ivigtut (1869 to 1879) and Jakobshavn (1873 to 1879), which show the same phenomenon as at Godthaab in a prominent fashion. Greenland lies to the north of Fritz's curve of maximum auroral frequency, and the suggestion has been made that the zone of maximum frequency expands to the south as sun-spots increase, and contracts again as they diminish, the number of auroras at a given station increasing or diminishing as the zone of maximum frequency approaches to or recedes from it. This theory, however, does not seem to fit all the facts and stands in want of confirmation.

13. *Auroral Meridian.*—It is a common belief that the summit of an auroral arc is to be looked for in the observer's magnetic meridian. On any theory it would be rather extraordinary if this were invariably true. In temperate latitudes auroral arcs are seldom near the zenith, and there is reason to believe them at very great heights. In high latitudes the average height is probably less, but the direction in which the magnetic needle

TABLE V.

Year.	Frequency.		Year.	Frequency.		Year.	Frequency.		Year.	Frequency.	
	Sun-spot.	Auroral.		Sun-spot.	Auroral.		Sun-spot.	Auroral.		Sun-spot.	Auroral.
1749	80·9	103	1789	118·1	89	1829	67·0	93	1869	73·9	160
1750	83·4	134	1790	89·9	90	1830	71·0	132	1870	139·1	195
1751	47·7	53	1791	66·6	54	1831	47·8	89	1871	111·2	185
1752	47·8	111	1792	60·0	64	1832	27·5	54	1872	101·7	200
1753	30·7	96	1793	46·9	29	1833	8·5	79	1873	66·3	189
1754	12·2	65	1794	41·0	37	1834	13·2	81	1874	44·7	158
1755	9·6	34	1795	21·3	34	1835	56·9	58	1875	17·1	133
1756	10·2	60	1796	16·0	37	1836	121·5	98	1876	11·3	137
1757	32·4	83	1797	6·4	61	1837	138·3	137	1877	12·3	126
1758	47·6	80	1798	4·1	35	1838	103·2	159	1878	3·4	..
1759	54·0	113	1799	6·8	28	1839	85·8	165	1879	6·0	..
1760	62·9	86	1800	14·5	30	1840	63·2	82	1880	32·3	..
1761	85·9	124	1801	34·0	34	1841	36·8	75	1881	54·3	..
1762	61·2	114	1802	45·0	65	1842	24·2	91	1882	59·7	..
1763	45·1	89	1803	43·1	73	1843	10·7	66	1883	63·7	..
1764	36·4	107	1804	47·5	101	1844	15·0	81	1884	63·5	..
1765	20·9	76	1805	42·2	85	1845	40·1	26	1885	52·2	..
1766	11·4	51	1806	28·1	62	1846	61·5	50	1886	25·4	..
1767	37·8	68	1807	10·1	42	1847	98·5	63	1887	13·1	..
1768	69·8	80	1808	8·1	20	1848	124·3	107	1888	6·8	..
1769	106·1	89	1809	2·5	20	1849	95·9	131	1889	6·3	..
1770	100·8	83	1810	0·0	4	1850	66·5	95	1890	7·1	..
1771	81·6	62	1811	1·4	13	1851	64·5	60	1891	35·6	..
1772	66·5	38	1812	5·0	11	1852	54·2	92	1892	73·0	..
1773	34·8	58	1813	12·2	18	1853	39·0	65	1893	84·9	..
1774	30·6	98	1814	13·9	17	1854	20·6	64	1894	78·0	..
1775	7·0	33	1815	35·4	10	1855	6·7	49	1895	64·0	..
1776	19·8	17	1816	45·8	33	1856	4·3	46	1896	41·8	..
1777	92·5	64	1817	41·1	60	1857	22·8	38	1897	26·2	..
1778	154·4	59	1818	30·4	74	1858	54·8	88	1898	26·7	..
1779	125·9	60	1819	23·9	43	1859	93·8	131	1899	12·1	..
1780	84·8	67	1820	15·7	62	1860	95·7	119	1900	9·5	..
1781	68·1	103	1821	6·6	37	1861	77·2	127	1901	2·7	..
1782	38·5	67	1822	4·0	33	1862	59·1	135	1902	5·0	..
1783	22·8	70	1823	1·8	13	1863	44·0	135	1903	24·4	..
1784	10·2	78	1824	8·5	14	1864	47·0	124	1904	42·0	..
1785	24·1	83	1825	16·6	40	1865	30·5	119	1905	62·8	..
1786	82·9	136	1826	36·3	58	1866	16·3	130	1906	53·8	..
1787	132·0	115	1827	49·7	79	1867	7·3	127	1907	62·0	..
1788	130·9	97	1828	62·5	60	1868	37·3	144	1908	48·5	..

points changes rapidly with change of latitude and longitude, and has a large diurnal variation. Thus there must in general be a difference between the observer's magnetic meridian—answering to the mean position of the magnetic needle at his station—and the direction the needle would have at a given hour, if undisturbed by the aurora, at any spot where the phenomena which the observer sees as aurora exist.

Very elaborate observations have been made during several Arctic expeditions of the azimuths of the summits of auroral arcs. At Cape Thorsden (7) in 1882–1883 the mean azimuth derived from 371 arcs was 24° 12′ W., or 11° 27′ to the W. of the magnetic meridian. As to the azimuths in individual cases, 130 differed from the mean by less than 10°, 118 by from 10° to 20°, 82 by from 20° to 30°, 21 by from 30° to 40°, 14 by from 40° to 50°; in six cases the departure exceeded 50°, and in one case it exceeded 70°. Also, whilst the mean azimuths deduced from the observations between 6 A.M. and noon, between noon and 6 P.M., and between 6 P.M. and midnight, were closely alike, their united mean being 22·4° W. of N. (or E. of S.), the mean derived from the 113 arcs observed between midnight and 6 A.M. was 47·8° W. At Jan Mayen (8) in 1882–1883 the mean azimuth of the summit of the arcs was 28·8° W. of N., thus approaching much more closely to the magnetic meridian 29·9° W. As to individual azimuths, 113 lay within 10° of the mean, 37 differed by from 10° to 20°, 18 by from 20° to 30°, 6 by from 30° to 40°, whilst 6 differed by over 40°. Azimuths were also measured at Jan Mayen for 338 auroral bands, the mean being 22·0° W., or 7·9° to the east of the magnetic meridian. Combining the results from arcs and bands, Carlheim-Gyllensköld gives the "anomaly" of the auroral meridian at Jan Mayen as 5·7° E. At the British Polar station of 1882, Fort Rae (62° 23′ N. lat., 115° 44′ W. long.), he makes it 15·7° W. At Godthaab in 1882–1883 the auroral anomaly was, according to Paulsen, 15·5° E., the magnetic meridian lying 57·6° W. of the astronomical.

14. *Auroral Zenith.*—Another auroral direction having apparently a close relation to terrestrial magnetism is the imaginary line drawn to the eye of an observer from the centre of the corona—*i.e.* the point to which the auroral rays converge. This seems in general to be nearly coincident with the direction of the dipping needle.

Thus at Cape Thorsden (7) in 1882–1883 the mean of a considerable number of observations made the angle between the two directions only 1° 7′, the magnetic inclination being 80° 35′, whilst the coronal centre had an altitude of 79° 55′ and lay somewhat to the west of the magnetic meridian. Even smaller mean values have been found for the angle between the auroral and magnetic "zeniths"—as the two directions have been called—*e.g.* 0° 50′ at Bossekop (16) in 1838–1839, and 0° 7′ at Treurenberg (17) (79° 55′ N. lat., 16° 51′ E. long.) in 1899–1900.

15. *Relations to Magnetic Storms.*—That there is an intimate connexion between aurora when visible in temperate latitudes and terrestrial magnetism is hardly open to doubt. A bright aurora visible over a large part of Europe seems always accompanied by a magnetic storm and earth currents, and the largest magnetic storms and the most conspicuous auroral displays have occurred simultaneously. Noteworthy examples are afforded by the auroras and magnetic storms of August 28-29 and September 1-2, 1859; February 4, 1872; February 13-14 and August 12, 1892; September 9, 1898; and October 31, 1903. On some of these occasions aurora was brilliant in both the northern and southern hemispheres, whilst magnetic disturbances were experienced the whole world over. In high latitudes, however, where both auroras and magnetic storms are most numerous, the connexion between them is much less uniform. Arctic observers, both Danish and British, have repeatedly reported displays of aurora unaccompanied by any special magnetic disturbance. This has been more especially the case when the auroral light has been of a diffused character, showing only minor variability. When there has been much apparent movement, and brilliant changes of colour in the aurora, magnetic disturbance has nearly always accompanied it. In the Arctic, auroral displays seem sometimes to be very local, and this may be the explanation. On the other hand, Arctic observers have reported an apparent connexion of a particularly definite character. According to Paulsen (18), during the Ryder expedition in 1891–1892, the following phenomenon was seen at least twenty times by Lieut. Vedel at Scoresby Sound (70° 27′ N. lat., 26° 10′ W. long.). An auroral curtain travelling with considerable velocity would approach from the south, pass right overhead and retire to the north. As the curtain approached, the compass needle always deviated to the west, oscillated as the curtain passed the zenith, and then deviated to the east. The behaviour of the needle, as Paulsen points out, is exactly what it should be if the space occupied by the auroral curtain were traversed by electric currents directed upwards from the ground. The Danish observers at Tasiusak (10) in 1898–1899 observed this phenomenon occasionally in a slightly altered form. At Tasiusak the auroral curtain after reaching the zenith usually retired in the direction from which it had come. The direction in which the compass needle deviated was west or east, according as the curtain approached from the south or the north; as the curtain retired the deviation eventually diminished.

Kr. Birkeland (19), who has made a special study of magnetic disturbances in the Arctic, proceeding on the hypothesis that they arise from electric currents in the atmosphere, and who has thence attempted to deduce the position and intensity of these currents, asserts that whilst in the case of many storms the data were insufficient, when it was possible to fix the position of the mean line of flow of the hypothetical current relatively to an auroral arc, he invariably found the directions coincident or nearly so.

16. In the northern hemisphere to the south of the zone of greatest frequency, the part of the sky in which aurora most generally appears is the magnetic north. In higher latitudes auroras are most often seen in the south. The relative frequency in the two positions seems to vary with the hour, the type of aurora, probably with the season of the year, and possibly with the position of the year in the sun-spot cycle.

At Jan Mayen (8) in 1882–1883, out of 177 arcs whose position was accurately determined, 44 were seen in the north, their summits averaging 38·5° above the northern horizon; 88 were seen in the south, their average altitude above the southern horizon being 33·5°; while 45 were in the zenith. At Tasiusak (10) in 1898–1899 the magnetic directions of the principal types were noted separately. The results are given in Table VI.

TABLE VI.

Direction.	Absolute Number for each Type.					Percentage from all Types.
	Arcs.	Bands.	Curtains.	Rays.	Patches.	
N.	9	16	5	15	4	10
N.E.	9	13	2	20	4	9
E.	3	11	2	26	3	9
S.E.	5	6	1	10	7	6
S.	45	43	1	16	15	24
S.W.	9	9	2	12	13	9
W.	3	11	2	22	6	9
N.W.	2	8	2	8	5	5

Table VI. accounts for only 81 % of the total displays; of the remainder 15 % appeared in the zenith, while 4 % covered the whole sky. Auroral displays generally cover a considerable area, and are constantly changing, so the figures are necessarily somewhat rough. But clearly, whilst the arcs and bands, and to a lesser extent the patches, showed a marked preference for the magnetic meridian, the rays showed no such preference.

At Cape Thorsden (7) in 1882–1883 auroras as a whole were divided into those seen in the north and those seen in the south. The variation throughout the twenty-four hours in the percentage seen in the south was as follows:—

Hour.	0–3.	3–6.	6–9.	9–12.
A.M.	69	55	44	35
P.M.	55	70	65	65

The mean from the whole twenty-four hours is sixty-three. Between 3 A.M. and 3 P.M. the percentage of auroras seen in the south thus appears decidedly below the mean.

17. The following data for the apparent angular width of arcs were obtained at Cape Thorsden, the arcs being grouped according to the height of the lower edge above the horizon. Group I. contained thirty arcs whose altitudes did not exceed 11° 45′; Group II. thirty arcs whose altitudes lay between 12° and 35°; and Group III. thirty arcs whose altitudes lay between 36° and 80°.

Group.	I.	II.	III.
Greatest width . . .	11·5°	12·0°	21·0°
Least ,, . . .	1·0°	0·75°	2·0°
Mean ,, . . .	3·45°	4·6°	6·9°

There is here a distinct tendency for the width to increase with the altitude. At the same time, arcs near the horizon often appeared wider than others near the zenith. Furthermore, Gyllensköld says that when arcs mounted, as they not infrequently did, from the horizon, their apparent width might go on increasing right up to the

zenith, or it might increase until an altitude of about 45° was reached and then diminish, appearing much reduced when the zenith was reached. Of course the phenomenon might be due to actual change in the arc, but it is at least consistent with the view that arcs are of two kinds, one form constituting a layer of no great vertical depth but considerable real horizontal width, the other form having little horizontal width but considerable vertical depth, and resembling to some extent an auroral curtain.

18. According to numerous observations made at Cape Thorsden, the apparent angular velocity of arcs increases on the average with their altitude. Dividing the whole number of arcs, 156, whose angular velocities were measured into three numerically equal groups, according to their altitude, the following were the results in minutes of arc per second of time (or degrees per minute of time):—

Group.	I.	II.	III.	All.
Mean altitude . . .	10·5°	34·6°	72·3°	..
Greatest velocity . .	4·81	15·12	109·09	..
Mean velocity . . .	0·48	2·42	8·67	3·86

Each group contained auroras which appeared stationary. The intervals to which the velocities referred were usually from five to ten minutes, but varied widely. The velocity 109·09 was much the largest observed, the next being 52·38; both were from observations lasting under half a minute.

19. In 1882–1883 the direction of motion of arcs was from north to south in 62% of the cases at Jan Mayen, and in 58% of the cases at Cape Thorsden. This seems the more common direction in the northern hemisphere, at least for stations to the south of the zone of maximum frequency, but a considerable preponderance of movements towards the north was observed in Franz Joseph Land by the Austrian Expedition of 1872–1874. The apparent motion of arcs is sometimes of a complicated character. One end only, for example, may appear to move, as if rotating round the other; or the two ends may move in opposite directions, as if the arc were rotating about a vertical axis through its summit.

20. *Height.*—If an auroral arc represented a definite self-luminous portion of space of small transverse dimensions at a uniform height above the ground, its height could be accurately determined by observations made with theodolites at the two ends of a measured base, provided the base were not too short compared to the height. If a very long base is taken, it becomes increasingly open to doubt whether the portions of space emitting auroral light to the observers at the two ends are the same. There is also difficulty in ensuring that the observations shall be simultaneous, an important matter especially when the apparent velocity is considerable. If the base is short, definite results can hardly be hoped for unless the height is very moderate. Amongst the best-known theodolite determinations of height are those made at Bossekop in Norway by the French Expedition of 1838–1839 (16) and the Norwegian Expedition of 1882–1883, and those made in the latter year by the Swedes at Cape Thorsden and the Danes at Godthaab. At Bossekop and Cape Thorsden there were a considerable proportion of negative or impossible parallaxes. Much the most consistent results were those obtained at Godthaab by Paulsen (15). The base was 5·8 km. (about 3½ miles) long, the ends being in the same magnetic meridian, on opposite sides of a fiord, and observations were confined to this meridian, strict simultaneity being secured by signals. Heights were calculated only when the observed parallax exceeded 1°, but this happened in three-fourths of the cases. The calculated heights—all referring to the lowest border of the aurora—varied from 0·6 to 67·8 km. (about 0·4 to 42 m.), the average being about 20 km. (12 m.). Regular arcs were selected in most cases, but the lowest height obtained was for a collection of rays forming a curtain which was actually situated between the two stations.

In 1885 Messrs Garde and Eherlin made similar observations at Nanortalik near Cape Farewell in Greenland, but using a base of only 1250 metres (about ¾ m.). Their results were very similar to Paulsen's. On one occasion twelve observations, extending over half an hour, were made on a single arc, the calculated heights varying in a fairly regular fashion from 1·6 to 12·9 km. (about 1 to 8 m.). The calculated horizontal distances of this arc varied between 5 and 24 km. (about 3 and 15 m.), the motion being sometimes towards, sometimes away from the observers, but not apparently exceeding 3 km. (nearly 2 m.) per minute. Heights of arcs have often been calculated from the apparent altitudes at stations widely apart in Europe or America. The heights calculated in this way for the under surface of the arc, have usually exceeded 100 m.; some have been much in excess of this figure. None of the results so obtained can be accepted without reserve, but there are several reasons for believing that the average height in Greenland is much below that in lower latitudes. Heights have been calculated in various less direct ways, by observing for instance the angular altitude of the summit of an arc and the angular interval between its extremities, and then making some assumption such as that the portion visible to an observer may be treated as a circle whose centre lies over the so-called auroral pole. The mean height calculated at Arctic stations, where careful observations have been made, in this or analogous ways, has varied from 58 km. (about 36 m.) at Cape Thorsden (Gyllenskôld) to 227 km. (about 141 m.) at Bossekop (Bravais). The height has also been calculated on the hypothesis that auroral light has its source where the atmospheric pressure is similar to that at which most brilliancy is observed when electric discharges pass in vacuum tubes. Estimates on this basis have suggested heights of the order of 50 km. (about 31 m.). There are, of course, many uncertainties, as the conditions of discharge in the free atmosphere may differ widely from those in glass vessels. If the Godthaab observations can be trusted, auroral discharges must often occur within a few miles of the earth's surface in Arctic regions. In confirmation of this view reference may be made to a number of instances where observers—*e.g.* General Sabine, Sir John Franklin, Prof. Selim Lemström, Dr David Walker (at Fort Kennedy in 1858–1859), Captain Parry (Fort Bowen, 1825) and others—have seen aurora below the clouds or between themselves and mountains. One or two instances of this kind have even been described in Scotland. Prof. Cleveland Abbe (20) has given a full historical account of the subject to which reference may be made for further details.

21. *Brightness.*—In auroral displays the brightness often varies greatly over the illuminated area and changes rapidly. Estimates of the intensity of the light have been based on various arbitrary scales, such for instance as the size of type which the observer can read at a given distance. The estimate depends in the case of reading type on the general illumination. In other cases scales have been employed which make the result mainly depend on the brightest part of the display. At Jan Mayen (8) in 1882–1883 a scale was employed running from 1, taken as corresponding to the brightness of the milky way, to 4, corresponding to full moonlight. The following is an analysis of the results obtained, showing the number of times the different grades were reached:—

Scale of Intensity.	1.	2.	3.	4.	Mean Intensity.
Arcs . . .	27	53	13	1	1·87
Bands . .	46	83	49	22	2·24
Rays . . .	30	116	138	28	2·21
Corona . .	3	14	12	12	2·81

On one or two occasions at Jan Mayen auroral light is described as making the full moon look like an ordinary gas jet in presence of electric light, whilst rays could be seen crossing and brighter than the moon's disk. Such extremely bright auroras seem very rare, however, even in the Arctic. There is a general tendency for both bands and rays to appear brightest at their lowest parts; arcs seldom appear as bright at their summits as nearer the horizon. It is not unusual for arcs and bands to look as if pulses or waves of light were travelling along them; also the direction in which these pulses travel does not seem to be wholly arbitrary. Movements to the east were twice as numerous at Jan Mayen and thrice as numerous at Traurenberg as movements to the west. In some cases changes of intensity take place round the auroral zenith, simulating the effect that would be produced by a cyclonic rotation of luminous matter. In the case of isolated patches the intensity often waxes and wanes as if a search-light were being thrown on and turned off.

22. *Colour.*—The ordinary colour of aurora is white, usually with a distinct yellow tint in the brighter forms, but silvery white when the light is faint. When the light is intense and changing rapidly, red is not infrequently present, especially towards the lower edge. Under these circumstances, green is also sometimes visible, especially towards the zenith. Thus a bright auroral ray may seem red towards the foot and green at its summit, with yellow intervening. In some cases the green may be only a contrast effect. Other colours, *e.g.* violet, have occasionally been noticed but are unusual.

23. *Spectrum.*—The spectrum of aurora consists of a number of lines. Numerous measurements have been made of the wave-lengths of the brightest. One line, in the yellow green, is so dominant optically as often to be described as the auroral line. Its wave-length is probably very near 5571 tenth-metres, and it is very close to, if not absolutely coincident with, a prominent line in the spectrum of krypton. This line is so characteristic that its presence or absence is the usual criterion for deciding

whether an atmospheric light is aurora. The Swedish Expedition (17) of 1899–1902, engaged in measuring an arc of the meridian in Spitsbergen, were unusually well provided spectrographically, and succeeded in taking photographs of aurora in conjunction with artificial lines—chiefly of hydrogen—which led to results claiming exceptional accuracy. In the spectrograms three auroral rays—including the principal one mentioned above—were pre-eminent. For the two shorter wave-lengths, for whose measurement he claims the highest precision, the observer, J. Westman, gives the values 4276·4 and 3913·5. In addition, he assigns wave-lengths for 156 other auroral lines between wave-lengths 5205 and 3513. The following table gives the wave-lengths of the photographically brightest of these, retaining four significant figures in place of Westman's five.

TABLE VII.

4830	4489	4329	3997	3861
4709	4420	4242	3986	3804
4699	4371	4230	3947	3793
4661	4356	4225	3937	3704
4560	4344	4078	3880	3607
4550	4337	4067	3876	3589

There are a number of optically bright lines of longer wave-length. For the principal of these Angot (1) gives the following wave-lengths (unit 1 $\mu\mu$ or 1×10^{-9} metre):—630, 578, 566, 535, 523, 500.

Out of a total of 146 auroral lines, with wave-lengths longer than 3684 tenth-metres, Westman identifies 82 with oxygen or nitrogen lines at the negative pole in vacuum discharges. Amongst the lines thus identified are the two principal auroral lines having wave-lengths 4276·4 and 3913·5. The interval considered by Westman contains at least 300 oxygen and nitrogen lines, so that approximate coincidence with a number of auroral lines was almost inevitable, and an appreciable number of the coincidences may be accidental. E. C. C. Baly (21), making use of the observations of the Russian expedition in Spitsbergen in 1899, accepts as the wave-lengths of the three principal auroral lines 5570, 4276 and 3912; and he identifies all three and ten other auroral lines ranging between 5570 and 3707 with krypton lines measured by himself. In addition to these, he mentions other auroral lines as very probably krypton lines, but in their case the wave-lengths which he quotes from Paulsen (22) are given to only three significant figures, so that the identification is more uncertain. The majority of the krypton lines which Baly identifies with auroral lines require for their production a Leyden jar and spark gap.

If, as is now generally believed, aurora represents some form of electrical discharge, it is only reasonable to suppose that the auroral lines arise from atmospheric gases. The conditions, however, as regards pressure and temperature under which the hypothetical discharges take place must vary greatly in different auroras, or even sometimes in different parts of the same aurora. Further, auroras are often possessed of rapid motion, so that conceivably spectral lines may receive small displacements in accordance with Doppler's principle. Thus the differences in the wave-lengths of presumably the same lines as measured by different Arctic observers may be only partly due to unfavourable observational conditions. Many of the auroral lines seen in any single aurora are exceedingly faint, so that even their relative positions are difficult to settle with high precision.

24. Whether or not auroral displays are ever accompanied by a characteristic sound is a disputed question. If sound waves originate at the seat of auroral displays they seem hardly likely to be audible on the earth, unless the aurora comes very low and great stillness prevails. It is thus to the Arctic one looks for evidence. According to Captain H. P. Dawson (26), in charge of the British Polar Station at Fort Rae in 1882–1883, "The Indians and *voyageurs* of the Hudson Bay Company, who often pass their nights in the open, say that it [sound] is not uncommon . . . there can be no doubt that distinct sound does occasionally accompany certain displays of aurora." On the one occasion when Captain Dawson says he heard it himself, "the sound was like the swishing of a whip or the noise produced by a sharp squall of wind in the upper rigging of a ship, and as the aurora brightened and faded so did the sound which accompanied it." If under these conditions the sound was really due to the aurora, the latter, as Captain Dawson himself remarks, must have been pretty close.

25. Usually the electric potential near the ground is positive compared to the earth and increases with the height (see ATMOSPHERIC ELECTRICITY). Several Arctic observers, however, especially Paulsen (18) have observed a diminution of positive potential, or even a change to negative, for which they could suggest no explanation except the presence of a bright aurora. Other Arctic observers have failed to find any trace of this phenomenon. If it exists, it is presumably confined to cases when the auroral discharge comes unusually low.

26. *Artificial Phenomena resembling Aurora.*—At Sodankylä, the station occupied by the Finnish Arctic Expedition of 1882–1883, Selim Lemström and Biese (23) described and gave drawings of optical phenomena which they believed to be artificially produced aurora. A number of metallic points, supported on insulators, were connected by wires enclosing several hundred square metres on the top of a hill. Sometimes a Holtz machine was employed, but even without it illumination resembling aurora was seen on several occasions, extending apparently to a considerable height. In the laboratory, Kr. Birkeland (19) has produced phenomena bearing a striking resemblance to several forms of aurora. His apparatus consists of a vacuum vessel containing a magnetic sphere—intended to represent the earth—and the phenomena are produced by sending electric discharges through the vessel.

27. *Theories.*—A great variety of theories have been advanced to account for aurora. All or nearly all the most recent regard it as some form of electrical discharge. Birkeland (19) supposes the ultimate cause to be cathode rays emanating from the sun; C. Nordmann (24) replaces the cathode rays by Hertzian waves; while Svante Arrhenius (25) believes that negatively charged particles are driven through the sun's atmosphere by the Maxwell-Bartoli repulsion of light and reach the earth's atmosphere. For the size and density of particles which he considers most likely, Arrhenius calculates the time required to travel from the sun as forty-six hours. By modifying the hypothesis as to the size and density, times appreciably longer or shorter than the above would be obtained. Cathode rays usually have a velocity about a tenth that of light, but in exceptional cases it may approach a third of that of light. Hertzian waves have the velocity of light itself. On either Birkeland's or Nordmann's theory, the electric impulse from the sun acts indirectly by creating secondary cathode rays in the earth's atmosphere, or ionizing it so that discharges due to natural differences of potential are immensely facilitated. The ionized condition must be supposed to last to a greater or less extent for a good many hours to account for aurora being seen throughout the whole night. The fact that at most places the morning shows a marked decay of auroral frequency and intensity as compared to the evening, the maximum preceding midnight by several hours, is certainly favourable to theories which postulate ionization of the atmosphere by some cause or other emanating from the sun.

AUTHORITIES.—The following works are numbered according to the references in the text:—(1) A. Angot, *Les Aurores polaires* (Paris, 1895); (2) H. Fritz, *Das Polarlicht* (Leipzig, 1881); (3) Svante August Arrhenius, *Lehrbuch der kosmischen Physik*; (4) Joseph Lovering, "On the Periodicity of the Aurora Borealis," *Mem. American Acad.* vol. x. (1868); (5) Sophus Tromholt, *Catalog der in Norwegen bis Juni 1878 beobachteten Nordlichter*; (6) *Observations internationales polaires* (1882–1883), *Expédition Danoise*, tome i. "Aurores boréales"; (7) Carlheim-Gyllensköld, "Aurores boréales" in *Observations faites au Cap Thorsden Spitzberg par l'expédition suédoise*, tome ii. 1; (8) "Die Österreichische Polar Station Jan Mayen" in *Die Internationale Polarforschung*, 1882–1883, Bd. ii. Abth. 1; (9) Henryk Arctowski, "Aurores australes" in *Expédition antarctique belge . . . Voyage du S. Y. "Belgica"*; (10) G. C. Amdrup, *Observations . . . faites par l'expédition danoise*; H. Ravn, *Observations de l'aurore boréale de Tasiusak*; (11) *K. Sven. Vet.-Akad. Hand.* Bd. 31, Nos. 2, 3, &c.; (12) *Sitz. d. k. Akad. d. Wiss.* (Vienna), Math. Naturw. Classe, Bd. xcvii. Abth. iia, 1888; (13) *Proc. Roy. Soc.*, 1906, lxxvii. A, 141; (14) *Kongl. Sven. Vet.-Akad. Hand.* Bd. 15, No. 5, Bd. 18, No. 1; (15) *Bull. Acad. Roy. Danoise*, 1889, p. 67; (16) *Voyages . . . pendant les années 1838, 1839 et 1840 sur . . . la Recherche*, "Aurores boréales," by MM. Lottin, Bravais, &c.; (17) *Missions scientifiques . . . au Spitzberg . . . en 1899–1902, Mission suédoise*, tome ii. VIIIe Section, C. "Aurores boréales"; (18) *Bull. Acad. R. des Sciences de Danemark*, 1894, p. 148; (19) Kr. Birkeland, *Expédition norvégienne 1899–1900 pour l'étude des aurores boréales* (Christiania, 1901); (20) *Terrestrial Magnetism*, vol. iii. (1898), pp. 5, 53, 149; (21) *Astrophysical Journal*, 1904, xix. p. 187; (22) *Rapports présentés au Conrgès International de Physique réuni à Paris*, 1900, iii. 438; (23) *Expédition polaire finlandaise* (1882–1884), tome iii.; (24) Charles Nordmann, *Thèses présentées à la Faculté des Sciences de Paris* (1903); (25) *Terrestrial Magnetism*, vol. 10, 1905, p. 1; (26) *Observations of the International Polar Expeditions 1882–1883 Fort Rae . . .* by Capt. H. P. Dawson, R.A. (C. CH.)

AURUNCI, the name given by the Romans to a tribe which in historical times occupied only a strip of coast on either side of the Mons Massicus between the Volturnus and the Liris, although it must at an earlier period have extended over a considerably wider area. Their own name for themselves in

the 4th century B.C. was *Ausônes*, and in Greek writers we find the name *Ausônia* applied to Latium and Campania (see Strabo v. p. 247; Aristotle, *Pol.* iv. (vii.) 10; Dion. Hal. i. 72), while in the Augustan poets (*e.g.* Virgil, *Aen.* vii. 795) it is used as one of many synonyms for Italy. In history the tribe appears only for a brief space, from 340 to 295 B.C. (Mommsen, *C.I.L.* x. pp. 451, 463, 465), and their struggle with the Romans ended in complete extermination; their territory was parcelled out between the Latin colonies of Cales (Livy viii. 16) and Suessa Aurunca (*id.* ix. 28) which took the place of an older town called *Ausona* (*id.* ix. 25; viii. 15), and the maritime colonies Sinuessa (the older *Vescia*) and Minturnae (both in 295 B.C., Livy x. 21). The coin formerly attributed to Suessa Aurunca on the strength of its supposed legend *Aurunkud* has now been certainly referred to Naples (see R. S. Conway, *Italic Dialects*, 145, and *Verner's law in Italy*, p. 78, where the change of *s* to *r* is explained as probably due to the Latin conquest). Seeing that the tribe was blotted out at the beginning of the 3rd century B.C., we can scarcely wonder that no record of its speech survives; but its geographical situation and the frequency of the *co*-suffix in that strip of coast (besides *Aurunci* itself we have the names *Vescia*, *Mons Massicus*, *Marica*, *Glanica* and *Caedicii*; see *Italic Dialects*, pp. 283 f.) rank them beyond doubt with their neighbours the Volsci (*q.v.*). (R. S. C.)

AUSCULTATION (from Lat. *auscultare*, to listen), a term in medicine, applied to the method employed by physicians for determining, by the sense of hearing, the condition of certain internal organs. The ancient physicians appear to have practised a kind of auscultation, by which they were able to detect the presence of air or fluids in the cavities of the chest and abdomen. Still no general application of this method of investigation was resorted to, or was indeed possible, till the advance of the study of anatomy led to correct ideas regarding the locality, structure and uses of the various organs of the body, and the alterations produced in them by disease. In 1761 Leopold Auenbrugger (1722–1809), a Viennese physician, published his *Inventum Novum*, describing the art of percussion in reference more especially to diseases of the chest. This consisted in tapping with the fingers the surface of the body, so as to elicit sounds by which the comparative resonance of the subjacent parts or organs might be estimated. Auenbrugger's method attracted but little attention till the French physician J. N. Corvisart (1755–1828) in 1808 demonstrated its great practical importance, and then its employment in the diagnosis of affections of the chest soon became general. Percussion was originally practised in the manner above mentioned (*immediate percussion*), but subsequently the method of *mediate percussion* was introduced by P. A. Piorry (1794–1879). It is accomplished by placing upon the spot to be examined some solid substance, upon which the percussion strokes are made with the fingers. For this purpose a thin oval piece of ivory (called a *plexímeter*, or stroke-measurer) may be used, with a small hammer; but one or more fingers of the left hand applied flat upon the part answer equally well, and this is the method which most physicians adopt. Percussion must be regarded as a necessary part of auscultation, particularly in relation to the examination of the chest; for the physician who has made himself acquainted with the normal condition of that part of the body in reference to percussion is thus able to recognize by the ear alterations of resonance produced by disease. But percussion alone, however important in diagnosis, could manifestly convey only limited and imperfect information, for it could never indicate the nature or extent of functional disturbance.

In 1819 the distinguished French physician R. T. H. Laënnec (1781–1826) published his *Traité de l'auscultation médiate*, embodying the present methods of auscultatory examination, and venturing definite conclusions based on years of his own study. He also invented the stethoscope (*στῆθος*, the breast, and *σκοπεῖν*, to examine). Since then many men have widened the scope of auscultation, notably Skoda, Wintrich, A. Geigel, Th. Weber and Gerhardt. According to Laënnec the essential of a good stethoscope was its capability of intensifying the tone vibrations. But since his time the opinion of experts on this matter has somewhat changed, and there are now two definite schools. The first and older condemns the resonating stethoscope, maintaining that the tones are bound to be altered; the second and younger school warmly advocates its use. In America, more than elsewhere, there is a type of phonendoscope much used by the younger men, which has the advantage that it can be used when the older type of instrument fails, viz. when the patient is recumbent and too ill to be moved. By slipping it beneath the patient's back a fairly accurate idea of the breathing over the bases of the lungs behind can often be obtained.

Stethoscopes have been made of many forms and materials. They usually consist of a hollow stem of wood, hard rubber or metal, with an enlarged tip slightly funnel-shaped at one end, and an ear-plate with a hole in the middle, fastened perpendicularly to the other end. To enable the instrument to be more conveniently carried, the ear-plate can be unscrewed from the tube. The length of the stem of the instrument is of minor importance, but its bore should be as nearly as possible that of the entrance of the external ear. A flexible stethoscope in general use both in England and America transmits the sound from a funnel through tubes to the ears of the observer. This is the common form of a binaural resonating stethoscope. It is convenient and gives a loud tone, but is condemned by the older school, who say that the resonance is confusing, and that the slightest movement in handling gives rise to perplexing murmurs. Nevertheless, it is this form of instrument which has by far the greatest vogue. It is probable, however, that the most skilled physicians of all find a special use in each form, the monaural non-resonating type being more sensitive to high-pitched sounds, and of greater assistance in differentiating the sounds and murmurs of the heart, the ordinary binaural form being more useful in examining the lungs and other organs. In using the stethoscope, it must be applied very carefully, so that the edge of the funnel makes an air-tight connexion with the skin, and in the monaural form the ear must be but lightly applied to the ear-plate, not pressing heavily on the patient.

The numerous diseases affecting the lungs can now be recognized and discriminated from each other with a precision which, but for auscultation and the stethoscope, would have been altogether unattainable. The same holds good in the case of the heart, whose varied and often complex forms of disease can, by auscultation, be identified with striking accuracy. But in addition to these its main uses, auscultation is found to render great assistance in the investigation of many obscure internal affections, such as aneurysms and certain diseases of the oesophagus and stomach. To the accoucheur the stethoscope yields valuable aid in the detection of some forms of uterine tumours, and especially in the diagnosis of pregnancy—the only evidence now accepted as absolutely diagnostic of that condition being the hearing of the foetal heart sounds.

AUSONIUS, DECIMUS MAGNUS (*c.* 310–395), Roman poet and rhetorician, was born at Burdigala [*Bordeaux*]. He received an excellent education, especially in grammar and rhetoric, but confesses that his progress in Greek was unsatisfactory. Having completed his studies, he practised for some time as an advocate, but his inclination lay in the direction of teaching. He set up (in 334) a school of rhetoric in his native place, which was largely attended, his most famous pupil being Paulinus, afterwards bishop of Nola. After thirty years of this work, he was summoned by Valentinian to the imperial court, to undertake the education of Gratian, the heir-apparent. The prince always entertained the greatest regard for his tutor, and after his accession bestowed upon him the highest titles and honours, culminating in the consulship (379). After the murder of Gratian (383), Ausonius retired to his estates near Burdigala. He appears to have been a (not very enthusiastic) convert to Christianity. He died about 395.

His most important extant works are: in prose, *Gratiarum Actio*, an address of thanks to Gratian for his elevation to the consulship; *Periochae*, summaries of the books of the *Iliad* and *Odyssey*; and one or two *epistolae*; in verse, *Epigrammata*, including several free translations from the Greek Anthology;

Ephemeris, the occupations of a day; *Parentalia* and *Commemoratio Professorum Burdigalensium*, on deceased relatives and literary friends; *Epitaphia*, chiefly on the Trojan heroes; *Caesares*, memorial verses on the Roman emperors from Julius Caesar to Elagabalus; *Ordo Nobilium Urbium*, short poems on famous cities; *Ludus Septem Sapientum*, speeches delivered by the Seven Sages of Greece; *Idyllia*, of which the best-known are the *Mosella*, a descriptive poem on the Moselle, and the infamous *Cento Nuptialis*. We may also mention *Cupido Cruciatus*, Cupid on the cross; *Technopaegion*, a literary trifle consisting of a collection of verses ending in monosyllables; *Eclogarum Liber*, on astronomical and astrological subjects; *Epistolae*, including letters to Paulinus and Symmachus; lastly, *Praefatiunculae*, three poetical epistles, one to the emperor Theodosius. Ausonius was rather a man of letters than a poet; his wide reading supplied him with material for a great variety of subjects, but his works exhibit no traces of a true poetic spirit; even his versification, though ingenious, is frequently defective.

There are no MSS. containing the whole of Ausonius's works. Editio princeps, 1472; editions by Scaliger 1575, Souchay 1730, Schenkl 1883, Peiper 1886; cf. *Mosella*, Böcking 1845, de la Ville de Mirmont (critical edition with translation) 1889, and *De Ausonii Mosella*, 1892, Hosius 1894. See Deydou, *Un Poète bordelais* (1868); Everat, *De Ausonii Opéribus* (1885); Jullian, *Ausone et Bordeaux* (1893); C. Verrier and R. de Gourmont, *Les Épigrammes d'Ausone* (translation with bibliography, 1905); R. Pichon, *Les Derniers Écrivains profanes* (1907).

AUSSIG (Czech *Oustí nad Labem*), a town of Bohemia, Austria, 68 m. N. of Prague by rail. Pop. (1900) 37,255, mostly German. It is situated in a mountainous district, at the confluence of the Biela and the Elbe, and, besides being an active river port, is an important junction of the northern Bohemian railways. Aussig has important industries in chemicals, textiles, glass and boat-building, and carries on an active trade in coal from the neighbouring mines, stone and stoneware, corn, fruit and wood. It was the birthplace of the painter, Raphael Mengs (1728–1779). Aussig is mentioned as a trading centre as early as 993. It was made a city by Ottokar II. in the latter part of the 13th century. In 1423 it was pledged by King Sigismund to the elector Frederick of Meissen, who occupied it with a Saxon garrison. In 1426 it was besieged by the Hussites, who on the 16th of June, though only 25,000 strong, defeated a German army of 70,000, which had been sent to its relief, with great slaughter. The town was stormed and sacked next day. After lying waste for three years, it was rebuilt in 1429. It suffered much during the Thirty Years' and Seven Years' Wars, and in 1830 it had only 1400 inhabitants. Not far from Aussig is the village of Kulm, where, on the 29th and 30th of August 1813, a battle took place between the French under Vandamme and an allied army of Austrians, Prussians and Russians. The French were defeated, and Vandamme surrendered with his army of 10,000 men.

AUSTEN, JANE (1775–1817), English novelist, was born on the 16th of December 1775 at the parsonage of Steventon, in Hampshire, a village of which her father, the Rev. George Austen, was rector. She was the youngest of seven children. Her mother was Cassandra Leigh, niece of Theophilus Leigh, a dry humorist, and for fifty years master of Balliol, Oxford. The life of no woman of genius could have been more uneventful than Miss Austen's. She did not marry, and she never left home except on short visits, chiefly to Bath. Her first sixteen years were spent in the rectory at Steventon, where she began early to trifle with her pen, always jestingly, for family entertainment. In 1801 the Austens moved to Bath, where Mr Austen died in 1805, leaving only Mrs Austen, Jane and her sister Cassandra, to whom she was always deeply attached, to keep up the home; his sons were out in the world, the two in the navy, Francis William and Charles, subsequently rising to admiral's rank. In 1805 the Austen ladies moved to Southampton, and in 1809 to Chawton, near Alton, in Hampshire, and there Jane Austen remained till 1817, the year of her death, which occurred at Winchester, on July 18th, as a memorial window in the cathedral testifies.

During her placid life Miss Austen never allowed her literary work to interfere with her domestic duties: sewing much and admirably, keeping house, writing many letters and reading aloud. Though, however, her days were quiet and her area circumscribed, she saw enough of middle-class provincial society to find a basis on which her dramatic and humorous faculties might build, and such was her power of searching observation and her sympathetic imagination that there are not in English fiction more faithful representations of the life she knew than we possess in her novels. She had no predecessors in this genre. Miss Austen's "little bit (two inches wide) of ivory" on which she worked "with so fine a brush"—her own phrases—was her own invention.

Her best-known, if not her best work, *Pride and Prejudice*, was also her first. It was written between October 1796 and August 1797, although, such was the blindness of publishers, not issued until 1813, two years after *Sense and Sensibility*, which was written, on an old scenario called "Eleanor and Marianne," in 1797 and 1798. Miss Austen's inability to find a publisher for these stories, and for *Northanger Abbey*, written in 1798 (although it is true that she sold that MS. in 1803 for £10 to a Bath bookseller, only, however, to see it locked away in a safe for some years, to be gladly resold to her later), seems to have damped her ardour; for there is no evidence that between 1798 and 1809 she wrote anything but the fragment called "The Watsons," after which year she began to revise her early work for the press. Her other three books belong to a later date—*Mansfield Park*, *Emma* and *Persuasion* being written between 1811 and 1816. The years of publication were *Sense and Sensibility*, 1811; *Pride and Prejudice*, 1813; *Mansfield Park*, 1814; and *Emma*, 1816—all in their author's lifetime. *Persuasion* and *Northanger Abbey* were published posthumously in 1818. All were anonymous, agreeably to their author's retiring disposition.

Although *Pride and Prejudice* is the novel which in the mind of the public is most intimately associated with Miss Austen's name, both *Mansfield Park* and *Emma* are finer achievements—at once riper and richer and more elaborate. But the fact that *Pride and Prejudice* is more single-minded, that the love story of Elizabeth Bennet and D'Arcy is not only *of* the book but *is* the book (whereas the love story of Emma and Mr Knightley and Fanny Price and Edmund Bertram have parallel streams), has given *Pride and Prejudice* its popularity above the others among readers who are more interested by the course of romance than by the exposition of character. Entirely satisfactory as is *Pride and Prejudice* so far as it goes, it is, however, thin beside the niceness of analysis of motives in *Emma* and the wonderful management of two housefuls of young lovers that is exhibited in *Mansfield Park*.

It has been generally agreed by the best critics that Miss Austen has never been approached in her own domain. No one indeed has attempted any close rivalry. No other novelist has so concerned herself or himself with the trivial daily comedy of small provincial family life, disdaining equally the assistance offered by passion, crime and religion. Whatever Miss Austen may have thought privately of these favourite ingredients of fiction, she disregarded all alike when she took her pen in hand. Her interest was in life's little perplexities of emotion and conduct; her gaze was steadily ironical. The most untoward event in any of her books is Louisa's fall from the Cobb at Lyme Regis, in *Persuasion*; the most abandoned, Maria's elopement with Crawford, in *Mansfield Park*. In pure ironical humour Miss Austen's only peer among novelists is George Meredith, and indeed *Emma* may be said to be her *Egoist*, or the *Egoist* his *Emma*. But irony and fidelity to the fact alone would not have carried her down the ages. To these gifts she allied a perfect sense of dramatic progression and an admirably lucid and flowing prose style which makes her stories the easiest reading.

Recognition came to Miss Austen slowly. It was not until quite recent times that to read her became a necessity of culture. But she is now firmly established as an English classic, standing far above Miss Burney (Madame d'Arblay) and Miss Edgeworth, who in her day were the popular women novelists of real life,

while Mrs Radcliffe and "Monk" Lewis, whose supernatural fancies *Northanger Abbey* was written in part to ridicule, are no longer anything but names. Although, however, she has become only lately a household word, Miss Austen had always her panegyrists among the best intellects—such as Coleridge, Tennyson, Macaulay, Scott, Sydney Smith, Disraeli and Archbishop Whately, the last of whom may be said to have been her discoverer. Macaulay, whose adoration of Miss Austen's genius was almost idolatrous, considered *Mansfield Park* her greatest feat; but many critics give the palm to *Emma*. Disraeli read *Pride and Prejudice* seventeen times. Scott's testimony is often quoted: "That young lady had a talent for describing the involvements, feelings and characters of ordinary life which is to me the most wonderful I have ever met with. The big bow-wow I can do myself like any one going; but the exquisite touch which renders commonplace things and characters interesting from the truth of the description and the sentiment is denied to me."

Many monographs on Miss Austen have been written, in addition to the authorized *Life* by her nephew J. E. Austen Leigh in 1870, and the collection of her *Letters* edited by Lord Brabourne in 1884. The chief books on her and around her are *Jane Austen*, by S. F. Malden (1889); *Jane Austen*, by Goldwin Smith (1890); *Jane Austen: Her Contemporaries and Herself*, by W. H. Pollock; *Jane Austen: Her Homes and Her Friends*, by Constance Hill (1902); *Jane Austen and Her Times*, by G. E. Mitton (1905); *Jane Austen's Sailor Brothers*, by J. H. and E. C. Hubback (1906); and the essay on her in Lady Richmond (Thackeray) Ritchie's *Book of Sibyls* (1883). (E. V. L.)

AUSTERLITZ (Czech *Slavkov*), a town of Austria, in Moravia, 15 m. E.S.E. of Brünn by rail. Pop. (1900) 3145, mostly Czech. It contains a magnificent palace belonging to the prince of Kaunitz-Rietberg, and a beautiful church.

The great battle in which the French under Napoleon I. defeated the Austrians and Russians on the 2nd of December 1805, was fought in the country to the west of Austerlitz, the position of Napoleon's left wing being almost equi-distant from Brünn and from Austerlitz. The wooded hills to the northward throw out to the south and south-west long spurs, between which are the low valleys of several rivers and brooks. The

scene of the most important fighting was the Pratzen plateau. The famous "lakes" in the southern part of the field were artificial ponds, which have long since been drained. On the west or Brünn side of the Goldbach is another and lower ridge, which formed in the battle the first position of the French right and centre. On the other wing is the mass of hills from which the spurs and streams descend: here the Olmütz-Brünn road passes. The road from Brünn to Vienna, Napoleon's presumed line of retreat, runs in a southerly direction, and near the village of Raigern (3 m. west of Mönitz) is very close to the extreme right of the French position, a fact which had a great influence on the course of the battle. (The course of events which led to the action is described under NAPOLEONIC CAMPAIGNS.) Napoleon, falling back before the advance of the allied Austrians and Russians from Olmütz, bivouacked west of the Goldbach, whilst the allies, holding, near Austerlitz, the junction of the roads from Olmütz and from Hungary, formed up in the valleys east of the Pratzen heights. The cavalry of both sides remained inactive, Napoleon's by express order, the enemy's seemingly from mere negligence, since they had 177 squadrons at their disposal. Napoleon, having determined to fight, as usual called up every available battalion; the splendid III. corps of Davout only arrived upon the field after a heavy march, late on the night of December 1st. The plan of the allies was to attack Napoleon's right, and to cut him off from Vienna, and their advanced guard began, before dark on the 1st of December, to skirmish towards Telnitz. At that moment Napoleon was in the midst of his troops, thousands of whom had made their bivouac-straw into torches in his honour. The glare of these seemed to the allies to betoken the familiar device of lighting fires previous to a retreat, and thus confirmed them in the impression which Napoleon's calculated timidity had given. Thus encouraged, those who desired an immediate battle soon gained the upper hand in the councils of the tsar and the emperor Francis. The attack orders for the 2nd of December (drawn up by the Austrian general Weyrother, and explained by him to a council of superior officers, of whom some were hostile, the greater part indifferent, and the chief Russian member, General Kutusov, asleep) gave the five columns and the reserve, into which the Austro-Russian army was organized, the following tasks: the first and second (Russians) to move south-westward behind the Pratzen ridge towards Telnitz and Sokolnitz; the third (Russian) to cross the southern end of the plateau, and come into line on the right of the first two; the fourth (Austrians and Russians under Kolowrat) on the right of the third to advance towards Kobelnitz. An Austrian advanced guard preceded the 1st and 2nd columns. Farther still on the right the 5th column (cavalry under Prince John of Liechtenstein) was to hold the northern part of the plateau, south of the Brünn-Olmütz road; across the road itself was the corps of Prince Bagration, and in rear of Liechtenstein's corps was the reserve (Russians under the grand-duke Constantine). Thus, the farther the four main columns penetrated into the French right wing, the wider would the gap become between Bagration and Kolowrat, and Liechtenstein's squadrons could not form a serious obstacle to a heavy attack of Napoleon's centre. The whole plan was based upon defective information and preconceived ideas; it has gone down to history as a classical example of bad generalship, and its author Weyrother, who was perhaps nothing worse than a pedant, as a charlatan.

Napoleon, on the other hand, with the exact knowledge of the powers of his men, which was the secret of his generalship, entrusted nearly half of his line of battle to a division (Legrand's) of Soult's corps, which was to be supported by Davout, some of whose brigades had marched, from Vienna, 90 m. in forty-eight hours. But the ground which this thin line was to hold against three columns of the enemy was marshy and densely intersected by obstacles, and the III. corps was the best in the *Grande Armée*, while its leader was perhaps the ablest of all Napoleon's marshals. The rest of the army formed in the centre and left. "Whilst they march to turn my right," said Napoleon in the inspiriting proclamation which he issued on the eve of the battle, "they present me their flank," and the great counterstroke was to be delivered against the Pratzen heights by the French centre. This was composed of Soult's corps, with Bernadotte's in second line. On the left, around the hill called by the French the Santon (which was fortified) was Lannes' corps, supported by the cavalry reserve under Murat. The general reserve consisted of the Guard and Oudinot's grenadiers.

The attack of the allies was begun by the first three columns, which moved down from their bivouacs behind the Pratzen plateau before dawn on the 2nd, towards Telnitz and Sokolnitz. The Austrian advanced guard engaged at daybreak, and the French in Telnitz made a vigorous defence; both parties were reinforced, and Legrand drew upon himself, in fulfilling his mission, the whole weight of the allied attack. The contest was long and doubtful, but the Russians gradually drove back Legrand and a part of Davout's corps; numerous attacks both of infantry and cavalry were made, and by the successive arrival of reinforcements each side in turn received fresh impetus. Finally, at about 10 A.M., the allies were in possession of the villages on the Goldbach from Sokolnitz southwards, and Davout's line of battle had reformed more than a mile to rearward, still, however, maintaining touch with the French centre on the Goldbach at Kobelnitz. Between the two lines the fighting continued almost to the close of the battle. With 12,500 men of all arms the Marshal held in front of him over 40,000 of the enemy.

In the centre, the defective arrangements of the allied staff had delayed the 4th column (Kolowrat), the line of march of which was crossed by Liechtenstein's cavalry moving in the opposite direction. The objective of this column was Kobelnitz, and the two emperors and Kutusov accompanied it. The delay had, however, opened a gap between Kolowrat and the 3rd column on his left; and towards this gap, and the denuded Pratzen plateau, Napoleon sent forward St Hilaire's division of Soult's corps for the decisive attack. Kutusov was pursuing this march to the south-west when he was surprised by the swift advance of Soult's men on the plateau itself. Napoleon had here double the force of the allies; Kutusov, however, displayed great energy, changed front to his right and called up his reserves. The French did not win the plateau without a severe struggle. St Hilaire's (the right centre) division was fiercely engaged by Kolowrat's column, General Miloradovich opposed the left centre attack under Vandamme, but the French leaders were two of the best fighting generals in their army. The rearmost troops of the Russian 2nd column, not yet committed to the fight on the Goldbach, made a bold counter stroke against St Hilaire's right flank, but were repulsed, and Soult now turned to relieve the pressure on Davout by attacking Sokolnitz. The Russians in Sokolnitz surrendered, an opportune cavalry charge further discomfited the allied left, and the Pratzen plateau was now in full possession of the French. Even the Russian Guard failed to shake Vandamme's hold. In the meanwhile Lannes and Murat had been engaged in the defence of the Santon. Here the allied leaders displayed the greatest vigour, but they were unable to drive back the French. The cavalry charges in this quarter are celebrated in the history of the mounted arm; and Kellermann, the hero of Marengo, won fresh laurels against the cavalry of Liechtenstein's command. The French not only held their ground, but steadily advanced and eventually forced back the allies on Austerlitz, thereby barring their retreat on Olmütz. The last serious attempt of the allies in the centre led to some of the hardest fighting of the day; the Russian Imperial Guard under the grand-duke Constantine pressed closely upon St Hilaire and Vandamme on the plateau, and only gave way when the French Guard and the Grenadiers came into action. After the "Chevalier Guards" had been routed by Marshal Bessières and the Guard cavalry, the allies had no more hope of victory; orders had already been sent to Buxhöwden, who commanded the three columns engaged against Davout, to retreat on Austerlitz. No further attempt was made on the plateau, which was held by the French from Pratzen to the Olmütz road. The allied army was cut in two, and the last confused struggle of the three Russian columns on the Goldbach was one for liberty only. The fighting in Telnitz was perhaps the hardest of the whole battle, but the inevitable retreat, every part of which was now under the fire of the French on the plateau, was terribly costly. Soult now barred the way to Austerlitz, and the allies turned southward towards Satschan. As they retreated, the ice of the Satschan pond was broken up by the French artillery, and many of the fugitives were drowned. In the twelve hours from 7 A.M. to nightfall, the 65,000 French troops had lost 6800 men, or about 10%; the allies (82,500 engaged) had 12,200 killed and wounded, and left in the enemy's hands 15,000 prisoners (many wounded) and 133 guns.

AUSTIN, ALFRED (1835–), English poet-laureate, was born at Headingley, near Leeds, on the 30th of May 1835. His father, Joseph Austin, was a merchant of the city of Leeds; his mother, a sister of Joseph Locke, M.P. for Honiton. Mr Austin was educated at Stonyhurst, Oscott, and London University, where he graduated in 1853. He was called to the bar four years later, and practised as a barrister for a short time; but in 1861, after two comparatively false starts in poetry and fiction, he made his first noteworthy appearance as a writer with a satire called *The Season*, which contained incisive lines, and was marked by some promise both in wit and observation. In 1870 he published a volume of criticism, *The Poetry of the Period*, which was again conceived in a spirit of satirical invective, and attacked Tennyson, Browning, Matthew Arnold and Swinburne in no half-hearted fashion. The book aroused some discussion at the time, but its judgments were extremely uncritical. In 1881 Mr Austin returned to verse with a tragedy, *Savonarola*, to which he added *Soliloquies* in 1882, *Prince Lucifer* in 1887, *England's Darling* in 1896, *The Conversion of Winckelmann* in 1897, &c. A keen Conservative in politics, for several years he edited *The National Review*, and wrote leading articles for *The Standard*. On Tennyson's death in 1892 it was felt that none of the then living poets, except Swinburne or William Morris, who were outside consideration on other grounds, was of sufficient distinction to succeed to the laurel crown, and for several years no new poet-laureate was nominated. In the interval the claims of one writer and another were much canvassed, but eventually, in 1896, Mr Austin was appointed. As poet-laureate, his occasional verses did not escape adverse criticism; his hasty poem in praise of the Jameson Raid in 1896 being a notable instance. The most effective characteristic of Mr Austin's poetry, as of the best of his prose, is a genuine and intimate love of nature. His prose idylls, *The Garden that I love* and *In Veronica's Garden*, are full of a pleasant, open-air flavour, which is also the outstanding feature of his *English Lyrics*. His lyrical poems are wanting in spontaneity and individuality, but many of them possess a simple, orderly charm, as of an English country lane. He has, indeed, a true love of England, sometimes not without a suspicion of insularity, but always fresh and ingenuous. A drama by him, *Flodden Field*, was acted at His Majesty's theatre in 1903.

AUSTIN, JOHN (1790–1859), English jurist, was born on the 3rd of March 1790. His father was the owner of flour mills at Ipswich and in the neighbourhood, and was in good circumstances. John was the eldest of five brothers. One of his brothers, Charles (1799–1874), obtained great distinction at the bar. John Austin entered the army at a very early age; he is said to have been only sixteen. He served with his regiment under Lord William Bentinck in Malta and Sicily. He seems to have liked his profession, and to have joined in the amusements and even in the follies of his brother officers. Yet it appears from a journal kept by him at the time that he occupied himself with studies of a far more serious kind than is common amongst young officers in the army. He notes having read in the course of one year Dugald Stewart's *Philosophical Essays*, Drummond's *Academical Questions*, Enfield's *History of Philosophy*, and Mitford's *History of Greece*, and upon all of these he makes observations which disclose much thought and a capacity for criticism which must have come from extensive reading elsewhere. The prevailing note of this journal is one of bitter self-depreciation. He says in it that the retrospect of the past year (1811) "has hardly given rise to one single feeling of satisfaction," and farther on he says that "indolence, always the prominent vice of my character," has "assumed over me an empire I almost despair of shaking off." It is difficult to believe that a man only just of age, whose serious reading consisted of such books, and who (as appears from the same journal) was in the habit of turning to the classics as an alternative, could have deserved the reproach of indolence.

In 1812, he resigned his commission in the army, and returned home. He then began to read law in the chambers of a barrister. He was called to the bar in the year 1818, and joined the Norfolk circuit, but he never obtained any large practice, and he finally retired from the bar in 1825. In 1819 he married Sarah Taylor (see AUSTIN, SARAH).

Although Austin had failed to attain success at the bar it was not long before he had an opportunity of exercising his abilities and in a manner peculiarly suited to his particular turn of mind. In 1826 a number of eminent men were engaged in the foundation of University College, and it was determined to establish in it a chair of jurisprudence. This chair was offered to Austin and he agreed to accept it. As he was not called upon to begin his lectures immediately, he resolved to proceed to Germany in order to prepare himself for his duties by studying the method of legal teaching pursued at German universities. He resided first at Heidelberg, and afterwards at Bonn, where he lived on terms of intimacy with such distinguished lawyers as Savigny and K. J. A. Mittermaier, and such eminent men of letters as Niebuhr, Brandis, Schlegel and A. W. Heffter. He began lecturing in 1828, and at first was not without encouragement. His class was a peculiarly brilliant one. It included a number of men who afterwards became eminent in law, politics and philosophy—Sir George Cornewall Lewis, Charles Buller, Charles Villiers, Sir Samuel Romilly and his brother Lord Romilly, Edward Strutt afterwards Lord Belper, Sir William Erle and John Stuart Mill were all members of his class. All of these have left on record expressions of the profound admiration which the lectures excited in the minds of those who heard them. But the members of his class, though exceptional in quality, were few in number, and as there was no fixed salary attached to the professorship, Austin could not afford to remain in London, and in 1832 he resigned. In that year he published his *Province of Jurisprudence determined*, being the first ten of his delivered lectures compressed into six.

There is ample testimony that Austin's lectures were very highly appreciated by those who heard them. Their one fault was that they were over-elaborated. In his desire to avoid ambiguity, he repeats his explanations and qualifications to an extent which must have tired his hearers. Nevertheless the lectures excited an admiration which almost amounted to enthusiasm. Nor was Austin's influence confined to his lectures. Sir William Erle says in a letter written to him in 1844, "The interchange of mind with you in the days of Lincoln's Inn I regard as a deeply important event in my life, and I ever remember your friendship with thankfulness and affection." John Stuart Mill, whose views on political subjects were entirely opposed to those of Austin, spoke of him after his death as the man "to whom he (Mill) had been intellectually and morally most indebted," and he expressed the opinion "that few men had contributed more by their individual influence, and their conversation, to the formation and growth of the most active minds of the generation."

In 1833 a royal commission was issued to draw up a digest of criminal law and procedure. Of this commission Austin was a member. The first report was signed by all the commissioners, and was presented in June 1834. Nevertheless it appears from some notes made at the time that Austin, though he thought it his duty to sign the report, strongly objected to some passages which it contained. It is pretty obvious from the nature of these objections that nothing would have satisfied him short of a complete recasting of the criminal law, whereas what the commissioners were ordered to produce was not a code but a digest. Probably Austin felt, as Mr Justice Wills felt some years later, that the anomalies which a code would remove would "choke a digest."

In 1834 the benchers of the Inner Temple appointed Austin to give lectures on the "General Principles of Jurisprudence and International Law." He delivered a few lectures in the spring of that year, but in June the course was by order of the benchers suspended on account of the smallness of the attendance, and it was never resumed. He then went to live with his wife and only child Lucie (afterwards Lady Duff-Gordon) at Boulogne. Here he remained for about a year and a half. He then accepted an appointment offered him by Sir James Stephen to go as royal commissioner to Malta in conjunction with Mr (afterward Sir George) Cornewall Lewis, to inquire into the nature and extent of the grievances of which the natives of that island complained.

The Austins remained in Malta until July 1838. After their return they lived a good deal abroad, and in 1844 they settled in Paris, where they remained until driven out of France by the revolution of 1848. They then took a house at Weybridge, and there Austin remained until his death in December 1859. He was urged by his friends to publish a second edition of the *Province of Jurisprudence*, which was then out of print, and he went so far as to allow a prospectus to be issued by Mr Murray of an extended work on "The Principles and Relations of Jurisprudence and Ethics." But nothing came of it.

In 1842 Austin published in the *Edinburgh Review* an attack upon Friedrich List's system of trade protection (*Das nationale System der politischen Ökonomie*). And in 1859 he published a pamphlet entitled "A Plea for the Constitution." This was occasioned by the publication of Lord Grey's essay on "Parliamentary Government." Its main object was to show that the consequences to be anticipated from Parliamentary Reform were all of them either impossible of realization or mischievous. He thought any attempt on the part of the poorer classes to improve their position was barred by the inexorable laws of political economy; and that if they obtained power they would only use it to plunder the rich; whilst, on the other hand, he seems not to have had any suspicion that the "proprietary class" were likely to disregard the interests of the poor. He thinks that political power is safest in the hands of those possessed of hereditary or acquired property; and that without property even intelligence and knowledge afford no presumption of political capacity. Undoubtedly Austin was a utilitarian in the Benthamite sense, and remained so to the end of his life. It must be remembered that Bentham's sole and immutable test of human action was the greatest happiness of the greatest number. This is a principle which an aristocrat may adopt if he chooses, no less than a democrat; an individualist no less than a socialist; and there is nothing in the "Plea for the Constitution" which contravenes this. But Austin thought, and in this no doubt he differed from Bentham, that the mass of the people did not know their own interests so well as "an aristocracy of independent gentlemen" who might be trusted to provide for the wants of all classes alike.

Austin's position as a jurist is much more difficult to estimate. Twice his influence appeared likely to produce some impression upon English law, but upon both occasions it lasted only a short time, and never extended very far. The men whom he influenced were very eminent, but in numbers they were few. As a rule, students for the bar never at any time paid any attention to his teaching. The first published lectures were almost forgotten when Mr (afterwards Sir Henry) Maine was appointed to lecture on jurisprudence at the Inner Temple. Both in his private and public lectures Maine constantly urged upon his hearers the importance of Austin's analytical inquiries into the meaning of legal terms. He used to say that it was Austin's inquiries which had made a philosophy of law possible. Undoubtedly Maine's influence revived for a short time the interest in Austin's teaching. Maine was lecturing about the time of Austin's death, and in 1861 Mrs Austin published a second edition of the *Province of Jurisprudence*, and this was followed soon after by two volumes which contained in addition in a fragmentary form the remaining lectures delivered at University College and other notes (*Lectures on Jurisprudence; or The Philosophy of Positive Law*).

It cannot be said that Austin's views of jurisprudence have had, as yet, any visible influence whatever on the study of English law. But if we consider what it was that Austin endeavoured to teach, it can hardly be said that the subject is one which a lawyer can with impunity neglect. He proposes to

distinguish law from morals; to explain the notions which have been entertained of duty, right, liberty, injury, punishment and redress; and their connexion with, and relations to, sovereignty; to examine the distinction between rights *in rem* and rights *in personam*, and between rights *ex contractu* and rights *ex delicto*; and further to determine the meaning of such terms as right, obligation, injury, sanction, person, thing, act and forbearance. These are some of the terms, notions and distinctions which Austin endeavoured to explain. They are daily in the mouth of every practising lawyer. The only portion of Austin's work which has attracted much attention of recent years is his conception of sovereignty, and his dictum that all laws properly so called must be considered as sanctioned expressly or tacitly by the sovereign. This has been indignantly denied. It has been considered enough to justify this denial to point out that there are in existence states where the seat of sovereignty, and the ultimate source of law, cannot be accurately indicated. But this criticism is entirely misplaced; for as pointed out by Maine (*Early History of Institutions*, Lecture xii.), in an elaborate discussion of Austin's views, which in the main he accepts, what Austin was engaged upon was not an inquiry into the nature of sovereignty as it is found to exist, but an inquiry into what was the connexion between the various forms of political superiority. And this inquiry was undertaken in order to enable him to distinguish the province of jurisprudence properly so called from the province of morality; an inquiry which was hopeless unless the connexion just stated was clearly conceived. Austin's views of sovereignty, therefore, was an abstraction, useless it is true for some purposes, but by no means useless for others. "There is," as Maine says, "not the smallest necessity for accepting all the conclusions of these great writers (*i.e.* Bentham and Austin) with implicit deference, but there is the strongest necessity for knowing what these conclusions are. They are indispensable, if for no other object, for the purpose of clearing the head." These last words exactly express the work which Austin set himself to do. It was to clear his own head, and the heads of his hearers, that he laboured so hard. As Austin once said of himself, his special vocation was that of untying intellectual knots. The disentangling of classifications and distinctions, the separation of real from accidental distinctions, the analysis of ideas confusedly apprehended, these (as has been truly said) were the characteristics of Austin's work which specially distinguished him. Austin thought that this somewhat irksome task was a necessary preliminary both to the study of law as a science, and to the production of a code. It is a curious reflection that whilst the lectures in which these inquiries were begun (though not completed) excited the admiration of his contemporaries, hardly any one now thinks such inquiries worth pursuing.

The *Lectures on Jurisprudence* were reviewed by J. S. Mill in the *Edinburgh Review* of October 1863, and this review is republished in Mill's *Dissertations and Discussions*, vol. 3, p. 206. Professor Jethro Brown has published (1906) an edition of Austin's earlier lectures, in which they are stated in an abbreviated form. There is a sketch of his life by his widow in the preface to the *Lectures on Jurisprudence*, which she published after his death. (W. Ma.)

AUSTIN, SARAH (1793–1867), English author, was born in 1793, the daughter of John Taylor (d. 1826), a wool-stapler and a member of the well-known Taylor family of Norwich. Her great grandfather, Dr John Taylor (1694–1761), had been pastor of the Presbyterian church there, and wrote a once famous polemical work on *The Scripture Doctrine of Original Sin* (1738), which called forth celebrated treatises by Jonathan Edwards on *Original Sin*. Her mother, Susannah Cook, was an exceedingly clever woman who transmitted both her beauty and her talent to her daughter. Their friends included Dr Alderson and his daughter Mrs Opie, Henry Crabbe Robinson, the Gurneys and Sir James Mackintosh. Sarah Taylor married in 1820 John Austin (*q.v.*). They lived in Queen Square, Westminster, where Mrs. Austin, whose tastes, unlike her husband's, were extremely sociable, gathered round her a large circle, Jeremy Bentham, James Mill and the Grotes being especially intimate. She received many Italian exiles, who found a real friend in her. In 1821 was born her only child, Lucie, afterwards Lady Duff-Gordon. Mrs. Austin never attempted any considerable original work, contenting herself chiefly with translations, of which the most important are the *History of the Reformation in Germany* and the *History of the Popes* (1840), from the German of Leopold von Ranke, *Report on the State of Public Instruction in Prussia* (1834) from the French of V. Cousin, and F. W. Carove's *The Story without an End* (1864). After her husband's death in 1859 she edited his *Lectures on Jurisprudence*. She also edited the *Memoirs of Sydney Smith* (1855) and Lady Duff-Gordon's *Letters from Egypt* (1865). She died at Weybridge on the 8th of August 1867.

See *Three Generations of Englishwomen* (1888), by her granddaughter, Mrs Janet Ross.

AUSTIN, STEPHEN FULLER (1793–1836), American pioneer, was born in Austinville, Wythe county, Virginia, on the 3rd of November 1793. He was the son of Moses Austin (1767–1821), a native of Durham, Connecticut, who in 1820 obtained from Mexico a grant of land for an American colony in Texas, but died before he could carry out his project. The son was educated in New London, Connecticut, and at Transylvania University, Lexington, Kentucky, and settled in Missouri, where he was a member of the territorial legislature from 1813 to 1819. In 1819 he removed to Arkansas Territory, where he was appointed a circuit judge. After his father's death he obtained a confirmation of the Texas grants from the newly established Mexican government, and in 1821–1823 he established a colony of several hundred American families on the Brazos river, the principal town being named, in his honour, San Felipe de Austin. He was a firm defender of the rights of the Americans in Texas, and in 1833 he was sent to the city of Mexico to present a petition from a convention in Texas praying for the erection of a separate state government. While there, despairing of success for his petition, he wrote home recommending the organization of a state without waiting for the consent of the Mexican congress. This letter falling into the hands of the Mexican government, Austin, while returning home, was arrested at Saltillo, carried as a prisoner back to Mexico, and imprisoned for a year without trial. Returning to Texas in 1835, he found the Texans in armed revolt against Mexican rule, and was chosen commander-in-chief of the revolutionary forces, but after failing to take San Antonio he resigned the command, for which he had never considered himself fitted, and in November 1835 went to the United States as a commissioner to secure loans and supplies, and to learn the position the United States authorities would be likely to take in the event of a declaration of Texan independence. He succeeded in raising large sums, and received assurances that satisfied him that Americans would look with great favour on an independent Texas. Returning to Texas in the summer of 1836, he became a candidate, rather reluctantly, for the presidency of the newly established republic of Texas, but was defeated by Samuel Houston, under whom he was secretary of state until his sudden death on the 7th of December 1836.

See *A Comprehensive History of Texas*, edited by D. G. Wooten (2 vols., Dallas, 1898).

AUSTIN, a city and the county-seat of Mower county, Minnesota, U.S.A., on the Red Cedar river and Turtle creek, (by rail) 105 m. S. of Minneapolis and 100 m. from St Paul. Pop. (1900) 5474; (1905, state census) 6489 (913 foreign-born); (1910, U.S. census) 6960. It is served by the Chicago Great Western and the Chicago, Milwaukee & St Paul railways. Austin is the seat of the Southern Minnesota Normal College and Austin School of Commerce (1896), and has a Carnegie library, court house and city hall. It is a market for live-stock, and for dairy and farm products, and has slaughtering and packing establishments, flour mills, creameries and cheese factories, canning and preserving factories, carriage works, a flax fibre mill and grain elevators. Brick, tile, sewer-pipe, and hydraulic cement are manufactured, and there are railway repair shops. A valuable water-power is utilized for manufacturing purposes. Fresh-water pearls of considerable value

and beauty are found in the Red Cedar river. The city owns and operates its own water-supply system and electric-lighting plant. Austin was settled in 1855, was incorporated as a village in 1868, and was chartered as a city in 1873.

AUSTIN, the capital of Texas, U.S.A., and the county-seat of Travis county, on the N. bank of the Colorado river, near the centre of the state and about 145 m. W.N.W. of Houston. Pop. (1890) 14,575; (1900) 22,258, of whom 5822 were negroes; (1910 census) 29,860. Austin is served by the Houston & Texas Central, the International & Great Northern, and the Missouri, Kansas & Texas railways. The city is built on high bluffs 40-120 ft. above the river, which is spanned here by a bridge, built in 1874. The Texas State Capitol, a handsome building of red Texas granite, with a dome 318 ft. high, cost more than $3,500,000, and stands in a square in the centre of the city. It was built (1881–1888) by Chicago capitalists in exchange for a land grant of 3,000,000 acres. It is in the form of a Greek cross, with an extreme length of 556·5 ft. and an extreme width of 288·8 ft. Next to the National Capitol at Washington, it is the largest capitol building in the United States, and it is said to be one of the ten largest buildings in the world. Austin is the seat of the University of Texas (opened in 1883; co-educational); the medical department of the state university is at Galveston, and the departments in Austin are the college of arts, department of education, department of engineering, department of law, school of pharmacy, and school of nursing. The government of the university is vested in a board of eight regents nominated by the governor and appointed with the advice and consent of the state senate. At Austin are also state institutions and asylums for the insane, the blind, the coloured deaf and blind; the state school for the deaf and dumb; the state Confederate home; the Confederate woman's home (1907; for wives and widows of Confederate soldiers and sailors), maintained by the Daughters of the Confederacy; St Mary's Academy (Roman Catholic, under the supervision of the Sisters of the Holy Cross, founded 1875, chartered 1886); St Edward's College (Roman Catholic, chartered 1885); the Austin Presbyterian Theological Seminary (Presbyterian Church, South), opened in 1902 by the Synod of Texas, and after 1905 partly controlled by the Synod of Arkansas; Tillotson College (a negro school under Congregational control, founded by the American Missionary Association, chartered in 1877, and opened in 1881); and Samuel Huston College (for negroes; Methodist Episcopal; opened in 1900 and named in honour of an Iowan benefactor). The principal newspapers of Austin are the *Statesman* (Democratic, established in 1871), a morning paper, and the *Tribune* (Democratic, established in 1891), an evening paper. The *Quarterly of the Texas State Historical Society* is published here. Austin is the principal trade and jobbing centre for central and western Texas, is an important market for live-stock, cotton, grain and wool, and has extensive manufactories of flour, cotton-seed oil, leather goods, lumber and wooden ware; the value of the factory product in 1905 was $1,569,353, being 105·2 % more than in 1900. The city owns and operates its water-supply system. In 1890–1893 one of the largest dams in the world, an immense structure of granite masonry, 1200 ft. long, 60-70 ft. high, and 18 to 66 ft. thick, was constructed across the Colorado river 2 m. above the city for the purpose of supplying water and power, creating a reservoir (Lake M'Donald) about 30 m. long. Freshets in the spring of 1900, however, undermined the wall, and on the 7th of April the dam broke with a resulting loss of several lives and about $1,000,000 worth of property. The rebuilding of the dam was projected in 1907. Austin was first settled in 1838 and was named Waterloo, but in 1839, when it was chosen as the site of the capital of the Republic of Texas, it was renamed in honour of Stephen F. Austin, one of its founders. Under the influence of General Sam Houston the capital was for a time in 1842–1845 removed from Austin to Houston, but in 1845 an ordinance was passed making Austin the capital, and it remained the state capital after Texas entered the Union, although Huntsville and Tehuacana Springs in 1850 and Houston in 1872 attempted in popular elections to be chosen in its place. The first Anglo-American settlement in Texas, established on the Brazos river in 1823 by members of the Austin colony, was San Felipe de Austin now San Felipe. In 1909 Austin adopted a commission form of government.

AUSTRALASIA, a term used by English geographers in a sense nearly synonymous with the Oceania of continental writers. It thus comprises all the insular groups which extend almost continuously from the south-eastern extremity of Asia to more than half-way across the Pacific. Its chief divisions are Malaysia with the Philippines; Australia with Tasmania and New Zealand; Melanesia, that is, New Guinea, New Britain, New Ireland, Admiralty, the Solomons, New Hebrides, Santa Cruz, Fiji, Loyalties and New Caledonia; Micronesia, that is, the Ladrones, Pelew and Carolines, with the Marshall and Gilbert groups; lastly, Polynesia, that is, Samoa, Tonga, Cook, Tahiti, the Marquesas, Ellice, Hawaii and all intervening clusters. The term is so far justified in that it harmonizes better than Oceania did with the names of the other continents, and also embodies the two essential facts that it is a south-eastern extension of Asia, and that its central and most important division is the great island-continent of Australia. In a more restricted sense the term Australasia corresponds to the large division including Australia, Tasmania and New Zealand.

See *Australasia*, 2 vols. Stanford Compendium Series, new issue (London, 1907–1908).

AUSTRALIA, the only continent entirely in the southern hemisphere. It lies between 10° 39′ and 39° 11½′ S., and between 113° 5′ and 153° 16′ E. Its greatest length is 2400 m. from east to west, and the greatest breadth 1971 m. from north to south. The area is, approximately, 2,946,691 sq. m., with a coast line measuring about 8850 m. This is equal to 1 m. to each 333 sq. m. of land, the smallest proportion of coast shown by any of the continents.

Physical Geography

Physiography.—The salient features of the Australian continent are its compact outline, the absence of navigable rivers communicating with the interior, the absence of active volcanoes or snow-capped mountains, its isolation from other lands, and its antiquity. Some of the most profound changes that have taken place on this globe occurred in Mesozoic times, and a great portion of Australia was already dry land when vast tracts of Europe and Asia were submerged; in this sense, therefore, Australia has been rightly referred to as one of the oldest existing land surfaces. It has been described as at once the largest island and the smallest continent on the globe. The general contours exemplify the law of geographers in regard to continents, viz. as to their having a high border around a depressed interior, and the highest mountains on the side of the greatest ocean. On the N. Australia is bounded by the Timor Sea, the Arafura Sea and Torres Strait; on the E. by the Pacific Ocean; on the S. by Bass Strait and the Southern Ocean; and on the W. by the Indian Ocean. It stands up from the ocean depths in three fairly well-marked terraces. The basal plain of these terraces is the bed of the ocean, which on the Pacific side has an average depth of 15,000 ft. From this profound foundation rise Australia, New Guinea and Melanesia, in varying slopes. The first ledge rising from the ocean floor has a depth averaging 8000 ft. below sea-level. The outer edge of this ledge is roughly parallel to the coast of Western Australia, and more than 150 m. from the land. Round the Australian Bight it continues parallel to the coast, until south of Spencer Gulf (the basal ledge still averaging 8000 ft. in depth) it sweeps southwards to lat. 55°, and forms a submarine promontory 1000 m. long. The edge of the abysmal area comes close to the eastern coasts of Tasmania and New South Wales, approaching to within 60 m. of Cape Howe. The terrace closest to the land, known as the continental shelf, has an average depth of 600 ft., and connects Australia, New Guinea, and Tasmania in one unbroken sweep. Compared with other continents, the Australian continental shelf is extremely narrow, and there are points on the eastern coast where

General character.

the land plunges down to oceanic depths with an abruptness rarely paralleled. Off the Queensland coast the shelf broadens, its outer edge being lined by the seaward face of the Great Barrier Reef. From Torres Strait to Dampier Land the shelf spreads out, and connects Australia with New Guinea and the Malay Archipelago. An elongation of the shelf to the south joins Tasmania with the mainland. The vertical relief of the land above the ocean is a very important factor in determining the climate as well as the distribution of the fauna and flora of a continent.

The land mass of Australia rises to a mean height much less than that of any other continent; and the chief mountain systems are parallel to, and not far from, the coast-line. Thus, taking the continent as a whole, it may be described as a plateau, fringed by a low-lying well-watered coast, with a depressed, and for the most part arid, interior. A great plain, covering quite 500,000 sq. m., occupies a position a little to the east of a meridional line bisecting the continent, and south of the 22nd degree, but portions of it stretch upwards to the low-lying country south of the Gulf of Carpentaria. The contour of the continent in latitude 30° 5′ is as follows:—a short strip of coastal plain; then a sharp incline rising to a mountain range 4000 ft. above sea-level, at a distance of 40 m. from the coast. From this a gently-sloping plateau extends to almost due north of Spencer Gulf, at which point its height has fallen almost to sea-level. Then there is a gentle rise to the low steppes, 500 to 1000 ft. above sea-level. A further gentle rise in the high steppes leads to the mountains of the West Australian coast, and another strip of low-lying coastal land to the sea.

With a circumference of 8000 m. Australia presents a contour wonderfully devoid of inlets from the sea except on its northern shores, where the coast-line is largely indented. The Gulf of Carpentaria, situated in the north, is enclosed on the east by the projection of Cape York, and on the west by Arnheim Land, and forms the principal bay on the whole coast, measuring about 6° of long. by 6° of lat. Farther to the west, Van Diemen's Gulf, though much smaller, forms a better-protected bay, having Melville Island between it and the ocean; while beyond this, Queen's Channel and Cambridge Gulf form inlets about 14° 50′ S. On the north-west of the continent the coast-line is much broken, the chief indentations being Admiralty Gulf, Collier Bay and King Sound, on the shores of Tasman Land. Western Australia, again, is not favoured with many inlets, Exmouth Gulf and Shark's Bay being the only bays of any size. The same remark may be made of the rest of the sea-board; for, with the exception of Spencer Gulf, the Gulf of St Vincent and Port Phillip on the south, and Moreton Bay, Hervey Bay and Broad Sound on the east, the coast-line is singularly uniform. There are, however, numerous spacious harbours, especially on the eastern coast, which are referred to in the detailed articles dealing with the different states. The Great Barrier Reef forms the prominent feature off the north-east coast of Australia; its extent from north to south is 1200 m., and it is therefore the greatest of all coral reefs. The channel between the reef and the coast is in places 70 m. wide and 400 ft. deep. There are a few clear openings in the outer rampart which the reef presents to the ocean. These are opposite to the large estuaries of the Queensland rivers, and might be thought to have been caused by fresh water from the land. The breaks are, however, some 30 to 90 m. away from land and more probably were caused by subsidence; the old river-channels known to exist below sea-level, as well as the former land connexion with New Guinea, seem to point to the conditions assumed in Darwin's well-known subsidence theory, and any facts that appear to be inconsistent with the theory of a steady and prolonged subsidence are explainable by the assumption of a slight upheaval.

With the exception of Tasmania there are no important islands belonging geographically to Australia, for New Guinea, Timor and other islands of the East Indian archipelago, though not removed any great distance from the continent, do not belong to its system. On the east coast there are a few small and unimportant islands. In Bass Strait are Flinders Island, about 800 sq. m. in area, Clarke Island, and a few other small islands. Kangaroo Island, at the entrance of St Vincent Gulf, is one of the largest islands on the Australian coast, measuring 80 m. from east to west with an average width of 20 m. Numerous small islands lie off the western coast, but none has any commercial importance. On the north coast are Melville and Bathurst Islands; the former, which is 75 m. long and 38 m. broad, is fertile and well watered. These islands are opposite Port Darwin, and to the westward of the large inlet known as Van Diemen's Gulf. In the Gulf of Carpentaria are numerous islands, the largest bearing the Dutch name of Groote Eylandt.

Along the full length of the eastern coast extends a succession of mountain chains. The vast cordillera of the Great Dividing Range originates in the south-eastern corner of the continent, and runs parallel with and close to the eastern shore, through the states of Victoria and New South Wales, right up to the far-distant York Peninsula in Queensland. In Victoria the greatest elevation is reached in the peaks of Mount Bogong (6508 ft.) and Mount Feathertop (6303 ft.), both of which lie north of the Dividing Range; in the main range Mount Hotham (6100 ft.) and Mount Cobberas (6025 ft.) are the highest summits. In New South Wales, but close to the Victorian border, are found the loftiest peaks of Australia, Mount Kosciusco and Mount Townsend, rising to heights of 7328 and 7260 ft. respectively. The range is here called the Muniong, but farther north it receives the name of Monaro Range; the latter has a much reduced altitude, its average being only about 2000 ft. As the tableland runs northward it decreases both in height and width, until it narrows to a few miles only, with an elevation of scarcely 1500 ft.; under the name of the Blue Mountains the plateau widens again and increases in altitude, the chief peaks being Mount Clarence (4000 ft.), Mount Victoria (3525 ft.), and Mount Hay (3270 ft.). The Dividing Range decreases north of the Blue Mountains, until as a mere ridge it divides the waters of the coastal rivers from those flowing to the Darling. The mass widens out once more in the Liverpool Range, where the highest peak, Mount Oxley, reaches 4500 ft., and farther north, in the New England Range, Ben Lomond reaches an elevation of 5000 ft. Near the Queensland border, Mount Lindsay, in the Macpherson Range, rises to a height of 5500 ft. In the latitude of Brisbane the chain swerves inland; no other peak north of this reaches higher than Mount Bartle Frere in the Bellenden Ker Range (5438 ft.). The Southern Ocean system of the Victorian Dividing Range hardly attains to the dignity of high mountains. An eastern system in South Australia touches at a few points a height of 3000 ft.; and the Stirling Range, belonging to the south-western system of South Australia, reaches to 2340 ft. There are no mountains behind the Great Australian Bight. On the west the Darling Range faces the Indian Ocean, and extends from Point D'Entrecasteaux to the Murchison river. North of the Murchison, Mount Augustus and Mount Bruce, with their connecting highlands, cut off the coastal drainage from the interior; but no point on the north-west coast reaches a greater altitude than 4000 ft. Several minor ranges, the topography of which is little known, extend from Cambridge Gulf, behind a very much broken coast-line, to Limmen Bight on the Gulf of Carpentaria. Nothing is more remarkable than the contrast between the aspect of the coastal ranges on the north-east and on the south-east of the continent. The higher Australian peaks in the south-east look just what they are, the worn and denuded stumps of mountains, standing for untold ages above the sea. Their shoulders are lifted high above the tree-line. Their summits stand out gaunt and lonely in an unbroken solitude. Having left the tree-line far behind him, nothing is visible to the traveller for miles around but barren peaks and torn crags in indescribable confusion. A verdure of herbage clothes the valleys that have been scooped from the summits downwards. But there are no perpetual snow-fields, no glaciers creep down these valleys, and no alpine hamlets ever appear to break the monotony. The mountains of the north-east, on the contrary, are clothed to their summits with a rich and varied flora. Naked crags, when they do appear, lift themselves from a sea of green, and a tropical vegetation, quite Malaysian in character, covers everything.

Mountains.

The absence of active volcanoes in Australia is a state of things, in a geological sense, quite new to the continent. Some of the volcanoes of the western districts of Victoria have been in eruption probably subsequent to the advent of the black-fellow. In some instances the cones are quite intact, and the beds of ash and scoriae are as yet almost unaffected by denuding agencies. Late in the Tertiary period vast sheets of lava poured from many points of the Great Dividing Range of eastern Australia. But it is notable that all recent volcanic action was confined to a wide belt parallel to the coast. No evidences of recent lava flows can be found in the interior over the great alluvial plain, the Lower, or the Higher Steppes. Nor has the continent, as a whole, in recent times been subjected to any violent earth tremors; though in 1873, to the north of Lake Amadeus, in central Australia, Ernest Giles records the occurrence of earthquake shocks violent enough to dislodge considerable rock masses.

Australia possesses one mountain which, though not a volcano, is a "burning mountain." This is Mount Wingen, situated in a spur of the Liverpool Range and close to the town of Scone. Its fires are not volcanic, but result from the combustion of coal some distance underground, giving off much smoke and steam; geologists estimate that the burning has been going on for at least 800 years.

The coastal belt of Australia is everywhere well watered, with the exception of the country around the Great Australian Bight and Spencer Gulf. Flowing into the Pacific Ocean on the east coast there are some fine rivers, but the majority have short and rapid courses. In Queensland a succession of rivers falls into the Pacific from Cape York to the southern boundary of the state. The Burdekin is the finest of these, draining an area of 53,500 sq. m., and emptying into Upstart Bay; it receives numerous tributaries in its course, and carries a large body of fresh water even in the driest seasons. The Fitzroy river is the second in point of size; it drains an area of 55,600 sq. m., and receives several tributary streams during its course to Keppel Bay. The Brisbane river, falling into Moreton Bay, is important chiefly from the fact that the city of Brisbane is situated on its banks. In New South Wales there are several important rivers, the largest of which is the Hunter, draining 11,000 sq. m., and having a course of 200 m. Taking them from north to south, the principal rivers are the Richmond, Clarence,

Rivers.

Macleay, Hastings, Manning, Hunter, Hawkesbury and Shoalhaven. The Snowy river has the greater part of its course in New South Wales, but its mouth and the last 120 m. are in Victoria. The other rivers worth mentioning are the Yarra, entering the sea at Port Phillip, Hopkins and Glenelg. The Murray (*q.v.*), the greatest river of Australia, debouches into Lake Alexandrina, and thence into the sea at Encounter Bay in South Australia. There are no other rivers of importance in South Australia, but the Torrens and the Gawler may be mentioned. Westward of South Australia, on the shores of the Australian Bight, there is a stretch of country 300 m. in length unpierced by any streams, large or small, but west of the bight, towards Cape Leeuwin, some small rivers enter the sea. The south-west coast is watered by a few streams, but none of any size; amongst these is the Swan, upon which Perth, the capital of Western Australia, is built. Between the Swan and North-West Cape the principal rivers are the Greenough, Murchison and Gascoyne; on the north-west coast, the Ashburton, Fortescue and De Grey; and in the Kimberley district, the Fitzroy, Panton, Prince Regent and the Ord. In the Northern Territory are several fine rivers. The Victoria river is navigable for large vessels for a distance of about 43 m. from the sea, and small vessels may ascend for another 80 m. The Fitzmaurice, discharging into the estuary of the Victoria, is also a large stream. The Daly, which in its upper course is called the Katherine, is navigable for a considerable distance, and small vessels are able to ascend over 100 m. The Adelaide, discharging into Adam Bay, has been navigated by large vessels for about 38 m., and small vessels ascend still farther. The South Alligator river, flowing into Van Diemen's Gulf, is also a fine stream, navigable for over 30 m. by large vessels; the East Alligator river, falling into the same gulf, has been navigated for 40 m. Besides those mentioned, there are a number of smaller rivers discharging on the north coast, and on the west shore of the Gulf of Carpentaria the Roper river discharges itself into Limmen Bight. The Roper is a magnificent stream, navigable for about 75 or 80 m. by vessels of the largest tonnage, and light draught vessels can ascend 20 m. farther. Along the portion of the south shore of the Gulf of Carpentaria which belongs to Queensland and the east coast, many large rivers discharge their waters, amongst them the Norman, Flinders, Leichhardt, Albert and Gregory on the southern shore, and the Batavia, Archer, Coleman, Mitchell, Staaten and Gilbert on the eastern shore. The rivers flowing into the Gulf of Carpentaria, as well as those in the Northern Territory, drain country which is subject to regular monsoonal rains, and have the general characteristics of sub-tropical rivers.

The network of streams forming the tributaries of the Darling and Murray system give an idea of a well-watered country. The so-called rivers have a strong flow only after heavy rains, and some of them do not ever reach the main drainage line. Flood waters disappear often within a distance of a few miles, being absorbed by porous soil, stretches of sand, and sometimes by the underlying bed-rocks. In many cases the rivers as they approach the main stream break up into numerous branches, or spread their waters over vast flats. This is especially the case with the tributaries of the Darling on its left bank, where in seasons of great rains these rivers overspread their banks and flood the flat country for miles around and thus reach the main stream. Lieutenant John Oxley went down the Lachlan (1817) during one of these periods of flood, and the great plains appeared to him to be the fringe of a vast inland sea. As a matter of fact, they are an alluvial deposit spread out by the same flood waters. The great rivers of Australia, draining inland, carve out valleys, dissolve limestone, and spread out their deposit over the plains when the waters become too sluggish to bear their burden farther. From a geological standpoint, the Great Australian Plain and the fertile valley of the Nile have had a similar origin. Taking the Lachlan as one type of Australian river, we find it takes its rise amongst the precipitous and almost unexplored valleys of the Great Dividing Range. With the help of its tributaries it acts as a denuding agent for 14,000 sq. m. of country, and carries its burden of sediment westwards. A point is reached about 200 m. from the Dividing Range, where the river ceases to act as a denuding agent, and the area of deposition begins, at a level of 250 ft. above the sea, but before the waters can reach the ocean they have still to travel about 1000 m.

The Darling is reckoned amongst the longest rivers in the world, for it is navigable, part of the year, from Walgett to its confluence with the Murray, 1758 m., and then to the sea, a further distance of 587 m.—making in all 2345 m. of navigable water. But this gives no correct idea of the true character of the Darling, for it can hardly be said to drain its own watershed. From the sources of its various tributaries to the town of Bourke, the river may be described as draining a watershed. But from Bourke to the sea, 550 m. in a direct line, the river gives rather than receives water from the country it flows through.

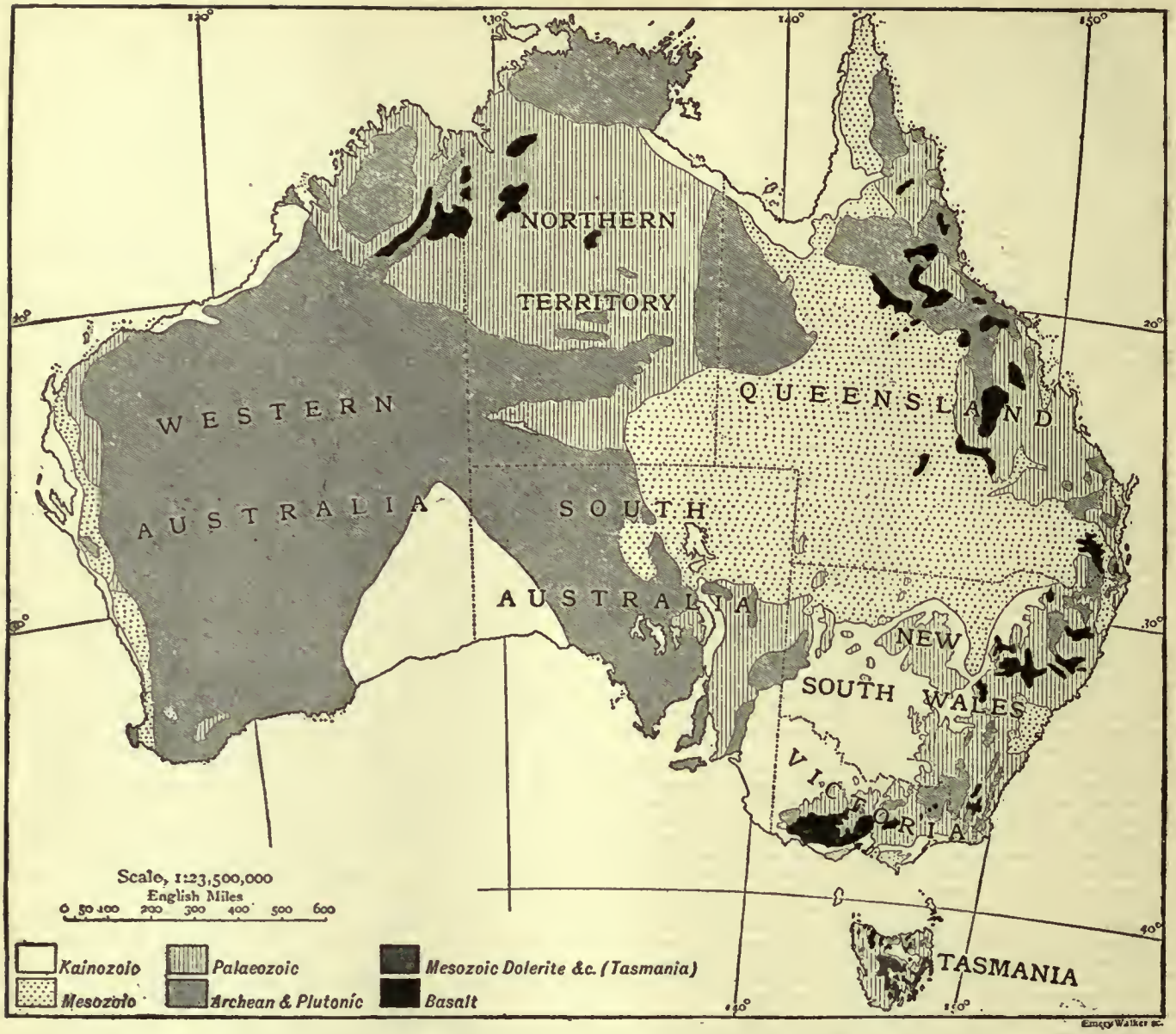
The annual rainfall and the area of the catchment afford no measure whatever as to the size of a river in the interior of Australia. The discharge of the Darling river at Bourke does not amount to more than 10 % of the rainfall over the country which it drains. It was this remarkable fact which first led to the idea that, as the rainfall could not be accounted for either by evaporation or by the river discharge, much of the 90 % unaccounted for must sink into the ground, and in part be absorbed by some underlying bed-rock. All Australian rivers, except the Murray and the Murrumbidgee, depend entirely and directly on the rainfall. They are flooded after rain, and in seasons of drought many of them, especially the tributaries of the Darling, become chains of ponds. Springs which would equalize the discharge of rivers by continuing to pour water into their beds after the rainy season has passed seem entirely absent in the interior. Nor are there any snowfields to feed rivers, as in the other continents. More remarkable still, over large tracts of country the water seems disposed to flow away from, rather than to, the river-beds. As the low-lying plains are altogether an alluvial deposit, the coarser sediments accumulate in the regions where the river first overflows its banks to spread out over the plains. The country nearest the river receiving the heaviest deposit becomes in this way the highest ground, and so continues until a "break-away" occurs, when a new river-bed is formed, and the same process of deposition and accumulation is repeated. As the general level of the country is raised by successive alluvial deposits, the more ancient river-beds become buried, but being still connected with the newer rivers at some point or other, they continue to absorb water. This underground network of old river-beds underlying the great alluvial plains must be filled to repletion before flood waters will flow over the surface. It is not surprising, therefore, that comparatively little of the rainfall over the vast extent of the great central plain ever reaches the sea by way of the river systems; indeed these systems as usually shown on the maps leave a false impression as to the actual condition of things.

The great alluvial plain is one of Australia's most notable inland features; its extent is upwards of 500,000 sq. m., lying east of 135° W. and extending right across the continent from the Gulf of Carpentaria to the Murray river. The interior of the continent west of 135° and north of the Musgrave ranges is usually termed by geographers the Australian Steppes. It is entirely different in all essential features from the great alluvial plains. Its prevailing aspect is characterized by flat and terraced hills, capped by desert sandstone, with stone-covered flats stretching over long distances. The country round Lake Eyre, where some of the land is actually below sea-level, comes under this heading. The higher steppes, as far as they are known, consist of Ordovician and Cambrian rocks, with an average elevation of 1500 to 3000 ft. above sea-level. Over this country water-courses are shown on maps. These run in wet seasons, but in every instance for a short distance only, and sooner or later they are lost in sand-hills, where their waters disappear and a line of stunted gum-trees (*Eucalyptus rostrata*) is all that is present to indicate that there may be even a soakage to mark the abandoned course. The steppes cover a surface of 400,000 sq. m., and from this vast expanse not a drop of the scanty rainfall reaches the sea; there is no leading drainage system and there are no rivers. Another notable feature of the interior is the so-called lake area, a district stretching to the north of Spencer Gulf. These lakes are expanses of brackish waters that spread or contract as the season is one of drought or rain. In seasons of drought they are hardly more than swamps and mud flats, which for a time may become a grassy plain, or desolate coast encrusted with salt. The country around is the dreariest imaginable, the surface is a dead level, there is no heavy timber and practically no settlement. Lake Torrens, the largest of these depressions, sometimes forms a sheet of water 100 m. in length. To the north again stretches Lake Eyre, and to the west Lake Gairdner. Some of these lake-beds are at or slightly below sea-level, so that a very slight depression of the land to the south of them would connect much of the interior with the Southern Ocean. (T. A. C.)

Steppes.

Lakes.

Geology.—The states of Australia are divided by natural boundaries, which separate geographical areas having different characters, owing, mainly, to their different geological structures. Hence the general stratigraphical geology can be most conveniently summarized for each state separately, dealing here with the geological history of Australia as a whole. Australia is essentially the fragment of a great plateau land of Archean rocks. It consists in the main of an Archean block or "coign," which still occupies nearly the whole of the western half of the continent, outcrops in north-eastern Queensland, forms the foundation of southern New South Wales and eastern Victoria, and is exposed in western Victoria, in Tasmania, and in the western flank of the Southern Alps of New Zealand. These areas of Archean rocks were doubtless once continuous. But they have been separated by the foundering of the Coral Sea and the Tasman Sea, which divided the continent of Australia from the islands of the Australasian festoon; and the foundering of the band across Australia, from the Gulf of Carpentaria, through western Queensland and western New South Wales, to the lower basin of the Murray, has separated the Archean areas of eastern and western Australia. The breaking up of the old Archean foundation block began in Cambrian and Ordovician times. A narrow Cambrian sea must have extended across central Australia from the Kimberley Goldfield in the north-west, through Tempe Downs and the Macdonnell chain in central Australia, to the South Australian highlands, central Victoria at Mansfield, and northern Tasmania. Cambrian rocks occur in each of these districts, and they are best developed in the South Australian highlands, where they include a long belt of contemporary glacial deposits. Marine Ordovician rocks were deposited along the same general course. They are best developed in the Macdonnell chain in



central Australia and in Victoria, where the fullest sequence is known; while they also extended north-eastward from Victoria into New South Wales, where, as yet, no Cambrian rocks have been found. The Silurian system was marked by the retreat of the sea from central Australia; but the sea still covered a band across Victoria, from the coast to the Murray basin, passing to the east of Melbourne. This Silurian sea was less extensive than the Ordovician in Victoria; but it appears to have been wider in New South Wales and in Queensland. The best Silurian sequence is in New South Wales. Silurian rocks are well developed in western Tasmania, and the Silurian sea must have washed the south-western corner of the continent, if the rocks of the Stirling Range be rightly identified as of this age.

The Devonian system includes a complex series of deposits, which are of most interest in eastern Australia. This period was marked by intense earth movements, which affected the whole of the east Australian highlands. The Lower Devonian beds are in the main terrestrial, or coarse littoral deposits, and volcanic rocks. The Middle Devonian was marked by the same great transgression as in Europe and America; it produced inland seas, extending into Victoria, New South Wales and Queensland, in which were deposited limestones with a rich coral fauna. The Upper Devonian was a period of marine retreat; the crustal disturbances of the Lower Devonian were renewed and great quartz-pebble beaches were formed on the rising shore lines, producing the West Coast Range conglomerates of Tasmania, and the similar rocks to the south-east of Mansfield in Victoria. Intrusions of granitic *massifs* in the Devonian period formed the primitive mountain axis of Victoria, which extends east and west across the state and forms the nucleus of the Victorian highlands. Similar granitic intrusions occurred in New South Wales and Queensland, and built up a mountain chain, which ran north and south across the continent; its worn-down stumps now form the east Australian highlands.

The Carboniferous period began with a marine transgression, enabling limestones to form in Tasmania and New South Wales; and at the same time the sea first got in along the western edge of the western plateau, depositing the Carboniferous rocks of the Gascoyne basin and the coastal plain of north-western Australia. The Upper Carboniferous period was in the main terrestrial, and during it were laid down the coal-seams of New South Wales; they are best developed in the basin of the Hunter river, and they extend southward, covered by Mesozoic deposits, beyond Sydney. The Coal Measures become narrower in the south, until, owing to the eastward projection of the highlands, the Lower Palaeozoic rocks reach the coast. The coal-seams must have been formed in well-watered, lowland forests, at the foot of a high mountain range, built up by the Devonian earth movements. The mountains both in Victoria and New South Wales were snow-capped, and glaciers flowed down their flanks and laid down Carboniferous glacial deposits, which are still preserved in basins that flank the mountain ranges, such as the famous conglomerates of Bacchus Marsh, Heathcote and the Loddon valley in Victoria, and of Branxton and other localities in New South Wales. The age of the glacial deposits is later than the *Glossopteris* flora and occurs early in the time of the *Gangamopteris* flora. Kitson's work in Tasmania shows that there also the glacial beds may be correlated with the lower or Greta Coal Measures of New South Wales.

The Permian deposits are best developed in New South Wales and Tasmania, where their characters show the continuation of the Carboniferous conditions. The Mesozoic begins with a Triassic land period in the mainland of Australia; while the islands of the Australasian festoon contain the Triassic marine limestones, which fringe

the whole of the Pacific. The Triassic beds are best known in New South Wales, where round Sydney they include a series of sandstones and shales. They also occur in northern Tasmania.

The Jurassic system is represented by two types. In Victoria, Tasmania, northern New South Wales and Queensland, there are Jurassic terrestrial deposits, containing the coal seams of Victoria, of the Clarence basin of north-eastern New South Wales, and of the Ipswich series in Queensland; the same beds range far inland on the western slopes of the east Australian highlands in New South Wales and Queensland and they occur, with coal-seams, at Leigh's Creek, at the northern foot of the South Australian highlands. They are also preserved in basins on the western plateau, as shown by brown coal deposits passed through in the Lake Phillipson bore. The second and marine type of the Jurassics occurs in Western Australia, on the coastal plain skirting the western foot of the western plateau.

The Cretaceous period was initiated by the subsidence of a large area to the south of the Gulf of Carpentaria, whereby a Lower Cretaceous sea spread southward, across western Queensland, western New South Wales and the north-eastern districts of South Australia. In this sea were laid down the shales of the Rolling Downs formation. The sea does not appear to have extended completely across Australia, breaking it into halves, for a projection from the Archean plateau of Western Australia extended as far east as the South Australian highlands, and thence probably continued eastward, till it joined the Victorian highlands. The Cretaceous sea gradually receded and the plains of the Rolling Downs formation formed on its floor were covered by the sub-aerial and lacustrine deposits of the Desert Sandstone.

The Kainozoic period opened with fresh earth movements, the most striking evidence of which are the volcanic outbreaks all round the Australian coasts. These movements in the south-east formed the Great Valley of Victoria, which traverses nearly the whole of the state between the Victorian highlands to the north, and the Jurassic sandstones of the Otway Ranges and the hills of south Gippsland. In this valley were laid down, either in Eocene or Oligocene times, a great series of lake beds and thick accumulations of brown coal. Similar deposits, of approximately the same age, occur in Tasmania and New Zealand; and at about the same time there began the Kainozoic volcanic period of Australasia. The first eruptions piled up huge domes of lavas rich in soda, including the geburite-dacites and sölvsbergites of Mount Macedon in Victoria, and the kenyte and tephrite domes of Dunedin, in New Zealand. These rocks were followed by the outpouring of the extensive older basalts in the Great Valley of Victoria and on the highlands of eastern Victoria, and also in New South Wales and Queensland. Then followed a marine transgression along most of the southern coast of Australia. The sea encroached far on the land from the Great Australian Bight and there formed the limestones of the Nullarbor Plains. The sea extended up the Murray basin into the western plains of New South Wales. Farther east the sea was interrupted by the still existing land-connexion between Tasmania and Victoria; but beyond it, the marine deposits are found again, fringing the coasts of eastern Gippsland and Croajingolong. These marine deposits are not found anywhere along the eastern coast of Australia; but they occur, and reach about the same height above sea-level, in New Guinea, and are widely developed in New Zealand. No doubt eastern Australia then extended far out into the Tasman Sea. The great monoclinal fold which formed the eastern face of the east Australian highlands, west of Sydney, is of later age. After this marine period was brought to a close the sea retreated. Tasmania and Victoria were separated by the foundering of Bass Strait, and at the same time the formation of the rift valley of Spencer Gulf, and Lake Torrens, isolated the South Australian highlands from the Eyre Peninsula and the Westralian plateau. Earth movements are still taking place both along Bass Strait and the Great Valley of South Australia, and apparently along the whole length of the southern coast of Australia.

The Flowing Wells of Central Australia.—The clays of the Rolling Downs formation overlie a series of sands and drifts, saturated with water under high pressure, which discharges at the surface as a flowing well, when a borehole pierces the impermeable cover. The first of these wells was opened at Kallara in the west of New South Wales in 1880. In 1882, Dr W. L. Jack concluded that western Queensland might be a deep artesian basin. The Blackhall bore, put down at his advice from 1885 to 1888, reached a water-bearing layer at the depth of 1645 ft. and discharged 291,000 gallons a day. It was the first of the deep artesian wells of the continent. As the plains on the Rolling Downs formation are mostly waterless, the discovery of this deep reservoir of water has been of great aid in the development of central Australia. In Queensland to the 30th of June 1904, 973 wells had been sunk, of which 596 were flowing wells, and the total flow was 62,635,722 cub. ft. a day. The deepest well is that at Whitewood, 5046 ft. deep. In New South Wales by the 30th of June 1903, the government had put down 101 bores producing 66 flowing wells and 22 sub-artesian wells, with a total discharge of 54,000,000 gallons a day; and there were also 144 successful private wells. In South Australia there are 38 deep bores, from 20 of which there is a flow of 6,250,000 gallons a day.

The wells were first called artesian in the belief that the ascent of the water in them was due to the hydrostatic pressure of water at a higher level in the Queensland hills. The well-water was supposed to have percolated underground, through the Blythesdale Braystone, which outcrops in patches on the eastern edge of the Rolling Downs formation. But the Blythesdale Braystone is a small local formation, unable to supply all the wells that have been sunk; and many of the wells derive their water from the Jurassic shales and mudstones. The difference in level between the outcrop of the assumed eastern intake and of the wells is often so small, in comparison with their distance apart, that the friction would completely sop up the whole of the available hydrostatic head. Many of the well-waters contain gases; thus the town of Roma is lighted by natural gas which escapes from its well. The chemical characters of the well-waters, the irregular distribution of the water-pressure, the distribution of the underground thermal gradients, and the occurrence in some of the wells of a tidal rise and fall of a varying period, are facts which are not explained on the simple hydrostatic theory. J. W. Gregory has maintained (*Dead Heart of Australia*, 1906, pp. 273-341) that the ascent of water in these wells is due to the tension of the included gases and the pressure of overlying sheets of rocks, and that some of the water is of plutonic origin.[1] (J. W. G.)

Climate.—The Australian continent, extending over 28° of latitude, might be expected to show a considerable diversity of climate. In reality, however, it experiences fewer climatic variations than the other great continents, owing to its distance (28°) from the Antarctic circle and (11°) from the equator. There is, besides, a powerful determining cause in the uniform character and undivided extent of its dry interior. The plains and steppes already described lie either within or close to the tropics. They present to the fierce play of the sun almost a level surface, so that during the day that surface becomes intensely heated and at night gives off its heat by radiation. Ordinarily the alternate expansion and contraction of the atmosphere which takes place under such circumstances would draw in a supply of moisture from the ocean, but the heated interior, covering some 900,000 sq. m., is so immense, that the moist air from the ocean does not come in sufficient supply, nor are there mountain chains to intercept the clouds which from time to time are formed; so that two-fifths of Australia, comprising a region stretching from the Australian Bight to 20° S. and from 117° to 142° E., receives less than an average of 10 in. of rain throughout the year, and a considerable portion of this region has less than 5 in. No part of Victoria and very little of Queensland and New South Wales lie within this area. The rest of the continent may be considered as well watered. The north-west coast, particularly the portions north of Cambridge Gulf and the shores of the Gulf of Carpentaria, are favoured with an annual visitation of the monsoon from December to March, penetrating as far as 500 m. into the continent, and sweeping sometimes across western and southern Queensland to the northern interior of New South Wales. It is this tropical downpour that fills and floods the rivers flowing into Lake Eyre and those falling into the Darling on its right bank. The whole of the east coast of the continent is well watered. From Cape York almost to the tropic of Capricorn the rainfall exceeds 50 in. and ranges to over 70 in. At Brisbane the fall is 50 in., and portions of the New South Wales coast receive a like quantity, but speaking generally the fall is from 30 in. to 40 in. The southern shores of the continent receive much less rain. From Cape Howe to Melbourne the fall may be taken at from 30 in. to 40 in., Melbourne itself having an average of 25·6 in. West of Port Phillip the fall is less, averaging 20 in. to 30 in., diminishing greatly away from the coast. Along the shores of Encounter Bay and St Vincent and Spencer Gulfs, the precipitation ranges from 10 to 20 in., the yearly rainfall at Adelaide is a little less than 21 in., while the head of Spencer Gulf is within the 5 to 10 in. district. The rest of the southern coast west as far as 124° E., with the exception of the southern projection of Eyre Peninsula, which receives from 10 to 20 in., belongs to the

[1] The literature of the geology of Australia is enumerated, to 1884, in the bibliography by Etheridge and Jack. A general summary of the stratigraphical geology was given by R. Tate, *Rep. Austral. Assoc. Adv. Sci.* vol. v. (1893), pp. 1-69. References to the chief sources of information regarding the states is given under each of them. A geological map of the whole continent, on the scale of 50 m. to the inch, was compiled by A. Everett, and issued in 1887 in six sheets, by the Geological Survey of Victoria.

district with from 5 to 10 in. annual rainfall. The south-western angle of the continent, bounded by a line drawn diagonally from Jurien river to Cape Riche, has an average of from 30 to 40 in. annual rainfall, diminishing to about 20 to 30 in. in the country along the diagonal line. The remainder of the south and west coast from 124° E. to York Sound in the Kimberley district for a distance of some 150 m. inland has a fall ranging from 10 to 20 in. The 10 to 20 in. rainfall band circles across the continent through the middle of the Northern Territory, embraces the entire centre and south-west of Queensland, with the exception of the extreme south-western angle of the state, and includes the whole of the interior of New South Wales to a line about 200 m. from the coast, as well as the western and northern portions of Victoria and South Australia south of the Murray.

The area of Australia subject to a rainfall of from 10 to 20 in. is 843,000 sq. m. On the seaward side of this area in the north and east is the 20 to 30 in. annual rainfall area, and still nearer the sea are the exceptionally well-watered districts. The following table shows the area of the rainfall zones in square miles:—

Rainfall.	Rainfall Areas in sq. m.
Under 10 inches	1,219,600
10 to 20 ,,	843,100
20 to 30 ,,	399,900
30 to 40 ,,	225,700
40 to 50 ,,	140,300
50 to 60 ,,	47,900
60 to 70 ,,	56,100
Over 70 ,,	14,100
Total	2,946,700

The tropic of Capricorn divides Australia into two parts. Of these the northern or intertropical portion contains 1,145,000 sq. m., comprising half of Queensland, the Northern Territory, and the north-western divisions of Western Australia. The whole of New South Wales, Victoria and South Australia proper, half of Queensland, and more than half of Western Australia, comprising 1,801,700 sq. m., are without the tropics. In a region so extensive very great varieties of climate are naturally to be expected, but it may be stated as a general law that the climate of Australia is milder than that of corresponding lands in the northern hemisphere. During July, which is the coldest month in southern latitudes, one-half of Australia has a mean temperature ranging from 45° to 61°, and the other half from 62° to 80°. The following are the areas subject to the various average temperatures during the month referred to:—

Temperature Fahr.	Area in sq. m.
45°-50°	18,800
50°-55°	506,300
55°-60°	681,800
60°-65°	834,400
65°-70°	515,000
70°-75°	275,900
75°-80°	24,500

The temperature in December ranges from 60° to above 95° Fahr., half of Australia having a mean temperature below 84°. Dividing the land into zones of average summer temperature, the following are the areas which would fall to each:—

Temperature Fahr.	Area in sq. m.
60°-65°	67,800
65°-70°	63,700
70°-75°	352,300
75°-80°	439,200
80°-85°	733,600
85°-90°	570,600
90°-95°	584,100
95° and over	135,400

Judging from the figures just given, it must be conceded that a considerable area of the continent is not adapted for colonization by European races. The region with a mean summer temperature in excess of 95° Fahr. is the interior of the Northern Territory north of the 20th parallel; and the whole of the country, excepting the seaboard, lying between the meridians of 120° and 140°, and north of the 25th parallel, has a mean temperature in excess of 90° Fahr.

The area of Australia is so large that the characteristics of its climate will not be understood without reference to the individual states. About one-half of the colony of Queensland lies in the tropics, the remaining area lying between the tropic and 29° S. The temperature, however, has a daily range less than that of other countries under the same isothermal lines. This circumstance is due to the sea-breezes, which blow with great regularity, and temper what would otherwise be an excessive heat. The hot winds which prevail during the summer in some of the other colonies are unknown in Queensland. Of course, in a territory of such large extent there are many varieties of climate, and the heat is greater along the coast than on the elevated lands of the interior. In the northern parts of the colony the high temperature is very trying to persons of European descent. The mean temperature at Brisbane, during December, January and February, is about 76°, while during the months of June, July and August it averages about 60°. Brisbane, however, is situated near the extreme southern end of the colony, and its average temperature is considerably less than that of many of the towns farther north. Thus the winter in Rockhampton averages nearly 65°, while the summer heat rises almost to 85°; and at Townsville and Normanton the average temperature is still higher. The average rainfall along the coast is high, especially in the north, where it ranges from 60 to 70 in. per annum, and along a strip of country south from Cape Melville to Rockingham Bay the average rainfall exceeds 70 in. At Brisbane the rainfall is about 50 in., taking an average of forty years. A large area of the interior is watered to the extent of 20 to 30 in. per annum, but in the west and south, more remote than from 250 to 300 m., there is a rainfall of less than 20 in.

Queensland.

Climatically, New South Wales is divided into three marked divisions. The coastal region has an average summer temperature ranging from 78° in the north to 67° in the south, with a winter temperature of from 59° to 52°. Taking the district generally, the difference between the mean summer and mean winter temperatures may be set down as averaging not more than 20°, a range smaller than is found in most other parts of the world. Sydney, situated in latitude 33°51′S., has a mean temperature of 62·9° Fahr., which corresponds with that of Barcelona in Spain and of Toulon in France, the former of these being in latitude 41° 22′ N. and the latter in 43°7′ N. At Sydney the mean summer temperature is 70·8° Fahr., and that of winter 53·9°. The range is thus 16·9° Fahr. At Naples, where the mean temperature for the year is about the same as at Sydney, the summer temperature reaches a mean of 74·4°, and the mean of winter is 47·6°, with a range 26·8°. The mean temperature of Sydney for a long series of years was spring 62°, summer 71°, autumn 64°, winter 54°.

New South Wales.

Passing from the coast to the tableland, a distinct climatic region is entered. Cooma, with a mean summer temperature of 65·4°, and a mean winter temperature of 41·4°, may be taken as illustrative of the climate of the southern tableland, and Armidale of the northern. The yearly average temperature of the latter is scarcely 65·5°, while the summer only reaches 67·7°, and the winter falls to 44·4°.

The climatic conditions of the western districts of the state are entirely different from those of the other two regions. The summer is hot, but on the whole the climate is very healthy. The town of Bourke, lying on the upper Darling, may be taken as an example of many of the interior districts, and illustrates peculiarly well the defects as well as the excellencies of the climate of the whole region. Bourke has exactly the same latitude as Cairo, yet its mean summer temperature is 1·3° less, and its mean annual temperature 4° less than that of the Egyptian city. New Orleans, also on the same parallel is, 4° hotter in summer. As regards winter temperature Bourke leaves little to be desired. The mean winter reading of the thermometer is 54·7, and accompanied as this is by clear skies and an absence of snow, the season is both pleasant and invigorating. The rainfall of New South Wales ranges from an annual average of 64 in. at various points on the northern coast, and at Kiandra in the Monaro district, to 9 in. at Milparinka in the trans-Darling district. The coastal districts average about 42 in. per annum, the tablelands 32 in., and the western interior has an average as low as 20 in. At Sydney, the average rainfall, since observations were commenced, has been 50 in.

Victoria.

The climate of Victoria does not differ greatly from that of New South Wales. The heat, however, is generally less intense in summer, and the cold greater in winter. Melbourne, which stands in latitude 37° 50′ S., has a mean temperature of 57·3°, and therefore corresponds with Washington in the United States, Madrid, Lisbon and Messina. The difference between summer and winter is, however, less at Melbourne than at any of the places mentioned, the result of a long series of observations being spring 57°, summer 65·3°, autumn 58·7°, and winter 49·2°. The highest recorded temperature in the shade at Melbourne is 110·7°, and the lowest 27°, but it is rare for the summer heat to exceed 85°, or for the winter temperature in the daytime to fall below 40°. Ballarat, the second city of Victoria, lies above 100 m. west from Melbourne at a height of 1400 ft. above sea-level. It has a minimum temperature of 29°, and a maximum of 104·5°, the average yearly mean being 54·1°. The rainfall of Melbourne averages 25·58 in., the mean number of rainy days being 131.

South Australia.

South Australia proper extends over 26 degrees of latitude, and naturally presents considerable variations of climate. The coldest months are June, July and August, during which the temperature is very agreeable, averaging 53·6°, 51·7°, and 54° in those months respectively. On the plains slight frosts occur occasionally, and ice is sometimes seen on the

highlands. In summer the sun has great power, and the temperature reaches 100° in the shade, with hot winds blowing from the interior. The weather on the whole is remarkably dry. At Adelaide there are on an average 120 rainy days per annum, with a mean rainfall of 20·88 in. The country is naturally very healthful, as evidence of which may be mentioned that no great epidemic has ever visited the state.

Western Australia has practically only two seasons, the winter or wet season, which commences in April and ends in October, and the summer or dry season, which comprises the remainder of the year. During the wet season frequent and heavy rains fall, and thunderstorms, with sharp showers, occur in the summer, especially on the north-west coast, which is sometimes visited by hurricanes of great violence. In the southern and early-settled parts of the state the mean temperature is about 64°, but in the more northern portions the heat is excessive, though the dryness of the atmosphere makes it preferable to moist tropical climates. The average rainfall at Perth is 33 in. per annum. ***Western Australia.***

The climate of the Northern Territory is extremely hot, except on the elevated tablelands; altogether, the temperature of this part of the continent is very similar to that of northern Queensland, and the climate is not favourable to Europeans. The rainfall in the extreme north, especially in January and February, is very heavy, and the annual average along the coast is about 63 in. The whole of the peninsula north of 15° S. has a rainfall considerably exceeding 40 in. This region is backed by a belt of about 100 m. wide, in which the rainfall is from 30 to 40 in., from which inwards the rainfall gradually declines until between Central Mount Stuart and Macdonnell ranges it falls to between 5 and 10 in.

Fauna and Flora.—The origin of the fauna and flora of Australia has attracted considerable attention. Much accumulated evidence, biological and geological, has pointed to a southern extension of India, an eastern extension of South Africa, and a western extension of Australia into the Indian Ocean. The comparative richness of proteaceous plants in Western Australia and South Africa first suggested a common source for these primitive types. Dr H. O. Forbes drew attention to a certain community amongst birds and other vertebrates, invertebrates, and amongst plants, on all the lands stretching towards the south pole. A theory was therefore propounded that these known types were all derived from a continent which has been named Antarctica. The supposed continent extended across the south pole, practically joining Australia and South America. Just as we have evidence of a former mild climate in the arctic regions, so a similar mild climate has been postulated for Antarctica. Modern naturalists consider that many of the problems of Australia's remarkable fauna and flora can be best explained by the following hypothesis:—The region now covered by the antarctic ice-cap was in early Tertiary times favoured by a mild climate; here lay an antarctic continent or archipelago. From an area corresponding to what is now South America there entered a fauna and flora, which, after undergoing modification, passed by way of Tasmania to Australia. These immigrants then developed, with some exceptions, into the present Australian flora and fauna. This theory has advanced from the position of a disparaged heresy to acceptance by leading thinkers. The discovery as fossil, in South America, of primitive or ancestral forms of marsupials has given it much support. One of these, *Prothylacinus*, is regarded as the forerunner of the marsupial wolf of Tasmania. An interesting link between divergent marsupial families, still living in Ecuador, the *Coenolestes*, is another discovery of recent years. On the Australian side the fact that Tasmania is richest in marsupial types indicates the gate by which they entered. It is not to be supposed that this antarctic element, to which Professor Tate has applied the name *Euronotian*, entered a desert barren of all life. Previous to its arrival Australia doubtless possessed considerable vegetation and a scanty fauna, chiefly invertebrate. At a comparatively recent date Australia received its third and newest constituent. The islands of Torres Strait have been shown to be the denuded remnant of a former extension of Cape York peninsula in North Queensland. Previous to the existence of the strait, and across its site, there poured into Australia a wealth of Papuan forms. Along the Pacific slope of the Queensland Cordillera these found in soil and climate a congenial home. Among the plants the wild banana, pepper, orange and mangosteen, rhododendron, epiphytic orchids and the palm; among mammals the bats and rats; among birds the cassowary and rifle birds; and among reptiles the crocodile and tree snakes, characterize this element. The numerous facts, geological, geographical and biological, which when linked together lend great support to this theory, have been well worked out in Australia by Mr Charles Hedley of the Australian Museum, Sydney.

The zoology of Australia and Tasmania presents a very conspicuous point of difference from that of other regions of the globe, in the prevalence of non-placental mammalia. The vast majority of the mammalia are provided with an organ in the uterus, by which, before the birth of their young, a vascular connexion is maintained between the embryo and the parent animal. There are two orders, the Marsupialia and the Monotremata, which do not possess this organ; both these are found in Australia, to which region indeed they are not absolutely confined. ***Fauna.***

The geographical limits of the marsupials are very interesting. The opossums of America are marsupials, though not showing anomalies as great as kangaroos and bandicoots (in their feet), and *Myrmecobius* (in the number of teeth). Except the opossums, no single living marsupial is known outside the Australian zoological region. The forms of life characteristic of India and the Malay peninsula come down to the island of Bali. Bali is separated from Lombok by a strait not more than 15 m. wide. Yet this narrow belt of water is the boundary line between the Australasian and the Indian regions. The zoological boundary passing through the Bali Strait is called "Wallace's line," after the eminent naturalist who was its discoverer. He showed that not only as regards beasts, but also as regards birds, these regions are thus sharply limited. Australia, he pointed out, has no woodpeckers and no pheasants, which are widely-spread Indian birds. Instead of these it has mound-making turkeys, honey-suckers, cockatoos and brush-tongued lories, all of which are found nowhere else in the world.

The marsupials constitute two-thirds of all the Australian species of mammals. It is the well-known peculiarity of this order that the female has a pouch or fold of skin upon her abdomen, in which she can place the young for suckling within reach of her teats. The opossum of America is the only species out of Australasia which is thus provided. Australia is inhabited by at least 110 different species of marsupials, which is about two-thirds of the known species; these have been arranged in five tribes, according to the food they eat, viz., the grass-eaters (kangaroos), the root-eaters (wombats), the insect-eaters (bandicoots), the flesh-eaters (native cats and rats), and the fruit-eaters (phalangers).

The kangaroo (*Macropus*) lives in droves in the open grassy plains. Several smaller forms of the same general appearance are known as wallabies, and are common everywhere. The kangaroo and most of its congeners show an extraordinary disproportion of the hind limbs to the fore part of the body. The rock wallabies again have short tarsi of the hind legs, with a long pliable tail for climbing, like that of the tree kangaroo of New Guinea, or that of the jerboa. Of the larger kangaroos, which attain a weight of 200 lb and more, eight species are named, only one of which is found in Western Australia. Fossil bones of extinct kangaroo species are met with; these kangaroos must have been of enormous size, twice or thrice that of any species now living.

There are some twenty smaller species in Australia and Tasmania, besides the rock wallabies and the hare kangaroos; these last are wonderfully swift, making clear jumps 8 or 10 ft. high. Other terrestrial marsupials are the wombat (*Phascolomys*), a large, clumsy, burrowing animal, not unlike a pig, which attains a weight of from 60 to 100 lb; the bandicoot (*Perameles*), a rat-like creature whose depredations annoy the agriculturist; the native cat (*Dasyurus*), noted robber of the poultry yard; the Tasmanian wolf (*Thylacinus*), which preys on large game; and the recently discovered *Notoryctes*, a small animal which burrows like a mole in the desert of the interior. Arboreal species include the well-known opossums (*Phalanger*); the extraordinary tree-kangaroo of the Queensland tropics; the flying squirrel, which expands a membrane between the legs and arms, and by its aid makes long sailing jumps from tree to tree; and the native bear (*Phascolarctos*), an animal with no affinities to the bear, and having a long soft fur and no tail.

The *Myrmecobius* of Western Australia is a bushy-tailed ant-eater about the size of a squirrel, and from its lineage and structure of more than passing interest. It is, Mivart remarks, a survival of a very ancient state of things. It had ancestors in a flourishing condition during the Secondary epoch. Its congeners even then lived in England, as is proved by the fact that their relics have been found in the Stonesfield oolitic rocks, the deposition of which is separated from that which gave rise to the Paris Tertiary strata by an abyss of past time which we cannot venture to express even in thousands of years.

We pass on to the other curious order of non-placental mammals, that of the Monotremata, so called from the structure of their organs of evacuation with a single orifice, as in birds. Their abdominal bones are like those of the marsupials; and they are furnished with pouches for their young, but have no teats, the milk being distilled into their pouches from the mammary glands. Australia and Tasmania possess two animals of this order—the echidna, or »piny

ant-eater (hairy in Tasmania), and the *Platypus anatinus*, the duck-billed water mole, otherwise named the *Ornithorhynchus paradoxus*. This odd animal is provided with a bill or beak, which is not, like that of a bird, affixed to the skeleton, but is merely attached to the skin and muscles.

Australia has no apes, monkeys or baboons, and no ruminant beasts. The comparatively few indigenous placental mammals, besides the dingo or wild dog—which, however, may have come from the islands north of this continent—are of the bat tribe and of the rodent or rat tribe. There are four species of large fruit-eating bats, called flying foxes, twenty of insect-eating bats, above twenty of land-rats, and five of water-rats. The sea produces three different seals, which often ascend rivers from the coast, and can live in lagoons of fresh water; many cetaceans, besides the "right whale" and sperm whale; and the dugong, found on the northern shores, which yields a valuable medicinal oil.

The birds of Australia in their number and variety of species may be deemed some compensation for its poverty of mammals; yet it will not stand comparison in this respect with regions of Africa and South America in the same latitudes. The black swan was thought remarkable when discovered, as belying an old Latin proverb. There is also a white eagle. The vulture is wanting. Sixty species of parrots, some of them very handsome, are found in Australia. The emu corresponds with the African and Arabian ostrich, the rhea of South America, and the cassowary of the Moluccas and New Guinea. In New Zealand this group is represented by the apteryx, as it formerly was by the gigantic moa, the remains of which have been found likewise in Queensland. The graceful *Menura superba*, or lyre-bird, with its tail feathers spread in the shape of a lyre, is a very characteristic form. The mound-raising megapodes, the bower-building satin-birds, and several others, display peculiar habits. The honey-eaters present a great diversity of plumage. There are also many kinds of game birds, pigeons, ducks, geese, plovers and quails. The ornithology of New South Wales and Queensland is more varied and interesting than that of the other provinces.

As for reptiles, Australia has a few tortoises, all of one family, and not of great size. The "leathery turtle," which is herbivorous, and yields abundance of oil, has been caught at sea off the Illawarra coast so large as 9 ft. in length. The saurians or lizards are numerous, chiefly on dry sandy or rocky ground in the tropical region. The great crocodile of Queensland has been known to attain a length of 30 ft.; there is a smaller one about 6 ft. in length to be met with in the shallow lagoons of the interior of the Northern Territory. Lizards occur in great profusion and variety. The monitor, or fork-tongued lizard, which burrows in the earth, climbs and swims, is said to grow to a length of 8 to 9 ft. This species and many others do not extend to Tasmania. The monitor is popularly known as the goanna, a name derived from the iguana, an entirely different animal. There are about twenty kinds of night-lizards, and many which hibernate. One species can utter a cry when pained or alarmed, and the tall-standing frilled lizard can lift its forelegs, and squat or hop like a kangaroo. There is also the *Moloch horridus* of South and Western Australia, covered with tubercles bearing large spines, which give it a very strange aspect. This and some other lizards have power to change their colour, not only from light to dark, but over some portions of their bodies, from yellow to grey or red. Frogs of many kinds are plentiful, the brilliant green frogs being especially conspicuous and noisy. Australia is rich in snakes, and has more than a hundred different kinds. Most of these are venomous, but all are not equally dreaded. Five rather common species are certainly deadly—the death adder, the brown, the black, the superb and the tiger snakes. During the colder months these reptiles remain in a torpid state. No certain cure has been or is likely to be discovered for their poison, but in less serious cases strychnine has been used with advantage. In tropical waters a sea snake is found, which, though very poisonous, rarely bites. Among the inoffensive species are counted the graceful green "tree snake," which pursues frogs, birds and lizards to the topmost branches of the forest; also several species of pythons, the commonest of which is known as the carpet snake. These great reptiles may attain a length of 10 ft.; they feed on small animals which they crush to death in their folds.

The Australian seas are inhabited by many fishes of the same genera as exist in the southern parts of Asia and Africa. Of those peculiar to Australian waters may be mentioned the arripis, represented by what is called among the colonists a salmon trout. A very fine fresh-water fish is the Murray cod, which sometimes weighs 100 lb; and the golden perch, found in the same river, has rare beauty of colour. Among the sea fish, the schnapper is of great value as an article of food, and its weight comes up to 50 lb. This is the *Pagrus unicolor*, of the family of *Sparidae*, which includes also the bream. Its colours are beautiful, pink and red with a silvery gloss; but the male as it grows old takes on a singular deformity of the head, with a swelling in the shape of a monstrous human-like nose. These fish frequent rocky shoals off the eastern coast and are caught in numbers outside Port Jackson for the Sydney market. Two species of mackerel, differing somewhat from the European species, are also caught on the coasts. The so-called red garnet, a pretty fish, with hues of carmine and blue stripes on its head, is much esteemed for the table. The *Trigla polyommata*, or flying garnet, is a greater beauty, with its body of crimson and silver, and its large pectoral fins, spread like wings, of a rich green, bordered with purple, and relieved by a black and white spot. Whiting, mullet, gar-fish, rock-cod and many others known by local names, are in the lists of edible fishes belonging to New South Wales and Victoria. Oysters abound on the eastern coast, and on the shelving banks of a vast extent of the northern coast the pearl oyster is the source of a considerable industry.

Two existing fishes may be mentioned as ranking in interest with the *Myrmecobius* (ant-eater) in the eyes of the naturalist. These are the *Ceratodus Forsteri* and the Port Jackson shark. The "mud-fish" of Queensland (*Ceratodus Forsteri*) belongs to an ancient order of fishes—the Dipnoi, only a few species of which have survived from past geological periods. The Dipnoi show a distinct transition between fishes and amphibia. So far the mud-fish has been found only in the Mary and the Burnett rivers. Hardly of less scientific interest is the Port Jackson shark (*Heterodontus*). It is a harmless helmeted ground-shark, living on molluscs, and almost the sole survivor of a genus abundant in the Secondary rocks of Europe.

Flora.

The eastern parts of Australia are very much richer both in their botany and in their zoology than any of the other parts. This is due in part to the different physical conditions there prevailing and in part to the invasion of the north-eastern portion of the continent by a number of plants characteristically Melanesian. This element was introduced via Torres Strait, and spread down the Queensland coast to portions of the New South Wales littoral, and also round the Gulf of Carpentaria, but has never been able to obtain a hold in the more arid interior. It has so completely obliterated the original flora, that a Queensland coast jungle is almost an exact replication of what may be seen on the opposite shores of the straits, in New Guinea. This wealth of plant life is confined to the littoral and the coastal valleys, but the central valleys and the plateaux have, if not a varied flora, a considerable wealth of timber trees in every way superior to the flora inland in the same latitudes. In the interior there is little change in the general aspect of the vegetation, from the Australian Bight to the region of Carpentaria, where the exotic element begins. Behind the luxuriant jungles of the sub-tropical coast, once over the main range, we find the purely Australian flora with its apparent sameness and sombre dulness. Physical surroundings rather than latitude determine the character of the flora. The contour lines showing the heights above sea-level are the directions along which species spread to form zones. Putting aside the exotic vegetation of the north and east coast-line, the Australian bush gains its peculiar character from the prevalence of the so-called gum-trees (*Eucalyptus*) and the acacias, of which last there are 300 species, but the eucalypts above all are everywhere. Dwarfed eucalypts fringe the tree-limit on Mount Kosciusco, and the soakages in the parched interior are indicated by a line of the same trees, stunted and straggling. Over the vast continent from Wilson's Promontory to Cape York, north, south, east and west—where anything can grow—there will be found a gum-tree. The eucalypts are remarkable for the oil secreted in their leaves, and the large quantity of astringent resin of their bark. This resinous exudation (Kino) somewhat resembles gum, hence the name "gum" tree. It will not dissolve in water as gums do, but it is soluble in alcohol, as resin usually is. Many of the gum-trees throw off their bark, so that it hangs in long dry strips from the trunk and branches, a feature familiar in "bush" pictures. The bark, resin and "oils" of the eucalyptus are well known as commercial products. As early as 1866, tannic acid, gallic acid, wood spirit, acetic acid, essential oil and eucalyptol were produced from various species of eucalyptus, and researches made by Australian chemists, notably by Messrs. Baker and Smith of the Sydney Technical College, have brought to light many other valuable products likely to prove of commercial value. The genus *Eucalyptus* numbers more than 150 species, and provides some of the most durable timbers known. The iron-bark of the eastern coast uplands is well known (*Eucalyptus sideroxylon*), and is so called from the hardness of the wood, the bark not being remarkable except for its rugged and blackened aspect. Samples of this timber have been studied after forty-three years' immersion in sea-water. Portions most liable to destruction, those parts between the tide marks, were found perfectly sound, and showed no signs of the ravages of marine organisms. Other valuable timber trees of the eastern portion of the continent are the blackbutt, tallow-wood, spotted gum, red gum, mahogany, and blue gum, eucalyptus; and the turpentine (*Syncarpia laurifolia*), which has proved to be more resistant to the attacks of teredo than any other timber and is largely used in wharf construction in infested waters. There are also several extremely valuable soft timbers, the principal being red cedar (*Cedrela Toona*), silky oak (*Grevillea robusta*), beech and a variety of teak, with several important species of pine. The red gum forests of the Murray valley and the pine forests bordering the Great Plains are important and valuable. In Western Australia there are extensive forests of hardwood, principally jarrah (*Eucalyptus marginata*), a very durable timber; 14,000 sq. m. of country are covered with this species. Jarrah timber is nearly impervious to the attacks of the teredo, and there is good evidence to show that, exposed to wear and weather, or placed under the soil, or used as submarine piles, the wood remained

intact after nearly fifty years' trial. The following figures show the high density of Australian timber:—

Australian timber.	Specific gravity.
Jarrah	1·12
Grey iron-bark	1·18
Red iron-bark	1·22
Forest oak	1·21
Tallow wood	1·23
Mahogany	1·20
Grey gum	·917
Red gum	·995
European timber.	**Specific gravity.**
Ash	·753
Beech	·690
Chestnut	·535
British oak	·99

The resistance to breaking or rupture of Australian timber is very high; grey iron-bark with a specific gravity of 1·18 has a modulus of rupture of 17,900 lb per sq. in. compared with 11,800 lb for British oak with a specific gravity of ·69 to ·99. No Australian timber in the foregoing list has a less modulus than 13,100 lb per sq. in.

Various "scrubs" characterize the interior, differing very widely from the coastal scrubs. "Mallee" scrub occupies large tracts of South Australia and Victoria, covering probably an extent of 16,000 sq. m. The mallee is a species of eucalyptus growing 12 to 14 ft. high. The tree breaks into thin stems close to the ground, and these branch again and again, the leaves being developed umbrella-fashion on the outer branches. The mallee scrub appears like a forest of dried osier, growing so close that it is not always easy to ride through it. Hardly a leaf is visible to the height of one's head; but above, a crown of thick leather-like leaves shuts out the sunlight. The ground below is perfectly bare, and there is no water. Nothing could add to the sterility and the monotony of these mallee scrubs. "Mulga" scrub is a somewhat similar thicket, covering large areas. The tree in this instance is one of the acacias, a genus distributed through all parts of the continent. Some species have rather elegant blossoms, known to the settlers as "wattle." They serve admirably to break the sombre and monotonous aspect of the Australian vegetation. Two species of acacia are remarkable for the delicate and violet-like perfume of their wood—myall and yarran. The majority of the species of *Acacia* are edible and serve as reserve fodder for sheep and cattle. In the alluvial portions of the interior salsolaceous plants—saltbush, bluebush, cottonbush—are invaluable to the pastoralist, and to their presence the pre-eminence of Australia as a wool-producing country is largely due.

Grasses and herbage in great variety constitute the most valuable element of Australian flora from the commercial point of view. The herbage for the most part grows with marvellous rapidity after a spring or autumn shower and forms a natural shelter for the more stable growth of nutritious grasses.

Under the system of grazing practised throughout Australia it is customary to allow sheep, cattle and horses to run at large all the year round within enormous enclosures and to depend entirely upon the natural growth of grass for their subsistence. Proteaceous plants, although not exclusively Australian, are exceedingly characteristic of Australian scenery, and are counted amongst the oldest flowering plants of the world. The order is easily distinguished by the hard, dry, woody texture of the leaves and the dehiscent fruits. They are found in New Zealand and also in New Caledonia, their greatest developments being on the south-west of the Australian continent. Proteaceae are found also in Tierra del Fuego and Chile. They are also abundant in South Africa, where the order forms the most conspicuous feature of vegetation. The range in species is very limited, no one being common to eastern and western Australia. The chief genera are banksia (*honeysuckle*), and hakea (*needle bush*).

The Moreton Bay pine (*Araucaria Cunninghamii*) is reckoned amongst the giants of the forest. The genus is associated with one long extinct in Europe. Moreton Bay pine is chiefly known by the utility of its wood. Another species, *A. Bidwillii*, or the bunya-bunya, afforded food in its nut-like seeds to the aborigines. A most remarkable form of vegetation in the north-west is the gouty-stemmed tree (*Adansonia Gregorii*), one of the Malvaceae. It is related closely to the famous baobab of tropical Africa. The "grass-tree" (*Xanthorrhoea*), of the uplands and coast regions, is peculiarly Australian in its aspect. It is seen as a clump of wire-like leaves, a few feet in diameter, surrounding a stem, hardly thicker than a walking-stick, rising to a height of 10 or 12 ft. This terminates in a long spike thickly studded with white blossoms. The grass-tree gives as distinct a character to an Australian picture as the agave and cactus do to the Mexican landscape. With these might be associated the gigantic lily of Queensland (*Nymphaea gigantea*), the leaves of which float on water, and are quite 18 in. across. There is also a gigantic lily (*Doryanthes excelsa*) which grows to a height of 15 feet. The "flame tree" is a most conspicuous feature of an Illawarra landscape, the largest racemes of crimson red suggesting the name. The waratah or native tulip, the magnificent flowering head of which, with the kangaroo, is symbolic of the country, is one of the Proteaceae. The natives were accustomed to suck its tubular flowers for the honey they contained. The "nardoo" seed, on which the aborigines sometimes contrived to exist, is a creeping plant, growing plentifully in swamps and shallow pools, and belongs to the natural order of Marsileaceae. The spore-cases remain after the plant is dried up and withered. These are collected by the natives, and are known over most of the continent as nardoo.

No speculation of hypothesis has been propounded to account satisfactorily for the origin of the Australian flora. As a step towards such hypothesis it has been noted that the Antarctic, the South African, and the Australian floras have many types in common. There is also to a limited extent a European element present. One thing is certain, that there is in Australia a flora that is a remnant of a vegetation once widely distributed. Heer has described such Australian genera as Banksia, Eucalyptus, *Grevillea* and *Hakea* from the Miocene of Switzerland. Another point agreed upon is that the Australian flora is one of vast antiquity. There are genera so far removed from every living genus that many connecting links must have become extinct. The region extending round the south-western extremity of the continent has a peculiarly characteristic assemblage of typical Australian forms, notably a great abundance of the Proteaceae. This flora, isolated by arid country from the rest of the continent, has evidently derived its plant life from an outside source, probably from lands no longer existing.

Political and Economic Conditions

Population.[1]—The Australian people are mainly of British origin, only 3¼% of the population of European descent being of non-British race. It is certain that the aborigines (see the section on Aborigines below) are very much less numerous than when the country was first colonized, but their present numbers can be given for only a few of the states. At the census of 1901, 48,248 aborigines were enumerated, of whom 7434 were in New South Wales, 652 in Victoria, 27,123 in South Australia, and 6212 in Western Australia. The assertion by the Queensland authorities that there are 50,000 aborigines in that state is a crude estimate, and may be far wide of the truth. In South Australia and the Northern Territory a large number are outside the bounds of settlement, and it is probable that they are as numerous there as in Queensland. The census of Western Australia included only those aborigines in the employment of the colonists; and as a large part of this, the greatest of the Australian states, is as yet unexplored, it may be presumed that the aborigines enumerated were very far short of the whole number of persons of that race in the state. Taking all things into consideration, the aboriginal population of the continent may be set down at something like 180,000. Chinese, numbering about 30,000, are chiefly found in New South Wales, Queensland, Victoria, and the Northern Territory. Of Japanese there were 3500, of Hindu and Sinhalese 4600, according to recent computation, but the policy of the Commonwealth is adverse to further immigration of other than whites. South Sea Islanders and other coloured races, numbering probably about 15,000, were in 1906 to be found principally in Queensland, but further immigration of Pacific Islanders to Australia is now restricted, and the majority of those in the country in 1906 were deported by the middle of 1907.

At the close of 1906 the population of Australia was approximately 4,120,000, exclusive of aborigines. The increase of population since 1871 was as follows: 1871, 1,668,377; 1881, 2,252,617; 1891, 3,183,237; 1901, 3,773,248. The expansion has been due mainly to the natural increase; that is, by reason of excess of births over deaths. Immigration to Australia has been very slight since 1891, owing originally to the stoppage of progress consequent on the bank crisis of 1893, and, subsequently, to the disinclination of several of the state governments towards immigration and their failure to provide for the welfare of immigrants on their arrival. During 1906 a more rational view of the value of immigration was adopted by the various state governments and by the federal government, and immigration to Australia is now systematically encouraged. Australia's gain of population by immigration,—*i.e.* the excess of the

[1] The statistical portion of this article includes Tasmania, which is a member of the Australian Commonwealth.

inward over the outward movement of a population—since the discovery of gold in 1851, arranged in ten years periods, was

1852–1861	520,713
1862–1871	188,158
1872–1881	223,326
1882–1891	374,097
1892–1901	2,377

During the five years following the last year of the foregoing table, there was practically no increase in population by immigration.

The birth rate averages 26·28 per thousand of the population and the death rate 12·28, showing a net increase of 14 per thousand by reason of the excess of births over deaths. The marriage rate varies as in other countries from year to year according to the degree of prosperity prevailing. In the five years 1881–1888 the rate was 8·08 marriages (16·1 persons) per thousand of the population, declining to 6·51 in 1891–1895; in recent years there has been a considerable improvement, and the Australian marriage rate may be quoted as ranging between 6·75 and 7·25. The death rate of Australia is much below that of European countries and is steadily declining. During the twenty years preceding the census of 1901 there was a fall in the death rate of 3·4 per thousand, of which, however, 1 per thousand is attributable to the decline in the birth rate, the balance being attributable to improved sanitary conditions.

Territorial Divisions.—Australia is politically divided into five states, which with the island of Tasmania form the Commonwealth of Australia. The area of the various states is as follows:

	Sq. m.
New South Wales	310,700
Victoria	87,884
Queensland	668,497
South Australia	903,690
Western Australia	975,920
	2,946,691
Tasmania	26,215
Commonwealth	2,972,906

To the area of the Commonwealth shown in the table might be added that of New Guinea, 90,000 sq. m.; this would bring the area of the territory controlled by the Commonwealth to 3,062,906 sq. m. The distribution of population at the close of 1906 (4,118,000) was New South Wales 1,530,000, Victoria 1,223,000, Queensland 534,000, South Australia 381,000, Western Australia 270,000, Tasmania 180,000. The rate of increase since the previous census was 1·5% per annum, varying from 0·31 in Victoria to 2·06 in New South Wales and 6·9 in Western Australia.

Australia contains four cities whose population exceeds 100,000, and fifteen with over 10,000. The principal cities and towns are Sydney (pop. 530,000), Newcastle, Broken Hill, Parramatta, Goulburn, Maitland, Bathurst, Orange, Lithgow, Tamworth, Grafton, Wagga and Albury, in New South Wales; Melbourne (pop. 511,900), Ballarat, Bendigo, Geelong, Eaglehawk, Warrnambool, Castlemaine, and Stawell in Victoria; Brisbane (pop. 128,000), Rockhampton, Maryborough, Townsville, Gympie, Ipswich, and Toowoomba in Queensland; Adelaide (pop. about 175,000), Port Adelaide and Port Pirie in South Australia; Perth (pop. 56,000), Fremantle, and Kalgoorlie in Western Australia; and Hobart (pop. 35,500) and Launceston in Tasmania.

Defence.—Up to the end of the 19th century, little was thought of any locally-raised or locally-provided defensive forces, the mother-country being relied upon. But the Transvaal War of 1899–1902, to which Australia sent 6310 volunteers (principally mounted rifles), and the gradual increase of military sentiment, brought the question more to the front, and more and more attention was given to making Australian defence a matter of local concern. Naval defence in any case remained primarily a question for the Imperial navy, and by agreement (1903, for ten years) between the British government and the governments of the Commonwealth (contributing an annual subsidy of £200,000) and of New Zealand (£40,000), an efficient fleet patrolled the Australasian waters, Sydney, its headquarters, being ranked as a first-class naval station. Under the agreement a royal naval reserve was maintained, three of the Imperial vessels provided being utilized as drill ships for crews recruited from the Australian states. At the end of 1908 the strength of the naval forces under the Commonwealth defence department was: permanent, 217, naval militia, 1016; the estimated expenditure for 1908–1909 being £63,531. In 1908–1909 a movement began for the establishment by Australia of a local flotilla of torpedo-boat destroyers, to be controlled by the Commonwealth in peace time, but subject to the orders of the British admiralty in war time, though not to be removed from the Australian coast without the sanction of the Commonwealth; and by 1909 three such vessels had been ordered in England preparatory to building others in Australia. The military establishment at the beginning of 1909 was represented by a small permanent force of about 1400, a militia strength of about 17,000, and some 6000 volunteers, besides 50,000 members of rifle clubs and 30,000 cadets; the expenditure being (estimate, 1908–1909) £623,946. But a reorganization of the military forces, on the basis of obligatory national training, was already contemplated, though the first Bill introduced for this purpose by Mr Deakin's government (Sept. 1908) was dropped, and in 1909 the subject was still under discussion.

Religion.—There is no state church in Australia, nor is the teaching of religion in any way subsidized by the state. The Church of England claims as adherents 39% of the population, and the Roman Catholic Church 22%; next in numerical strength are the Wesleyans and other Methodists, numbering 12%, the various branches of the Presbyterians 11%, Congregationalists 2%, and Baptists 2%. These proportions varied very little between 1881 and 1906, and may be taken as accurately representing the present strength of the various Christian denominations. Churches of all denominations are liberally supported throughout the states, and the residents of every settlement, however small, have their places of worship erected and maintained by their own contributions.

Instruction.—Education is very widely distributed, and in every state it is compulsory for children of school ages to attend school. The statutory ages differ in the various states; in New South Wales and Western Australia it is from 6 to 13 years inclusive, in Victoria 6 to 12 years, in Queensland 6 to 11 years, and in South Australia 7 to 12 years inclusive. Religious instruction is not imparted by the state-paid teachers in any state, though in certain states persons duly authorized by the religious organizations are allowed to give religious instruction to children of their own denomination where the parents' consent has been obtained. According to the returns for 1905 there were 7292 state schools, with 15,628 teachers and 648,927 pupils, and the average attendance of scholars was 446,000. Besides state schools there were 2145 private schools, with 7825 teachers and 137,000 scholars, the average number of scholars in attendance being 120,000. The census of 1901 showed that about 83% of the whole population and more than 91% of the population over five years of age could read and write. There was, therefore, a residue of 9% of illiterates, most of whom were not born in Australia. The marriage registers furnish another test of education. In 1905 only ten persons in every thousand married were unable to sign their names, thus proving that the number of illiterate adults of Australian birth is very small.

Instruction at state schools is either free or at merely nominal cost, and high schools, technical colleges and agricultural colleges are maintained by appropriations from the general revenues of the states. There are also numerous grammar schools and other private schools. Universities have been established at Sydney, Melbourne, Adelaide and Hobart, and are well equipped and numerously attended; they are in part supported by grants from the public funds and in part by private endowments and the fees paid by students. The number of students attending lectures is about 2500 and the annual income a little over £100,000. The cost of public instruction in Australia averages about 11s. 4d. per inhabitant, and the cost per scholar in average attendance at state schools is £4 :13 : 9.

Pastoral and Agricultural Industries.—The continent is

essentially a pastoral one, and the products of the flocks and herds constitute the chief element in the wealth of Australia. Practically the whole of the territory between the 145° meridian and the Great Dividing Range, as well as extensive tracts in the south and west, are a natural sheep pasture with climatic conditions and indigenous vegetation pre-eminently adapted for the growth of wool of the highest quality. Numerically the flocks of Australia represent one-sixth of the world's sheep, and in just over half a century (1851–1905) the exports of Australian wool alone reached the value of £650,000,000. During the same period, owing to the efforts of pastoralists to improve their flocks, there was a gradual increase in the weight of wool produced per sheep from 3¼lb to an average of over 7lb. The cattle and horse-breeding industries are of minor importance as compared with wool-growing, but nevertheless represent a great source of wealth, with vast possibilities of expansion in the over-sea trade. The perfection of refrigeration in over-sea carriage, which has done so much to extend the markets for Australian beef and mutton, has also furthered the expansion of dairying, there being an annual output of over 160 million lb of butter, valued at £6,000,000; of this about 64 million lb, valued at £2,500,000, is exported annually to British markets.

Next to the pastoral industry, agriculture is the principal source of Australian wealth. At the close of 1905 the area devoted to tillage was 9,365,000 acres, the area utilized for the production of breadstuffs being 6,270,000 acres or over two-thirds of the whole extent of cultivation. At first wheat was cultivated solely in the coastal country, but experience has shown that the staple cereal can be most successfully grown over almost any portion of the arable lands within the 20 to 40 in. rainfall areas. The value of Australian wheat and flour exported in 1905 was £5,500,000.

Other important crops grown are—maize, 324,000 acres; oats, 493,000 acres; other grains, 160,000 acres; hay, 1,367,000 acres; potatoes, 119,000 acres; sugar-cane, 141,000 acres; vines, 65,000 acres; and other crops, 422,000 acres. The chief wheat lands are in Victoria, South Australia and New South Wales; the yield averages about 9 bushels to the acre; this low average is due to the endeavour of settlers on new lands to cultivate larger areas than their resources can effectively deal with; the introduction of scientific farming should almost double the yield. Maize and sugar-cane are grown in New South Wales and Queensland. The vine is cultivated in all the states, but chiefly in South Australia, Victoria and New South Wales. Australia produces abundant quantities and nearly all varieties of fruits; but the kinds exported are chiefly oranges, pine-apples, bananas and apples. Tobacco thrives well in New South Wales and Victoria, but kinds suitable for exportation are not largely grown. Compared with the principal countries of the world, Australia does not take a high position in regard to the gross value of the produce of its tillage, the standard of cultivation being for the most part low and without regard to maximum returns, but in value per inhabitant it compares fairly well; indeed, some of the states show averages which surpass those of many of the leading agricultural countries. For 1905 the total value of agricultural produce estimated at the place of production was £18,750,000 sterling, or about £4: 13 : 4 per inhabitant.

Timber Industry.—Although the timbers of commercial value are confined practically to the eastern and a portion of the western coastal belt and a few inland tracts of Australia, they constitute an important national asset. The early settlement of heavily timbered country was characterized by wanton destruction of vast quantities of magnificent timber; but this waste is a thing of the past, and under the pressure of a demand for sound timber both for local use and for exportation, the various governments are doing much to conserve the state forests. In Western Australia, New South Wales, Tasmania and Queensland there are many hundreds of well-equipped saw-mills affording employment to about 5000 men. The export of timber is in ordinary years valued at a million sterling and the total production at £2,250,000.

Fisheries.—Excellent fish of many varieties abound in the Australian seas and in many of the rivers. In several of the states, fish have been introduced successfully from other countries. Trout may now be taken in many of the mountain streams. At one time whaling was an important industry on the coasts of New South Wales and Tasmania, and afterwards on the Western Australian coasts. The industry gravitated to New Zealand, and finally died out, chiefly through the wasteful practice of killing the calves to secure the capture of the mothers. Of late years whaling has again attracted attention, and a small number of vessels prosecute the industry during the season. The only source of maritime wealth that is now being sufficiently exploited to be regarded as an industry is the gathering of pearl-oysters from the beds off the northern and north-western coasts of the continent. In Queensland waters there are about 300 vessels, and on the Western Australian coast about 450 licensed craft engaged in the industry, the annual value of pearl-shell and pearls raised being nearly half a million sterling. Owing to the depletion of some of the more accessible banks, and to difficulties in connexion with the employment of coloured crews, many of the vessels have now gone farther afield. As the pearl-oyster is remarkably prolific, it is considered by experts that within a few years of their abandonment by fishing fleets the denuded banks will become as abundantly stocked as ever.

Mineral Production.—Australia is one of the great gold producers of the world, and its yield in 1905 was about £16,000,000 sterling, or one-fourth of the gold output of the world; and the total value of its mineral production was approximately £25,000,000. Gold is found throughout Australia, and the present prosperity of the states is largely due to the discoveries of this metal, the development of other industries being, in a country of varied resources, a natural sequence to the acquisition of mineral treasure. From the date of its first discovery, up to the close of 1905, gold to the value of £460,000,000 sterling has been obtained in Australia. Victoria, in a period of fifty-four years, contributed about £273,000,000 to this total, and is still a large producer, its annual yield being about 800,000 oz., 29,000 men being engaged in the search for the precious metal. Queensland's annual output is between 750,000 and 800,000 oz.; the number of men engaged in gold-mining is 10,000. In New South Wales the greatest production was in 1852, soon after the first discovery of the precious metal, when the output was valued at £2,660,946; the production in 1905 was about 270,000 oz., valued at £1,150,000. For many years Western Australia was considered to be destitute of mineral deposits of any value, but it is now known that a rich belt of mineral country extends from north to south. The first important discovery was made in 1882, when gold was found in the Kimberley district; but it was not until a few years later that this rich and extensive area was developed. In 1887 gold was found in Yilgarn, about 200 m. east of Perth. This was the first of the many rich discoveries in the same district which have made Western Australia the chief gold-producer of the Australian group. In 1907 there were eighteen goldfields in the state, and it was estimated that over 30,000 miners were actively engaged in the search for gold. In 1905 the production amounted to 1,983,000 oz., valued at £8,300,000. Tasmania is a gold producer to the extent of about 70,000 or 80,000 oz. a year, valued at £300,000; South Australia produces about 30,000 oz.

Gold.

Gold is obtained chiefly from quartz reefs, but there are still some important alluvial deposits being worked. The greatest development of quartz reefing is found in Victoria, some of the mines being of great depth. There are eight mines in the Bendigo district over 3000 ft. deep, and fourteen over 2500 ft. deep. In the Victoria mine a depth of 3750 ft. has been reached, and in Lazarus mine 3424 ft. In the Ballarat district a depth of 2520 ft. has been reached in the South Star mine. In Queensland there is one mine 3156 ft. deep, and several others exceed 2000 ft. in depth. A considerable number of men are engaged in the various states on alluvial fields, in hydraulic sluicing, and dredging is now adopted for the winning of gold in river deposits. So far this form of winning is chiefly carried on in New South Wales, where there are about fifty gold-dredging plants in

successful operation. Over 70,000 men are employed in the gold-mining industry, more than two-thirds of them being engaged in quartz mining.

Silver.

Silver has been discovered in all the states, either alone or in the form of sulphides, antimonial and arsenical ores, chloride, bromide, iodide and chloro-bromide of silver, and argentiferous lead ores, the largest deposits of the metal being found in the last-mentioned form. The leading silver mines are in New South Wales, the returns from the other states being comparatively insignificant. The fields of New South Wales have proved to be of immense value, the yield of silver and lead during 1905 being £2,500,000, and the total output to the end of the year named over £40,000,000. The Broken Hill field, which was discovered in 1883, extends over 2500 sq. m. of country, and has developed into one of the principal mining centres of the world. It is situated beyond the river Darling, and close to the boundary between New South Wales and South Australia. The lodes occur in Silurian metamorphic micaceous schists, intruded by granite, porphyry and diorite, and traversed by numerous quartz reefs, some of which are gold-bearing. The Broken Hill lode is the largest yet discovered. It varies in width from 10 ft. to 200 ft., and may be traced for several miles. Although indications of silver abound in all the other states, no fields of great importance have yet been discovered. Up to the end of 1904 Australia had produced silver to the value of £45,000,000. At Broken Hill mines about 11,000 miners are employed.

Copper.

Copper is known to exist in all the states, and has been mined extensively in South Australia, New South Wales, Queensland and Tasmania. The low quotations which ruled for a number of years had a depressing effect upon the industry, and many mines once profitably worked were temporarily closed, but in 1906 there was a general revival. The discovery of copper had a marked effect on the fortunes of South Australia at a time when the young colony was surrounded by difficulties. The first important mine, the Kapunda, was opened up in 1842. It is estimated that at one time 2000 tons were produced annually, but the mine was closed in 1879. In 1845 the celebrated Burra Burra mine was discovered. This mine proved to be very rich, and paid £800,000 in dividends to the original owners. For a number of years, however, the mine has been suffered to remain untouched, as the deposits originally worked were found to be depleted. For many years the average output was from 10,000 to 13,000 tons of ore, yielding from 22 to 23% of copper. For the period of thirty years during which the mine was worked the production of ore amounted to 234,648 tons, equal to 51,622 tons of copper, valued at £4,749,924. The Wallaroo and Moonta mines, discovered in 1860 and 1861, proved to be even more valuable than the Burra Burra, the Moonta mines employing at one time upwards of 1600 hands. The dividends paid by these mines amounted to about £1,750,000 sterling. The satisfactory price obtained during recent years has enabled renewed attention to be paid to copper mining in South Australia, and the production of the metal in 1905 was valued at £470,324. The principal deposits of copper in New South Wales are found in the central part of the state between the Macquarie, Darling and Bogan rivers. Deposits have also been found in the New England and southern districts, as well as at Broken Hill, showing that the mineral is widely distributed throughout the state. The more important mines are those of Cobar, where the Great Cobar mine produces annually nearly 4000 tons of refined copper. In northern Queensland copper is found throughout the Cloncurry district, in the upper basin of the Star river, and the Herberton district. The returns from the copper fields in the state are at present a little over half a million sterling per annum, and would be still greater if it were not for the lack of suitable fuel for smelting purposes, which renders the economical treatment of the ore difficult; the development of the mines is also retarded by the want of easy and cheaper communication with the coast. In Western Australia copper deposits have been worked for some years. Very rich lodes of the metal have been found in the Northampton, Murchison and Champion Bay districts, and also in the country to the south of these districts on the Irwin river. Tasmania is now the largest copper-producing state of the Commonwealth; in 1905 the output was over £672,010 and in earlier years even larger. The chief mines belong to the Mount Lyell Mining & Railway Co., and are situated on the west side of the island with an outlet by rail to Strahan on the west coast. The total value of copper produced in Australia up to the end of 1905 was £42,500,000 sterling, £24,500,000 having been obtained in South Australia, £7,500,000 in New South Wales, £6,400,000 in Tasmania and over £3,500,000 in Queensland.

Tin.

Tin was known to exist in Australia from the first years of colonization. The wealth of Queensland and the Northern Territory in this mineral, according to the reports of Dr Jack, late Government geologist of the former state, and the late Rev. J. E. Tenison-Woods, appears to be very great. The most important tin-mines in Queensland are in the Herberton district, south-west of Cairns; at Cooktown, on the Annan and Bloomfield rivers; and at Stanthorpe, on the border of New South Wales. Herberton and Stanthorpe have produced more than three-fourths of the total production of the state. Towards the close of the 19th century the production greatly decreased in consequence of the low price of the metal, but in 1899 a stimulus was given to the industry, and since then the production has increased very considerably, the output for 1905 being valued at £989,627. In New South Wales lode tin occurs principally in the granite and stream tin under the basaltic country in the extreme north of the state, at Tenterfield, Emmaville, Tingha, and in other districts of New England. The metal has also been discovered in the Barrier ranges, and many other places. The value of the output in 1905 was £226,110. The yield of tin in Victoria is very small, and until lately no fields of importance have been discovered; but towards the latter end of 1890 extensive deposits were reported to exist in the Gippsland district —at Omeo and Tarwin. In South Australia tin-mining is unimportant. In Western Australia the production from the tin-fields at Greenbushes and elsewhere was valued at £87,000. Tasmania during the last few years has attained the foremost position in the production of tin, the annual output now being about £363,000. The total value of tin produced in Australia is nearly a million sterling per annum, and the total production to the end of 1905 was £22,500,000, of which Tasmania produced about 40%, New South Wales one-third, Queensland a little more than a fourth.

Iron.

Iron is distributed throughout Australia, but for want of capital for developing the fields this industry has not progressed. In New South Wales there are, together with coal and limestone in unlimited supply, important deposits of rich iron ores suitable for smelting purposes; and for the manufacture of steel of certain descriptions abundance of manganese, chrome and tungsten ores are available. The most extensive fields are in the Mittagong, Wallerawang and Rylstone districts, which are roughly estimated to contain in the aggregate 12,944,000 tons of ore, containing 5,853,000 tons of metallic iron. Extensive deposits, which are being developed successfully, occur in Tasmania, it being estimated that there are, within easy shipping facilities, 17,000,000 tons of ore. Magnetite, or magnetic iron, the richest of all iron ores, is found in abundance near Wallerawang in New South Wales. The proximity of coal-beds now being worked should accelerate the development of the iron deposits, which, on an average, contain 41% of metal. Magnetite occurs in great abundance in Western Australia, together with haematite, which would be of enormous value if cheap labour were available. Goethite, limonite and haematite are found in New South Wales, at the junction of the Hawkesbury sandstone formation and the Wianamatta shale, near Nattai, and are enhanced in their value by their proximity to coal-beds. Near Lithgow extensive deposits of limonite, or clay-band ore, are interbedded with coal. Some samples of ore, coal and limestone, obtained in the Mittagong district, with pig-iron and castings manufactured therefrom, were exhibited at the Mining Exhibition in London and obtained a first award.

Other minerals.

Antimony is widely diffused throughout Australia, and is sometimes found associated with gold. In New South Wales the principal centre of this industry is Hillgrove, near Armidale, where the Eleanora Mine, one of the richest in the state, is situated. The ore is also worked for gold. In Victoria the production of antimony gave employment in 1890 to 238 miners, but owing to the low price of the metal, production has almost ceased. In Queensland the fields were all showing development in 1891, when the output exhibited a very large increase compared with that of former years; but, as in the case of Victoria, the production of the metal seems to have ceased. Good lodes of stibnite (sulphide of antimony) have been found near Roebourne in Western Australia, but no attempt has yet been made to work them.

Bismuth is known to exist in all the Australian states, but up to the present time it has been mined for only in three states, viz. New South Wales, Queensland, South Australia and Tasmania. It is usually found in association with tin and other minerals. The principal mine in New South Wales is situated at Kingsgate, in the New England district, where the mineral is generally associated with molybdenum and gold.

Manganese probably exists in all the states, deposits having been found in New South Wales, Victoria, Queensland and Western Australia, the richest specimens being found in New South Wales. Little, however, has been done to utilize the deposits, the demands of the colonial markets being extremely limited. The ore generally occurs in the form of oxides, manganite and pyrolusite, and contains a high percentage of sesquioxide of manganese.

Platinum and the allied compound metal iridosmine have been found in New South Wales, but so far in inconsiderable quantities. Iridosmine occurs commonly with gold or tin in alluvial drifts.

The rare element tellurium has been discovered in New South Wales at Bingara and other parts of the northern districts, as well as at Tarana, on the western line, though at present in such minute quantities as would not repay the cost of working. At many of the mines at Kalgoorlie, Western Australia, large quantities of ores of telluride of gold have been found in the lode formations.

Lead is found in all the Australian states, but is worked only when associated with silver. In Western Australia the lead occurs in the form of sulphides and carbonates of great richness, but the quantity of silver mixed with it is very small. The lodes are most frequently of great size, containing huge masses of galena, and so little gangue that the ore can very easily be dressed to 83 or 84%. The association of this metal with silver in the Broken Hill mines of New South Wales adds very greatly to the value of the product.

Mercury is found in New South Wales and Queensland. In New

South Wales, in the form of cinnabar, it has been discovered on the Cudgegong river, near Rylstone, and it also occurs at Bingara, Solferino, Yulgilbar and Cooma. In the last-named place the assays of ore yielded 22 % of mercury.

Titanium, in the minerals known as octahedrite and brookite, is found in alluvial deposits in New South Wales, in conjunction with diamonds.

Wolfram (tungstate of iron and manganese) occurs in some of the states, notably in New South Wales, Victoria, Tasmania and Queensland. Scheelite, another mineral of tungsten, is also found in Queensland. Molybdenum, in the form of molybdenite (sulphide of molybdenum), is found in Queensland, New South Wales and Victoria, associated in the parent state with tin and bismuth in quartz reefs.

Zinc ores, in the several varieties of carbonates, silicates, oxide, sulphide and sulphate of zinc, have been found in several of the Australian states, but have attracted little attention except in New South Wales, where special efforts are being made successfully to produce a high-grade zinc concentrate from the sulphide ores. Several companies are devoting all their energies to zinc extraction, and the output is now equal to about 5% of the world's production.

Nickel, so abundant in the island of New Caledonia, has up to the present been found in none of the Australian states except Queensland and Tasmania. Few attempts, however, have been made to prospect systematically for this valuable mineral.

Cobalt occurs in New South Wales, Victoria and South Australia, and efforts have been made in the former state to treat the ore, the metal having a high commercial value; but the market is small, and no attempt has been made up to 1907 to produce it on any large scale. The manganese ores of the Bathurst district of New South Wales often contain a small percentage of cobalt—sufficient, indeed, to warrant further attempts to work them. In New South Wales chromium is found in the northern portion of the state, in the Clarence and Tamworth districts and also near Gundagai. It is usually associated with serpentine. In the Gundagai district the industry was rapidly becoming a valuable one, but the low price of chrome has greatly restricted the output. Chromium has been discovered in Tasmania also.

Arsenic, in its well-known and beautiful forms, orpiment and realgar, is found in New South Wales and Victoria. It usually occurs in association with other minerals in veins.

The Australian states have been bountifully supplied with mineral fuel. Five distinct varieties of black coal, of well-characterized types, may be distinguished, and these, with the two extremes of brown coal or lignite and anthracite, form a perfectly continuous series. Brown coal, or lignite, occurs principally in Victoria. Attempts have frequently been made to use the mineral for ordinary fuel purposes, but its inferior quality has prevented its general use. Black coal forms one of the principal resources of New South Wales; and in the other states the deposits of this valuable mineral are being rapidly developed. Coal of a very fair description was discovered in the basin of the Irwin river, in Western Australia, as far back as the year 1846. It has been ascertained from recent explorations that the area of carboniferous formation in that state extends from the Irwin northwards to the Gascoyne river, about 300 m., and probably all the way to the Kimberley district. The most important discovery of coal in the state, so far, is that made in the bed of the Collie river, near Bunbury, to the south of Perth. The coal has been treated and found to be of good quality, and there are grounds for supposing that there are 250,000,000 tons in the field. Dr Jack, late government geologist of Queensland, considers the extent of the coal-fields of that state to be practically unlimited, and is of opinion that the carboniferous formations extend to a considerable distance under the Great Western Plains. It is roughly estimated that the Coal Measures at present practically explored extend over an area of about 24,000 sq. m. Coal-mining is an established industry in Queensland, and is progressing satisfactorily. The mines, however, are situated too far from the coast to permit of serious competition with Newcastle in an export trade, and the output is practically restricted to supplying local requirements. The coal-fields of New South Wales are situated in three distinct regions—the northern, southern and western districts. The first of these comprises chiefly the mines of the Hunter river districts; the second includes the Illawarra district, and, generally, the coastal regions to the south of Sydney, together with Berrima, on the tableland; and the third consists of the mountainous regions on the Great Western railway and extends as far as Dubbo. The total area of the Carboniferous strata of New South Wales is estimated at 23,950 sq. m. The seams vary in thickness. One of the richest has been found at Greta in the Hunter river district; it contains an average thickness of 41 ft. of clean coal, and the quantity underlying each acre of ground has been computed to be 63,700 tons. The coal mines of New South Wales give employment to 14,000 persons, and the annual production is over 6,600,000 tons. Black coal has been discovered in Victoria, and about 250,000 tons are now being raised. The principal collieries in the state are the Outtrim Howitt, the Coal Creek Proprietary and the Jumbunna. In South Australia, at Leigh's Creek, north of Port Augusta, coal-beds have been discovered. The quantity of coal extracted annually in Australia had in 1906 reached 7,497,000 tons.

Fuel.

Kerosene shale (torbanite) is found in several parts of New South Wales. It is a species of cannel coal, somewhat similar to the Boghead mineral of Scotland, but yielding a much larger percentage of volatile hydro-carbon than the Scottish mineral. The richest quality yields about 100 to 130 gallons of crude oil per ton, or 17,000 to 18,000 cub. ft. of gas, with an illuminating power of 35 to 40 sperm candles, when gas only is extracted from the shale.

Large deposits of alum occur close to the village of Bulladelah, 30 m. from Port Stephens, New South Wales. It is said to yield well, and a quantity of the manufactured alum is sent to Sydney for local consumption. Marble is found in many parts of New South Wales and South Australia. Kaolin, fire-clays and brick-clays are common to all the states. Except in the vicinity of cities and townships, however, little use has been made of the abundant deposits of clay. Kaolin, or porcelain clay, although capable of application to commercial purposes, has not as yet been utilized to any extent, although found in several places in New South Wales and in Western Australia.

Asbestos has been found in New South Wales in the Gundagai Bathurst and Broken Hill districts—in the last-mentioned district in considerable quantities. Several specimens of very fair quality have also been met with in Western Australia.

Many descriptions of gems and gem stones have been discovered in various parts of the Australian states, but systematic search has been made principally for the diamond and the noble opal. Diamonds are found in all the states; but only in New South Wales have any attempts been made to work the diamond drifts. The best of the New South Wales diamonds are harder and much whiter than the South African diamonds, and are classified as on a par with the best Brazilian gems; but no large specimens have yet been found. The finest opal known is obtained in the Upper Cretaceous formation at White Cliffs, near Wilcannia, New South Wales, and at these mines about 700 men find constant employment. Other precious stones, including the sapphire, emerald, oriental emerald, ruby, opal, amethyst, garnet, chrysolite, topaz, cairngorm, onyx, zircon, &c., have been found in the gold and tin bearing drifts and river gravels in numerous localities throughout the states. The sapphire is found in all the states, principally in the neighbourhood of Beechworth, Victoria. The oriental topaz has been found in New South Wales. Oriental amethysts also have been found in that state, and the ruby has been found in Queensland, as well as in New South Wales. Turquoises have been found near Wangaratta, in Victoria, and mining operations are being carried on in that state. Chrysoberyls have been found in New South Wales; spinel rubies in New South Wales and Victoria; and white topaz in all the states. Chalcedony, carnelian, onyx and cat's eyes are found in New South Wales; and it is probable that they are also to be met with in the other states, particularly in Queensland. Zircon, tourmaline, garnet and other precious stones of little commercial value are found throughout Australia.

Gems.

Commerce.—The number of vessels engaged in the over-sea trade of Australia in 1905 was 2112, viz. 1050 steamers, with a tonnage of 2,629,000, and 1062 sailers, tonnage 1,090,000; the total of both classes was 3,719,000 tons. The nationality of the tonnage was, British 2,771,000, including Australian 288,000, and foreign 948,000. The destination of the shipping was, to British ports 2,360,000 tons, and to foreign ports 1,350,000 tons. The value of the external trade was £95,188,000, viz. £38,347,000 imports, and £56,841,000 exports. The imports represent £9:11:6 per inhabitant and the exports £14:4:2, with a total trade of £23:15:8. The import trade is divided between the United Kingdom and possessions and foreign countries as follows:—United Kingdom £23,074,000, British possessions £5,384,000, and foreign states £9,889,000, while the destination of the exports is, United Kingdom £26,703,000, British possessions £12,519,000, and foreign countries £17,619,000. The United Kingdom in 1905 sent 60 % of the imports taken by Australia, compared with 26 % from foreign countries, and 14 % from British possessions; of Australian imports the United Kingdom takes 47 %, foreign countries 31 % and British possessions 22 %. In normal years (that is to say, when there is no large movement of capital) the exports of Australia exceed the imports by some £15,300,000. This sum represents the interest payable on government loans placed outside Australia, mainly in England, and the income from British and other capital invested in the country; the former may be estimated at £7,300,000 and the latter £8,000,000 per annum. The principal items of export are wool, skins, tallow, frozen mutton, chilled beef, preserved meats, butter and other articles of pastoral produce, timber, wheat, flour and fruits, gold, silver, lead, copper, tin and other metals. In 1905 the value of the wool export regained the £20,000,000 level, and with the rapid recovery of the numerical

strength of the flocks, great improvements in the quality and weight of fleeces, this item is likely to show permanent advancement. The exports of breadstuffs—chiefly to the United Kingdom—exceed six millions per annum, butter two and a half millions, and minerals of all kinds, except gold, six millions. Gold is exported in large quantities from Australia. The total gold production of the country is from £14,500,000 to £16,000,000, and as not more than three-quarters of a million are required to strengthen existing local stocks, the balance is usually available for export, and the average export of the precious metal during the ten years, 1896–1905, was £12,500,000 per annum. The chief articles of import are apparel and textiles, machinery and hardware, stimulants, narcotics, explosives, bags and sacks, books and paper, oils and tea.

Lines of steamers connect Australia with London and other British ports, with Germany, Belgium, France, Italy, Japan, China, India, San Francisco, Vancouver, New York and Montevideo, several important lines being subsidized by the countries to which they belong, notably Germany, France and Japan.

Railways.—Almost the whole of the railway lines in Australia are the property of the state governments, and have been constructed and equipped wholly by borrowed capital. There were on the 30th of June 1905, 15,000 m. open for traffic, upon which nearly £135,000,000 had been expended.

The railways are of different gauges, the standard narrow gauge of 4 ft. 8½ in. prevailing only in New South Wales; in Victoria the gauge is 5 ft. 3 in., in South Australia 5 ft. 3 in. and 3 ft. 6 in., and in the other states 3 ft. 6 in. Taking the year 1905, the gross earnings amounted to £11,892,262; the working expenses, exclusive of interest, £7,443,546; and the net earnings £4,448,716; the latter figure represents 3·31% upon the capital expended upon construction and equipment; in the subsequent year still better results were obtained. In several of the states, New South Wales and South Australia proper, the railways yield more than the interest paid by the government on the money borrowed for their construction. The earnings per train-mile vary greatly; but for all the lines the average is 7s. 1d., and the working expenses about 4s. 5d., making the net earnings 2s. 8d. per train-mile. The ratio of receipts from coaching traffic to total receipts is about 41%, which is somewhat less than in the United Kingdom; but the proportion varies greatly amongst the states themselves, the more densely populated states approaching most nearly to the British standard. The tonnage of goods carried amounts to about 16,000,000 tons, or 4 tons per inhabitant, which must be considered fairly large, especially as no great proportion of the tonnage consists of minerals on which there is usually a low freightage. Excluding coal lines and other lines not open to general traffic, the length of railways in private hands is only 382 m. or about 2½% of the total mileage open. Of this length, 277 m. are in Western Australia. The divergence of policy of that state from that pursued by the other states was caused by the inability of the government to construct lines, when the extension of the railway system was urgently needed in the interests of settlement. Private enterprise was, therefore, encouraged by liberal grants of land to undertake the work of construction; but the changed conditions of the state have now altered the state policy, and the government have already acquired one of the two trunk lines constructed by private enterprise, and it is not likely that any further concessions in regard to railway construction will be granted to private persons.

Posts and Telegraphs.—The postal and telegraphic facilities offered by the various states are very considerable. There are some 6686 post-offices throughout the Commonwealth, or about one office to every 600 persons. The letters carried amount to about 80 per head, the newspapers to 32 per head and the packets to 15 per head. The length of telegraph lines in use is 46,300 m., and the length of wire nearly three times that distance. In 1905 there were about 11,000,000 telegraphic messages sent, which gives an average of 2·7 messages per inhabitant. The postal services and the telegraphs are administered by the federal government.

Banking.—Depositors in savings banks represent about twenty-nine in every hundred persons, and in 1906 the sum deposited amounted to £37,205,000 in the names of 1,152,000 persons. In ordinary banks the deposits amounted to £106,625,000, so that the total deposits stood at £143,830,000, equivalent to the very large sum of £34, 18s. per inhabitant. The coin and bullion held by the banks varies between 20 and 24 millions sterling and the note circulation is almost stationary at about 3¼ millions.

Public Finance.—Australian public finance requires to be treated under the separate headings of Commonwealth and states finance. Under the Constitution Act the Commonwealth is given the control of the postal and telegraph departments, public defence and several other services, as well as the power of levying customs and excise duties; its powers of taxation are unrestricted, but so far no taxes have been imposed other than those just mentioned. The Commonwealth is empowered to retain one-fourth of the net revenue from customs and excise, the balance must be handed back to the states. This arrangement was to last until 1910. Including the total receipts derived from the customs, the Commonwealth revenue, during the year 1906, was made up as follows:—

Customs and excise	£8,999,485
Posts, telegraphs, &c.	2,824,182
Other revenue	55,676
	£11,879,343

The return made to the states was £7,385,731, so that the actual revenue disposed of by the Commonwealth was less by that amount, or £4,493,612. The expenditure was distributed as follows:—

Customs collection	£261,864
Posts, telegraphs, &c.	2,774,804
Defence	949,286
Other expenditure	508,887
Total	£4,494,841

The states have the same powers of taxation as the Commonwealth except in regard to customs and excise, over which the Commonwealth has exclusive power, but the states are the owners of the crown lands, and the revenues derived from this source form an important part of their income. The states have a total revenue, from sources apart from the Commonwealth, of £23,820,439, and if to this be added the return of customs duties made by the federal government, the total revenue is £31,206,170. Although the financial operations of the Commonwealth and the states are quite distinct, a statement of the total revenue of the Australian Commonwealth and states is not without interest as showing the weight of taxation and the different sources from which revenue is obtained. For 1906 the respective revenues were:—

Commonwealth	£11,879,343
States	23,820,439
	£35,699,782
Direct taxation	£3,200,000
Indirect taxation; customs and excise	8,999,485
Land revenue	3,500,000
Post-office and telegraphs	2,824,182
Railways, &c.	13,650,000
Other service	3,526,115

The revenue from direct taxation is equal to 15s. 10d. per inhabitant, from indirect taxation £2: 4: 6, and the total revenue from all sources £35,699,782, equal to £8 : 16 : 2 per inhabitant. The federal government has no public debt, but each of the six states has contracted debts which aggregate £237,000,000, equal to about £58, 8s. per inhabitant. The bulk of this indebtedness has been contracted for the purpose of constructing railways, tramways, water-supplies, and other revenue-producing works and services, and it is estimated that only 8% of the total indebtedness can be set down for unproductive services.

Information regarding Australian state finance will be found under the heading of each state. (T. A. C.)

Aborigines

The origin of the natives of Australia presents a difficult problem. The chief difficulty in deciding their ethnical relations is their remarkable physical difference from the neighbouring peoples. And if one turns from physical criteria to their manners and customs it is only to find fresh evidence of their isolation. While their neighbours, the Malays, Papuans and Polynesians, all cultivate the soil, and build substantial huts and houses, the Australian natives do neither. Pottery, common to Malays and Papuans, the bows and arrows of the latter, and the elaborate canoes of all three races, are unknown to the Australians. They then must be considered as representing an extremely primitive type of mankind, and it is necessary to look far afield for their prehistoric home.

Origin.

Wherever they came from, there is abundant evidence that their first occupation of the Australian continent must have been at a time so remote as to permit of no traditions. No record, no folk tales, as in the case of the Maoris of New Zealand, of their migration, are preserved by the Australians. True, there are legends and tales of tribal migrations and early tribal history, but nothing, as A. W. Howitt points out, which can be twisted into referring even indirectly to their first arrival. It is almost incredible there should be none, if the date of their arrival is to be reckoned as only dating

back some centuries. Again, while they differ physically from neighbouring races, while there is practically nothing in common between them and the Malays, the Polynesians, or the Papuan Melanesians, they agree in type so closely among themselves that they must be regarded as forming one race. Yet it is noteworthy that the languages of their several tribes are different. The occurrence of a large number of common roots proves them to be derived from one source, but the great variety of dialects—sometimes unintelligible between tribes separated by only a few miles—cannot be explained except by supposing a vast period to have elapsed since their first settlement. There is evidence in the languages, too, which supports the physical separation from their New Zealand neighbours and, therefore, from the Polynesian family of races. The numerals in use were limited. In some tribes there were only three in use, in most four. For the number "five" a word meaning "many" was employed. This linguistic poverty proves that the Australian tongue has no affinity to the Polynesian group of languages, where denary enumeration prevails: the nearest Polynesians, the Maoris, counting in thousands. Further evidence of the antiquity of Australian man is to be found in the strict observance of tribal boundaries, which would seem to show that the tribes must have been settled a long time in one place.

A further difficulty is created by a consideration of the Tasmanian people, extinct since 1876. For the Tasmanians in many ways closely approximated to the Papuan type. They had coarse, short, woolly hair and Papuan features. They clearly had no racial affinities with the Australians. They did not possess the boomerang or woomerah, and they had no boats. When they were discovered, a mere raft of reeds in which they could scarcely venture a mile from shore was their only means of navigation. Yet while the Tasmanians are so distinctly separated in physique and customs from the Australians, the fauna and flora of Tasmania and Australia prove that at one time the two formed one continent, and it would take an enormous time for the formation of Bass Strait. How did the Tasmanians with their Papuan affinities get so far south on a continent inhabited by a race so differing from Papuans? Did they get to Tasmania before or after its separation from the main continent? If before, why were they only found in the south? It would have been reasonable to expect to find them sporadically all over Australia. If after, how did they get there at all? For it is impossible to accept the theory of one writer that they sailed or rowed round the continent—a journey requiring enormous maritime skill, which, according to the theory, they must have promptly lost.

Four points are clear: (1) the Australians represent a distinct race; (2) they have no kinsfolk among the neighbouring races; (3) they have occupied the continent for a very long period; (4) it would seem that the Tasmanians must represent a still earlier occupation of Australia, perhaps before the Bass Strait existed.

Several theories have been propounded by ethnologists. An attempt has been made to show that the Australians have close affinities with the African negro peoples, and certain resemblances in language and in customs have been relied on. Sorcery, the scars raised on the body, the knocking out of teeth, circumcision and rules as to marriage have been quoted; but many such customs are found among savage peoples far distant from each other and entirely unrelated. The alleged language similarities have broken down on close examination. A. R. Wallace is of the opinion that the Australians "are really of Caucasian type and are more nearly allied to ourselves than to the civilized Japanese or the brave and intelligent Zulus." He finds near kinsmen for them in the Ainus of Japan, the Khmers and Chams of Cambodia and among some of the Micronesian islanders who, in spite of much crossing, still exhibit marked Caucasic types. He regards the Australians as representing the lowest and most primitive examples of this primitive Caucasic type, and he urges that they must have arrived in Australia at a time when their ancestors had no pottery, knew no agriculture, domesticated no animals, had no houses and used no bows and arrows. This theory has been supported by the investigations of Dr Klaatsch, of the university of Heidelberg, who would, however, date Australian ancestry still farther back, for his studies on the spot have convinced him that the Australians are "a generalized, not a specialized, type of humanity—that is to say, they are a very primitive people, with more of the common undeveloped characteristics of man, and less of the qualities of the specialized races of civilization." Dr Klaatsch's view is that they are survivals of a primitive race which inhabited a vast Antarctic continent of which South America, South Africa and Australia once formed a part, as evidenced by the identity of many species of birds and fish. He urges that the similarities of some of the primitive races of India and Africa to the aborigines of Australia are indications that they were peopled from one common stock. This theory, plausible and attractive as it is, and fitting in, as it does, with the acknowledged primitive character of the Australian blackfellow, overlooks, nevertheless, the Tasmanian difficulty. Why should a Papuan type be found in what was certainly once a portion of the Australian continent? The theory which meets this difficulty is that which has in its favour the greatest weight of evidence, viz. that the continent was first inhabited by a Papuan type of man who made his way thither from Flores and Timor, New Guinea and the Coral Sea. That in days so remote as to be undateable, a Dravidian people driven from their primitive home in the hills of the Indian Deccan made their way south via Ceylon (where they may to-day be regarded as represented by the Veddahs) and eventually sailed and drifted in their bark boats to the western and north-western shores of Australia. It is difficult to believe that they at first arrived in such numbers as at once to overwhelm the Papuan population. There were probably several migrations. What seems certain, if this theory is adopted, is that they did at last accumulate to an extent which permitted of their mastering the former occupiers of the soil, who were probably in very scattered and defenceless communities.

In the slow process of time they drove them into the most southerly corner of Australia, just as the Saxons drove the Celts into Cornwall and the Welsh hills. Even if this Dravidian invasion is put subsequent to the Bass Strait forming, even if one allows the probability of much crossing between the two races at first, in time the hostilities would be renewed. With their earliest settlements on the north-north-west coasts, the Dravidians would probably tend to spread out north, north-east and east, and a southerly line of retreat would be the most natural one for the Papuans.[1] When at last they were driven to the Strait they would drift over on rafts or in clumsy shallops; being thereafter left in peace to concentrate their race, then possibly only in an approximately pure state, in the island to which the Dravidians would not take the trouble to follow them, and where they would have centuries in which once more to fix their racial type and emphasize over again those differences, perhaps temporarily marred by crossing, which were found to exist on the arrival of the Whites.

This Indo-Aryan origin for the Australian blackfellows is borne out by their physique. In spite of their savagery they are admitted by those who have studied them to be far removed from the low or Simian type of man. Dr Charles Pickering (1805–1878), who studied the Australians on the spot, writes:

[1] In his *Discoveries in Central Australia*, E. T. Eyre has ingeniously attempted to reconstruct the routes taken by the Australians in their advance across the continent. He has relied, however, in his efforts to link the tribes together, too much on the prevalence or absence of such customs as circumcision—always very treacherous evidences—to allow of his hypothetical distribution being regarded very seriously. The migrations must have always been dependent upon physical difficulties, such as waterless tracts or mountain barriers. They were probably not definite massed movements, such as would permit of the survival of distinctive lines of custom between tribe and tribe; but rather spasmodic movements, sometimes of tribes or of groups, sometimes only of families or even couples, the first caused by tribal wars, the second to escape punishment for some offence against tribal law, such as the defiance of the rules as to clan-marriages.

"Strange as it may appear, I would refer to an Australian as the finest model of the human proportions I have ever met; in muscular development combining perfect symmetry, activity and strength, while his head might have compared with the antique bust of a philosopher." Huxley concluded, from descriptions, that "the Deccan tribes are indistinguishable from the Australian races." Sir W. W. Hunter states that the Dravidian tribes were driven southwards in Hindustan, and that the grammatical relations of their dialects are "expressed by suffixes," which is true as to the Australian languages. He states that Bishop Caldwell,[1] whom he calls "the great missionary scholar of the Dravidian tongue," showed that the south and western Australian tribes use almost the same words for "I, thou, he, we, you, as the Dravidian fishermen on the Madras coast." When in addition to all this it is found that physically the Dravidians resemble the Australians; that the boomerang is known among the wild tribes of the Deccan alone (with the doubtful exception of ancient Egypt) of all parts of the world except Australia, and that the Australian canoes are like those of the Dravidian coast tribes, it seems reasonable enough to assume that the Australian natives are Dravidians, exiled in remote times from Hindustan, though when their migration took place and how they traversed the Indian Ocean must remain questions to which, by their very nature, there can be no satisfactory answer.

The low stage of culture of the Australians when they reached their new home is thus accounted for, but their stagnation is remarkable, because they must have been frequently in contact with more civilized peoples. In the north of Australia there are traces of Malay and Papuan blood. That a far more advanced race had at one time a settlement on the north-west coast is indicated by the cave-paintings and sculptures discovered by Sir George Grey. In caves of the valley of the Glenelg river, north-west Australia, about 60 m. inland and 20 m. south of Prince Regent's river, are representations of human heads and bodies, apparently of females clothed to the armpits, but all the faces are without any indication of mouths. The heads are surrounded with a kind of head-dress or halo and one wears a necklace. They are drawn in red, blue and yellow. The figures are almost life-size. Rough sculptures, too, were found, and two large square mounds formed of loose stones, and yet perfect parallelograms in outline, placed due east and west. In the same district Sir George Grey noticed among the blackfellows people he describes as "almost white." On the Gascoyne river, too, were seen natives of an olive colour, quite good-looking; and in the neighbourhood of Sydney rock-carvings have been also found. All this points to a temporary occupation by a race at a far higher stage of culture than any known Australians, who were certainly never capable of executing even the crude works of art described.

Physically the typical Australian is the equal of the average European in height, but is inferior in muscular development, the legs and arms being of a leanness which is often emphasized by an abnormal corpulence. The bones are delicately formed, and there is the lack of calf usual in black races. The skull is abnormally thick and the cerebral capacity small. The head is long and somewhat narrow, the forehead broad and receding, with overhanging brows, the eyes sunken, large and black, the nose thick and very broad at the nostrils. The mouth is large and the lips thick but not protuberant. The teeth are large, white and strong. In old age they appear much ground down; particularly is this the case with women, who chew the different kinds of fibres, of which they make nets and bags. The lower jaw is heavy; the cheekbones somewhat high, and the chin small and receding. The neck is thicker and shorter than that of most Europeans. The colour of the skin is a deep copper or chocolate, never sooty black. When born, the Australian baby is of a much lighter colour than its parents and remains so for about a week. The hair is long, black or very dark auburn, wavy and sometimes curly, but never woolly, and the men have luxuriant beards and whiskers, often of an auburn tint, while the whole body inclines to hairiness. On the Balonne river, Queensland, Baron Mikluho Maclay found a group of hairless natives. The head hair is usually matted with grease and dirt, but when clean is fine and glossy. The skin gives out an objectionable odour, owing to the habit of anointing the body with fish-oils, but the true fetor of the negro is lacking in the Australian. The voices of the blackfellows are musical. Their mental faculties, though inferior to those of the Polynesian race, are not contemptible. They have much acuteness of perception for the relations of individual objects, but little power of generalization. No word exists in their language for such general terms as tree, bird or fish; yet they have invented a name for every species of vegetable and animal they know. The grammatical structure of some north Australian languages has a considerable degree of refinement. The verb presents a variety of conjugations, expressing nearly all the moods and tenses of the Greek. There is a dual, as well as a plural form in the declension of verbs, nouns, pronouns and adjectives. The distinction of genders is not marked, except in proper names of men and women. All parts of speech, except adverbs, are declined by terminational inflections. There are words for the elementary numbers, one, two, three; but "four" is usually expressed by "two-two." They have no idea of decimals. The number and diversity of separate languages is bewildering.

Physique.

In disposition the Australians are a bright, laughter-loving folk, but they are treacherous, untruthful and hold human life cheaply. They have no great physical courage. They are mentally in the condition of children. None of them has an idea of what the West calls morality, except the simple one of right or wrong arising out of property. A wife will be beaten without mercy for unfaithfulness to her husband, but the same wife will have had to submit to the first-night promiscuity, a widespread revel which Roth shows is a regular custom in north-west-central Queensland. A husband claims his wife as his absolute property, but he has no scruple in handing her over for a time to another man. There is, however, no proof that anything like community of women or unlimited promiscuity exists anywhere. It would be wrong, however, to conclude that moral considerations have led up to this state of things. Of sexual morality, in the everyday sense of the word, there is none. In his treatment of women the aboriginal may be ranked lower than even the Fuegians. Yet the Australian is capable of strong affections, and the blind (of whom there have always been a great number) are cared for, and are often the best fed in a tribe.

Character.

The Australians when first discovered were found to be living in almost a prehistoric simplicity. Their food was the meat they killed in the chase, or seeds and roots, grubs or reptiles. They never, in any situation, cultivated the soil for any kind of food-crop. They never reared any kind of cattle, or kept any domesticated animal except the dog, which probably came over with them in their canoes. They nowhere built permanent dwellings, but contented themselves with mere hovels for temporary shelter. They neither manufactured nor possessed any chattels beyond such articles of clothing, weapons, ornaments and utensils as they might carry on their persons, or in the family store-bag for daily use. In most districts both sexes are entirely nude. Sometimes in the south during the cold season they wear a cloak of skin or matting, fastened with a skewer, but open on the right-hand side.

Manners.

When going through the bush they sometimes wear an apron of skins, for protection merely. No headgear is worn, except sometimes a net to confine the hair, a bunch of feathers, or the tails of small animals. The breast or back, of both sexes, is usually tattooed, or rather, scored with rows of hideous raised scars, produced by deep gashes made at puberty. Their dwellings for the most part are either bowers, formed of the branches of trees, or hovels of piled logs, loosely covered with grass or bark, which they can erect in an hour, wherever they encamp. But some huts of a more substantial form were seen by Captain Matthew Flinders on the south-east coast in 1799, and by Captain King and Sir T. Mitchell on the north-east, where they

[1] *The Languages of India* (1875).

no longer appear. The ingenuity of the race is mostly exhibited in the manufacture of their weapons of warfare and the chase. While the use of the bow and arrow does not seem to have occurred to them, the spear and axe are in general use, commonly made of hard-wood; the hatchets of stone, and the javelins pointed with stone or bone. The characteristic weapon of the Australian is the boomerang (*q.v.*). Their nets, made by women, either of the tendons of animals or the fibres of plants, will catch and hold the kangaroo or the emu, or the very large fish of Australian rivers. Canoes of bent bark, for the inland waters, are hastily prepared at need; but the inlets and straits of the north-eastern sea-coast are navigated by larger canoes and rafts of a better construction. As to food, they are omnivorous. In central Queensland and elsewhere, snakes, both venomous and harmless, are eaten, the head being first carefully smashed to pulp with a stone.

Tribal organization.

The tribal organization of the Australians was based on that of the family. There were no hereditary or formally elected chiefs, nor was there any vestige of monarchy. The affairs of a tribe were ruled by a council of men past middle age. Each tribe occupied a recognized territory, averaging perhaps a dozen square miles, and used a common dialect. This district was subdivided between the chief heads of families. Each family, or family group, had a dual organization which has been termed (1) the Social, (2) the Local. The first was matriarchal, inheritance being reckoned through the mother. No territorial association was needed. All belonged to the same totem or totemic class, and might be scattered throughout the tribe, though subject to the same marriage laws. The second was patriarchal and of a strictly territorial nature. A family or group of families had the same hunting-ground, which was seldom changed, and descended through the males. Thus, the sons inherited their fathers' hunting-ground, but bore their mothers' name and therewith the right to certain women for wives. The Social or matriarchal took precedence of the Local or patriarchal organization. In many cases it arranged the assemblies and ceremonial of the tribe; it regulated marriage, descent and relationship; it ordered blood feuds, it prescribed the rites of hospitality and so on. Nevertheless the Local side of tribal life in time tended to overwhelm the Social and to organize the tribe irrespective of matriarchy, and inclined towards hereditary chieftainship.

The most intricate and stringent rules existed as to marriage within and without the totemic inter-marrying classes. There is said to be but one exception to the rule that marriage must be contracted outside the totem name. This exception was discovered by Messrs Spencer and Gillen among the Arunta of central Australia, some allied septs, and their nearest neighbours to the north, the Kaitish. This tribe may legally marry within the totem, but always avoids such unions. Even in casual amours these class laws were invariably observed, and the young man or woman who defied them was punished, he with death, she with spearing or beating. At the death of a man, his widows passed to his brother of the same totem class. Such a system gave to the elder men of a tribe a predominant position, and generally respect was shown to the aged. Laws and penalties in protection of property were enforced by the tribe. Thus, among some tribes of Western Australia the penalty for abducting another's wife was to stand with leg extended while each male of the tribe stuck his spear into it. Laws, however, did not protect the women, who were the mere chattels of their lords. Stringent rules, too, governed the food of women and the youth of both sexes, and it was only after initiation that boys were allowed to eat of all the game the forest provided. In every case of death from disease or unknown causes sorcery was suspected and an inquest held, at which the corpse was asked by each relative in succession the name of the murderer. This formality having been gone through, the flight of the first bird which passed over the body was watched, the direction being regarded as that in which the sorcerer must be sought. Sometimes the nearest relative sleeps with his head on the corpse, in the belief that he will dream of the murderer. The most sacred duty an Australian had to perform was the avenging of the death of a kinsman, and he was the object of constant taunts and insults till he had done so. Cannibalism was almost universal, either in the case of enemies killed in battle or when animal food was scarce. In the Luritcha tribe it was customary when a child was in weak health to kill a younger and healthy one and feed the weakling on its flesh. Cannibalism seems also to have sometimes been in the nature of a funeral observance, in honour of the deceased, of whom the relatives reverently ate portions.

Religion.

They had no special forms of religious worship, and no idols. The evidence on the question of whether they believed in a Supreme Being is very contradictory. Messrs Spencer and Gillen appear to think that such rudimentary idea of an All-Father as has, it is thought, been detected among the blackfellows is an exotic growth fostered by contact with missionaries. A. W. Howitt and Dr Roth appear to have satisfied themselves of a belief, common to most tribes, in a mythic being (he has different names in different tribes) having some of the attributes of a Supreme Deity. But Mr Howitt finds in this being "no trace of a divine nature, though under favourable conditions the beliefs might have developed into an actual religion." Other authorities suggest that it is going much too far to deny the existence of religion altogether, and instance as proof of the divinity of the supra-normal anthropomorphic beings of the Baiame class, the fact that the Yuin and cognate tribes dance around the image of Daramulun (their equivalent of Baiame) and the medicine men "invocate his name." A good deal perhaps depends on each observer's view of what religion really is. The Australians believed in spirits, generally of an evil nature, and had vague notions of an after-life. The only idea of a god known to be entertained by them seems to be that of the Euahlayi and Kamilaori tribe, Baiame, a gigantic old man lying asleep for ages, with his head resting on his arm, which is deep in the sand. He is expected one day to awake and eat up the world. Researches go to show that Baiame has his counterpart in other tribes, the myth varying greatly in detail. But the Australians are distinguished by possessing elaborate initiatory ceremonies. Circumcision of one or two kinds was usual in the north and south, but not in Western Australia or on the Murray river. In South Australia boys had to undergo three stages of initiation in a place which women were forbidden to approach. At about ten they were covered with blood from head to foot, several elder men bleeding themselves for the purpose. At about twelve or fourteen circumcision took place and (or sometimes as an alternative on the east coast) a front tooth was knocked out, to the accompaniment of the booming of the bullroarer (*q.v.*). At the age of puberty the lad was tattooed or scarred with gashes cut in back, shoulders, arms and chest, and the septum of the nose was pierced. The gashes varied in patterns for the different tribes. Girls, too, were scarred at puberty and had teeth knocked out, &c. The ceremonies—known to the Whites under the native generic term for initiatory rites, *Bora*—were much the same throughout Australia. Polygamy was rare, due possibly to the scarcity of women.[1] Infanticide was universally recognized. The mode of disposing of the dead varied. Among some tribes a circular grave was dug and the body placed in it with its face towards the east, and a high mound covered with bark or thatch raised over it. In New South Wales the body is often burned and the ashes buried. On the Lower Murray the body is placed on a platform of sticks and left to decay. Young children are often not buried for months, but are carried about by their mothers. At the funeral of men there is much mourning, the female relatives cutting or tearing their hair off and plastering their faces with clay, but for women no public ceremonies took place.

The numbers of the native Australians are steadily diminishing. It was estimated that when first visited by Europeans the native

[1] The existence of "Group Marriage" is a much-controverted point. This custom, which has been defined as the invasion of actual marriage by allotting permanent paramours, is confined to a special set of tribes.

population did not much exceed 200,000. A remnant of the race exists in each of the provinces, while a few tribes still wander over the interior.

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HISTORY

1. *The Discovery of Australia.*

It is impossible to say who were the first discoverers of Australia, although there is evidence that the Chinese had some knowledge of the continent so far back as the 13th century. The Malays, also, would seem to have been acquainted with the northern coast; while Marco Polo, who visited the East at the close of the 13th century, makes reference to the reputed existence of a great southern continent. There is in existence a map, dedicated to Henry VIII. of England, on which a large southern land is shown, and the tradition of a Terra Australis appears to have been current for a long period before it enters into authentic history.

In 1503 a French navigator named Binot Paulmyer, sieur de Gonneville, was blown out of his course, and landed on a large island, which was claimed to be the great southern land of tradition, although Flinders and other authorities are inclined to think that it must have been Madagascar. Some French authorities confidently put forward a claim that Guillaume le Testu, of Provence, sighted the continent in 1531. The Portuguese also advance claims to be the first discoverers of Australia, but so far the evidence cannot be said to establish their pretensions. As early as 1597 the Dutch historian, Wytfliet, describes the Australis Terra as the most southern of all lands, and proceeds to give some circumstantial particulars respecting its geographical relation to New Guinea, venturing the opinion that, were it thoroughly explored, it would be regarded as a fifth part of the world.

Early in the 17th century Philip III. of Spain sent out an expedition from Callao, in Peru, for the purpose of searching for a southern continent. The little fleet comprised three vessels, with the Portuguese pilot, De Quiros, as navigator, and De Torres as admiral or military commander. They left Callao on the 21st of December 1605, and in the following year discovered the island now known as Espiritu Santo, one of the New Hebrides group, which De Quiros, under the impression that it was indeed the land of which he was in search, named *La Austrialia del Espiritu Santo*. Sickness and discontent led to a mutiny on De Quiros' vessel, and the crew, overpowering their officers during the night, forced the captain to navigate his ship to Mexico. Thus, abandoned by his consort, De Torres, compelled to bear up for the Philippines to refit, discovered and sailed through the strait that bears his name, and may even have caught a glimpse of the northern coast of the Australian continent. His discovery was not, however, made known until 1792, when Dalrymple rescued his name from oblivion, bestowing it upon the passage which separates New Guinea from Australia. De Quiros returned to Spain to re-engage in the work of petitioning the king to despatch an expedition for the purpose of prosecuting the discovery of the Terra Australis. He was finally successful in his petitions, but died before accomplishing his work, and was buried in an unknown grave in Panama, never being privileged to set his foot upon the continent the discovery of which was the inspiration of his life.

De Torres.

During the same year in which De Torres sailed through the strait destined to make him famous, a little Dutch vessel called the "Duyfken," or "Dove," set sail from Bantam, in Java, on a voyage of discovery. This ship entered the Gulf of Carpentaria, and sailed south as far as Cape Keerweer, or Turn-again. Here some of the crew landed, but, being attacked by natives, made no attempt to explore the country. In 1616 Dirk Hartog discovered the island bearing his name. In 1622 the "Leeuwin," or "Lioness," made some discoveries on the south-west coast; and during the following year the yachts "Pera" and "Arnheim" explored the shores of the Gulf of Carpentaria. Arnheim Land, a portion of the Northern Territory, still appears on many maps as a memento of this voyage. Among other early Dutch discoverers were Edel; Pool, in 1629, in the Gulf of Carpentaria; Nuyts, in the "Gulde Zeepaard," along the southern coast, which he called, after himself, Nuyts Land; De Witt; and Pelsaert, in the "Batavia." Pelsaert was wrecked on Houtman's Abrolhos; his crew mutinied, and he and his party suffered greatly from want of water. The record of his voyage is interesting from the fact that he was the first to carry back to Europe an authentic account of the western coast of Australia, which he described in any but favourable terms. It is to Dutch navigators in the early portion of the 17th century that we owe the first really authentic accounts of the western coast and adjacent islands, and in many instances the names given by these mariners to prominent physical features are still retained. By 1665 the Dutch possessed rough charts of almost the whole of the western littoral, while to the mainland itself they had given the name of New Holland. Of the Dutch discoverers, Pelsaert was the only one who made any detailed observations of the character of the country inland, and it may here be remarked that his journal contains the first notice and description of the kangaroo that has come down to us.

Dutch discoverers.

In 1642 Abel Janszoon Tasman sailed on a voyage of discovery from Batavia, the headquarters of the governor and council of the Dutch East Indies, under whose auspices the expedition was undertaken. He was furnished with a yacht, the "Heemskirk," and a fly-boat, the "Zeehaen" (or "Sea Hen"), under the command of Captain Jerrit Jansen. He left Batavia on what has been designated by Dutch historians the "Happy Voyage," on the 14th of August 1642. After a visit to the Mauritius, then a Dutch possession, Tasman bore away to the south-east, and on the 24th of November sighted the western coast of the land which he named Van Diemen's Land, in honour of the governor under whose directions he was acting. The honour was later transferred to the discoverer himself, and the island is now known as Tasmania. Tasman doubled the southern extremity of Van Diemen's Land and explored the east coast for some distance. The ceremony of hoisting a flag and taking possession of the country in the name of the government of the Netherlands was actually performed, but the description of the wildness of the country, and of the fabulous giants by which Tasman's sailors believed it to be inhabited, deterred the Dutch from occupying the island, and by the international principle of "non-user" it passed from their hands. Resuming his voyage in an easterly direction, Tasman sighted the west coast of the South Island of New Zealand on the 13th of December of the same year, and describes the coast-line as consisting of "high mountainous country."

The first English navigator to sight the Australian continent was William Dampier, who made a visit to these shores in 1688, as supercargo of the "Cygnet," a trader whose crew had turned buccaneers. On his return to England he published an account of his voyage, which resulted in his being sent out in the "Roebuck" in 1699 to prosecute his discoveries further. To him we owe the exploration of the coast for about 900 m.—from Shark's Bay to Dampier's Archipelago, and thence to Roebuck Bay. He appears to have landed in several places in search of water. His account of the country was

Dampier.

quite as unfavourable as Pelsaert's. He described it as barren and sterile, and almost devoid of animals, the only one of any importance somewhat resembling a raccoon—a strange creature, which advanced by great bounds or leaps instead of walking, using only its hind legs, and covering 12 or 15 ft. at a time. The reference is, of course, to the kangaroo, which Pelsaert had also remarked and quaintly described some sixty years previously.

During the interval elapsing between Dampier's two voyages, an accident led to the closer examination of the coasts of Western Australia by the Dutch. In 1684 a vessel had sailed from Holland for the Dutch possessions in the East Indies, and after rounding the Cape of Good Hope, she was never again heard of. Some twelve years afterwards the East India Company fitted out an expedition under the leadership of Commander William de Vlamingh, with the object of searching for any traces of the lost vessel on the western shores of New Holland. Towards the close of the year 1696 this expedition reached the island of Rottnest, which was thoroughly explored, and early the following year a landing party discovered and named the Swan river. The vessels then proceeded northward without finding any traces of the object of their search, but, at the same time, making fairly accurate charts of the coast-line.

The great voyage of Captain James Cook, in 1769–1770, was primarily undertaken for the purposes of observing the transit of Venus, but he was also expressly commissioned to ascertain "whether the unexplored part of the southern hemisphere be only an immense mass of water, or contain another continent." H.M.S. "Endeavour," the vessel fitted out for the voyage, was a small craft of 370 tons, carrying twenty-two guns, and built originally for a collier, with a view rather to strength than to speed. Chosen by Cook himself, she was renamed the "Endeavour," in allusion to the great work which her commander was setting out to achieve. Mr Charles Green was commissioned to conduct the astronomical observations, and Sir Joseph Banks and Dr Solander were appointed botanists to the expedition. After successfully observing the transit from the island of Tahiti, or Otaheite, as Cook wrote it, the "Endeavour's" head was turned south, and then north-west, beating about the Pacific in search of the eastern coast of the great continent whose western shores had been so long known to the Dutch. On the 6th of October 1769 the coast of New Zealand was sighted, and two days later Cook cast anchor in Poverty Bay, so named from the inhospitality and hostility of the natives.

Cook.

After voyaging westward for nearly three weeks, Cook, on the 19th of April 1770, sighted the eastern coast of Australia at a point which he named after his lieutenant, who discovered it, Point Hicks, and which modern geographers identify with Cape Everard.

The "Endeavour" then coasted northward, and after passing and naming Mount Dromedary, the Pigeon House, Point Upright, Cape St George and Red Point, Botany Bay was discovered on the 28th of April 1770, and as it appeared to offer a suitable anchorage, the "Endeavour" entered the bay and dropped anchor. The ship brought-to opposite a group of natives, who were cooking over a fire. The great navigator and his crew, unacquainted with the character of the Australian aborigines, were not a little astonished that these natives took no notice of them or their proceedings. Even the splash of the anchor in the water, and the noise of the cable running out through the hawse-hole, in no way disturbed them at their occupation, or caused them to evince the slightest curiosity. But as the captain of the "Endeavour" ordered out the pinnace and prepared to land, the natives threw off their nonchalance; for on the boat approaching the shore, two men, each armed with a bundle of spears, presented themselves on a projecting rock and made threatening signs to the strangers. It is interesting to note that the ingenious *wommera*, or throw-stick, which is peculiar to Australia, was first observed on this occasion. As the men were evidently determined to oppose any attempt at landing, a musket was discharged between them, in the hope that they would be frightened by the noise, but it produced no effect beyond causing one of them to drop his bundle of spears, of which, however, he immediately repossessed himself, and with his comrade resumed the same menacing attitude. At last one cast a stone towards the boat, which earned him a charge of small shot in the leg. Nothing daunted, the two ran back into the bush, and presently returned furnished with shields made of bark, with which to protect themselves from the firearms of the crew. Such intrepidity is certainly worthy of passing notice. Unlike the American Indians, who supposed Columbus and his crew to be supernatural beings, and their ships in some way endowed with life, and were thrown into convulsions of terror by the first discharge of firearms which they witnessed, these Australians were neither excited to wonder by the ship nor overawed by the superior number and unknown weapons of the strangers. Cook examined the bay in the pinnace, and landed several times; but by no endeavour could he induce the natives to hold any friendly communication with him. The well-known circumstance of the great variety of new plants here obtained, from which Botany Bay derives its name, should not be passed over. Before quitting the bay the ceremony was performed of hoisting the Union Jack, first on the south shore, and then near the north head, formal possession of the territory being thus taken for the British crown. During the sojourn in Botany Bay the crew had to perform the painful duty of burying a comrade—a seaman named Forby Sutherland, who was in all probability the first British subject whose body was committed to Australian soil.

After leaving Botany Bay, Cook sailed northward. He saw and named Port Jackson, but forbore to enter the finest natural harbour in Australia. Broken Bay and other inlets, and several headlands, were also seen and named, but the vessel did not come to an anchor till Moreton Bay was reached, although the wind prevented Cook from entering this harbour. Still sailing northward, taking notes as he proceeded for a rough chart of the coast, and landing at Bustard and Keppel Bays and the Bay of Inlets, Cook passed over 1300 m. without the occurrence of any event worthy of being chronicled, till suddenly one night at ten o'clock the water was found to shoal, without any sign of breakers or land. While Cook was speculating on the cause of this phenomenon, and was in the act of ordering out the boats to take soundings, the "Endeavour" struck heavily, and fell over so much that the guns, spare cables, and other heavy gear had at once to be thrown overboard to lighten the ship. As day broke, attempts were made to float the vessel off with the morning tide; but these were unsuccessful. The water was rising so rapidly in the hold that with four pumps constantly going the crew could hardly keep it in check. At length one of the midshipmen suggested the device of "fothering," which he had seen practised in the West Indies. This consists of passing a sail, attached to cords, and charged with oakum, wool, and other materials, under the vessel's keel, in such a manner that the suction of the leak may draw the canvas into the aperture, and thus partially stop the vent. This was performed with great success, and the vessel was floated off with the evening tide. The land was soon after made near the mouth of a small stream, which Cook called, after the ship, the Endeavour river. A headland close by he named Cape Tribulation. The ship was steered into the river, and there careened and thoroughly repaired. Cook having completed the survey of the east coast, to which he gave the name of New South Wales, sighted and named Cape York, the northernmost point of Australia, and took final possession of his discoveries northward from 38° S. to 10½° S., on a spot which he named Possession Island, thence returning to England by way of Torres Straits and the Indian Ocean.

The great navigator's second voyage, undertaken in 1772, with the "Resolution" and the "Adventure," is of less importance. The vessels became separated, and both at different times visited New Zealand. Captain Tobias Furneaux, in the "Adventure," also found his way to Storm Bay in Tasmania. In 1777, while on his way to search for a north-east passage between the Atlantic and Pacific oceans, Cook again touched at the coast of Tasmania and New Zealand.

On his first voyage, in 1770, Cook had some grounds for the belief that Van Diemen's Land, as Tasmania was then called, was a separate island. The observations of Captain Furneaux, however, did not strengthen this belief, and when making his final voyage, the great navigator appears to have definitely concluded that it was part of the mainland of Australia. This continued to be the opinion of geographers until 1798, when Bass discovered the strait which bears his name. The next recorded expedition is a memorable one in the annals of Australian history—the despatch of a British colony to the shores of Botany Bay. The fleet sailed in May 1787, and arrived off the Australian coast early in the following January.

2. *Inland Exploration.*

For a period of twenty-five years after the first establishment of a British settlement in Australia, the colonists were only acquainted with the country along the coast extending northwards about 70 m. from Sydney and about a like distance to the south and shut in to the west by the Blue Mountain range, forming a narrow strip not more than 50 m. wide at its broadest part.

The Blue Mountains attain a height of between 3000 and 4000 ft. only, but they are intersected with precipitous ravines 1500 ft. deep, which baffled every effort to reach the interior until in 1813, when a summer of severe drought had made it of vital importance to find new pastures, three of the colonists, Messrs Blaxland, Lawson and Wentworth, more fortunate than their predecessors in exploration, after crossing the Nepean river at Emu Plains and ascending the Dividing Range, were able to reach a position enabling them to obtain a view of the grassy valley of the Fish river, which lies on the farther side of the Dividing Range. The western descent of the mountains appeared to the explorers comparatively easy, and they returned to report their discovery. A line of road was constructed across the mountains as far as the Macquarie river by the surveyor, Mr Evans, and the town of Bathurst laid out. This marks the beginning of the occupation of the interior of the continent. Some small expeditions were made from Bathurst, resulting in the discovery of the Lachlan, and in 1816 the first of the great exploration expeditions of Australia was fitted out under Lieutenant Oxley, R.N. Oxley was accompanied by Mr Evans and Mr Allan Cunningham the botanist, and the object of his expedition was to trace the course of the Lachlan in a westerly direction. Oxley traced the river until it lost itself in the swamps east of 147° E., then crossing the river he traversed the country between the Lachlan and Murrumbidgee as far as 34° S. and 144° 30′ E. On his return journey Oxley again crossed the Lachlan about 160 m., measured along the river, below the point where he left it on his journey south. Continuing in a north-easterly direction Oxley struck the Macquarie river at a place he called Wellington, and from this place in the following year he organized a second expedition in hopes of discovering an inland sea. He was, however, disappointed in this, as after descending the course of the Macquarie below Mount Harris, he found that the river ended in an immense swamp overgrown with reeds. Oxley now turned aside—led by Mr Evans's report of the country eastward—crossed the Arbuthnot range, and traversing the Liverpool Plains, and ascending the Peel and Cockburn rivers to the Blue Mountains, gained sight of the open sea, which he reached at Port Macquarie. A valuable extension of geographical knowledge had been gained by this circuitous journey of more than 800 m. Yet its result was a disappointment to those who had looked for means of inland navigation by the Macquarie river, and by its supposed issue in a mediterranean sea.

Oxley.

During the next two or three years public attention was occupied with Captain King's maritime explorations of the north-west coast in three successive voyages, and by explorations of Western Australia in 1821. These steps were followed by the foundation of a settlement on Melville Island, in the extreme north, which, however, was soon abandoned. In 1823 Lieutenant Oxley proceeded to Moreton Bay and Port Curtis, the first place 500 m., the other 690 m. north of Sydney, to choose the site of a new penal establishment. From a shipwrecked English sailor he met with, who had lived with the savages, he heard of the river Brisbane. About the same time, in the opposite direction, south-west of Sydney, a large extent of the interior was revealed. Messrs Hamilton Hume and Hovell set out from Lake George, crossed the Murrumbidgee, and, after following the river for a short distance, struck south, skirting the foothills of what are now known as the Australian Alps until they reached a fine river, which was called the Hume after the leader's father. Crossing the Murray at Albury, the explorers, bearing to the south-west, skirted the western shore of Port Philip and reached the sea-coast near where the town of Geelong now stands. In 1827 and the two following years, Cunningham prosecuted instructive explorations on both sides of the Liverpool range, between the upper waters of the Hunter and those of the Peel and other tributaries of the Brisbane north of New South Wales. Some of his discoveries, including those of Pandora's Pass and the Darling Downs, were of great practical utility.

By this time much had thus been done to obtain an acquaintance with the eastern parts of the Australian continent, although the problem of what could become of the large rivers flowing north-west and south-west into the interior was still unsolved. With a view to determine this question, Governor Sir Ralph Darling, in the year 1828, sent out the expedition under Captain Charles Sturt, who, proceeding first to the marshes at the end of the Macquarie river, found his progress checked by the dense mass of reeds in that quarter. He therefore turned westward, and struck a large river, with many affluents, to which he gave the name of the Darling. This river, flowing from north-east to south-west, drains the marshes in which the Macquarie and other streams from the south appeared to be lost. The course of the Murrumbidgee, a deep and rapid river, was followed by the same eminent explorer in his second expedition in 1831 with a more satisfactory result. He travelled on this occasion nearly 2000 m., and discovered that both the Murrumbidgee, carrying with it the waters of the Lachlan morass, and likewise the Darling, from a more northerly region, finally joined another and larger river. This stream, the Murray, in the upper part of its course runs in a north-westerly direction, but afterwards turning southwards, almost at a right angle, expands into Lake Alexandrina on the south coast, about 60 m. south-east of the town of Adelaide, and finally enters the sea at Encounter Bay in E. long. 139°.

Darling.

After gaining a practical solution of the problem of the destination of the westward-flowing rivers, Sir Thomas Mitchell, in 1833, led an expedition northward to the upper branches of the Darling; the party met with a sad disaster in the death of Richard Cunningham, brother of the eminent botanist, who was murdered by the blacks near the Bogan river. The expedition reached the Darling on the 25th of May 1833, and after establishing a depot at Fort Bourke, Mitchell traced the Darling southwards for 300 m. until he was certain the river was identical with that reported by Sturt as joining the Murray about 142° E.

Mitchell.

Meantime, from the new colony of Adelaide, South Australia, on the shores of Gulf St Vincent, a series of adventurous journeys to the north and to the west was begun by Mr Eyre, who explored a country very difficult of access. In 1840 he performed a feat of extraordinary personal daring, travelling all the way along the barren sea-coast of the Great Australian Bight, from Spencer Gulf to King George Sound. Eyre also explored the interior north of the head of Spencer Gulf, where he was misled, however, by appearances to form an erroneous theory about the water-surfaces named Lake Torrens. It was left to the veteran explorer, Sturt, to achieve the arduous enterprise of penetrating from the Darling northward to the very centre of the continent. This was in 1845, the route lying for the most part over a stony desert, where the heat (reaching 131° Fahr.), with scorching winds, caused much suffering to the party. The most northerly point reached by Sturt on this occasion was about S. lat. 24° 25′.

Eyre.

Drawn and Engraved by Justus Perthes, Gotha, Germany.

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A military station having been fixed by the British government at Port Victoria, on the coast of Arnheim Land, for the protection of shipwrecked mariners on the north coast, it was thought desirable to find an overland route between this settlement and Moreton Bay, in what then was the northern portion of New South Wales, now called Queensland. This was the object of Dr Leichhardt's expedition in 1844, which proceeded first along the banks of the Dawson and the Mackenzie, tributaries of the Fitzroy river, in Queensland. It thence passed farther north to the Burdekin, ascending to the source of that river, and turned westward across a table-land, from which there was an easy descent to the Gulf of Carpentaria. Skirting the low shores of this gulf, all the way round its upper half to the Roper, Leichhardt crossed Arnheim Land to the Alligator river, which he descended to the western shore of the peninsula, and arrived at Port Victoria, otherwise Port Essington, after a journey of 3000 m., performed within a year and three months. In 1847 Leichhardt undertook a much more formidable task, that of crossing the entire continent from east to west. His starting-point was on the Fitzroy Downs, north of the river Condamine, in Queensland, between the 26th and 27th degrees of S. latitude. But this eminent explorer had not proceeded far into the interior before he met his death, his last despatch dating from the Cogoon, 3rd of April 1848. In the same region, from 1845 to 1847, Sir Thomas Mitchell and Mr E. B. Kennedy explored the northern tributaries of the Darling, and a river in S. lat. 24°, named the Barcoo or Victoria, which flows to the south-west. This river was more thoroughly examined by Mr A. C. Gregory in 1858. Mr Kennedy lost his life in 1848, being killed by the natives while attempting to explore the peninsula of Cape York, from Rockingham Bay to Weymouth Bay.

Leichhardt.

Among the performances of less renown, but of much practical utility in surveying and opening new paths through the country, we may mention that of Captain Banister, showing the way across the southern part of Western Australia, from Swan river to King George Sound, and that of Messrs Robinson and G. H. Haydon in 1844, making good the route from Port Phillip to Gipps' Land with loaded drays, through a dense tangled scrub, which had been described by Strzelecki as his worst obstacle. Again, in Western Australia there were the explorations of the Arrowsmith, the Murchison, the Gascoyne, and the Ashburton rivers, by Captain Grey, Mr Roe, Governor Fitzgerald, Mr R. Austin, and the brothers Gregory. whose discoveries have great importance from a geographical point of view.

These local researches, and the more comprehensive attempts of Leichhardt and Mitchell to solve the chief problems of Australian geography, must yield in importance to the grand achievement of Mr Stuart in 1862. The first of his tours independently performed, in 1858 and 1859, were around the South Australian lakes, namely, Lake Torrens, Lake Eyre and Lake Gairdner. These waters had been erroneously taken for parts of one vast horseshoe or sickle shaped lake, only some 20 m. broad, believed to encircle a large portion of the inland country, with drainage at one end by a marsh into Spencer Gulf. The mistake, shown in all the old maps of Australia, had originated in a curious optical illusion. When Mr Eyre viewed the country from Mount Deception in 1840, looking between Lake Torrens and the lake which now bears his own name, the refraction of light from the glittering crust of salt that covers a large space of stony or sandy ground produced an appearance of water. The error was discovered, after eighteen years, by the explorations of Mr Babbage and Major Warburton in 1858, while Mr Stuart, about the same time, gained a more complete knowledge of the same district.

Stuart.

A reward of £10,000 having been offered by the legislature of South Australia to the first man who should traverse the whole continent from south to north, starting from the city of Adelaide, Mr Stuart resolved to make the attempt. He started in March 1860, passing Lake Torrens and Lake Eyre, beyond which he found a pleasant, fertile country till he crossed the Macdonnell range of mountains, just under the line of the tropic of Capricorn. On the 23rd of April he reached a mountain in S. lat. nearly 22°, and E. long. nearly 134°, which is the most central marked point of the Australian continent, and has been named Central Mount Stuart. Mr Stuart did not finish his task on this occasion, on account of indisposition and other causes. But the 18th degree of latitude had been reached, where the watershed divided the rivers of the Gulf of Carpentaria from the Victoria river, flowing towards the north-west coast. He had also proved that the interior of Australia was not a stony desert, like the region visited by Sturt in 1845. On the first day of the next year, 1861, Mr Stuart again started for a second attempt to cross the continent, which occupied him eight months. He failed, however, to advance farther than one geographical degree north of the point reached in 1860, his progress being arrested by dense scrubs and the want of water.

Meanwhile, in the province of Victoria, by means of a fund subscribed among the colonists and a grant by the legislature, the ill-fated expedition of Messrs Burke and Wills was started. It made for the Barcoo (Cooper's Creek), with a view to reach the Gulf of Carpentaria by a northerly course midway between Sturt's track to the west and Leichhardt's to the east. The leading men of the party were Mr Robert O'Hara Burke, an officer of police, and Mr William John Wills, of the Melbourne observatory. Leaving the main body of his party at Menindie on the Darling under a man named Wright, Burke, with seven men, five horses and sixteen camels, pushed on for Cooper's Creek, the understanding being that Wright should follow him in easy stages to the depot proposed to be there established. Wright frittered away his time in the district beyond the Darling and did not attempt to follow the party to Cooper's Creek, and Burke, tired of waiting, determined to push on. Accordingly, dividing his party, leaving at the depot four men and taking with him Wills and two men, King and Gray, with a horse and six camels, he left Cooper's Creek on the 16th of December and crossed the desert traversed by Sturt fifteen years before. They got on in spite of great difficulties, past the McKinlay range of mountains, S. lat. 21° and 22°, and then reached the Flinders river, which flows into the head of the Gulf of Carpentaria. Here, without actually standing on the sea-beach of the northern shore, they met the tidal waters of the sea. On the 23rd of February 1861 they commenced the return journey, having in effect accomplished the feat of crossing the Australian continent. Gray, who had fallen ill, died on the 16th of April. Five days later, Burke, Wills and King had repassed the desert to the place on Cooper's Creek (the Barcoo, S. lat. 27° 40′, E. long. 140° 30′), where they had left the depot, with the rest of the expedition. Here they experienced a cruel disappointment. The depot was abandoned; the men in charge had quitted the place the same day, believing that Burke and those with him were lost. The men who had thus abandoned the depot rejoined the main body of the expedition under Wright, who at length moved to Cooper's Creek, and, incredible to relate, neglected to search for the missing explorers. Burke, Wills and King, when they found themselves so fearfully left alone and unprovided in the wilderness, wandered about in that district till near the end of June. They subsisted miserably on the bounty of some natives, and partly by feeding on the seeds of a plant called nardoo. At last both Wills and Burke died of starvation. King, the sole survivor, was saved by meeting the friendly blacks, and was found alive in September by Mr A. W. Howitt's party, sent on purpose to find and relieve that of Burke.

Burke and Wills.

Four other parties, besides Howitt's, were sent out that year from different Australian provinces. Three of them, respectively commanded by Mr Walker, Mr Landsborough, and Mr Norman, sailed to the north, where the latter two landed on the shores of the Gulf of Carpentaria, while Mr Walker marched inland from Rockhampton. The fourth party, under Mr J. McKinlay, from Adelaide, made for the Barcoo by way of Lake Torrens. By these means, the unknown region of Mid Australia was simultaneously entered from the north, south, east and west, and important additions were made to geographical knowledge. Landsborough crossed the entire continent from north to south.

between February and June 1862; and McKinlay, from south to north, before the end of August in that year. The interior of New South Wales and Queensland, all that lies east of the 140th degree of longitude, was examined. The Barcoo or Cooper's Creek and its tributary streams were traced from the Queensland mountains, holding a south-westerly course to Lake Eyre in South Australia; the Flinders, the Gilbert, the Gregory, and other northern rivers watering the country towards the Gulf of Carpentaria were also explored. These valuable additions to Australian geography were gained through humane efforts to relieve the lost explorers. The bodies of Burke and Wills were recovered and brought to Melbourne for a solemn public funeral, and a noble monument has been erected to their honour.

Mr Stuart, in 1862, made his third and final attempt to traverse the continent from Adelaide along a central line, which, inclining a little westward, reaches the north coast of Arnheim Land, opposite Melville Island. He started in January, and on the 7th of April reached the farthest northern point, near S. lat. 17°, where he had turned back in May of the preceding year. He then pushed on, through a very thick forest, with scarcely any water, till he came to the streams which supply the Roper, a river flowing into the western part of the Gulf of Carpentaria. Having crossed a table-land of sandstone which divides these streams from those running to the western shores of Arnheim Land, Mr Stuart, in the month of July, passed down what is called the Adelaide river of north Australia. Thus he came at length to stand on the verge of the Indian Ocean; "gazing upon it," a writer has said, "with as much delight as Balboa, when he crossed the Isthmus of Darien from the Atlantic to the Pacific." The line crossing Australia which was thus explored has since been occupied by the electric telegraph connecting Adelaide, Melbourne, Sydney, and other Australian cities with London.

A third part, at least, of the interior of the whole continent, between the central line of Stuart and the known parts of Western Australia, from about 120° to 134° E. long., an extent of half a million square miles, still remained a blank in the map. But the two expeditions of 1873, conducted by William Christie Gosse (1842–1881), afterwards deputy surveyor-general for South Australia, and Colonel (then Major) Egerton Warburton, made a beginning in the exploration of this *terra incognita* west of the central telegraph route. That line of more than 1800 m., having its southern extremity at the head of Spencer Gulf, its northern at Port Darwin, in Arnheim Land, passes Central Mount Stuart, in the middle of the continent, S. lat. 22°, E. long. 134°. Mr Gosse, with men and horses provided by the South Australian government, started on the 21st of April from the telegraph station 50 m. south of Central Mount Stuart, to strike into Western Australia. He passed the Reynolds range and Lake Amadeus in that direction, but was compelled to turn south, where he found a tract of well-watered grassy land. A singular rock of conglomerate, 2 m. long, 1 m. wide, and 1100 ft. high, with a spring of water in its centre, struck his attention. The country was mostly poor and barren, sandy hillocks, with scanty growth of spinifex. Mr Gosse, having travelled above 600 m., and getting to 26° 32′ S. and 127° E., two degrees within the Western Australian boundary, was forced to return. Meantime a more successful attempt to reach the western coast from the centre of Australia was made by Major Warburton, with thirty camels, provided by Mr (afterwards Sir) T. Elder, of South Australia. Leaving the telegraph line at Alice Springs (23° 40′ S., 133° 14′ E.), 1120 m. north of Adelaide city, Warburton succeeded in making his way to the De Grey river, Western Australia. Overland routes had now been found possible, though scarcely convenient for traffic, between all the widely separated Australian provinces. In northern Queensland, also, there were several explorations about this period, with results of some interest. That performed by Mr W. Hann, with Messrs Warner, Tate and Taylor, in 1873, related to the country north of the Kirchner range, watered by the Lynd, the Mitchell, the Walsh and the Palmer rivers, on the east side of the Gulf of Carpentaria. The coasting expedition of Mr G. Elphinstone Dalrymple, with Messrs Hill and Johnstone, finishing in December 1873, effected a valuable survey of the inlets and navigable rivers in the Cape York Peninsula.

Gosse.

Warburton.

Of the several attempts to cross Western Australia, even Major Warburton's expedition, the most successful, had failed in the important particular of determining the nature of the country through which it passed. Major Warburton had virtually raced across from the Macdonnell range in South Australia to the headwaters of the Oakover river on the north-west coast, without allowing himself sufficient time to note the characteristics of the country. The next important expedition was differently conducted. John (afterwards Sir John) Forrest was despatched by the Perth government with general instructions to obtain information regarding the immense tract of country out of which flow the rivers falling into the sea on the northern and western shores of Western Australia. Leaving Yewin, a small settlement about lat. 28° S., long. 116° E., Forrest travelled north-east to the Murchison river, and followed the course of that river to the Robinson ranges; thence his course lay generally eastward along the 26th parallel. Forrest and his party safely crossed the entire extent of Western Australia, and entering South Australia struck the overland telegraph line at Peake station, and, after resting, journeyed south to Adelaide. Forrest traversed seventeen degrees of desert in five months, a very wonderful achievement, more especially as he was able to give a full report of the country through which he passed. His report destroyed all hope that pastoral settlement would extend to the spinifex region; and the main object of subsequent explorers was to determine the extent of the desert in the direction of north and south. Ernest Giles made several attempts to cross the Central Australian Desert, but it was not until his third attempt that he was successful. His journey ranks almost with Forrest's in the importance of its results and the success with which the appalling difficulties of the journey were overcome. Through the generosity of Sir Thomas Elder, of Adelaide, Giles's expedition was equipped with camels. It started on the 23rd of May 1875 from Port Augusta. Working westerly along the line of the 30th parallel, Giles reached Perth in about five months. After resting in Perth for a short time, he commenced the return journey, which was made for the most part between the 24th and 25th parallels, and again successfully traversed the desert, reaching the overland telegraph line in about seven months. Giles's journeys added greatly to our knowledge of the characteristics of Western and South Australia, and he was able to bear out the common opinion that the interior of Australia west of 132° E. long. is a sandy and waterless waste, entirely unfit for settlement.

Forrest.

Giles.

The list of explorers since 1875 is a long one; but after Forrest's and Giles's expeditions the main object ceased to be the discovery of pastoral country: a new zest had been added to the cause of exploration, and most of the smaller expeditions concerned themselves with the search for gold. Amongst the more important explorations may be ranked those of Tietkins in 1889, of Lindsay in 1891, of Wells in 1896, of Hübbe in 1896, and of the Hon. David Carnegie in 1896–97. Lindsay's expedition, which was fitted out by Sir Thomas Elder, the generous patron of Australian exploration, entered Western Australia about the 26th parallel south lat., on the line of route taken by Forrest in 1874. From this point the explorer worked in a south-westerly direction to Queen Victoria Springs, where he struck the track of Giles's expedition of 1875. From the Springs the expedition went north-west and made a useful examination of the country lying between 119° and 115° meridians and between 26° and 28° S. lat. Wells's expedition started from a base about 122° 20′ E. and 25° 54′ S., and worked northward to the Joanna Springs, situated on the tropic of Capricorn and near the 124th meridian. From the springs the journey was continued along the same meridian to the Fitzroy river. The country passed through was mostly of a forbidding character, except where the Kimberley district was entered, and the expedition suffered even more than the

Recent explorers.

usual hardships. The establishment of the gold-fields, with their large population, caused great interest to be taken in the discovery of practicable stock routes, especially from South Australia in the east, and from Kimberley district in the north. Alive to the importance of the trade, the South Australian government despatched Hübbe from Oodnadatta to Coolgardie. He successfully accomplished his journey, but had to report that there was no practicable route for cattle between the two districts.

One of the most successful expeditions which traversed Western Australia was that led and equipped by the Hon. David Carnegie, which started in July 1896, and travelled north-easterly until it reached Alexander Spring; then turning northward, it traversed the country between Wells's track of 1896 and the South Australian border. The expedition encountered very many hardships, but successfully reached Hall Creek in the Kimberley district. After a few months' rest it started on the return journey, following Sturt Creek until its termination in Gregory's Salt Sea, and then keeping parallel with the South Australian border as far as Lake Macdonald. Rounding that lake the expedition moved south-west and reached the settled districts in August 1897. The distance travelled was 5000 m., and the actual time employed was eight months. This expedition put an end to the hope, so long entertained, that it was possible to obtain a direct and practicable route for stock between Kimberley and Coolgardie gold-fields; and it also proved that, with the possible exception of small isolated patches, the desert traversed contained no auriferous country.

It may be said that exploration on a large scale is now at an end; there remain only the spaces, nowhere very extensive, between the tracks of the old explorers yet to be examined, and these are chiefly in the Northern Territory and in Western Australia north of the tropic of Capricorn. The search for gold and the quest for unoccupied pasturage daily diminish the extent of these areas.

3. *Political History.*

Of the six Australian states, New South Wales is the oldest. It was in 1788, eighteen years after Captain Cook explored the east coast, that Port Jackson was founded as a penal station for criminals from England; and the settlement retained that character, more or less, during the subsequent fifty years, transportation being virtually suspended in 1839. The colony, however, from 1821 had made a fair start in free industrial progress. By this time, too, several of the other provinces had come into existence. Van Diemen's Land, now called Tasmania, had been occupied as early as 1803. It was an auxiliary penal station under New South Wales till in 1825 it became a separate government. From this island, ten years later, parties crossed Bass Strait to Port Phillip, where a new settlement was shortly established, forming till 1851 a part of New South Wales, but now the state of Victoria. In 1827 and 1829, an English company endeavoured to plant a settlement at the Swan river, and this, added to a small military station established in 1825 at King George Sound, constituted Western Australia. On the shores of the Gulf St Vincent, again, from 1835 to 1837, South Australia was created by another joint-stock company, as an experiment in the Wakefield scheme of colonization. Such were the political component parts of British Australia up to 1839. The early history, therefore, of New South Wales is peculiar to itself. Unlike the other mainland provinces, it was at first held and used chiefly for the reception of British convicts. When that system was abolished, the social conditions of New South Wales, Victoria, and South Australia became more equal. Previous to the gold discoveries of 1851 they may be included, from 1839, in a general summary view.

Early colonization.

The first British governors at Sydney, from 1788, ruled with despotic power. They were naval or military officers in command of the garrison, the convicts and the few free settlers. The duty was performed by such men as Captain Arthur Phillip, Captain Hunter, and others. In the twelve years' rule of General Macquarie, closing with 1821, the colony made a substantial advance. By means of bond labour roads and bridges were constructed, and a route opened into the interior beyond the Blue Mountains. A population of 30,000, three-fourths of them convicts, formed the infant commonwealth, whose attention was soon directed to the profitable trade of rearing fine wool sheep, first commenced by Captain John McArthur in 1803. During the next ten years, 1821–1831, Sir Thomas Brisbane and Sir Ralph Darling, two generals of the army, being successively governors, the colony increased, and eventually succeeded in obtaining the advantages of a representative institution, by means of a legislative council. Then came General Sir Richard Bourke, whose wise and liberal administration proved most beneficial. New South Wales became prosperous and attractive to emigrants with capital. Its enterprising ambition was encouraged by taking fresh country north and south. In the latter direction, explored by Mitchell in 1834 and 1836, lay Australia Felix, now Victoria, including the well-watered, thickly-wooded country of Gipps' Land.

Rise of New South Wales.

This district, then called Port Phillip, in the time of Governor Sir George Gipps, 1838–1846, was growing fast into a position claiming independence. Melbourne, which began with a few huts on the banks of the Yarra-Yarra in 1835, was in 1840 a busy town of 6000 inhabitants, the population of the whole district, with the towns of Geelong and Portland, reaching 12,850; while its import trade amounted to £204,000, and its exports to £138,000. Such was the growth of infant Victoria in five years; that of Adelaide or South Australia, in the same period, was nearly equal to it. At Melbourne there was a deputy governor, Mr Latrobe, under Sir George Gipps at Sydney. Adelaide had its own governors, first Captain Hindmarsh, next Colonel Gawler, and then Captain George Grey. Western Australia progressed but slowly, with less than 4000 inhabitants altogether, under Governors Stirling and Hutt.

Growth of Victoria.

The general advancement of Australia, to the era of the gold-mining, had been satisfactory, in spite of a severe commercial crisis, from 1841 to 1843, caused by extravagant land speculations and inflated prices. Victoria produced already more wool than New South Wales, the aggregate produce of Australia in 1852 being 45,000,000 lb; and South Australia, between 1842 and this date, had opened most valuable mines of copper. The population of New South Wales in 1851 was 190,000; that of Victoria, 77,000; and that of South Australia about the same. At Summerhill Creek, 20 m. north of Bathurst, in the Macquarie plains, gold was discovered, in February 1851, by Mr E. Hargraves, a gold-miner from California. The intelligence was made known in April or May; and then began a rush of thousands,—men leaving their former employments in the bush or in the towns to search for the ore so greatly coveted in all ages. In August it was found at Anderson's Creek, near Melbourne; a few weeks later the great Ballarat gold-field, 80 m. west of that city, was opened; and after that, Bendigo to the north. Not only in these lucky provinces, New South Wales and Victoria, where the auriferous deposits were revealed, but in every British colony of Australasia, all ordinary industry was left for the one exciting pursuit. The copper mines of South Australia were for the time deserted, while Tasmania and New Zealand lost many inhabitants, who emigrated to the more promising country. The disturbance of social, industrial and commercial affairs, during the first two or three years of the gold era, was very great. Immigrants from Europe, and to some extent from North America and China, poured into Melbourne, where the arrivals in 1852 averaged 2000 persons in a week. The population of Victoria was doubled in the first twelvemonth of the gold fever, and the value of imports and exports was multiplied tenfold between 1851 and 1853. The colony of Victoria was constituted a separate province in July 1851, Mr Latrobe being appointed governor, followed by Sir Charles Hotham and Sir Henry Barkly in succession.

Discovery of gold.

The separation of the northern part of eastern Australia,

under the name of Queensland, from the original province of New South Wales, took place in 1859. At that time the district contained about 25,000 inhabitants; and in the first six years its population was quadrupled and its trade trebled. At the beginning of 1860, when the excitement of the gold discoveries was wearing off, five of the states had received from the home government the boon of responsible government, and were in a position to work out the problem of their position without external interference; it was not, however, until 1890 that Western Australia was placed in a similar position. After the establishment of responsible government the main questions at issue were the secular as opposed to the religious system of public instruction, protection as opposed to a revenue tariff, vote by ballot, adult suffrage, abolition of transportation and assignment of convicts, and free selection of lands before survey; these, and indeed all the great questions upon which the country was divided, were settled within twenty years of the granting of self-government.[1] With the disposal of these important problems, politics in Australia became a struggle for office between men whose political principles were very much alike, and the tenure of power enjoyed by the various governments did not depend upon the principles of administration so much as upon the personal fitness of the head of the ministry, and the acceptability of his ministry to the members of the more popular branch of the legislature.

Responsible government.

The two most striking political events in the modern history of Australia, as a whole, apart from the readiness it has shown to remain a part of the British empire (*q.v.*), and to develop along Imperial lines, are the advent of the Labour party and the establishment of federation. As regards the last mentioned it may be said that it was accomplished from within, there being no real external necessity for the union of the states. Leading politicians have in all the states felt the cramping effects of mere domestic legislation, albeit on the proper direction of such legislation depends the well-being of the people; and to this sense of the limitations of local politics was due, as much as to anything else, the movement towards federation.

General Australian problems.

Before coming, however, to the history of federation, and the evolution of the Labour party, we must refer briefly to some other questions which have been of general interest in Australia. Taking the states as a whole, agrarian legislation has been the most important subject that has engrossed the attention of their parliaments, and every state has been more or less engaged in tinkering with its land laws. The main object of all such legislation is to secure the residence of the owners on the land. The object of settlers, however, in a great many, perhaps in the majority of instances, is to dispose of their holdings as soon as possible after the requirements of the law have been complied with, and to avoid permanent settlement. This has greatly facilitated the formation of large estates devoted chiefly to grazing purposes, contrary to the policy of the legislature, which has everywhere sought to encourage tillage, or tillage joined to stock-rearing, and to discourage large holdings. The importance of the land question is so great that it is hardly an exaggeration to say that it is usual for every parliament of Australia to have before it a proposal to alter or amend its land laws. Since 1870 there have been five radical changes made in New South Wales. In Victoria the law has been altered five times, and in Queensland and South Australia seven times.

Agrarian legislation.

The prevention or regulation of the immigration of coloured races has also claimed a great share of parliamentary attention. The agitation against the influx of Chinese commenced very soon after the gold discoveries, the European miners objecting strongly to the presence of these aliens upon the diggings. The allegations made concerning the Chinese really amounted to a charge of undue industry. The Chinese were hard-working and had the usual fortune attending those who work hard. They spent little on drink or with the storekeepers, and were, therefore, by no means popular. As early as 1860 there had been disturbances of a serious character, and the Chinese were chased off the goldfields of New South Wales, serious riots occurring at Lambing Flat, on the Burrangong goldfield. The Chinese difficulty, so far as the mining population was concerned, was solved by the exhaustion of the extensive alluvial deposits; the miners' prejudice against the race, however, still exists, though they are no longer serious competitors, and the laws of some of the states forbid any Chinese to engage in mining without the express authority in writing of the minister of mines. The nearness of China to Australia has always appeared to the Australian democracy as a menace to the integrity of the white settlements; and at the many conferences of representatives from the various states, called to discuss matters of general concern, the Chinese question has always held a prominent place, but the absence of any federal authority had made common action difficult. In 1888 the last important conference on the Chinese question was held in Sydney and attended by delegates from all the states. Previously to the meeting of the conference there had been a great deal of discussion in regard to the influx of Chinese, and such influx was on all sides agreed to be a growing danger. The conference, therefore, merely expressed the public sentiment when it resolved that, although it was not advisable to prohibit altogether this class of immigration, it was necessary in the public interests that the number of Chinese privileged to land should be so limited as to prevent the people of that race from ever becoming an important element in the community. In conformity with this determination the various state legislatures enacted new laws or amended the existing laws to cope with the difficulty; these remained until they were in effect superseded by Commonwealth legislation. The objection to admitting immigrants was not only to the Chinese, but extended to all Asiatics; but as a large proportion of the persons whose entrance into the colonies it was desired to stop were British subjects, and the Imperial government refused to sanction any measure directly prohibiting in plain terms the movement of British subjects from one part of the empire to another, resort was made to indirect legislation; this was the more advisable, as the rise of the Japanese power in the East and the alliance of that country with Great Britain rendered it necessary to pay attention to the susceptibilities of a powerful nation whose subjects might be affected by restrictive laws. Eventually the difficulty was overcome by the device of an educational test based on the provisions of an act in operation in Natal. It was provided that a person was to be prohibited from landing in Australia who failed to write in any prescribed language fifty words dictated to him by the commonwealth officer supervising immigration. The efficacy of this legislation is in its administration, the language in which coloured aliens are usually tested being European. The agitation against the Chinese covered a space of over fifty years, a long period in the history of a young country, and was promoted and kept alive almost entirely by the trades unions, and the restriction acts were the first legislative triumph of the Labour party, albeit that party was not at the time directly represented in parliament.

Immigration question.

One of the most notable events in the modern history of Australia occurred shortly after the great strike of 1890. This was what is ordinarily termed the bank crisis of 1893. Although this crisis followed on the great strike, the two things had no real connexion, the crisis being the natural result of events long anterior to 1890. The effects of the crisis were mainly felt in the three eastern states, Queensland, New South Wales and Victoria, Tasmania and South Australia being affected chiefly by reason of the fact of their intimate financial connexion with the eastern states. The approach of the crisis was heralded by many signs. Deposits were shifted from bank to bank, there were small runs on several of the savings banks guaranteed by the government, mortgagees required additional security from their debtors, bankruptcies

Bank crisis of 1893.

[1] Australia, it may be noted, has woman's suffrage in all the states (Victoria, the last, adopting it in November 1908), and for the federal assembly.

became frequent, and some of the banks began to accumulate gold against the evil day. The building societies and financial institutions in receipt of deposits, or so many of them as were on an unsound footing, failed at an early period of the depression, so also did the weaker banks. There was distrust in the minds of the depositors, especially those whose holdings were small, and most of the banks were, at a very early period, subjected to the strain of repaying a large proportion of their deposits as they fell due. For a time the money so withdrawn was hoarded, but after a while it found its way back again into the banks. The crisis was by no means a sudden crash, and even when the failures began to take place they were spread over a period of sixteen weeks.

The first noticeable effect of the crisis was a great scarcity of employment. Much capital was locked up in the failed banks, and was therefore not available for distribution amongst wage-earners. Wages fell precipitately, as also did rents. There was an almost entire cessation of building, and a large number of houses in the chief cities remained untenanted, the occupants moving to lodgings and more than one family living in a single house. Credit became greatly restricted, and all descriptions of speculative enterprise came to an end. The consuming power of the population was greatly diminished, and in the year following the crisis the imports into Australia from abroad diminished by four and three-quarter millions. In fact, everywhere the demand for goods, especially of those for domestic consumption, fell away; and there was a reduction in the average number of persons employed in the manufacturing industries to the extent of more than 20%. The lack of employment in factories naturally affected the coal mining industry, and indeed every industry in the states, except those connected with the export trade, was severely affected. During the crisis banks having a paid-up capital and reserves of £5,000,000 and deposits of £53,000,000 closed their doors. Most of these, however, reopened for business before many weeks. The crisis was felt in the large cities more keenly than in the country districts, and in Melbourne more severely than in any other capital. The change of fortune proved disastrous to many families, previously to all appearances in opulent circumstances, but by all classes alike their reverses were borne with the greatest bravery. In its ultimate effects the crisis was by no means evil. Its true meaning was not lost upon a business community that had had twenty years of almost unchecked prosperity. It required the chastening of adversity to teach it a salutary lesson, and a few years after, when the first effects of the crisis had passed away, business was on a much sounder footing than had been the case for very many years. One of the first results was to put trade on a sound basis and to abolish most of the abuses of the credit system, but the most striking effect of the crisis was the attention which was almost immediately directed to productive pursuits. Agriculture everywhere expanded, the mining industry revived, and, if it had not been for the low prices of staple products, the visible effects of the crisis would have passed away within a very few years.

Another matter which deserves attention was the great drought which culminated in the year 1902. For some years previously the pastoral industry had been declining and the number of sheep and cattle in Australia had greatly diminished, but the year 1902 was one of veritable drought. The failure of the crops was almost universal and large numbers of sheep and cattle perished for want of food. The truth is, pastoralists for the most part carried on their industry trusting very greatly to luck, not making any special provisions against the vicissitudes of the seasons. Enormous quantities of natural hay were allowed every year to rot or be destroyed by bush fires, and the bountiful provision made by nature to carry them over the seasons of dry weather absolutely neglected; so that when the destructive season of 1902 fell upon them, over a large area of territory there was no food for the stock. The year 1903 proved most bountiful, and in a few years all trace of the disastrous drought of 1902 passed away. But beyond this the pastoralist learnt most effectually the lesson that, in a country like Australia, provision must be made for the occasional season when the rainfall is entirely inadequate to the wants of the farmer and the pastoralist.

Drought of 1902.

The question of federation was not lost sight of by the framers of the original constitution which was bestowed upon New South Wales. In the report of the committee of the legislative council appointed in 1852 to prepare a constitution for that colony, the following passage occurs:—"One of the most prominent legislative measures required by the colony, and the colonies of the Australian group generally, is the establishment at once of a general assembly, to make laws in relation to those intercolonial questions that have arisen or may hereafter arise among them. The questions which would claim the exercise of such a jurisdiction appear to be (1) intercolonial tariffs and the coasting trade; (2) railways, roads, canals, and other such works running through any two of the colonies; (3) beacons and lighthouses on the coast; (4) intercolonial gold regulations; (5) postage between the said colonies; (6) a general court of appeal from the courts of such colonies; (7) a power to legislate on all other subjects which may be submitted to them by addresses from the legislative councils and assemblies of the colonies, and to appropriate to any of the above-mentioned objects the necessary sums of money, to be raised by a percentage on the revenues of all the colonies interested." This wise recommendation received very scant attention, and it was not until the necessities of the colonies forced them to it that an attempt was made to do what the framers of the original constitution suggested. Federation at no time actually dropped out of sight, but it was not until thirty-five years later that any practical steps were taken towards its accomplishment. Meanwhile a sort of makeshift was devised, and the Imperial parliament passed a measure permitting the formation of a federal council, to which any colony that felt inclined to join could send delegates. Of the seven colonies New South Wales and New Zealand stood aloof from the council, and from the beginning it was therefore shorn of a large share of the prestige that would have attached to a body speaking and acting on behalf of a united Australia. The council had also a fatal defect in its constitution. It was merely a deliberative body, having no executive functions and possessing no control of funds or other means to put its legislation in force. Its existence was well-nigh forgotten by the people of Australia until the occurrence of its biennial meetings, and even then but slight interest was taken in its proceedings. The council held eight meetings, at which many matters of intercolonial interest were discussed. The last occasion of its being called together was in 1899, when the council met in Melbourne. In 1889 an important step towards federation was taken by Sir Henry Parkes. The occasion was the report of Major-General Edwards on the defences of Australia, and Sir Henry addressed the other premiers on the desirability of a federal union for purposes of defence. The immediate result was a conference at Parliament House, Melbourne, of representatives from each of the seven colonies. This conference adopted an address to the queen expressing its loyalty and attachment, and submitting certain resolutions which affirmed the desirability of an early union, under the crown, of the Australasian colonies, on principles just to all, and provided that the remoter Australasian colonies should be entitled to admission upon terms to be afterwards agreed upon, and that steps should be taken for the appointment of delegates to a national Australasian convention, to consider and report upon an adequate scheme for a federal convention. In accordance with the understanding arrived at, the various Australasian parliaments appointed delegates to attend a national convention to be held in Sydney, and on the 2nd March 1891 the convention held its first meeting. Sir Henry Parkes was elected president, and he moved a series of resolutions embodying the principles necessary to establish, on an enduring foundation, the structure of a federal government. These resolutions were slightly altered by the conference, and were adopted in the following form:—

Federation.

1. The powers and rights of existing colonies to remain intact, except as regards such powers as it may be necessary to hand over to the Federal government.
2. No alteration to be made in states without the consent of the legislatures of such states, as well as of the federal parliament.
3. Trade between the federated colonies to be absolutely free.
4. Power to impose customs and excise duties to be in the Federal government and parliament.
5. Military and naval defence forces to be under one command.
6. The federal constitution to make provision to enable each state to make amendments in the constitution if necessary for the purposes of federation.

Other formal resolutions were also agreed to, and on the 31st of March Sir Samuel Griffith, as chairman of the committee on constitutional machinery, brought up a draft Constitution Bill, which was carefully considered by the convention in committee of the whole and adopted on the 9th of April, when the convention was formally dissolved. The bill, however, fell absolutely dead, not because it was not a good bill, but because the movement out of which it arose had not popular initiative, and therefore failed to reach the popular imagination.

Although the bill drawn up by the convention of 1891 was not received by the people with any show of interest, the federation movement did not die out; on the contrary, it had many enthusiastic advocates, especially in the colony of Victoria. In 1894 an unofficial convention was held at Corowa, at which the cause of federation was strenuously advocated, but it was not until 1895 that the movement obtained new life, by reason of the proposals adopted at a meeting of premiers convened by Mr G. H. Reid of New South Wales. At this meeting all the colonies except New Zealand were represented, and it was agreed that the parliament of each colony should be asked to pass a bill enabling the people to choose ten persons to represent the colony on a federal convention; the work of such convention being the framing of a federal constitution to be submitted to the people for approval by means of the referendum. During the year 1896 Enabling Acts were passed by New South Wales, Victoria, Tasmania, South Australia and Western Australia, and delegates were elected by popular vote in all the colonies named except Western Australia, where the delegates were chosen by parliament. The convention met in Adelaide on the 22nd of March 1897, and, after drafting a bill for the consideration of the various parliaments, adjourned until the 2nd of September. On that date the delegates reassembled in Sydney, and debated the bill in the light of the suggestions made by the legislatures of the federating colonies. In the course of the proceedings it was announced that Queensland desired to come within the proposed union; and in view of this development, and in order to give further opportunity for the consideration of the bill, the convention again adjourned. The third and final session was opened in Melbourne on the 20th of January 1898, but Queensland was still unrepresented; and, after further consideration, the draft bill was finally adopted on the 16th of March and remitted to the various colonies for submission to the people.

The constitution was accepted by Victoria, South Australia and Tasmania by popular acclamation, but in New South Wales very great opposition was shown, the main points of objection being the financial provisions, equal representation in the Senate, and the difficulty in the way of the larger states securing an amendment of the constitution in the event of a conflict with the smaller states. As far as the other colonies were concerned, it was evident that the bill was safe, and public attention throughout Australia was fixed on New South Wales, where a fierce political contest was raging, which it was recognized would decide the fate of the measure for the time being. The fear was as to whether the statutory number of 80,000 votes necessary for the acceptance of the bill would be reached. This fear proved to be well founded, for the result of the referendum in New South Wales showed 71,595 votes in favour of the bill and 66,228 against it, and it was accordingly lost. In Victoria, Tasmania and South Australia, on the other hand, the bill was accepted by triumphant majorities. Western Australia did not put it to the vote, as the Enabling Act of that colony only provided for joining a federation of which New South Wales should form a part. The existence of such a strong opposition to the bill in the mother colony convinced even its most zealous advocates that some changes would have to be made in the constitution before it could be accepted by the people; consequently, although the general election in New South Wales, held six or seven weeks later, was fought on the federal issue, yet the opposing parties seemed to occupy somewhat the same ground, and the question narrowed itself down to one as to which party should be entrusted with the negotiations to be conducted on behalf of the colony, with a view to securing a modification of the objectionable features of the bill. The new parliament decided to adopt the procedure of again sending the premier, Mr Reid, into conference, armed with a series of resolutions affirming its desire to bring about the completion of federal union, but asking the other colonies to agree to the reconsideration of the provisions which were most generally objected to in New South Wales. The other colonies interested were anxious to bring the matter to a speedy termination, and readily agreed to this course of procedure. Accordingly a premiers' conference was held in Melbourne at the end of January 1899, at which Queensland was for the first time represented. At this conference a compromise was effected, something was conceded to the claims of New South Wales, but the main principles of the bill remained intact. The bill as amended was submitted to the electors of each colony and again triumphantly carried in Victoria, South Australia and Tasmania. In New South Wales and Queensland there were still a large number of persons opposed to the measure, which was nevertheless carried in both colonies. New South Wales having decided in favour of federation, the way was clear for a decision on the part of Western Australia. The Enabling Bill passed the various stages in the parliament of that colony, and the question was then adopted by referendum.

In accordance with this general verdict of all the states, the colonial draft bill was submitted to the imperial government for legislation as an imperial act; and six delegates were sent to England to explain the measure and to pilot it through the cabinet and parliament. A bill was presented to the British parliament which embodied and established, with such variations as had been accepted on behalf of Australia by the delegates, the constitution agreed to at the premiers' conference of 1899 and speedily became law. Under this act, which was dated the 9th of July 1900, a proclamation was issued on the 17th of September of the same year, declaring that, on and after the 1st of January 1901, the people of New South Wales, Victoria, South Australia, Queensland, Tasmania and Western Australia should be united in a federal commonwealth under the name of the Commonwealth of Australia.

Provisions of the Act of 1900.

The six colonies entering the Commonwealth were denominated original states, and new states might be admitted, or might be formed by separation from or union of two or more states or parts of states; and territories (as distinguished from states) might be taken over and governed under the legislative power of the Commonwealth. The legislative power is vested in a federal parliament, consisting of the sovereign, a senate, and a house of representatives, the sovereign being represented by a governor-general. The Senate was to consist of the same number of members (not less than six) for each state, the term of service being six years, but subject to an arrangement that half the number would retire every three years. The House of Representatives was to consist of members chosen in the different states in numbers proportioned to their population, but never fewer than five. The first House of Representatives was to contain seventy-five members. For elections to the Senate the governors of states, and for general elections of the House of Representatives the governor-general, would cause writs to be issued. The Senate would choose its own president, and the House of Representatives its speaker; each house would make its own rules of procedure; in each, one-third of the number of members would form a quorum; the members of each must take oath, or make affirmation of allegiance; and all alike would receive an allowance of £400 a year. The legislative powers of the parliament have a wide range, many matters being transferred to it from the colonial parliaments. The more important subjects with which it deals are trade, shipping and railways; taxation, bounties, the borrowing of money on the credit of the Commonwealth; the postal and telegraphic services; defence, census and statistics; currency, coinage, banking, bankruptcy; weights and measures; copyright, patents and trade

marks; marriage and divorce; immigration and emigration; conciliation and arbitration in industrial disputes. Bills imposing taxation or appropriating revenue must not originate in the Senate, and neither taxation bills nor bills appropriating revenue for the annual service of the government may be amended in the Senate, but the Senate may return such bills to the House of Representatives with a request for their amendment. Appropriation laws must not deal with other matters. Taxation laws must deal with only one subject of taxation; but customs and excise duties may, respectively, be dealt with together. Votes for the appropriation of the revenue shall not pass unless recommended by the governor-general. The constitution provides means for the settlement of disputes between the houses, and requires the assent of the sovereign to all laws. The executive power is vested in the governor-general, assisted by an executive council appointed by himself. He has command of the army and navy, and appoints federal ministers and judges. The ministers are members of the executive council, and must be, or within three months of their appointment must become, members of the parliament. The judicial powers are vested in a high court and other federal courts, and the federal judges hold office for life or during good behaviour. The High Court has appellate jurisdiction in cases from other federal courts and from the supreme courts of the states, and it has original jurisdiction in matters arising under laws made by the federal parliament, in disputes between states, or residents in different states, and in matters affecting the representatives of foreign powers. Special provisions were made respecting appeals from the High Court to the sovereign in council. The constitution set forth elaborate arrangements for the administration of finance and trade during the transition period following the transference of departments to the Commonwealth. Within two years uniform customs duties were to be imposed; thereafter the parliament of the Commonwealth had exclusive power to impose customs and excise duties, or to grant bounties; and trade within the Commonwealth was to be absolutely free. Exceptions were made permitting the states to grant bounties on mining and (with the consent of the parliament) on exports of produce or manufactures —Western Australia being for a time partially exempted from the prohibition to impose import duties.

The constitution, parliament and laws of each state, subject to the federal constitution, retained their authority; state rights were carefully safeguarded, and an inter-state commission was given powers of adjudication and of administration of the laws relating to trade, transport and other matters. Provision was made for necessary alteration of the constitution of the Commonwealth, but so that no alteration could be effected unless the question had been directly submitted to, and the change accepted by the electorate in the states. The seat of government was to be within New South Wales, not less than 100 m. distant from Sydney, and of an area not less than 100 sq. m. Until other provision was made, the governor-general was to have a salary of £10,000, paid by the Commonwealth. Respecting the salaries of the governors of states, the constitution made no provision.

The choice of governor-general of the new Commonwealth fell upon Lord Hopetoun (afterwards Lord Linlithgow), who had won golden opinions as governor of Victoria a few years before; Mr (afterwards Sir Edmund) Barton, who had taken the lead among the Australian delegates, became first prime minister; and the Commonwealth was inaugurated at the opening of 1901. The first parliament under the constitution was elected on the 29th and 30th of March 1901, and was opened by the prince of Wales on the 9th of May following. In October 1908 the Yass-Canberra district, near the town of Yass, N.S.W., was at length selected by both federal houses to contain the future federal capital.

Labour movement.

The Labour movement in Australia may be traced back to the early days when transportation was in vogue, and the free immigrant and the time-expired convict objected to the competition of the bond labourer. The great object of these early struggles being attained, Labour directed its attention mainly to securing shorter hours. It was aided very materially by the dearth of workers consequent on the gold discoveries, when every man could command his own price. When the excitement consequent on the gold finds had subsided, there was a considerable reaction against the claims of Labour, and this was greatly helped by the congested state of the labour market; but the principle of an eight-hours day made progress, and was conceded in several trades. In the early years of the 'seventies the colonies entered upon an era of well-being, and for about twelve years every man, willing to work and capable of exerting himself, readily found employment. The Labour unions were able to secure in these years many concessions both as to hours and wages. In 1873 there was an important rise in wages, in the following year there was a further advance, and another in 1876; but in 1877 wages fell back a little, though not below the rate of 1874. In 1882 there was a very important advance in wages; carpenters received 11s. a day, bricklayers 12s. 6d., stone-masons 11s. 6d., plasterers 12s., painters 11s., blacksmiths 10s., and navvies and general labourers 8s., and work was very plentiful. For five years these high wages ruled; but in 1886 there was a sharp fall, though wages still remained very good. In 1888 there was an advance, and again in 1889. In 1890 matters were on the eve of a great change and wages fell, in most cases to a point 20 % below the rates of 1885. During the whole period from 1873 onwards, prices, other than of labour, were steadily tending downwards, so that the cost of living in 1890 was much below that of 1873. Taking everything into consideration the reduction was, perhaps, not less than 20 %, so that, though the nominal or money wages in 1873 and 1890 were the same, the actual wages were much higher in the latter year. Much of the improvement in the lot of the wage-earners has been due to the Labour organizations, yet so late as 1881 these organizations were of so little account, politically, that when the law relating to trades unions was passed in New South Wales, the English law was followed, and it was simply enacted that the purposes of any trades union shall not be deemed unlawful (so as to render a member liable to criminal prosecution for conspiracy or otherwise) merely by reason that they are in restraint of trade. After the year 1884 Labour troubles became very frequent, the New South Wales coal miners in particular being at war with the colliery owners during the greater part of the six years intervening between then and what is called the Great Strike. The strong downward tendency of prices made a reduction of wages imperative; but the labouring classes failed to recognize any such necessity, and strongly resented any reductions proposed by employers. It was hard indeed for a carter drawing coal to a gasworks to recognize the necessity which compelled a reduction in his wages because wool had fallen 20 %. Nor were other labourers, more nearly connected with the producing interests, satisfied with a reduction of wages because produce had fallen in price all round. Up to 1889 wages held their ground, although work had become more difficult to obtain, and some industries were being carried on without any profit. It was at such an inopportune time that the most extensive combination of Labour yet brought into action against capital formulated its demands. It is possible that the London dockers' strike was not without its influence on the minds of the Australian Labour leaders. That strike had been liberally helped by the Australian unions, and it was confidently predicted that, as the Australian workers were more effectively organized than the English unions, a corresponding success would result from their course of action. A strike of the Newcastle miners, after lasting twenty-nine weeks, came to an end in January 1890, and throughout the rest of the year there was great unrest in Labour circles. On the 6th of September the silver mines closed down, and a week later a conference of employers issued a manifesto which was met next day by a counter-manifesto of the Intercolonial Labour Conference, and almost immediately afterwards by the calling out of 40,000 men. The time chosen for the strike was the height of the wool season, when a cessation of work would be attended with the maximum of inconvenience. Sydney was the centre of the disturbance, and the city was in a state of industrial siege, feeling running to dangerous extremes. Riotous scenes occurred both in Sydney and on the coal-fields, and a large number of special constables were sworn in by the government. Towards the end of October 20,000 shearers were called out, and many other trades, principally concerned with the handling or shipping of wool, joined the ranks of the strikers, with the result that the maritime and pastoral industries throughout the whole of Australia were most injuriously disturbed. The Great Strike terminated early in November 1890, the employers gaining a decisive victory. The colonies were, however, to have other and bitter experiences of strikes before Labour recognized that of all means for settling industrial

The Great Strike of 1890.

disputes strikes are, on the whole, the most disastrous that it can adopt. The strikes of the years 1890 and 1892 are just as important on account of their political consequences as from the direct gains or losses involved.

As one result of the strike of 1890 a movement was set afoot by a number of enthusiasts, more visionary than practical, that has resulted in a measure of more or less disaster. This was the planting of a colony of communistic Australians in South America. After much negotiation the leader, Mr William Lane, a Brisbane journalist, decided on Paraguay, and he tramped across the continent, preaching a new crusade, and gathering in funds and recruits in his progress. On the 16th of July 1893 the first little army of "New Australians" left Sydney in the "Royal Tar," which arrived at Montevideo on the 31st of August. Other consignments of intending settlers in "New Australia" followed; but though the settlement is still in existence it has completely failed to realize the impracticable ideals of its original members. The Queensland government assisted some of the disillusioned to escape from the paradise which proved a prison; some managed to get away on their own account; and those that have remained have split into as many settlements almost as there are settlers. Another effect of the Great Strike was in a more practical direction. New South Wales was the first country which endeavoured to settle its labour grievances through the ballot-box and to send a great party to parliament as the direct representation of Labour, pledged to obtain through legislation what it was unable to obtain by strikes and physical force. The principle of one-man one-vote had been persistently advocated without arousing any special parliamentary or public enthusiasm until the meeting of the Federal Convention in 1891. The convention was attended by Sir George Grey, who was publicly welcomed to the colony by New Zealanders resident in Sydney, and by other admirers, and his reception was an absolute ovation. He eloquently and persistently advocated the principle of one-man one-vote as the bed-rock of all democratic reform. This subsequently formed the first plank of the Labour platform. Several attempts had been made by individuals belonging to the Labour party to enter the New South Wales parliament, but it was not until 1891 that the occurrence of a general election gave the party the looked-for opportunity for concerted action. The results of the election came as a complete surprise to the majority of the community. The Labour party captured 35 seats out of a House of 125 members; and as the old parties almost equally divided the remaining seats, and a fusion was impossible, the Labour representatives dominated the situation. It was not long, however, before the party itself became divided on the fiscal question; and a Protectionist government coming into power, about half the Labour members gave it consistent support and enabled it to maintain office for about three years, the party as a political unit being thus destroyed. The events of these three years taught the Labour leaders that a parliamentary party was of little practical influence unless it was able to cast on all important occasions a solid vote, and to meet the case a new method was devised. The party therefore determined that they would refuse to support any person standing in the Labour interests who refused to pledge himself to vote on all occasions in such way as the majority of the party might decide to be expedient. This was called the "solidarity pledge," and, united under its sanction, what was left of the Labour party contested the general election of 1894. The result was a defeat, their numbers being reduced from 35 to 19; but a signal triumph was won for solidarity. Very few of the members who refused to take the pledge were returned and the adherents of the united party were able to accomplish more with their reduced number than under the old conditions.

Political consequences.

The two features of the Labour party in New South Wales are its detachment from other parties and the control of the caucus. The caucus, which is the natural corollary of the detachment, determines by majority the vote of the whole of the members of the party, independence of action being allowed on minor questions only. So far the party has refrained from formal alliance with the other great parties of the state. It supports the government as the power alone capable of promoting legislation, but its support is given only so long as the measures of the government are consistent with the Labour policy. This position the Labour party has been able to maintain with great success, owing to the circumstance that the other parties have been almost equally balanced.

The movement towards forming a parliamentary Labour party was not confined to New South Wales; on the contrary, it was common to all the states, having its origin in the failure of the Great Strike of 1890. The experience of the party was also much the same as in New South Wales, but its greatest triumphs were achieved in South Australia. The Labour party has been in power in Queensland, Western Australia and South Australia, and has, on many occasions, decided the fate of the government on a critical division in all the states except Tasmania and Victoria. Different ideals dominate the party in the different states. The one ideal which has just been described represents the Labour party from the New South Wales standpoint. The only qualification worth mentioning is the signing of the pledge of solidarity. The other ideal, typified by the South Australian party, differs from this in one important respect. To the Labour party in that state are admitted only persons who have worked for their living at manual labour, and this qualification of being an actual worker is one that was strongly insisted upon at the formation of the party and strictly adhered to, although the temptation to break away from it and accept as candidates persons of superior education and position has been very great. On the formation of the Commonwealth a Labour party was established in the federal houses. It comprises one-third of the representation in the House of Representatives, and perhaps a still larger proportion in the Senate. The party is, however, formed on a broader basis than the state parties, the solidarity pledge extends only to votes upon which the fate of a government depends. Naturally, however, as the ideals of the members of the party are the same, the members of the Labour party will be generally found voting together on all important divisions, the chief exception being with regard to free trade or protection. The Labour party held power in the Commonwealth for a short period, and has had the balance of power in its hands ever since the formation of the Commonwealth. (T. A. C.)

Parliamentary Labour party.

Australian legislation in the closing years of the 19th century and the first decade of the 20th bore the most evident traces of the Labour party's influence. In all the colonies a complete departure from principles laid down by the leading political economists of the 19th century was made when acts were passed subjecting every branch of domestic industry to the control of specially constituted tribunals, which were empowered among other important functions to fix the minimum rate of wages to be paid to all grades of workmen. (See also the articles ARBITRATION AND CONCILIATION; TRADE UNIONS; LABOUR LEGISLATION.)

Recent legislation.

Victoria was the pioneer in factory legislation, the first Victorian act of that character dating from 1873. In 1884 a royal commission, appointed two years earlier to inquire into the conditions of employment in the colony and certain allegations of "sweating" that had then recently been made, reported that:— "The most effective mode of bringing about industrial co-operation and mutual sympathy between employers and employed, and thus obviating labour conflicts in the future, is by the establishment of courts of conciliation in Victoria, whose procedure and awards shall have the sanction and authority of law." This report led to the passing of a number of acts which, proving ineffectual, were followed by the Factories and Shops Act of 1896, passed by the ministry of Mr (afterwards Sir Alexander) Peacock. This measure, together with several subsequent amending acts, of which the most important became law in 1903, 1905 and 1907, forms a complete industrial code in which the principle of state regulation of wages is recognized and established. Its central enactment was to bring into existence (1) "Special Boards," consisting of an equal number of representatives of employers and workmen respectively in any trade, under the presidency of an independent chairman, and (2) a Court of Industrial Appeals. A special board may be formed at the request of any union of employers or of workmen, or on the initiative of the Labour department. After hearing evidence, which may be given on oath, the special board issues a "determination," fixing the minimum rate of wages to be paid to various classes of workers of both sexes and different ages in the trade covered by the determination, including apprentices; and specifying the number of hours

Victoria.

per week for which such wages are payable, with the rates for overtime when those hours are exceeded. The determination is then gazetted, and it becomes operative over a specified area, which varies in different cases, on a date fixed by the board. Either party, or the minister for Labour, may refer a determination to the court of industrial appeals, and the court, in the event of a special board failing to make a determination, may itself be called upon to frame one. The general administration of the Factories and Shops Acts, to which the special boards owe their being, is vested in a chief inspector of factories, subject to the control of the minister of Labour in matters of policy. Before the end of 1906 fifty-two separate trades in Victoria had obtained special boards, by whose determinations their operations were controlled.

South Australia. A similar system was introduced into South Australia by an act passed in 1900 amending the Factory Act of 1894, which was the first legislation of the sort passed in that state.

Queensland. In Queensland, where the earliest factory legislation dates from 1896, keen parliamentary conflict raged round the proposal in 1907 to introduce the special boards system for fixing wages. More than one change of government occurred before the bill became law in April 1908.

New South Wales. In New South Wales, whose example was followed by Western Australia, the machinery adopted for fixing the statutory rate of wages was of a somewhat different type. The model followed in these two states was not Victoria but New Zealand, where an Industrial Conciliation and Arbitration Act was passed in 1894. A similar measure, under the guidance of the attorney-general, the Hon. B. R. Wise, was carried after much opposition in New South Wales in 1901, to remain in force till the 30th of June 1908. By it an arbitration court was instituted, consisting of a president and assessors representing the employers' unions and the workers' unions respectively; in any trade in which a dispute occurs, any union of workmen or employers registered under the act was given the right to bring the matter before the arbitration court, and if the court makes an award, an application may be made to it to make the award a "common rule," which thereupon becomes binding over the trade affected, wherever the act applies. The award of the court is thus the equivalent of the determination of a special board in Victoria, and deals with the same questions, the most important of which are the minimum rates of wages and the number of working hours per week. The act contained stringent provisions forbidding strikes; but in this respect it failed to effect its purpose, several strikes occurring in the years following its enactment, in which there were direct refusals to obey awards.

Western Australia. In the years 1900 and 1902 acts were passed in Western Australia still more closely modelled on the New Zealand act than was the above-mentioned statute in New South Wales. Unlike the latter, they reproduced the institution of district conciliation boards in addition to the arbitration court; but these boards were a failure here as they were in New Zealand, and after 1903 they fell into disuse. In Western Australia, too, the act failed to prevent strikes taking place. In 1907 a serious strike occurred in the timber trade, attended by all the usual accompaniments, except actual disorder, of an industrial conflict.

Federal Arbitration Act 1904. In all this legislation one of the most hotly contested points was whether the arbitration court should be given power to lay it down that workers who were members of a trade union should be employed in preference to non-unionists. This power was given to the tribunal in New South Wales, but was withheld in Western Australia. It was the same question that formed the chief subject of debate over the Federal Conciliation and Arbitration Act, which, after causing the defeat of more than one ministry, passed through the Commonwealth parliament in 1904. It was eventually compromised by giving the power, but only with safeguarding conditions, to the Federal arbitration court. This tribunal differs from similar courts in the states inasmuch as it consists of a single member, called the "president," an officer appointed by the governor-general from among the justices of the High Court of Australia. The president has the power to appoint assessors to advise him on technical points; and considerable powers of devolution of authority for the purpose of inquiry and report are conferred upon the court, the main object of which is to secure settlement by conciliatory methods. The distinctive object of the Federal Act, as defined in the measure itself, is to provide machinery for dealing with industrial disputes extending beyond any one state, examples of which were furnished by the first two important cases submitted to the court—the one concerning the merchant marine of Australia, and the other the sheep shearers, both of which were heard in 1907. An additional duty was thrown on the Federal arbitration court by the Customs and Excise Tariff Acts of 1906, in which were embodied the principles known as the "New Protection." By the Customs Act the duty was raised on imported agricultural implements, while as a safeguard to the consumer the maximum prices for the retail of the goods were fixed. In order to provide a similar protection for the artisans employed in the protected industries, an excise duty was imposed on the home-produced articles, which was to be remitted in favour of manufacturers who could show that they paid "fair and reasonable" wages, and complied with certain other conditions for the benefit of their workmen. The chief authority for determining whether these conditions are satisfied or not is the Federal arbitration court.

Old age pensions. The same period that saw this legislation adopted was also marked by the establishment of old age pensions in the three eastern states, and also in the Commonwealth. By the Federal Act, passed in the session of 1908, a pension of ten shillings a week was granted to persons of either sex over sixty-five years of age, or to persons over sixty who are incapacitated from earning a living. The Commonwealth legislation thus made provision for the aged poor in the three states which up to 1908 had not accepted the principle of old age pensions, and also for those who, owing to their having resided in more than one state, were debarred from receiving pension in any.

Tariff. An important work of the Commonwealth parliament was the passing of a uniform tariff to supersede the six separate tariffs in force at the establishment of the Commonwealth, but many other important measures were considered and some passed into law. During the first six years of federation there were five ministries; the tenure of office under the three-yearly system was naturally uncertain, and this uncertainty was reflected in the proposals of whatever ministry was in office. The great task of adjusting the financial business of the Commonwealth on a permanent basis was one of very great difficulty, as the apparent interests of the states and of the Commonwealth were opposed. Up till 1908 it had been generally assumed that the constitution required the treasurer of the Commonwealth to hand over to the states month by month whatever surplus funds remained in his hands. But in July 1908 a Surplus Revenue Act was passed which was based on a different interpretation of the constitution. Under this act the appropriation of these surplus funds to certain trust purposes in the Federal treasury is held to be equivalent to payment to the states. The money thus obtained was appropriated in part to naval defence and harbours, and in part to the provision of old age pensions under the Federal Old Age Pension Act of 1908. The act was strongly opposed by the government of Queensland, and the question was raised as to whether it was based on a true interpretation of the constitution. The chief external interest, however, of the new financial policy of the Commonwealth lay in its relation towards the empire as a whole. At the Imperial Conference in London in 1907 Mr Deakin, the Commonwealth premier, was the leading advocate of colonial preference with a view to imperial commercial union; and though no reciprocal arrangement was favoured by the Liberal cabinet, who temporarily spoke for the United Kingdom, the colonial representatives were all agreed in urging such a policy, and found the Opposition (the Unionist party) in England prepared to adopt it as part of Mr Chamberlain's tariff reform movement. In spite of the official rebuff received from the mother-country, the Australian ministry, in drawing up the new Federal tariff, gave a substantial preference to British imports, and thus showed their willingness to go farther. (See the article BRITISH EMPIRE.) (R. J. M.)

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AUSTRASIA. The word *Austria* signifies the realm of the east (Ger. *Ost Reich*). In Gregory of Tours this word is still used vaguely, but the sense of it is gradually defined, and finally the name of *Austria* or *Austrasia* was given to the eastern-most part of the Frankish kingdom. It usually had Metz for its capital, and the inhabitants of the kingdom were known as the *Austrasii*. Retrospectively, later historians have given this name to the kingdom of Theuderich I. (511–534), of his son Theudebert (534–548), and of his grandson Theudebald (548–555); then, after the death of Clotaire I., to the kingdom of Sigebert (561–575), and of his son Childebert (575–597). They have even tried to interpret the long struggle between Fredegond and Brunhilda as a rivalry between the two kings of Neustria and Austrasia. When these two words are at last found in the texts in their precise signification, Austrasia is applied to that part of the Frankish kingdom which Clotaire II. entrusted to his son Dagobert, subject to the guardianship of Pippin and Arnulf (623–629), and which Dagobert in his turn handed on to his son Sigebert (634–639), under the guardianship of Cunibert, bishop of Cologne, and Ansegisel, mayor of the palace. After the death of Dagobert, Austrasia and Neustria almost always had separate kings, with their own mayors of the palace, and then there arose a real rivalry between these two provinces, which ended in the triumph of Austrasia. The Austrasian mayors of the palace succeeded in enforcing their authority in the western as well as in the eastern part, and in re-establishing to their own advantage the unity of the Frankish kingdom. The mayor Pippin the Short was even powerful enough to take the title of king over the whole.

At the time of Charlemagne, the word Austrasia underwent a change of meaning and became synonymous with *Francia orientalis*, and was applied to the Frankish dominions beyond the Rhine (Franconia). This Franconia was in 843 included in the kingdom of Louis the German, and was then increased by the addition of the territories of Mainz, Spires and Worms, on the right bank of the river.

See A. Huguenin, *Histoire du royaume mérovingien d'Austrasie* (Paris, 1857); Aug. Digot, *Histoire du royaume d'Austrasie*, 4 vols. (Nancy, 1863); L. Drapeyron, *Essai sur l'origine, le développement et les résultats de la lutte entre la Neustrie et l'Austrasie* (Paris, 1867); Auguste Longnon, *Atlas historique*, 1st and 2nd parts. (C. Pf.)

AUSTRIA. (Ger. *Österreich*), a country of central Europe, bounded E. by Russia and Rumania, S. by Hungary, the Adriatic Sea and Italy, W. by Switzerland, Liechtenstein and the German empire (Bavaria), and N. by the German empire (Saxony and Prussia) and Russia. It has an area of 115,533 sq. m., or about twice the size of England and Wales together. Austria is one of the states which constitute the Austro-Hungarian (Habsburg) monarchy (see Austria-Hungary: *History*), and is also called Cisleithania, from the fact that it contains the portion of that monarchy which lies to the west of the river Leitha. Austria does not form a geographical unity, and the constituent parts of this empire belong to different geographical regions. Thus, Tirol, Styria and Carinthia belong, like Switzerland, to the system of the Alps, but these provinces together with those lying in the basin of the Danube form, nevertheless, a compact stretch of country. On the other hand Galicia, extending on the eastern side of the Carpathians, belongs to the great plain of Russia; Bohemia stretches far into the body of Germany; while Dalmatia, which is quite separated from the other provinces, belongs to the Balkan Peninsula.

Coasts.—Austria has amongst all the great European countries the most continental character, in so far as its frontiers are mostly land-frontiers, only about one-tenth of them being coast-land. The Adriatic coast, which stretches for a distance of about 1000 m., is greatly indented. The Gulf of Trieste on the west, and the Gulf of Fiume or Quarnero on the east, include between them the peninsula of Istria, which has many sheltered bays. In the Gulf of Quarnero are the Quarnero islands, of which the most important are Cherso, Veglia and Lussin. The coast west of the mouth of the Isonzo is fringed by lagoons, and has the same character as the Venetian coast, while the Gulf of Trieste and the Istrian peninsula have a steep coast with many bays and safe harbours. The principal ports are Trieste, Capodistria, Pirano, Parenzo, Rovigno and Pola, the great naval harbour and arsenal of Austria. The coast of Dalmatia also possesses many safe bays, the principal being those of Zara, Cattaro and Ragusa, but in some places it is very steep and inaccessible. On the other hand a string of islands extends along this coast, which offer many safe and easily accessible places of anchorage to ships during the fierce winter gales which rage in the Adriatic. The principal are Pago, Pasman, Isola Lunga and Isola Incoronata, Brazza, Lesina, Curzola and Meleda.

The political divisions of Austria correspond, for the most part, so closely to natural physical divisions that the detailed account of the physical features, natural resources and the movement of the population has been given under those separate headings. In this general article the geography of Austria—physical, economical and political—has been treated in its broad aspects, and those points insisted upon which give an adequate idea of the country as a whole.

Mountains.—Austria is the most mountainous country of Europe after Switzerland, and about four-fifths of its entire area is more than 600 ft. above the level of the sea. The mountains of Austria belong to three different mountain systems, namely, the Alps (*q.v.*), the Carpathians (*q.v.*), and the Bohemian-Moravian Mountains. The Danube, which is the principal river of Austria, divides the Alpine region, which occupies the whole country lying at its south, from the Bohemian-Moravian Mountains and their offshoots lying at its north; while the valleys of the March and the Oder separate the last-named mountains from the Carpathians. Of the three principal divisions of the Alps—the western, the central and the eastern Alps—Austria is traversed by several groups of the central Alps, while the eastern Alps lie entirely within its territory. The eastern Alps are continued by the Karst mountains, which in their turn are continued by the Dinaric Alps, which stretch through Croatia and Dalmatia. The second great mountain-system of Austria, the Carpathians, occupy its eastern and north-eastern portions, and stretch in the form of an arch through Moravia, Silesia, Galicia and Bukovina, forming the frontier towards Hungary, within which territory they principally extend. Finally, the Bohemian-Moravian Mountains, which enclose Bohemia and Moravia, and form the so-called quadrilateral of Bohemia, constitute the link of the Austrian mountain-system with the hilly region (the *Mittelgebirge*) of central Europe. Only a little over 25 % of the area of Austria is occupied by plains. The largest is the plain of Galicia, which is part of the extensive Sarmatic plain; while in the south, along the Isonzo, Austria comprises a small part of the Lombardo-Venetian plain. Several smaller plains are found along the Danube, as the Tulner Becken in Lower Austria, and the Wiener Becken, the plain on which the capital is situated; to the north of the Danube this plain is called the Marchfeld, and is continued under the name of the Marchebene into Moravia as far north as Olmütz. Along the other principal rivers there are also plains of more or less magnitude, some of them possessing tracts of very fertile soil.

Rivers.—Austria possesses a fairly great number of rivers, pretty equally distributed amongst its crown lands, with the exception of Istria and the Karst region, where there is a great scarcity of even the smallest rivers. The principal rivers are: the Danube, the Dniester, the Vistula, the Oder, the Elbe, the Rhine and the Adige or Etsch. As the highlands of Austria form part of the great watershed of Europe, which divides the waters flowing northward into the North Sea or the Baltic from those flowing southward or eastward into the Mediterranean or the Black Sea, its rivers flow in three different directions—northward, southward and eastward. With the exception of the small streams belonging to it which fall into the Adriatic, all its rivers have their mouths in other countries, and its principal river, the Danube, has also its source in another country. When it enters Austria at the gorge of Passau, where it receives the Inn, a river which has as large a body of water as itself, the Danube is already navigable. Till it leaves the country at Hainburg, just before Pressburg, its banks are pretty closely hemmed by the Alps, and the river passes through a succession of narrow defiles. But the finest part of its whole course, as regards the picturesqueness of the scenery on its banks, is between Linz and Vienna. Where it enters Austria the Danube is 898 ft. above the level of the sea, and where it leaves it is only 400 ft.; it has thus a fall within the country of 498 ft., and is at first a very rapid stream, becoming latterly much slower. The Danube has in Austria a course of 234 m., and it drains an area of 50,377 sq.m. Its principal affluents in Austria, besides the Inn, are the Traun, the Enns and the March. The Dniester, which, like the Danube, flows into the Black Sea, has its source in the Carpathians in Eastern Galicia, and pursues a very winding course towards the south-east, passing into Russia. It has in Austria a course of 370 m. of which 300 are navigable, and drains

an area of 12,000 sq. m. The Vistula and the Oder both fall into the Baltic. The former rises in Moravia, flows first north through Austrian Silesia, then takes an easterly direction along the borders of Prussian Silesia, and afterwards a north-easterly, separating Galicia from Russian Poland, and leaving Austria not far from Sandomir. Its course in Austria is 240 m., draining an area of 15,500 sq. m. It is navigable for nearly 200 m., and its principal affluents are the Dunajec, the San and the Bug. The Oder has also its source in Moravia, flows first east and then north-east through Austrian Silesia into Prussia. Its length within the Austrian territory is only about 55 m., no part of which is navigable. The only river of this country which flows into the North Sea is the Elbe. It has its source in the Riesengebirge, not far from the Schneekoppe, flows first south, then west, and afterwards north-west through Bohemia, and then enters Saxony. Its principal affluents are the Adler, Iser and Eger, and, most important of all, the Moldau. The Elbe has a course within the Austrian dominions of 185 m., for about 65 of which it is navigable. It drains an area of upwards of 21,000 sq. m. The Rhine, though scarcely to be reckoned a river of the country, flows for about 25 m. of its course between it and Switzerland. The principal river of Austria which falls into the Adriatic is the Adige or Etsch. It rises in the mountains of Tirol, flows south, then east, and afterwards south, into the plains of Lombardy. It has in Austria a course of 138 m., and drains an area of 4266 sq. m. Its principal affluent is the Eisak. Of the streams which have their course entirely within the country, and fall into the Adriatic, the principal is the Isonzo, 75 m. in length, but navigable only for a short distance from its mouth.

Lakes.—Austria does not possess any great lakes; but has numerous small mountain lakes situated in the Alpine region, the most renowned for the beauty of their situation being found in Salzburg, Salzkammergut, Tirol and Carinthia. There should also be mentioned the periodical lakes situated in the Karst region, the largest of them being the Lake of Zirknitz. The numerous and large marshes, found now mostly in Galicia and Dalmatia, have been greatly reduced in the other provinces through the canalization of the rivers, and other works of sanitation.

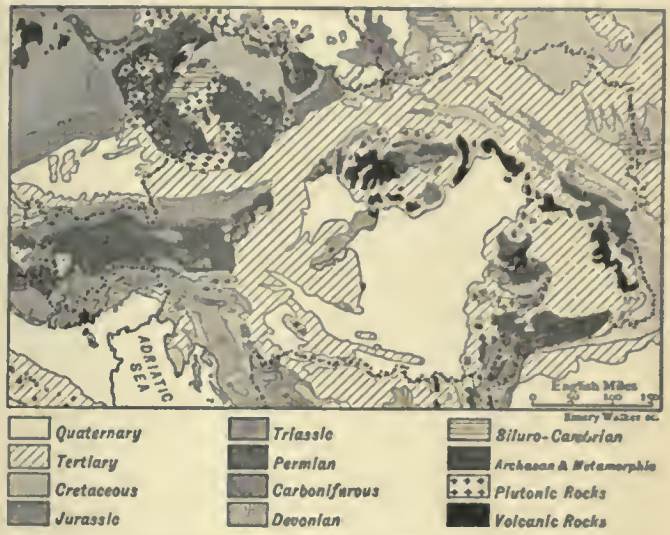
Mineral Springs.—No other European country equals Austria in the number and value of its mineral springs. They are mostly to be found in Bohemia, and are amongst the most frequented watering-places in the world. The most important are, the alkaline springs of Carlsbad, Marienbad, Franzensbad and Bilin; the alkaline acidulated waters of Giesshübel, largely used as table waters; the iron springs of Marienbad, Franzensbad and of Pyrawarth in Lower Austria; the bitter waters of Püllna, Saidschitz and Sedlitz; the saline waters of Ischl and of Aussee in Styria; the iodine waters of Hall in Upper Austria; the different waters of Gastein; and lastly the thermal waters of Teplitz-Schönau, Johannisbad, and of Römerbad in Styria. Altogether there are reckoned to exist over 1500 mineral springs, of which many are not used. (O. Br.)

Geology.—The Austro-Hungarian Monarchy is traversed by the great belt of folded beds which constitutes the Alps and the Carpathians; a secondary branch proceeding from the main belt runs along the Adriatic coast and forms the Julian and Dinaric Alps. In the space which is thus enclosed, lies the Tertiary basin of the Hungarian plain; and outside the belt, on the northern side, is a region which, geologically, is composite, but has uniformly resisted the Carpathian folding. In the neighbourhood of Vienna a gap in the folded belt—the gap between the Alps and the Carpathians—has formed a connexion between these two regions since the early part of the Miocene period. On its outer or convex side the folded belt is clearly defined by a depression which is generally filled by modern deposits. Beyond this, in Russia and Galicia, lies an extensive plateau, much of which is covered by flat-lying Miocene and Pliocene beds; but in the deep valleys of the Dniester and its tributaries the ancient rocks which form the foundation of the plateau are laid bare. Archaean granite is thus exposed at Yampol and other places in Russia, and this is followed towards the west by Silurian and Devonian beds in regular succession—the Devonian being of the Old Red Sandstone type characteristic of the British Isles and of Northern Russia. Throughout, the dip is very low and the beds are unaffected by the Carpathian folds, the strike being nearly from north to south. After Devonian times the region seems to have been dry land until the commencement of the Upper Cretaceous period, when it was overspread by the Cenomanian sea, and the deposits of that sea lie flat upon the older sediments.

Some 25 or 30 m. of undulating country separate the Dniester from the margin of the Carpathian chain, and in this space the Palaeozoic floor sinks far beneath the surface, so that not even the deep-cut valley of the Pruth exposes any beds of older date than Miocene. Towards the north-west, also, the Palaeozoic foundation falls beneath an increasing thickness of Cretaceous beds and lies buried far below the surface. At Lemberg a boring 1650 ft. in depth did not reach the base of the Senonian. West of Cracow the Cretaceous beds are underlaid by Jurassic and Triassic deposits, the general dip being eastward. It is not till Silesia that the Palaeozoic formations again rise to the surface. Here is the margin, often concealed by very modern deposits, of the great mass of Archaean and Palaeozoic rocks which forms nearly the whole of Bohemia and Moravia. The Palaeozoic beds no longer lie flat and undisturbed, as in the Polish plain. They are faulted and folded. But the folds are altogether independent of those of the Carpathians; they are of much earlier date, and are commonly different in direction. The principal folding took place towards the close of the Carboniferous period, and the *massif* is a fragment of an ancient mountain chain, the *Variscische Gebirge* of E. Suess, which in Permian and Triassic times stretched across the European area from west to east.

In Bohemia and Moravia the whole of the beds from the Cambrian to the Lower Carboniferous are of marine origin; but after the Carboniferous period the area appears to have been dry land until the beginning of the Upper Cretaceous period, when the sea again spread over it. The deposits of this sea are now visible in the large basin of Upper Cretaceous beds which stretches from Dresden south-eastward through Bohemia. Since the close of the Cretaceous period the Bohemian *massif* has remained above the sea; but the depression which lies immediately outside the Carpathian chain has at times been covered by an arm of the sea and at other times has been occupied by a chain of salt lakes, to which the salt deposits of Wieliczka and numerous brine springs owe their origin.

The large area which is enclosed within the curve of the Carpathians is for the most part covered by loess, alluvium and other modern deposits, but Miocene and Pliocene beds appear around its borders. In the hilly region of western Transylvania a large mass of



Geological Map of Austria-Hungary.

more ancient rocks is exposed; the Carboniferous system and all the Mesozoic systems have been recognized here, and granite and volcanic rocks occur. In the middle of Hungary a line of hills rises above the plain, striking from the Platten See towards the north-east, where it merges into the inner girdle of the Carpathian chain. These hills are largely formed of volcanic rocks of late Tertiary age; but near the Platten See Triassic beds of Alpine type are well developed. The Tertiary eruptions were not confined to this line of hills. They were most extensive along the inner border of the Carpathians, and they occurred also in the north of Bohemia. Most of the eruptions took place during the Miocene and Pliocene periods.

The mineral wealth of Austria is very great. The older rocks are in many places peculiarly rich in metalliferous ores of all kinds. Amongst them may be mentioned the silver-bearing lead ores of Erzgebirge and of Přibram in Bohemia; the iron ores of Styria and Bukovina; and the iron, copper, cobalt and nickel of the districts of Zips and Gömör. The famous cinnabar and mercury mines of Idria in Carniola are in Triassic beds; and the gold and silver of northern Hungary and of Transylvania are associated with the Tertiary volcanic rocks. The Carboniferous coal-fields of Silesia and Bohemia are of the greatest importance; while Jurassic coal is worked at Steyerdorf and Fünfkirchen in Hungary, and lignite at many places in the Tertiary beds. The great salt mines of Galicia are in Miocene deposits; but salt is also worked largely in the Trias of the Alps. (See also Alps; Carpathians; Hungary and Tirol.) (P. La.)

Climate.—The climate of Austria, in consequence of its great extent, and the great differences in the elevation of its surface, is very various. It is usual to divide it into three distinct zones. The most southern extends to 46° N. lat., and includes Dalmatia and the country along the coast, together with the southern portions of Tirol and Carinthia. Here the seasons are mild and equable, the winters are short (snow seldom falling), and the summers last for five months. The vine and maize are everywhere cultivated, as well as olives and other southern products. In the south of Dalmatia tropical plants flourish in the open air. The central zone lies between 46° and 49° N. lat., and includes Lower and Upper Austria, Salzburg, Styria, Carinthia, Carniola, Central and Northern Tirol, Southern Moravia

and a part of Bohemia. The seasons are more marked here than in the preceding. The winters are longer and more severe, and the summers are hotter. The vine and maize are cultivated in favourable situations, and wheat and other kinds of grain are generally grown. The northern zone embraces the territory lying north of 49° N. lat., comprising Bohemia, Northern Moravia, Silesia and Galicia. The winters are here long and cold; the vine and maize are no longer cultivated, the principal crops being wheat, barley, oats, rye, hemp and flax. The mean annual temperature ranges from about 59° in the south to 48° in the north. In some parts of the country, however, it is as low as 46° 40′ and even 36°. In Vienna the average annual temperature is 50°, the highest temperature being 94°, the lowest 2° Fahr. In general the eastern part of the country receives less rain than the western. In the south the rains prevail chiefly in spring and autumn, and in the north and central parts during summer. Storms are frequent in the region of the south Alps and along the coast. In some parts in the vicinity of the Alps the rainfall is excessive, sometimes exceeding 60 in. It is less among the Carpathians, where it usually varies from 30 to 40 in. In other parts the rainfall usually averages from 20 to 24 in.

Flora.—From the varied character of its climate and soil the vegetable productions of Austria are very diverse. It has floras of the plains, the hills and the mountains; an alpine flora, and an arctic flora; a flora of marshes, and a flora of steppes; floras peculiar to the clay, the chalk, the sandstone and the slate formations. The number of different species is estimated at 12,000, of which one-third are phanerogamous, or flowering plants, and two-thirds cryptogamous, or flowerless. The crown land of Lower Austria far surpasses in this respect the other divisions of the country, having about four-ninths of the whole, and not less than 1700 species of flowering plants. As stated above, Austria is a very mountainous country and the mountains are frequently covered with vegetation to a great elevation. At the base are found vines and maize; on the lower slopes are green pastures, or wheat, barley and other kinds of corn; above are often forests of oak, ash, elm, &c.; and still higher the yew and the fir may be seen braving the climatic conditions. Corn grows to between 3400 and 4500 ft. above the level of the sea, the forests extend to 5600 or 6400 ft., and the line of perpetual snow is from 7800 to 8200 ft.

Fauna.—The animal kingdom embraces, besides the usual domestic animals (as horses, cattle, sheep, swine, goats, asses, &c.), wild boars, deer, wild goats, hares, &c.; also bears, wolves, lynxes, foxes, wild cats, jackals, otters, beavers, polecats, martens, weasels and the like. Eagles and hawks are common, and many kinds of singing birds. The rivers and lakes abound in different kinds of fish, which are also plentiful on the sea-coast. Among the insects the bee and the silkworm are the most useful. The leech forms an article of trade. In all there are 90 different species of mammals, 248 species of birds, 377 of fishes and more than 13,000 of insects.

Divisions.—Austria is composed of seventeen "lands," called also "crown lands." Of these, three—namely, Bohemia, Galicia and Lodomeria, and Dalmatia—are kingdoms; two—Lower and Upper Austria—archduchies; six—Salzburg, Styria, Carinthia, Carniola, Silesia and Bukovina—duchies; two—Görz-Gradisca and Tirol—countships of princely rank (*gefürstete Grafschaften*); two—Moravia and Istria—margraviates (march counties). Vorarlberg bears the title simply of "land." Trieste, with its district, is a town treated as a special crown land. For administrative purposes Trieste, with Görz-Gradisca and Istria, constituting the Küstenland (the Coast land) and Tirol and Vorarlberg, are each comprehended as one administrative territory. The remaining lands constitute each an administrative territory by itself.

Population.—Austria had in 1900 a population of 26,107,304 inhabitants,[1] which is equivalent to 226 inhabitants per sq. m. As seen from the above table the density of the population is unequal in the various crown lands. The most thickly populated province is Lower Austria; the Alpine provinces are sparsely populated, while Salzburg is the most thinly populated crown land of Austria. As regards sex, for every 1000 men there were 1035 women, the female element being the most numerous in every crown land, except the Küstenland, Bukovina and Dalmatia. Compared with the census returns of 1890, the population shows an increase of 2,211,891, or 9·3% of the total population. The increase between the preceding census returns of 1880 and 1890 was of 1,750,093 inhabitants, or 7·9% of the total population. A very important factor in the movement of the population is the large over-sea emigration, mostly to the United States of America, which has grown very much during the last quarter of the 19th century, and which shows a tendency to become still larger. Between 1891 and 1900 the number of over-sea emigrants was 387,770 persons. The movement of the population shown in the other vital statistics—births, marriages, deaths—are mostly satisfactory, and show a steady and normal progress. The annual rate per thousand of population in 1900 was: births, 37·0; still-births, 1·1; deaths, 25·2; marriages, 8·2. The only unsatisfactory points are the great number of illegitimate births, and the high infant mortality. Of the total population of Austria 14,009,233 were scattered in 26,321 rural communities with less than 2000 inhabitants; while the remainder was distributed in 1742 communities with a population of 2000–5000; in 260 communities with a population of 5000–10,000; in 96 towns with a population of 10,000–20,000; in 41 towns with a population of 20,000–50,000; in 6 towns with a population of 50,000–100,000; and in 6 towns with a population of over 100,000 inhabitants. The principal towns of Austria are Vienna (1,662,269), Prague (460,849), Trieste (132,879), Lemberg (159,618), Graz (138,370), Brünn (108,944), Cracow (91,310), Czernowitz (67,622), Pilsen (68,292) and Linz (58,778).

Administrative Territories.	Areas in Square Miles.	Population.		Density of Population per sq. m. in 1900.
		1890.	1900.	
AUSTRIA—				
Lower Austria	7,654	2,661,799	3,100,493	405
Upper Austria	4,617	785,831	809,918	175
Salzburg	2,757	173,510	193,247	69
Styria	8,642	1,282,708	1,356,058	156
Carinthia	3,992	361,008	367,344	91
Carniola	3,844	498,958	508,348	132
Küstenland	3,074	695,384	755,183	245
Tirol and Vorarlberg	11,287	928,769	979,878	86
Bohemia	19,997	5,843,094	6,318,280	315
Moravia	8,555	2,276,870	2,435,081	284
Silesia	1,981	605,649	680,529	342
Galicia	30,212	6,607,816	7,295,538	241
Bukovina	4,022	646,591	729,921	181
Dalmatia	4,923	527,426	591,597	120
Total	115,533	23,895,413	26,107,304	226

Races.—From an ethnographical point of view Austria contains a diversity of races; in fact no other European state contains within its borders so many nationalities as the Austrian empire. The three principal races of Europe—the Latin, the Teutonic and the Slavonic—are all represented in Austria. The Slavonic race, numbering 15,690,000, is numerically the principal race in Austria, but as it is divided into a number of peoples, differing from one another in language, religion,

[1] The census returns of 1857, and of 1869, which were the first systematic censuses taken, gave the population of Austria as 18,224,500 and 20,394,980 respectively. It must be noticed that between these two dates Austria lost its Lombardo-Venetian territories, with a population of about 5,000,000 inhabitants.

culture, customs and historical traditions, It does not possess a national unity. Besides, these various nationalities are geographically separated from one another by other races, and are divided into two groups. The northern group includes the Czechs, the Moravians, the Slovaks, the Ruthenians and the Poles; while the southern group contains the Slovenes, the Servians and the Croats. Just as their historical traditions are different, so are also the aspirations of these various peoples of the Slavonic race different, and the rivalries between them, as for instance between the Poles and the Ruthenians, have prevented them from enjoying the full political advantage due to their number. The Germans, numbering 9,171,614, constitute the most numerous nationality in Austria, and have played and still play the principal rôle in the political life of the country. The Germans are in a relative majority over the other peoples in the empire, their language is the vehicle of communication between all the other peoples both in official life and in the press; they are in a relatively more advanced state of culture, and they are spread over every part of the empire. Historically they have contributed most to the foundation and to the development of the Austrian monarchy, and think that for all the above-mentioned reasons they are entitled to the principal position amongst the various nationalities of Austria. The Latin race is represented by the Italians, Ladini and Rumanians.

The following table gives the numbers of different nationalities, as determined by the languages spoken by them in 1900:—

Germans	9,171,614
Czechs and Slovaks	5,955,397
Poles	4,252,483
Ruthenians	3,381,570
Slovenes	1,192,780
Italians and Ladini	727,102
Servians and Croats	711,380
Rumanians	230,963
Magyars	9,516

The Germans occupy exclusively Upper Austria, Salzburg, Vorarlberg, and, to a large extent, Lower Austria; then the north and central part of Styria, the north and western part of Carinthia, and the north and central part of Tirol. In Bohemia they are concentrated round the borders, in the vicinity of the mountains, and they form nearly half the population of Silesia; besides they are found in every part of the monarchy. The Czechs occupy the central and eastern parts of Bohemia, the greatest part of Moravia and a part of Silesia. The Poles are concentrated in western Galicia, and in a part of Silesia; the Ruthenians in eastern Galicia and a part of Bukovina; the Slovenes in Carniola, Görz and Gradisca, Istria, the south of Styria, and the Trieste territory. The Servians and Croats are found in Istria and Dalmatia; the Italians and Ladini in southern Tirol, Görz and Gradisca, Trieste, the coast of Istria, and in the towns of Dalmatia; while the Rumanians live mostly in Bukovina.

Agriculture.—Notwithstanding the great industrial progress made by Austria during the last quarter of the 19th century, agriculture still forms the most important source of revenue of its inhabitants. In 1900 over 50 % of the total population of Austria derived their income from agricultural pursuits. The soil is generally fertile, although there is a great difference in the productivity of the various crown-lands owing to their geographical situation. The productive land of Austria covers 69,519,953 acres, or 93·8 % of the total area, which is 74,102,001 acres; to this must be added 0·4 of lakes and fish-ponds, making a total of 94·2 % of productive area. The remainder is unproductive, or used for other, not agricultural purposes. The area of the productive land has been steadily increasing—it was estimated to cover about 89 % in 1875,—and great improvements in the agricultural methods have also been introduced. Of the whole productive area of Austria, 37·6 % is laid out in arable land; 34·6 % in woods; 25·2 % in pastures and meadows; 1·3 % in gardens, 0·9 % in vineyards; and 0·4 % in lakes, marshes and ponds. The provinces having the largest proportion of arable land are Bohemia, Galicia, Moravia and Lower Austria. The principal products are wheat, rye, barley, oats, maize, potatoes, sugar beet, and cattle turnip. The produce of the ploughed land does not, on the whole, suffice for the home requirements. Large quantities in particular of wheat and maize are imported from Hungary for home consumption. Only barley and oats are usually reaped in quantity for export. The provinces which have the lowest proportion of arable land are Tirol and Salzburg. Besides these principal crops, other crops of considerable magnitude are: buckwheat in Styria, Galicia, Carniola and Carinthia; rape and rape-seed in Bohemia and Galicia, poppy in Moravia and Silesia; flax in Bohemia, Moravia, Styria and Galicia; hemp in Galicia, chicory in Bohemia; tobacco, which is a state monopoly, in Galicia, Bukovina, Dalmatia and Tirol; fuller's thistle in Upper Austria and Styria; hops in Bohemia, including the celebrated hops round Saaz, in Galicia and Moravia; rice in the Küstenland; and cabbage in Bohemia, Galicia, Lower Austria and Styria. The principal garden products are kitchen vegetables and fruit, of which large quantities are exported. The best fruit districts are in Bohemia, Moravia, Upper Austria and Styria. Certain districts are distinguished for particular kinds of fruit, as Tirol for apples, Bohemia for plums, Dalmatia for figs, pomegranates and olives. The chestnut, olive and mulberry trees are common in the south—chiefly in Dalmatia, the Küstenland and Tirol; while in the south of Dalmatia the palm grows in the open air, but bears no fruit.

The vineyards of Austria covered in 1901 an area of 626,044 acres, the provinces with the largest proportion of vineyards being Dalmatia, the Küstenland, Lower Austria, Styria and Moravia. The wines of Dalmatia are mostly sweet wines, and not suitable to be kept for long periods, while those of the other provinces are not so sweet, but improve with age.

Forests.—The forests occupy just a little over one-third of the whole productive area of Austria, and cover 24,157,709 acres. In the forests tall timber predominates to the extent of 85 %, and consists of conifers much more than of green or leaved trees, in the proportion of seventy against fifteen out of the 85 % of the total forests laid out in tall timber. Exceptions are the forest lands of the Karst region, where medium-sized trees and underwood occupy 80 %, and of Dalmatia, where underwood occupies 92·6 % of the whole forest land. The Alpine region is well wooded, and amongst the other provinces Bukovina is the most densely wooded, having 43·2 % of its area under forests, while Galicia with 25·9 % is the most thinly-wooded crown-land of Austria. The forests are chiefly composed of oak, pine, beech, ash, elm, and the like, and constitute one of the great sources of wealth of the country. Forestry is carried on in a thoroughly scientific manner. Large works of afforestation have been undertaken in Carinthia, Carniola and Tirol with a view of checking the periodical inundations, while similar works have been successfully carried out in the Karst region.

Landed Property.—Of the whole territory of the state, 74,102,001 acres, about 29 %, is appropriated to large landed estates; 71 % is disposed of in medium and smaller properties. Large landed property is most strongly represented in Bukovina, where it absorbs 46 % of the whole territory, and in Salzburg, Galicia, Silesia and Bohemia. To the state belongs 4½ % of the total territory. The Church, the communities, and the corporations are also in possession of large areas of land; 4 % (speaking roundly) of the territory of Austria is held on the tenure of *fidei-commissum*. Of the entire property in large landed estates, 59 % is laid out in woods; of the property in *fidei-commissum*, 66 % is woodland; of the entire forest land, about 10 % is the property of the state; 14·5 % is communal property; and 3·8 % is the property of the Church. The whole of the territory in large landed estates includes 52 % of the entire forest land. The forest land held under *fidei-commissum* amounts to over 9 % of the entire forest land.

Live Stock.—Although richly endowed by nature, Austria cannot be said to be remarkable as a cattle-rearing country. Indeed, except in certain districts of the Alpine region, where this branch of human activity is carried on under excellent conditions, there is much room for improvement. The amount of live stock is registered every ten years along with the census of the population.

	1880.	1890.	1900.
Horses	1,463,282	1,548,197	1,711,077
Mules and asses	49,618	57,952	66,638
Cattle	8,584,077	8,643,936	9,506,626
Goats	1,006,675	1,035,832	1,015,682
Sheep	3,841,340	3,186,787	2,621,026
Pigs	2,721,541	3,549,700	4,682,734
Beehives	926,312	920,640	996,139

Austria is distinguished for the number and superiority of its horses, for the improvements of which numerous studs exist all over the country. All kinds of horses are represented from the heaviest to the lightest, from the largest to the smallest. The most beautiful horses are found in Bukovina, the largest and strongest in Salzburg; those of Styria, Carinthia, Northern Tirol and Upper Austria are also famous. In Dalmatia, the Küstenland and Southern Tirol, horses are less numerous, and mules and asses in a great measure take their place. The finest cattle are to be found in the Alpine region; of the Austrian provinces, Salzburg and Upper Austria contain the largest proportion of cattle. The number of sheep has greatly diminished, but much has been done in the way of improving the breeds, more particularly in Bohemia, Moravia, Silesia and Upper and Lower Austria. The main object has been the improvement of the wool, and with this object the merino and other fine-woolled breeds have been introduced. Goats abound mostly in Dalmatia, Bohemia and Tirol. The rearing of pigs is carried on most largely in Styria, Bohemia, Galicia and Upper and Lower Austria. Bees are extensively kept in Carinthia, Carniola, Lower Austria and Galicia. The silk-worm is reared more particularly in Southern Tirol and in the Küstenland, and the average annual yield is 5,000,000 lb of cocoons. In the Alpine region dairy-farming has attained a great degree of development, and large quantities of

butter and cheese are annually produced. Altogether, the rearing of cattle, with all its actual shortcomings, constitutes a great source of revenue, and yields a certain amount for export.

Fisheries.—The fisheries of Austria are very extensive, and are divided into river, lake and sea fisheries. The numerous rivers of Austria swarm with a great variety of fishes. The lake fisheries are mostly pursued in Bohemia, where pisciculture is an art of old standing, and largely developed. The sea fisheries on the coast of Dalmatia and of the Küstenland constitute an important source of wealth to the inhabitants of these provinces. About 4000 vessels, with a number of over 16,000 fishermen are employed, and the average annual catch realizes £240,000.

In the mountainous regions of Austria game is plentiful, and constitutes a large source of income.

Minerals.—In the extent and variety of its mineral resources Austria ranks among the first countries of Europe. With the exception of platinum, it possesses every useful metal; thus, besides the noble metals, gold and silver, it abounds in ores of more or less richness in iron, copper, lead and tin. Rich deposits of coal, both pit coal and brown coal are to be found, as well as extensive basins of petroleum, and large deposits of salt. In smaller quantities are found zinc, antimony, arsenic, cobalt, nickel, manganese, bismuth, chromium, uranium, tellurium, sulphur, graphite and asphalt. There are also marble, roofing-slate, gypsum, porcelain-earth, potter's clay, and precious stones. It is therefore natural that mining operations should have been carried out in Austria from the earliest times, as, for instance, the salt mines of Hallstatt in Upper Austria, which had already been worked during the Celtic and Romanic period. Famous through the middle ages were also the works, especially for the extraction of gold and silver, carried out in Bohemia and Moravia, whose early mining regulations, for instance those of Iglau, were adopted in other countries. But the great industrial development of the 19th century, with its growing necessity for fuel, has brought about the exploitation of the rich coal-fields of the country, and to-day the coal mines yield the heaviest output of any mineral products. To instance the rapid growth in the extraction of coal, it is worth mentioning that in 1825 its output was about 150,000 tons; in 1875, or only after half a century, the output has become 100 times greater, namely, over 15,000,000 tons; while in 1900 it was 32,500,000 tons. Coal is found in nearly every province of Austria, with the exception of Salzburg and Bukovina, but the richest coal-fields are in Bohemia, Silesia, Styria, Moravia and Carniola in the order named. Iron ores are found more or less in all the crown-lands except Upper Austria, the Küstenland and Dalmatia, but it is most plentiful in Styria, Carinthia, Bohemia and Moravia. Gold and silver ores are found in Bohemia, Salzburg and Tirol. Quicksilver is found at Idria in Carniola, which after Almaden in Spain is the richest mine in Europe. Lead is extracted in Carinthia and Bohemia, while the only mines for tin in the whole of Austria are in Bohemia. Zinc is mostly found in Galicia, Tirol and Bohemia, and copper is extracted in Tirol, Moravia and Salzburg. Petroleum is found in Galicia, where ozocerite is also raised. Rock-salt is extracted in Galicia, while brine-salt is produced in Salzburg, Salzkammergut and Tirol. Graphite is extracted in Bohemia, Moravia, Styria and Lower Austria. Uranium, bismuth and antimony are dug out in Bohemia, while procelain earth is found in Bohemia and Moravia. White, red, black and variously-coloured marbles exist in the Alps, particularly in Tirol and Salzburg; quartz, felspar, heavy spar, rock-crystal, and asbestos are found in various parts; and among precious stones may be specially mentioned the Bohemian garnets. The total value of the mines and foundry products throughout Austria in 1875 was £5,000,000. The number of persons employed in the mines and in the smelting and casting works in the same year was 94,019. The total value of the mining products throughout Austria in 1902 was £10,500,000, and the value of the product of the foundries was £3,795,000. Of this amount £3,150,000 represents the value of the iron: raw steel and pig iron. The increase in the value of the mining products during the period 1892–1902 was 40 %; and the increase in the product of the furnaces in the same period was 35 %. The number of persons employed in 1902 in mining was 140,890; in smelting works 7148; and in the extraction of salt, 7963. The value of the chief mining products of Austria in 1903 was: Brown coal (21,808,583 tons), £4,182,516; coal (12,145,000 tons), £4,059,807; iron ores (1,688,960 tons), £615,273; lead ores, £135,965; silver ores, £119,637; quicksilver ores, £92,049; graphite, £78,437; tin ores, £78,275; copper ores, £22,119; manganese ores, £5368; gold ores, £4407; asphalt, £2250; alum and vitriol slate, £992. The production of petroleum was 660,000 tons, and of salt 340,000 tons. The value of the principal products of the smelting furnaces in 1903 was: Iron (955,543 tons), £2,970,866; coke, £862,137; zinc (metallic), £174,344; silver, £141,594; copper, £57,542; sulphuric acid, £8488; copper vitriol, £5710; mineral colours, £5565; lead, £5067; tin, £4566; gold, £878; iron vitriol, £603; litharge, £384; quicksilver, £218; coal briquettes, £92,000.

Industry.—The manufactures of Austria were much developed during the last quarter of the 19th century, although Austria as a whole cannot be said to be an industrial country. Austria possesses many favourable conditions for a great industrial activity. It possesses an abundance of raw materials, of fuel—both mineral and wood,—of metals and minerals, in fact all the necessaries for a great and flourishing industry; and the rivers can easily be utilized as producers of motive power. It is besides densely populated, and has an adequate supply of cheap labour, while the undeveloped industries of the Balkan states also offer a ready market for its products. The glass manufacture in Bohemia is very old, and has kept up its leading position in the markets of the world up to the present day. Industrial activity is greatly developed in Bohemia, Lower Austria, Silesia, Moravia and Vorarlberg, while in Dalmatia and Bukovina it is almost non-existent. The principal branches of manufactures are, the textile industry, the metallurgic industries; brewing and distilling; leather, paper and sugar; glass, porcelain and earthenware; chemicals; and scientific and musical instruments.

The textile industry in all its branches—cotton, woollen, linen, silk, flax and hemp—is mostly concentrated in Bohemia, Moravia, Silesia and Lower Austria. It is an old industry, and one which has made great progress since 1875. Thus the number of mechanical looms increased more than threefold during this period, and numbered in 1902 about 120,000. In the same year the number of spindles at work was about 3,100,000. Austria had in 1902, 21,837 textile factories with 337,514 workmen. The principal seat of the manufacture of cotton goods is in northern Bohemia, from the Eger to Reichenberg, which can be considered as the Lancashire of Austria, Lower Austria between the Wiener Wald and the Leitha, and in Vorarlberg. Woollen goods are manufactured in the above places, and besides in Moravia, at Brünn and at Iglau; in Silesia; and at Biala in Galicia. Vienna is also distinguished for its manufacture of shawls. The coarser kind of woollen goods are manufactured all over the country, principally in the people's houses as a home industry. The most important places for the linen industry are in Bohemia at Trautenau; in Moravia and Silesia, while the commoner kinds of linen are mostly produced as a home industry by the peasants in the above-mentioned crown-lands. The manufacture of ribbons, embroidery and lace, the two latter being carried on principally as a house industry in Vorarlberg and in the Bohemian Erzgebirge, also thrives. The industry in stitched stuffs is especially developed in northern Bohemia. Ready-made men's clothes and oriental caps (fezes) are produced on a large scale in Bohemia and Moravia. The manufacture of silk goods is mainly carried on in Vienna, while the spinning of silk has its principal seat in southern Tirol, and to a smaller extent in the Küstenland.

The metallurgic industry forms one of the most important branches of industry, because iron ore of excellent quality is extracted annually in great quantities. The principal seats of the iron and steel manufactures are in Bohemia, Moravia, Silesia, Upper and Lower Austria, Styria and Carinthia, which contain extensive iron-works. The most important manufactured products are cutlery, firearms, files, wire, nails, tin-plates, scythes, sickles, steel pens, needles, rails, iron furniture, drains, and kitchen utensils. A famous place for its iron manufacture is Steyr in Upper Austria. The manufacture of machinery, for industrial and agricultural purposes, and of railway engines is mainly concentrated in Vienna, Wiener-Neustadt, Prague, Brünn and Trieste; while the production of rolling stock for railways is carried on in Vienna, Prague and Graz. Ship-building yards for sea-vessels are at Trieste and Pola; while for river-vessels the largest yards are at Linz. Among other metal manufactures, the principal are copper works at Brixlegg and other places in Tirol, and in Galicia, tin and lead in Bohemia, and metallic alloys, especially *Packfong* or German silver, an alloy of nickel and copper, at Berndorf in Lower Austria. The precious metals, gold and silver, are principally worked in the larger towns, particularly at Vienna and Prague. Vienna is also the principal seat for scientific and surgical instruments. In the manufacture of musical instruments Austria takes a leading part amongst European states, the principal places of production being Vienna, Prague, Königgrätz, Graslitz and Schönbach.

The glass manufacture is one of the oldest industries in Austria, and is mainly concentrated in Bohemia. Its products are of the best quality, and rule the markets of the world. In the manufacture of earthenwares Austria plays also a leading part, and the porcelain industry round Carlsbad and in the Eger district in Bohemia has a world-wide reputation. The leather industry is widely extended, and is principally carried on in Lower Austria, Bohemia and Moravia. Vienna and Prague are great centres for the boot and shoe trade, and the gloves manufactured in these towns enjoy a great reputation. The manufacture of wooden articles is widespread over the country, and is very varied. In Vienna and other large towns the production of ornamental furniture has attained a great development. The industry in paper has also assumed great proportions, its principal seats being in Bohemia, Moravia, Upper and Lower Austria. Of food-stuffs, besides milling, and other flour products, the principal industry is the manufacture of sugar from beet-root. The sugar industry is almost exclusively carried on in Bohemia, Moravia, Silesia and Galicia. It has attained such large proportions that large districts in those provinces have been converted from wheat-growing districts into fields for the cultivation of beet-root. Brewing is extensively carried on, and the beer produced is of a good quality. The largest brewing establishment is at Schwechat near Vienna, and large breweries are also found at Pilsen and Budweiss in Bohemia, whose products enjoy a great reputation abroad. There were in Austria 1341 breweries, which produced 422,993,120 gallons of beer,

in 1902–1903. Distilling is carried on on a large scale in Galicia, Bukovina, Bohemia, Moravia and Lower Austria; the number of distilleries being 1257, which produced 30,435,812 gallons of spirit. Rosoglio, maraschino, and other liqueurs are made in Dalmatia and Moravia. The manufacture as well as the growth of tobacco is a government monopoly, which has 30 tobacco factories with over 40,000 work-people, the largest establishment being at Hainburg in Lower Austria. Other important branches of industry are the manufacture of chemicals, in Vienna and in Bohemia; petroleum refineries in Galicia, and the extraction of various petroleum products; the manufacture of buttons; printing, lithographing, engraving, and map-making, especially in Vienna, &c.

In 1900 the various manufacturing industries employed in Austria 3,138,800 persons, of whom 2,264,871 were workmen and 103,854 were labourers. Including families and domestic servants, a little over 7,000,000 were dependent on industry for their livelihood.

Commerce.—Austria forms together with Hungary one customs and commercial territory, and the statistics for the foreign trade are given under AUSTRIA-HUNGARY. Owing to its situation, the bulk of the Austrian trade is carried on the railways and on the inland navigable rivers. Only a small portion is sea-borne trade, while the commercial interchange between the provinces lying on the Adriatic coast is very small.

Commercial Navy.—The commercial sea navy of Austria, excluding small coasting vessels and fishing-boats, consisted in 1900 of 154 vessels, with a tonnage of 198,322 tons, of which 123 vessels with a tonnage of 183,949 were steamers. The greatest navigation company is the Austrian Lloyd in Trieste, which in 1900 employed 70 steamers of 165,430 tons. During 1900 the total tonnage of vessels engaged in the foreign trade, which entered all the Austrian ports, was 1,448,763 tons under the Austro-Hungarian flag, and 888,707 under foreign flags; the total tonnage of vessels cleared during the same period was 1,503,532 tons under the Austro-Hungarian flag, and 866,591 under foreign flags.

Government.—Austria is a parliamentary or constitutional (limited) monarchy, its monarch bearing the title of emperor. The succession to the throne is hereditary, in the order of primogeniture, in the male line of the house of Habsburg-Lothringen; and failing this, in the female line. The monarch must be a member of the Roman Catholic Church. The emperor of Austria is also king of Hungary, but except for having the same monarch and a few common affairs (see AUSTRIA-HUNGARY), the two states are quite independent of one another. The emperor has the supreme command over the armed forces of the country, has the right to confer degrees of nobility, and has the prerogatives of pardon for criminals. He is the head of the executive power, and shares the legislative power with the Reichsrat; and justice is administered in his name. The constitution of Austria is based upon the following statutes:—(1) the Pragmatic Sanction of the emperor Charles VI., first promulgated on the 19th of April 1713, which regulated the succession to the throne; (2) the Pragmatic Patent of the emperor Francis II. of the 1st of August 1804, by which he took the title of Emperor of Austria; (3) the Diploma of the emperor Francis Joseph I. of the 20th of October 1860, by which the constitutional form of government was introduced; (4) the Diploma of the emperor Francis Joseph I. of the 26th of February 1861, by which the provincial diets were created; (5) the six fundamental laws of the 21st of December 1867, which contain the exposition and guarantee of the civil and political rights of the citizen, the organization of justice, the organization and method of election for the Reichsrat, &c.

The executive power is vested in the council of ministers, at whose head is the minister-president. There are eight ministries, namely, the ministry of the interior, of national defence, of worship and instruction, of finance, of commerce, of agriculture, of justice, and of railways. There are, further, two ministries, without portfolio, for Galicia and Bohemia. The civil administration in the different provinces is carried out by governors or stadtholders (*Statthalter*), to whom are subordinate the heads of the 347 districts in which Austria was divided in 1900, and of the 33 towns with special statute, *i.e.* of the towns which have also the management of the civil administration. Local self-government of the provinces, districts and communities is also granted, and is exercised by various elective bodies. Thus, the autonomous provincial administration is discharged by the provincial committees elected by the local diets; and the affairs of the communities are discharged by an elected communal council.

The legislative power for all the kingdoms and lands which constitute Austria is vested in the Reichsrat. It consists of two Houses: an Upper House (the *Herrenhaus*), and a Lower House (the *Abgeordnetenhaus*). The Upper House is composed of (1) princes of the imperial house, who are of age (14 in 1907); (2) of the members of the large landed nobility, to which the emperor had conferred this right, and which is hereditary in their family (78 in 1907); (3) of 9 archbishops and 8 prince-bishops; and (4) of life members nominated by the emperor for distinguished services (170 in 1907). The Lower House has undergone considerable changes since its creation in 1861, by the various modifications of the electoral laws passed in 1867, 1873, 1892, 1896 and 1907. The general spirit of those modifications was to broaden the electoral basis, and to extend the franchise to a larger number of citizens. The law of the 26th of January 1907 granted universal franchise to Austrian male citizens over twenty-four years of age, who have resided for a year in the place of election. The Lower House consists of 516 members, elected for a period of six years. The members receive payment for their services, as well as an indemnity for travelling expenses. A bill to become law must pass through both Houses, and must receive the sanction of the emperor. The emperor is bound to summon the Reichsrat annually.

According to the imperial Diploma of the 26th February 1861, local diets have been created for the legislation of matters of local interest. These provincial parliaments are 17 in number, and their membership varies from 22 members, which compose the diet of Görz and Gradisca, to the 242 members which constitute that of Bohemia. They assemble annually and are composed of members elected for a period of six years, and of members *ex-officio*, namely, the archbishops and bishops of the respective provinces, and the rector of the local university.

Religion.—Religious toleration was secured throughout the Habsburg dominions by the patent of the 13th of October 1781, but Protestants were not given full civil rights until the issue of the *Protestantenpatent* of the 8th of April 1861, after the promulgation of the imperial constitution of the 26th of February. The principle underlying this and all subsequent acts is the guarantee to all religious bodies *recognized by law* of freedom of worship, the management of their own affairs, and the undisturbed possession and disposal of their property. Though all the churches are, in a sense, "established," the Roman Catholic Church, to which the sovereign must belong, is the state religion. The reigning house, however, though strongly attached to the Roman faith, has always resisted the extreme claims of the papacy, an attitude which in Joseph II.'s time resulted, under the influence of Febronianism (*q.v.*), in what was practically a national schism. Thus the emperor retains the right to tax church property, to nominate bishops, and to prohibit the circulation of papal bulls without his permission. By the concordat of August 18, 1855, this traditional attitude was to some extent reversed; but this agreement soon became a dead letter and was formally denounced by the Austrian government after the promulgation of the dogma of papal infallibility.

Of the population of Austria in 1900, 23,796,814 (91%) were Roman Catholics, including 3,134,439 uniate Greeks and 2096 uniate Armenians. There were 12,937 Old Catholics, in scattered communities, 606,764 members of the Eastern Orthodox Church, mainly in Bukovina and Dalmatia, and 698 Armenians, also mainly in Bukovina. The Protestants, who in the 16th century comprised 90 % of the population, are now only 1·9 %. In 1900, 365,505 of them were returned as belonging to the Augsburg Confession (Lutheran), 128,557 to the Helvetic (Reformed). Other Christian Confessions in Austria are Herrnhuters (Moravian Brethren) in Bohemia, Mennonites in Galicia, Lippovanians (akin to the Russian Skoptsi) in Bukovina, and Anglicans. The Jews compose 4·7 % of the population, and are strongest in Galicia, Lower Austria, Bohemia, Moravia and Bukovina. The Roman Catholic Church is divided into eight provinces, seven of the Latin rite—Vienna, Prague, Lemberg, Salzburg, Olmütz, Görz and Zara—with 23 bishoprics, and one of the Greek rite (Lemberg), with two bishoprics. The Armenian bishopric of Lemberg and the Austrian part of the archdiocese of Breslau are under the immediate jurisdiction of the Holy See. The Greek Orthodox Church has one archbishopric (at Czernowitz) and two bishoprics. There are 559 communities of the Jewish religion (253 in Galicia, and 255 in Bohemia). In 1900 there were, belonging to the Roman Catholic Church, 541 monasteries with 7775 monks, and 877 convents with 19,194 nuns; while the Greek Orthodox Church had 14 monasteries with 85 members. The Evangelical Church, according to the constitution granted by imperial decree on the 9th of April 1861 (modified by those of January 6, 1866 and December 9, 1891) is organized on a territorial basis, being

administered by 10 superintendents, who are, in their turn, subject to the Supreme Church Council (*K.K. Oberkirchenrat*) at Vienna, the emperor as sovereign being technically head of the Church. The small Anglican community at Trieste is under the jurisdiction of the Evangelical superintendent of Vienna.

Education.—The system of elementary schools dates from the time of Maria Theresa; the present organization was introduced by the education law of May 14, 1869 (amended in 1883). By this law the control of the schools, hitherto in the hands of the Church, was assumed by the state, every local community being bound to erect and maintain public elementary schools. These are divided into *Volksschulen* (national or primary schools) and *Bürgerschulen* (higher elementary schools). Attendance is obligatory on all from the age of six to fourteen (in some provinces six to twelve). Religious instruction is given by the parish priest, but in large schools a special grant is made or a teacher *ad hoc* appointed in the higher classes (law of June 17, 1888). Private schools are also allowed which, if fulfilling the legal requirements, may be accorded the validity of public primary schools. The language of instruction is that of the nationality prevalent in the district. In about 40% of the schools the instruction is given in German; in 26% in Czech; in 28% in other Slavonic languages, and in the remainder in Italian, Rumanian or Magyar. In 1903 there were in Austria 20,268 elementary schools with 78,025 teachers, frequented by 3,618,837 pupils, which compares favourably with the figures of the year 1875, when there were 14,257 elementary schools with 27,677 teachers, frequented by 2,050,808 pupils. About 88% of the children who are of school age actually attend school, but in some provinces like Upper Austria and Salzburg nearly the full 100 attend, while in the eastern parts of the monarchy the percentage is much lower. In 1900 62% of the total population of Austria could read and write, and 2·9% could only read. In the number of illiterates are included children under seven years of age. For the training of teachers of elementary schools there were in 1900 54 institutions for masters and 38 for mistresses. In these training colleges, as also in the secondary or "middle" schools (*Mittelschulen*), religious instruction is also in the hands of the Roman Catholic Church; but, by the law of June 20, 1870, the state must provide for such teaching in the event of the Protestant pupils numbering 20 or upwards (the school authorities usually refuse to take more than 19 Protestants in consequence).

Besides the elementary schools three other groups of educational establishments exist in Austria: "middle" schools (*Mittelschulen*); "high" schools (*Hochschulen*); professional and technical schools (*Fachlehranstalten* and *Gewerbeschulen*). The "middle" schools include the classical schools (*Gymnasien*), "modern" schools with some Latin teaching (*Realgymnasien*), and modern schools simply (*Realschulen*). In 1903 there were 202 *Gymnasien*, 19 *Realgymnasien* and 117 *Realschulen*, with 7121 teachers and 111,012 scholars. The "high" schools include the universities and the technical high schools (*Technische Hochschulen*). Of state universities there are eight:—Vienna, Gratz, Innsbruck, Prague (German), and Czernowitz, in which German is the language of instruction; Prague (Bohemian) with Czech; and Cracow and Lemberg with Polish as the language of instruction. Each university has four faculties—theology, law and political science, medicine, and philosophy. In Czernowitz, however, the faculty of medicine is wanting. Since 1905 an Italian faculty of law has been added to the university of Innsbruck. The theological faculties are all Roman Catholic, except Czernowitz, where the theological faculty is Orthodox Eastern. All the universities are maintained by the state. The number of professors and lecturers was about 1596 in 1903; while the number of students was 17,498.

Justice.—The judicial authorities in Austria are:—(1) the county courts, 963 in number; (2) the provincial and district courts, 74 in number, to which are attached the jury courts,—both these courts are courts of first instance; (3) the higher provincial courts, 9 in number, namely, at Vienna, Graz, Trieste, Innsbruck, Zara, Prague, Brünn, Cracow and Lemberg; these are courts of appeal from the lower courts, and have the supervision of the criminal courts in their jurisdiction; (4) the supreme court of justice and court of cassation in Vienna. The judicial organization is independent of the executive power. There are also special courts for commercial, industrial, shipping, military and other matters. There is also the court of the Empire at Vienna, which has the power to decide in case of conflict between different authorities.

Finance.—The growth of the Austrian budget is shown by the following figures:—

	1885	1895	1900	1905
Expenditure	£44,121,600	£55,396,916	£66,003,494	£74,013,000
Revenue . .	£43,714,666	£57,446,091	£66,020,475	£74,079,000

The chief sources of revenue are direct taxes, indirect taxes, customs duties, post and telegraph and post-office savings banks receipts, railway receipts, and profits or royalties on forests, domains and mining. The direct taxes are divided into two groups, real and personal; the former include the land tax and house-rent tax, and the latter the personal income tax, tax on salaries, tax on commercial and industrial establishments, tax on all business with properly audited accounts (like the limited liability companies), and tax on investments. The principal indirect taxes are the tobacco monopoly, stamps and fees, excise duties on sugar, alcohol and beer, the salt monopoly, excise duty on mineral oil, and excise duty on meat and cattle for slaughtering.

The national debt of Austria is divided into two groups, a general national debt, incurred jointly by the two halves of the Austro-Hungarian monarchy for common affairs, and is therefore jointly borne by both parts, and a separate debt owed only by Austria alone. The following table shows the growth of the Austrian debt in millions sterling:—

1885	1890	1895	1900	1905
45·	88·23	119·60	140·68	167·91

At the close of 1903 the debt of Austria was £156,724,000, an increase since 1900 of £16,044,000. This large increase is due to the great expenditure on public works, as railways, navigable canals, harbour works, &c., started by the Austrian government since 1900.

Railways.—As regards internal communications, Austria is provided with an extensive network of railways, the industrial provinces being specially favoured. This has been accomplished in spite of the engineering difficulties owing to the mountainous nature of the country and of the great financial expenses resulting therefrom. The construction of the Semmering railway, opened in 1854, for instance, was the first mountain railway built in the European continent, and marked an epoch in railway engineering. The first railway laid down in Austria was in 1824 between Budweis and Kerschbaum, over a distance of 40 m., and was at first used for horse tramway. The first steam railway was opened in 1837 over a distance of about 10 m. between Floridsdorf (near Vienna) and Wagram. From the first, the policy of the Austrian government was to construct and to work the railways itself; and in granting concessions to private companies it stipulated among its conditions the reversionary right of the state, whereby the line becomes the property of the state without compensation after the lapse of the period of concession. With various modifications, according to its financial means, it vigorously pursued its policy, by both building railways itself, and encouraging private companies to build. In 1905 the total length of railways in Austria was 13,590 m., of which 5017 m. belonged to and were worked by the state, and 3359 m. belonged to private companies, but were worked by the state.

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